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Datasheet for the decision of 15 December 2022

Case Number: T 0218/20 - 3.2.04

Application Number: 12160237.9

Publication Number: 2500552

IPC: F02C9/26, F02C7/236

Language of the proceedings: EN

Title of invention:
Dual pump fuel flow system for a gas turbine engine and method of controlling

Patent Proprietor:
Hamilton Sundstrand Corporation

Opponent:
Safran Aircraft Engines

Headword:

Relevant legal provisions:
EPC Art. 84, 123(2), 56
RPBA 2020 Art. 12(2), 12(4)

Keyword:
Claims - lack of clarity after amendment (no)
Amendments - intermediate generalisation
Inventive step - non-obvious alternative
Amendment to case - reasons for submitting amendment in appeal proceedings (yes) - procedural economy

Decisions cited:

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 0218/20 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 15 December 2022

Appellant: (Opponent)	Safran Aircraft Engines 2 boulevard du Général Martial Valin 75015 Paris (FR)
Representative:	Cabinet Beau de Loménie 158, rue de l'Université 75340 Paris Cedex 07 (FR)
Respondent: (Patent Proprietor)	Hamilton Sundstrand Corporation One Hamilton Road Windsor Locks, CT 06096-1010 (US)
Representative:	Dehns St. Bride's House 10 Salisbury Square London EC4Y 8JD (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 27 November 2019 concerning maintenance of the European Patent No. 2500552 in amended form.**

Composition of the Board:

Chairman	A. de Vries
Members:	S. Hillebrand
	T. Bokor

Summary of Facts and Submissions

I. The appeal was filed by the Opponent against the interlocutory decision of the Opposition Division finding that the patent in suit in an amended form according to auxiliary request 2 met the requirements of the EPC.

In particular, the Opposition Division held that the subject-matter of claims 1 and 10 did not extend beyond the content of the application as filed and involved an inventive step.

II. In a communication pursuant to Rule 15(1) RPBA, the Board gave a preliminary opinion on the relevant issues.

III. On 15 December 2022 oral proceedings were held before the Board in the form of a videoconference.

IV. The Appellant requests that the decision under appeal be set aside and that the European patent No. 2500552 be revoked, and the reimbursement of the appeal fee.

The Respondent (Proprietor) requests as main request that the patent be maintained in amended form according to the fourth auxiliary request, in the alternative according to the fifth auxiliary request, or according to one of first to third auxiliary request in that order, all requests filed or re-filed with letter of 5 August 2020.

V. The independent claims of the main request (fourth auxiliary request) read as follows, amendments with regard to the version upheld highlighted by the Board:

1. "A fuel flow system (10) for a gas turbine engine, the system comprising: nozzles of a combustion chamber;
a first pump (20) connected to an actuator and the nozzles by a main fuel flow path (12c) formed between the first pump, the actuator and the nozzles;
a second pump (30) in parallel with the first pump and connected to the main fuel flow path for supplementing fuel flow from the first pump;
a check valve (32) connected between the second pump and the main fuel flow path, wherein the check valve is arranged to open when the pressure of the fuel from the second pump is equal to or greater than the pressure of the fuel from the first pump;
a fuel-oil heat exchanger (16) disposed upstream from the first pump and the second pump;
a boost pump (14) disposed upstream of the fuel-oil heat exchanger;
a filter (18) disposed downstream of the fuel-oil heat exchanger and upstream of the first pump and the second pump;
a minimum pressure and shut off valve (28) configured to regulate a discharge pressure of the first pump above an inlet pressure of the first pump;
a bypass loop (36) connected to the first pump and the second pump for recycling excess fuel from the first pump and excess fuel from the second pump back to inlets of the first and second pumps and downstream from the heat exchanger;
a metering valve (26) downstream of the first and second pumps, and upstream from the nozzles; and
a dual window valve (24) comprising:
a housing having a high pressure side (40), a low pressure side (42), a first inlet annulus (56) connected to the first pump, a first outlet annulus (64) connected to the bypass loop, a first flow passage

(66) connected between the first inlet annulus and the first outlet annulus, a second inlet annulus (58) connected to the second pump, a second outlet annulus (70) connected to the bypass loop, and a second flow passage (72) connected between the second inlet and the second outlet;
a spool (44) slidably received within the housing and having a high pressure end (44a) proximate the high pressure side of the housing, a low pressure end (44b) proximate the low pressure side of the housing, a first metering edge (48), and a second metering edge (50), wherein the first inlet annulus of the housing and the first metering edge of the spool define a first window (24a), and wherein the second inlet annulus of the housing and the second metering edge of the spool define a second window (24b); and
a spring (60) disposed between the low pressure side of the housing and the low pressure end of the spool; wherein the metering valve is in communication with the second pump when the second window is restricted."

