Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 22 January 2020

Case Number: T 0476/15 - 3.2.05

Application Number: 06253009.2

Publication Number: 1731810

IPC: F16K27/02, F16K37/00, F16K1/22, B64D37/32

Language of the proceedings: EN

Title of invention:
Shrouded valve apparatus and related methods

Patent Proprietor:
The Boeing Company

Opponents:
Airbus Operations Limited/Airbus SAS/Airbus Operations SAS/Airbus Operations GmbH/Airbus Operations SL

Relevant legal provisions:
EPC Art. 123(2)
EPC 1973 Art. 56, 83

Keyword:
Amendments - allowable (yes)
Sufficiency of disclosure (yes)
Inventive step (yes)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 0476/15 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 22 January 2020

Appellants: (Joint opponents)

Airbus Operations Limited
Pegasus House, Aerospace Avenue, Filton
GB-Bristol BS34 7PA

Airbus SAS
1, Rond Point Maurice Bellonte
FR-31707 Blagnac cedex

Airbus Operations SAS
316 Route de Bayonne
FR-31060 Toulouse

Airbus Operations GmbH
Kreetslag 10
DE-21129 Hamburg

Airbus Operations SL
Avenida de John Lennon S/N, Getafe
ES-28906 Madrid

Representative:

Ribeiro, James Michael
Withers & Rogers LLP
4 More London Riverside
London SE1 2AU (GB)

Respondent: (Patent Proprietor)

The Boeing Company
100 North Riverside Plaza
Chicago, IL 60606-1596 (US)

Representative:

Boult Wade Tennant LLP
Salisbury Square House
8 Salisbury Square
London EC4Y 8AP (GB)

Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted on 5 January 2015 concerning maintenance of the European Patent No. 1731810 in amended form.**

Composition of the Board:

Chairman M. Poock
Members: T. Vermeulen
T. Karamanli

Summary of Facts and Submissions

I. The joint opponents lodged an appeal against the interlocutory decision of the opposition division that European patent No. 1 731 810 as amended according to auxiliary request 7 submitted during the oral proceedings before the opposition division met the requirements of the European Patent Convention.

II. The opposition had been filed against the patent as a whole on the basis of Article 100(a) (lack of novelty and lack of inventive step), 100(b) and 100(c) EPC 1973.

III. In the appeal proceedings the parties essentially relied on the following documents:

A1 US 2 649 769 ;

A6 Advisory Circular 25-8 "Auxiliary Fuel System Installations", dated 1986, US Department of Transportation, Federal Aviation Administration, pages I-VI and 1-24;

A7 US 2004/0026922 A1;

A10 US 5 947 151.

IV. Oral proceedings before the board were held on 22 January 2020.

V. The appellants (joint opponents) 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 (main request).

VI. Claim 1 of the main request, which corresponds to auxiliary request 7 underlying the decision under appeal, reads (the feature numbering used by the board is introduced in square brackets):

"[**F1**] An aircraft fuel system having a shrouded valve apparatus (110), the shrouded valve apparatus comprising: [**F2**] an outer conduit (114); [**F3**] an inner conduit (112) disposed within the outer conduit, the inner conduit (112) including an inner lumen (116); [**F4**] a valve member disposed in the inner conduit (112) and operable to regulate flow through the inner conduit (112); and [**F5**] an actuator (118) for actuating the valve member; wherein: [**F6**] the shrouded valve apparatus (110) includes two shrouded end fittings (122) for connecting the shrouded valve apparatus (110) to shrouded end fittings of fluid-conducting apparatus, both shrouded end fittings (122) holding the inner conduit (112) substantially stationery [*sic*] with respect to the outer conduit (114); characterised in that [**F7**] each shrouded end fitting (122) includes an inner portion and an outer portion separated by a spaced distance, the outer portion including an end fitting flange that defines a plurality of holes for receiving mechanical fasteners; each shrouded end fitting (122) includes a plurality of spokes, webs or fins that are disposed between the inner and outer portions; [**F8**] the shrouded valve apparatus (110) is fabricated by joining two parts (160,164) of the outer conduit (114) together to form a further flange which has holes (172) via which the parts (160,164) are bolted or screwed together; [**F9**] the actuator (118) is affixed to the inner conduit (112) of the shrouded valve apparatus (110) in a manner that prevents fluid from crossing between the inner (112) and outer (114) conduits but does not prevent fluid communication

between portions of the outer conduit (114); [**F10**] the outer conduit (114) and the actuator (118) cooperate to shroud the inner conduit (112), to contain in the outer conduit (114) any fluid leaking from the inner conduit (112); and [**F11**] the actuator (118) includes a motor that turns a shaft extending into the inner lumen (116) and into a pivot location in the inner conduit (112), the valve member being fixedly mounted on the shaft and the actuator (118) being operable to rotate the shaft and the valve member in the pivot location."

VII. The submissions of the appellants may be summarised as follows:

Amendments

The embodiment of Figure 2, on which the added feature F8 was based, required that the actuator 118 passed through the further flange. The omission of this further information from the amended claim amounted to an unallowable intermediate generalisation. Feature F8 also required that the two parts 160 and 164 corresponded to the outer conduit 114. There was, however, no mention anywhere in the application as filed that the outer conduit, as distinct from the valve apparatus as a whole, was formed in two parts.

Several of the features added to claim 1 were only based on examples other than that shown in Figure 2, which was however the only embodiment of the invention. Such amendments were not in accordance with the invention. In particular, the wording of feature F6 was only originally disclosed in the context of the example of Figure 1. Moreover, original claim 6 referred to "configured to interfit" rather than to "connecting" used in feature F6.

Similarly, feature F11 was taken from the description of Figure 4, which was not in accordance with the invention. In the context of Figure 2, no further details of the valve member were described. It was evident from the difference in shape of the actuators depicted in Figures 2 and 4 that the actuator of Figure 4 could not be used with the embodiment of Figure 2.

Sufficiency of disclosure

The interface between the actuator and the further flange of Figure 2 created an interface with a complex shape, for which the skilled person would not know how to provide a seal. In particular, the skilled person would be confronted with the complex problems of how to provide a fuel-tight seal at the horizontal interfaces between the actuator and the inner and outer conduits, how to provide a fuel-tight seal at the vertical interface between the actuator and the further flange, and how to avoid a clash between the actuator and the further flange. Three separate seals would therefore be required. Simple O-rings were not suitable. The complex interface would be difficult to weld.

Furthermore, no disclosure was found in the patent of how leaks were mitigated. Figure 4 showed the presence of a leak path between the valve shaft and the inner conduit. Fuel leaking into the actuator housing would, however, not be contained in the outer conduit, contrary to what was required by feature F10. The skilled person would not be able to find an arrangement that reconciled leaks at the valve shaft with feature F10.

Inventive Step

The invention was all about putting a known valve into a known shrouded conduit. The closest prior art was document A7 dealing with an aircraft fuel system. This choice was confirmed in the impugned decision. The embodiment of Figure 18 disclosed a joint between two shrouded fluid-conducting apparatus, schematically shown in Figure A below, each apparatus having a shrouded end fitting in accordance with feature F7.

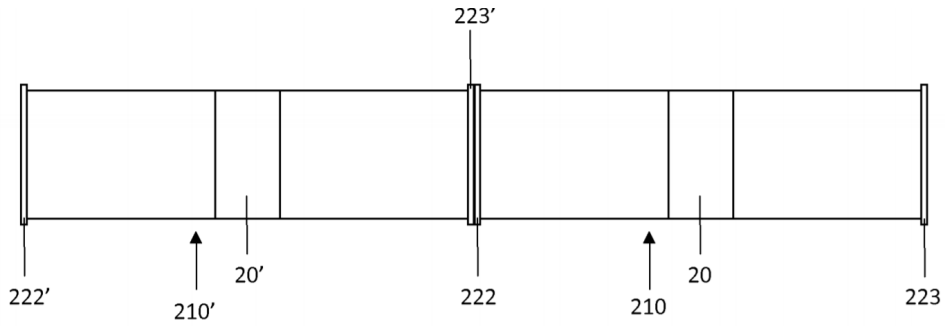

Figure A

The outer conduit had two parts joined together to form a further flange at 222/223'. In Figure 18, the fittings 222 and 223' were welded to the outer tubes 14 and 14'.

Document A7 did not disclose a valve member disposed in the inner conduit or an actuator for actuation of the valve member. The objective technical problem was to regulate the flow through the inner conduit. As document A7 already dealt with a shrouded apparatus for an aircraft fuel system, there was no need to include this in the problem.