9. "A method for controlling a fuel flow system (10) for a gas turbine engine, the method comprising the steps of:
passing a fuel flow through a boost pump (14);
passing ~~a~~ the fuel flow through a fuel-oil heat exchanger (16) downstream of the boost pump;
passing the fuel flow through a filter (18) downstream of the fuel-oil heat exchanger;
dividing the fuel flow downstream from the ~~fuel oil heat exchanger~~ filter between a first pump (20) and a second pump (30);
directing a first portion of the fuel flow from the first pump to an actuator;
directing a second portion of fuel flow from the first pump through a main fuel flow path (12c) to a metering

valve (26), a minimum pressure and shut off valve (28) and nozzles of a combustion chamber disposed downstream from the metering valve and minimum pressure shut off valve, wherein the metering valve is downstream from the first and second pumps;
selectively directing a third portion of the fuel flow from the first pump through a bypass loop (36) to inlets of the first and second pumps downstream from the heat exchanger;
selectively directing a first portion of the fuel flow from the second pump through the metering valve and to the nozzles by opening a check valve (32) connected between the second pump and the metering valve when fuel flow from the second pump has a pressure equal to or greater than fuel flow from the first pump; and
selectively directing a second portion of the fuel flow from the second pump through the bypass loop to the inlets of the first and second pumps downstream from the heat exchanger;
~~wherein the metering valve is downstream from the first and second pumps and upstream from the nozzles;~~ and
wherein the fuel flow system comprises a dual window valve (24) comprising:
a housing having a high pressure side (40), a low pressure side (42), a first inlet annulus (56) connected to the first pump, a first outlet annulus (64) connected to the bypass loop, a first flow passage (66) connected between the first inlet annulus and the first outlet annulus, a second inlet annulus (58) connected to the second pump, a second outlet annulus (70) connected to the bypass loop, and a second flow passage (72) connected between the second inlet and the second outlet;
a spool (44) slidably received within the housing and having a high pressure end (44a) proximate the high pressure side of the housing, a low pressure end (44b)

proximate the low pressure side of the housing, a first metering edge (48), and a second metering edge (50), wherein the first inlet annulus of the housing and the first metering edge of the spool define a first window (24a), and wherein the second inlet annulus of the housing and the second metering edge of the spool define a second window (24b); and
a spring (60) disposed between the low pressure side of the housing and the low pressure end of the spool; and wherein the selective directing of the first portion of the fuel flow from the second pump through the metering valve and to the nozzles occurs when the second window is restricted."

VI. In the present decision, reference is made to the following documents:

O1: EP 1 329 617 A2
O3: EP 1 557 546 A1
O5: EP 1 715 161 A2
O6: EP 0 391 610 A1.

VII. The Appellant's arguments can be summarised as follows:
The auxiliary requests, in particular the new main request, should not be admitted as they should have been filed earlier and were not prima facie allowable.
Claim 1 according to the main request was not clear and its subject-matter extended beyond the content of the application as originally filed due to an intermediate generalisation. It did also not involve an inventive step. All objections applied correspondingly to the method of claim 9. The appeal fee should be reimbursed because of a substantial procedural violation, i.e. a lack of reasoning in the decision under appeal.

The Respondent's arguments can be summarised as follows:

The main request (former fourth auxiliary request) represented a reaction to a number of objections raised by the Appellant in their appeal, because the Opposition Division has not followed them. Amended claims 1 and 9 of the main request complied with the provisions of the EPC. The objections with regard to inventive step were based on hindsight.

Reasons for the Decision

1. The appeal is admissible.

2. **The patent and its technical background**

The patent deals with a fuel system for a gas turbine, which delivers fuel to nozzles in a combustion chamber, but wherein fuel is also employed to cool oil for various components like bearings. Consequently, it is not desirable that the fuel itself reaches high temperatures, because this affects its cooling capacity. However, this might occur if a single main fuel pump stage is used for delivering fuel at all flight conditions, all the more when also (hydraulic) actuators are driven by fuel pressure. This is because the main stage has to be sized to meet maximum fuel requirements such as during start, whereas during all other operating conditions, excess fuel has to be recycled back or "bypassed" to the low pressure side of the pump stage, increasing the temperature of the fuel and wasting pump capacity. Solutions with two parallel pumps of different configuration have already been proposed in O1 and O3 to mitigate these disadvantages. The invention as defined in claim 1 attempts to

increase the amount of heat rejectable from oil to fuel by means of a specific dual window valve in the bypass loop for regulating excess fuel flow from both pumps.