The skilled person, who was an aircraft engineer with experience in fuel systems, would be motivated to look for a shrouded valve in view of the FAA regulations referred at in document A7. The FAA regulations related to fuel systems could be found in the Advisory Circular

according to document A6. Points b and c on pages 13 and 14 of that Circular indicated the need for shrouding fuel system valves on board of aircraft in order to contain and isolate leakage.

A shrouded valve apparatus was disclosed by document A10. This prior-art apparatus was not limited to any particular field other than applications involving hazardous materials. Its simplicity and high degree of leakage protection made it well suited for use in an aircraft fuel system and therefore compatible with document A7. The "manhole" mentioned in the background of the invention concerned the access to the apparatus rather than referring to its size.

The shrouded valve apparatus of document A10 comprised a valve member in the inner conduit and an actuator, which included the stem casing 311, affixed to the inner conduit without preventing fluid communication between portions of the outer conduit. Any fluid leaking from the inner conduit was contained in the outer conduit by the shrouding arrangement of the outer conduit and the actuator.

The skilled person knew from their common general knowledge that a motor was required for operating the valve on an aircraft, see page 14 of the Advisory Circular A6. The motor would be mounted on the inner conduit through the stem casing 311 shown in Figure 3 of document A10. Although leak paths were not explicitly mentioned in document A10, the stem casing was mounted to the inner and outer conduit in a fluid tight manner. The skilled person would design the system taking possible leakage into account. The joint of document A7 was already electrically grounded and

this document also mentioned sensors implying an electrical connection.

There would be no difficulty installing the valve of document A10 into the joint of document A7. The skilled person would have various options to its avail, either

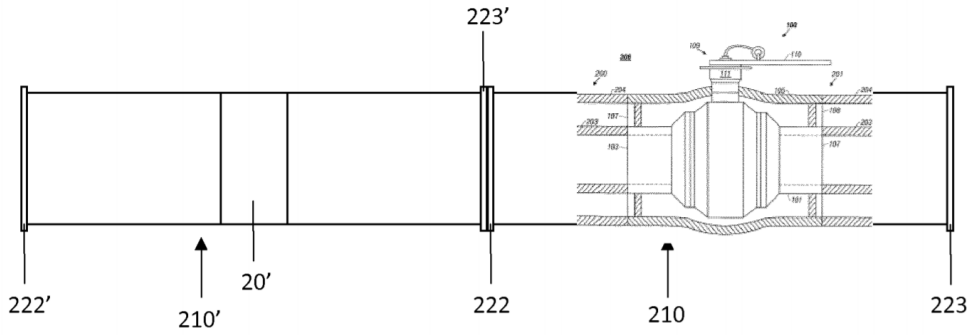

Figure B

substituting the valve for the support member 20, as depicted in Figure B above, or passing the valve actuator through the slightly modified further flange 222/223', as in Figure C below.

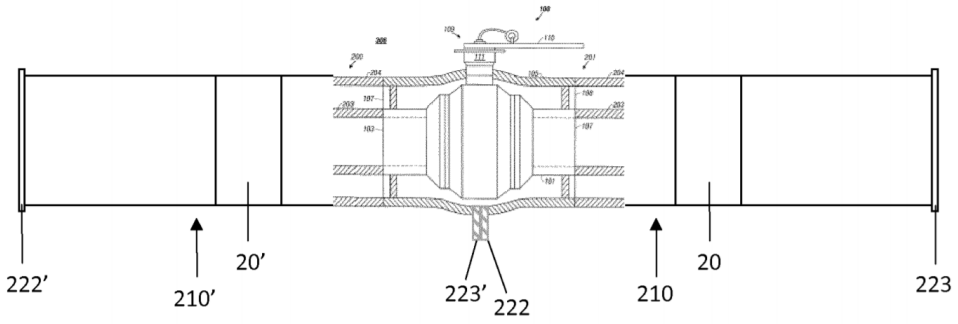

Figure C

In a variant to the option of Figure B, submitted as Figure D by the respondent,

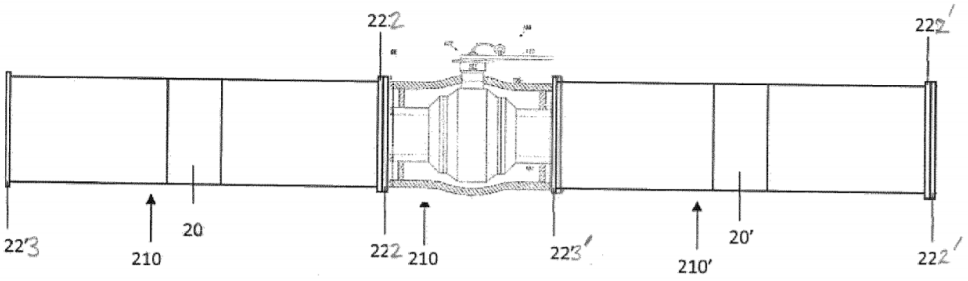

FIGURE D

the valve was attached between two shrouded pipes known from document A7.

In all of these options, both the inner and the outer conduits would be a combination of different parts rigidly connected to each other, the two shrouded end fittings holding the different parts of the inner conduit. The valve could be welded to the adjacent pipes. Even if the further flange in the centre was formed by joining end fittings, it was still a further flange.

VIII. The respondent's submissions were essentially as follows:

Amendments

In view of Figure 4, the formation of the outer conduit in two parts could not import any technical requirement for the location of the flange in Figure 2. The particular location of the flange relative to the actuator could only be derived from the drawings and was not essential in a technical sense. The outer conduit 114 was clearly shown in the shrouded valve apparatus of Figure 2 as being fabricated by joining two parts 160 and 164 together to form a further flange. The inner conduit 112 had to be a continuous, unbroken component, since no joint could be seen on its inner surface.

It was clear to the skilled person that the embodiments of Figures 1 and 2 were linked. The word "interfit" was merely a preferable feature set out in a dependent claim. The description as originally filed referred to "connect".

In the description of Figure 2, the author had not elaborated on all the features, but referred to a further description through the wording "as further specified below". This was a reference to Figure 4, because its description was the only text describing the actuation of a valve member within the inner conduit 112. Therefore, there was no incompatibility between the embodiment of Figure 2 and the description of features in the context of Figure 4. Feature F11 was *verbatim* disclosed in the specification in relation to Figure 4. The different shape of the actuators in Figures 2 and 4 did not make it impossible for the skilled person to apply the feature of Figure 4 to the actuator of Figure 2.

Sufficiency of disclosure

The objection of lack of sufficiency of disclosure required there to be serious doubts substantiated by verifiable facts. No serious doubts had been raised by the appellants. The skilled person would be familiar with all manner of means for sealing fuel lines. In particular, welding and/or gaskets would be used to adequately seal all manner of junctions between the components. Reference was made to point 1.1 of the reasons of the impugned decision. A possibility would be to first insert the shaft through the inner conduit using an O-ring, then to weld the perimeter of contact between the actuator and the inner conduit, to bring the two parts of the outer conduit together and, finally, to weld the parts along the line of contact between the parts and the actuator.

According to the established case law, the onus was on the appellants to prove the lack of sufficiency of disclosure. The skilled person would provide a seal

around the rotating valve shaft. The actuator housing was a static component removing the need for an outer seal between the outer conduit and the shaft. The important issue of the arrangement according to the patent was that fuel could not escape to the surroundings.

Inventive Step

Document A7 simply disclosed a conduit without means of controlling fluid flow through an aircraft fuel system. It therefore did not share the same purpose and required substantial structural modification. Instead, document A1 would be the better starting point.

On a strict application of the claim analysis, all features except for the aircraft fuel system provided novelty over document A7. The fluid conducting apparatus shown in Figure A submitted by the appellants merely comprised two separate outer conduits and two separate inner conduits. The end fittings each held a separate inner conduit. The centre flange was not provided by the outer conduit, but was formed by the shrouded end fittings 222 and 223', see paragraph [0087] of document A7. Feature F6 further required that the shrouded end fittings were separate from the outer conduit, which was not the case here.

The technical effects of the differences were to control the flow by closing the inner lumen, to remotely control the valve, and to provide two seals so as to meet the FAA requirements. The objective technical problem would be to allow remotely controlled regulation of flow through the inner conduit of a shrouded conduit of an aircraft fuel system. This was solved by claim 1 through the shrouded valve in the

inner lumen, through the actuator fixed to the inner conduit, by using the actuator and the outer conduit to shroud the inner conduit and to contain leaks in the outer conduit and by the further flange.