3. **Main Request - Admission**

3.1 The main request was filed as fourth auxiliary request together with the Respondent's reply to the appeal. Its admission to the proceedings is therefore subject to the discretion of the Board under Articles 12(2) and 12(4) RPBA. The Board has indicated in point 2.1 of its communication according to Article 15(1) RPBA that it was inclined to admit the fourth auxiliary request for the following reasons:

"*The Appellant requests non-admittance of auxiliary requests 1 - 5 filed with the reply to the appeal under Article 12(6) RPBA.*

Auxiliary requests 1 - 5 are said to be in response to new inventive step objections first raised in the oral proceedings before the Opposition Division. As the Opposition Division was not convinced by these or any other objections, there was no need at the oral proceedings to file any further auxiliary requests to those already on file. With the response to the appeal the Respondent has availed themselves of the first opportunity to now respond to these attacks. As such these requests seem to be fair and appropriate reactions to these attacks. Therefore they appear justified in the sense of Art 12(4) RPBA. The Board therefore intends to admit them to the appeal proceedings in exercising its discretion under Article 12(2), (4) RPBA."

3.2 The Appellant did not wish to comment further on the Board's provisional opinion on admission in writing or during oral proceedings. They argued, however, that the main request should not be admitted since changing the original order of the requests at the beginning of the oral proceedings, in particular promoting the original fourth auxiliary request to main request, represented an amendment falling under the provisions of Article 13 RPBA. Moreover, the subject-matter of the independent claims according to the new main request was not clearly allowable, because the amendments failed to resolve all issues raised by the Appellant. The new order of requests also resulted in non-converging requests, given that the lower ranking requests now had broader independent claims than higher ranking ones.

3.3 The Board is unconvinced. In particular it does not see how merely changing the order of requests that were all filed as early as possible in the appeal, and which the parties and the Board have had ample opportunity to consider, should mean that the much stricter provisions of Article 13 RPBA must now apply for their admission. In this case the subject of the proceedings and the issues raised have clearly not changed. Indeed, promoting a lower, more limited request to main request may benefit procedural economy: if the newly promoted request is held allowable, issues raised against previously higher requests will become moot. If not, it may (at worst) mean that the same issues will have to be discussed, possibly in a different order. The lack of convergence of the remaining now lower ranking auxiliary requests with the present request can play no role in the admission of the higher-ranking request. This may at most be an issue for the admission of the lower-ranking requests, which need not be decided yet.

From the above it follows that the relevant provisions for admission remain those of Articles 12(2) and 12(4) RPBA. Thus, the criteria mentioned in Article 13 RPBA, such as that of clear allowability, do not apply.

3.4 For the above reasons the Board decides to admit the main request (former fourth auxiliary request) under Article 12(2), (4) RPBA.

4. **Main request - clarity**

4.1 Original claim 1 contained the feature that the first pump (20) was "connected to an actuator", a main fuel flow path (12c) being formed between the first pump "and the actuator". These actuator features had been omitted in claim 1 as upheld and were re-introduced into claim 1 of the main request.

According to the Appellant, the re-introduction gives rise to a clarity problem since it was not clear to the skilled person whether the actuator was or was not part of the claimed fuel flow system.

4.2 The Board considers the skilled person to be an engineer with special knowledge of aircraft gas turbine engines and in particular their fuel delivery systems.

The fuel flow system is typically integrated between other aircraft systems, such as in the path from the fuel tanks to the combustion chamber with its nozzles and will be connected to further accessory systems such as heat exchanging loops and hydraulic actuators. There is thus no single way to define objectively clear and distinct borders of the fuel flow system. Rather, this is done on a case by case basis depending on the definition of the individual fuel flow system. In this

case the Board agrees with the Respondent that the system clearly comprises nozzles and an actuator, not only fuel paths leading to these devices. Although this is only explicitly stated for the nozzles, it can be derived in a sufficiently clear manner from the identical wording employed for both as being "connected to" the first pump by a main fuel flow path and will be understood without difficulty by the skilled reader.

4.3 Therefore the Board concludes that claim 1 complies with the requirements of Article 84 EPC.

5. **Main request - added subject-matter**

5.1 Claim 1 is based on original claims 1, 5 to 7 and 10 as well as on paragraphs [0009], [0010], [0012], [0014], [0015] disclosing the added features of the boost pump, fuel oil heat exchanger, filter, minimum pressure and shut-off valve (MPSOV) and nozzles, and on paragraphs [0029], [0030] which disclose a dual window valve.