The appellants actually combined not two but three documents A7, A10 and A6 in their assessment of lack of inventive step. In aircraft, very specific requirements applied in terms of leak avoidance and remote operation (see the references to the FAA regulations in document A7). It would therefore be imperative to look for a solution in the field of aircraft. In none of the prior-art documents, however, a shrouded valve apparatus for use in an aircraft was disclosed. The skilled person would not consider the solution of document A10, where a valve was manually operated by a handle 110. Moreover, through the use of the expressions "manhole", "bolted door", "workers" and "hazardous" in document A10, a subterranean application was alluded to, making the valve of document A10 entirely unsuited for use in an aircraft. In addition, substantial amendments were necessary to what was known from document A10.

There was no need for the valve of document A10 to be motorised. Practical difficulties such as the provision of electrical power close to explosive fluids would typically be avoided. Even if the operation of the valve of document A10 was motorised, as shown in a modified Figure 3 below,

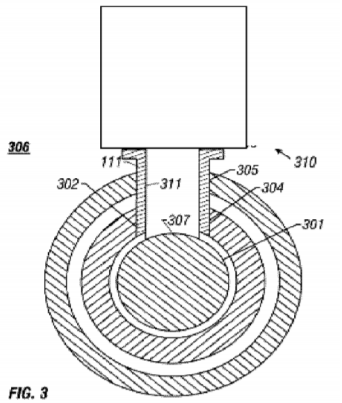

FIG. 3

the actuator would only include the motor and shaft, not the stem casing 311. The leak path leading directly from the inner lumen along the stem shaft 300 to the exterior would be detrimental to safety and would definitely not be allowed by the FAA regulations. The skilled person would not be prompted to turn to a document which deliberately provided a bore from the inner conduit to the outside. In contrast, the patent provided a sealing between the actuator and the outer conduit. Both were used to shroud the inner conduit, corresponding to what was required for the shrouded conduit of document A7 (cf. paragraph [0040]).

The options of combining the documents A7 and A10 along the lines of Figures B, C and D resulted in a system that substantially differed from the claimed subject-matter. Figure B basically described a shrouded valve apparatus connected to a shrouded fluid conducting apparatus. Figure C depicted a shrouded valve section between two shrouded fluid conducting apparatus. No reason was given why the skilled person would opt for this solution, where the added flanges 222 and 223' interfered with the rotation of the handle member 110. The connection in Figure D was not realistic, since document A10 proposed to join dual containment pipes through butt-welding, i.e. without the need for a further flange.

Reasons for the Decision

1. Amendments

1.1 Feature F8

The board notes that feature F8 of claim 1 has its origin in lines 18 to 20 of page 5 of the application as originally filed, where it is disclosed in the context of the detailed description of Figure 2. The drawing of Figure 2 shows two abutting flange portions at an intermediate position between the end fittings 122. The perspective view suggests that the motor housing interferes in some way with the flanged portion of the first part 160 of the outer conduit. Whether this flanged portion is interrupted at the side walls of the motor housing or passes through a recess in the housing cannot be inferred from the drawing without ambiguity. Nor does the description reveal how the two parts 160 and 164 are mounted with respect to the motor housing. As the drawing is clearly schematic and the description fails to provide any further information on the matter, the board is not convinced that the position of the actuator with respect to the flange directly and unambiguously follows from the original application, let alone that it is closely linked to the feature F8.

In respect of the wording "two parts ... of the outer conduit" of feature F8, the board concurs with the opposition division, which reasoned on page 10 of the impugned decision that the reference signs 160 and 164 in Figure 2 "clearly refer to the outer conduit 114, which must then be made of two parts". In the drawing of Figure 2, the inner surface of the inner conduit 112

is depicted as a continuous surface, which dismisses the possibility that the inner conduit is also made of two parts.

1.2 Feature F6

The shrouded valve apparatus shown in Figure 2 only differs from that of Figure 1 in that it is fabricated by joining two parts 160 and 164 together to form a further flange, i.e. as shown in feature F8. The other features of the apparatus are identical to those of the example of Figure 1. This also follows from the exact same wording used in lines 6 to 17 of page 5, on the one hand, and in lines 17 to 25 and lines 28 to 31 of page 3, on the other hand, to describe the apparatus of Figure 2 and the apparatus of Figure 1, respectively. The description as originally filed does not contain any passage that would suggest a further difference.

The board does therefore see no reason why the wording used in lines 2 to 4 of page 4 of the description in the context of Figure 1 would not equally apply to the apparatus shown in Figure 2.

Regarding the term "connecting" adopted in feature F6, it is noted that both the original description of Figure 1 in line 29 of page 3 and the original description of Figure 2 in line 16 of page 5 use the verb "to connect" instead of "to interfit" in conjunction with the shrouded end fittings.

1.3 Feature F11

The wording of feature F11 is taken *verbatim* from lines 15 to 19 of page 6 of the description as originally filed.

It is clear from the application as a whole that the cross-sectional view of Figure 4 serves to illustrate some constructional details of the shrouded valve apparatus, which are purposively left out from or which cannot be seen in the perspective views of the other figures. In particular, Figure 4 illustrates the arrangement and the operation of the valve member in the inner conduit, as well as some constructional details of the end fittings.

The board is in agreement with the respondent that these details apply not only to the apparatus shown in Figure 3, but also to the apparatus shown in Figures 1 and 2. This follows from the wording "As further described below" in line 10 of page 5 of the description as filed, which establishes a direct link to the description on page 6 of the valve actuator and the valve member shown in Figure 4. The board fails to see why the difference in shape of the motor housing (prismatic in Figures 1-2 vs. cylindrical in Figures 3-4) would alter this conclusion, especially since the arrangement and the operation of the valve member in the inner conduit according to feature F8 would not be affected by the shape of the motor housing.

1.4 Hence, the patent is not amended in such a way that it contains subject-matter which extends beyond the content of the application as filed (Article 123(2) EPC).

2. Sufficiency of disclosure

2.1 The appellants objected that the assembly of the aircraft fuel system in line with feature F8 and as

shown in Figure 2 of the patent would result in a complex interface for which the skilled person would not know how to provide a seal.

The board has no doubt that the person skilled in the art of mechanical engineering would be able to come up with a solution for sealing the interface between the actuator housing and the outer conduit, even when a further flange would interfere therewith, be it by providing three separate seals as proposed by the appellants or by welding the different components together (cf. point 1.1 of the reasons of the impugned decision). Concretely, the board is satisfied that the skilled person would come up with the solution submitted by the respondent: the valve shaft is first inserted through an aperture in the inner conduit where it is sealed by an O-ring, the actuator is then welded onto the inner conduit before joining the two parts of the outer conduit together and welding them along the line of contact between the parts and the actuator.

In consequence, the board concludes that the appellants' first objection of insufficiency of disclosure is unfounded.

2.2 A further objection was raised in respect of feature F10 and a possible leak path along the valve shaft.

From the very schematic drawing of Figure 4 of the patent it would appear that the valve shaft 310 extends through the wall of the inner conduit 312 into the housing of the actuator 260. Leakage of fuel along the shaft into the actuator housing must be prevented. The person skilled in the art knows that this can typically be achieved by providing a seal at the interface

between the shaft and the inner conduit and/or between the shaft and the opening in the actuator housing.

In view of the wording used in feature F9 ("prevents fluid from crossing between the inner (112) and outer (114) conduits") the board understands the phrase "to contain in the outer conduit (114) any fluid leaking from the inner conduit (112)" in feature F10 to refer to fuel that has leaked from the inner conduit into the annular space between the inner and the outer conduits. Any fuel leaking from the inner to the outer conduit is held within the outer conduit. That is the very purpose of a shrouded fluid-conducting apparatus.

Contrary to the assertion of the appellants, feature F10 does therefore not concern fuel that has leaked between the valve shaft and the inner conduit into the actuator housing.

2.3 The invention is therefore disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 83 EPC 1973).

3. Inventive Step

3.1 Starting point

The selection of document A7 as closest prior art by the appellants was rebutted by the respondent, who put forward document A1 as the most appropriate starting point.

Document A1 is a patent publication dated 1953, which concerns what appear to be bulky subterranean or

submarine valves regulating flow through an inner conduit. The board does not share the view of the respondent that such a shrouded valve apparatus would be a realistic starting point when assessing the inventive step in respect of a fuel system for an aircraft.

Document A7, on the other hand, combines the purpose of safely transporting fuel through ignition zones in aircraft - similarly to paragraph [0002] of the patent - with several structural similarities (dual containment pipe, end fittings with flanges, spokes).

The board therefore concurs with the appellants that document A7 is an appropriate starting point for assessing inventive step.

3.2 Differences

There is no dispute between the parties that document A7 fails to disclose a valve member and an actuator for actuating the valve member.

The appellants are nevertheless in disagreement with the respondent on the question whether the assembly of two inner and two outer conduits in the shrouded fluid-conducting joint disclosed in document A7 can be considered to comprise an inner and an outer conduit in the sense of claim 1.

The board finds the approach taken by the appellants credible. The result of assembling two shrouded fluid-conducting apparatus of the type shown in Figure 17 of document A7 will still be a shrouded fluid-conducting apparatus. In the same way as the outer conduit defined in feature F2 is made of two parts in feature F8, the

claim wording does not exclude that the inner conduit is made of several parts. The joint shown in Figures 18, 21 and 22 of document A7 and schematically illustrated by the appellants in Figure A therefore discloses a shrouded fluid-conducting apparatus with an inner and an outer conduit. At each of its opposite ends, the joined fluid-conducting apparatus has a shrouded end fitting 222'/223. Through their connection with portions 12/12' of the inner conduit and with portions 14/14' of the outer conduit, the shrouded end fittings hold the inner conduit substantially stationery with respect to the outer conduit.

The respondent's argument that the further flange 222/223' depicted in Figure A (cf. reference sign 284 in Figures 18 and 22 of document A7) is not formed by two parts of the outer conduit cannot be followed. According to paragraphs [0092], [0093], [0103] and [0104] of document A7, the fittings 222 and 223' are welded to the respective parts 14 and 14' of the outer conduit (see also the reference signs 272 and 281' in Figure 21). The act of joining the two parts 14 and 14' together therefore forms the further flange.

In view thereof, the subject-matter of claim 1 differs from the aircraft fuel system shown in Figures 18 and 22 of document A7 by a valve member disposed in the inner conduit and by an actuator for actuating the valve member having the features F9 to F11.

3.3 Objective technical problem

The technical effect of disposing a valve member in an shrouded inner conduit and operating the valve member through a shaft driven by an actuator affixed to the inner conduit is that the flow through the inner

conduit of the fluid-conducting apparatus is easily controlled, cf. paragraphs [0003], [0013], [0016] and [0020] of the patent.

The board does not agree with the respondent that the motorisation of an actuator is necessarily linked to a remote control. The incorporation of the field of application ("aircraft fuel systems") in the formulation of the objective technical problem, on the other hand, is considered to be necessary to reflect the stringent requirements potential solutions have to meet.

The objective technical problem is therefore to regulate the flow through the shrouded inner conduit of an aircraft fuel system.

3.4 Obviousness

3.4.1 Common general knowledge - document A6

Dual containment conduits are widely known in the prior art and are used whenever extensive protection against leakage is required. A person skilled in the art of aeronautical engineering is aware of the airworthiness standards prescribed by the Federal Aviation Administration (FAA). This includes the so-called Advisory Circulars, of which document A6 is an example. In point b on page 13 of document A6 it is emphasised that "*Tanks, line fittings, connections and other components, such as valves ... must be shrouded or provided with redundant barriers such that leaks from any of these sources will not present a fire hazard*" and that "*The system should be capable of containing and isolating any leakage*". According to point c on page 14, "*Valves and other components, unless otherwise*

protected, can have possible leak paths through shafts and at control motor or solenoid connections or seals in addition to their line connections, and should be completely shrouded".

In view thereof, it belongs to the common general knowledge in the technical field of aircraft fuel systems that components such as valves are shrouded for safety reasons. Consequently, the board shares the view of the appellants that the person skilled in the art faced with the objective technical problem will be prompted to install a valve in the shrouded aircraft fuel system known from document A7 and schematically represented in Figure A.

In order to establish how the valve would be implemented in the existing fluid conducting apparatus, the appellants have referred to document A10.

3.4.2 Document A10

It is in dispute between the parties whether the content of document A10 would be consulted by the skilled person who strives to solve the objective technical problem.

At first glance, the apparent size of the prior-art valve and the operating handle seen in Figures 1 to 3 of document A10 would make it less appropriate for use on an aircraft. The appellants, on the other hand, convincingly argued that no field of application was mentioned in the document other than the flow of hazardous materials.

The board agrees with the appellants that the expressions "manhole" and "bolted door" in the

'Background of the Invention' section can be understood in a metaphorical sense as general means for accessing the shrouded valve. Furthermore, the particular emphasis on leakage protection throughout the description urges on the skilled person to have a closer look at the content of document A10.

According to Figure 1 of document A10, a valve assembly 109 is installed in a dual containment conduit so that the flow of fluid through the inner conduit 101 is regulated. Figure 3 is a view of a cross-section taken along line A-A in Figure 1. A valve member 301 is disposed in the inner conduit 101 to regulate the flow through the inner conduit. It is fixedly mounted on a shaft 300 that extends to the exterior through a first aperture 304 in the inner conduit and through a second aperture 305 in the outer conduit. An operating handle 110 is secured to the top end of the shaft and acts as the valve actuator. A stem casing 111 is welded at its perimetry to the inner and outer conduits and encloses the apertures 304 and 305, allowing the rotary movement of the shaft therein. The stem casing prevents fluid from crossing between the inner and outer conduits but does not prevent fluid communication between portions of the outer conduit.

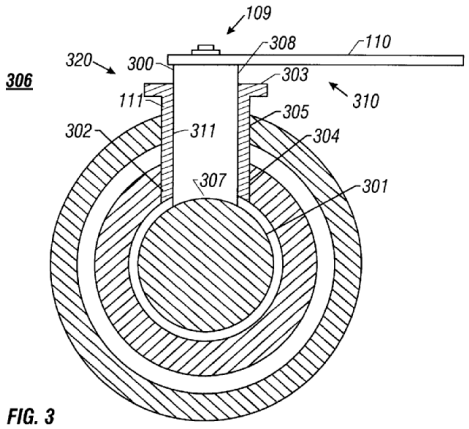

FIG. 3

The board concurs with the respondent that a shrouded valve of this type exhibits potential leakage paths that cannot be reconciled with the safety requirements of an aircraft fuel system. The person skilled in the art will realise without undue effort that the vertical bore in the stem casing 311 allows fluid from the inner

conduit to leak directly to the exterior. This aspect is all the more important as it is at the core of what document A10 aims to achieve: a quick and easy access to the valve (column 1, line 60, to column 2, line 15).

In contrast, fuel conducting apparatus in ignition zones on aircraft are strictly required to be completely shrouded (cf. document A6 and paragraph [0040] of document A7) in order to avoid leakage to the exterior. The incongruity between these requirements will dissuade the skilled person from implementing a shrouded valve of the type disclosed in document A10 in the fluid conducting apparatus of document A7.

This would not be any different if the operating handle of document A10 were replaced by a motor, in accordance with feature F11. The respondent has visualised in a modified Figure 3 how such an arrangement would look like: the motor housing would sit on top of the flanged end 303 of the stem casing 311. Even seals arranged around the shaft and between the motor housing and the flanged end would not undo the direct connection between the inner conduit and the exterior.

The board wishes to remark that it is the stem casing 311 that is responsible for preventing fluid from crossing between the inner and the outer conduits, not the actuator of the modified Figure 3, which is supported by the stem casing at a position exterior of the outer conduit. Moreover, the actuator does not actually cooperate with the outer conduit to shroud the inner conduit. This means that, in the unlikely event that the skilled person would opt to implement the shrouded valve of document A10 (with added actuator) in the fluid conducting apparatus of A7, features F9 and F10 would still be lacking.

In summary, the appellants have not persuaded the board that the person skilled in the art would apply the teaching of document A10 in order to solve the objective technical problem posed. Furthermore, even if documents A7 and A10 were combined, this would not result in the claimed subject-matter.

3.5 In view of the above, the subject-matter of claim 1 involves an inventive step (Article 56 EPC 1973).

4. Since none of the appellants' objections against the present patent as amended applies, the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

N. Schneider M. Poock

Decision electronically authenticated