5.2 Most of the objections raised under Article 123(2) EPC by the Appellant against claim 1 as upheld are moot in respect of claim 1 of the main request. In particular, the omission of the features defining the second pump in original claim 1 "[for supplementing fuel flow from the first pump] under certain conditions" is resolved by introduction of the check valve features and the metering valve being "in communication with the second pump when the second window is restricted". Both represent concrete examples of "certain conditions".

However, the Appellant is still of the opinion that the the actuator intoduced from original claim 1 and the nozzles in connection with the MPSOV introduced from the description are inextricably linked to the position

of the MPSOV as shown in figure 1 and derivable from paragraph [0009] as well as to its function as disclosed in paragraph [0014] of the original application. The Appellant argues that omitting these further features of the MPSOV in claim 1 leads to an intermediate generalisation.

5.3 The Board disagrees.

The minium pressure shut-off valve or MPSOV is claimed as being "configured for regulating a discharge pressure of the first pump above an inlet pressure of the first pump". Although this formulation finds its basis in paragraph [0014], lines 27 to 29, it merely states what is already apparent from figure 1 in conjunction with paragraph [0009] and what the skilled person would expect an MPSOV in a fuel system to do: ensuring that the discharge pressure of a fuel pump, in this case the first pump, is always above its inlet pressure. In order to do so it has to be located downstream of the first pump, where discharge pressure prevails as goes without saying. Since The MPSOV is not not only for maintaining a minimum pressure, but also for shut-off, i.e. for reliably shutting down a gas turbine engine by interrupting fuel flow to the nozzles, it is also always and implicitly located upstream of the nozzles. There is thus no need to explicitly mention these positions in claim 1.

Paragraph [0014] continues by specifying that the the minimum pressure is so as "to assure positive operation of the actuators against their design loads". However, it will be immediately clear to the skilled person that this further qualification must be read in the specific context of "high pressure fluid actuators" introduced in paragraph [0014], but not claimed in claim 1. Nor

does the claimed connection between first pump and actuator already imply that the actuator operates on high pressure directly delivered from the first pump. Otherwise, it will also be equally evident to the skilled person from a contextual reading of paragraph [0014] with paragraph [0009] and in the light of figure 1 that the conventional operation of the MPSOV as added to claim 1 is independent of the high pressure regime necessary for the high pressure fluid actuators of paragraph [0014]. Thus, there is no indication in figure 1 or paragraph [0009] that the fuel flow control system shown there is limited or otherwise linked to high pressure actuation, or, in its placement of the MPSOV 28, is specifically configured to ensure positive operation of the actuators against their design loads. It is indeed not clear, objectively speaking, from a purely technical point of view, what link might exist between maintaining first pump discharge pressure above its inlet pressure (or otherwise it is shut off) and allowing the actuators to operate against their design loads.

5.4 For these reasons the Board holds that the subject-matter of claim 1 does not extend beyond the content of the application as filed, Article 123(2) EPC.
This conclusion applies also for the corresponding features added to independent method claim 9. This is not disputed by the Appellant.

6. **Main request - inventive step**

6.1 The Appellant challenges inventive step for the main request starting from O3 or O5 in combination with O1 or O6 alternatively starting from O1 in combination with O3 or O5. Originally these attacks were directed against an inventive step of claim 1 as upheld, but the

latter contains essentially the same differing valve features as claim 1 of the main request. The Board had commented on these submissions as follows:

"*O1 seems to disclose in figure 1 a fuel flow system comprising:*
- nozzles of a combustion chamber (implicit within the engine ENG 72),
- a first pump 48 (main pump) and a second pump 50 (actuator pump, which supplements fuel form the first pump under certain conditions, see paragraph [0021),
- a main fuel path 66, 68,
- a fuel-oil heat exchanger 32 (IDG FOC),
- a bypass loop 70 (FUEL BYPASS FLOW, which can also join the main fuel path downstream of the fuel-oil heat exchanger 20, see paragraph [0025]),
- a metering valve 74 (MV),
- a valve 72 (PRV) for regulating the amount of excess fuel flowing into the bypass loop 70, see paragraph [0022].

O3 seems to disclose in figure 3, paragraphs [0041]-[0046] a fuel flow system comprising:
- nozzles of a combustion chamber (implicit within the engine),
- a first pump 11 and a second pump 12 (which supplements fuel from the first pump under certain conditions, see paragraph [0021),
- a main fuel path 32,
- a bypass loop 26, 13,
- a metering valve 33,
- a valve 16 (combining spill valve CSV), 145 for regulating the amount of excess fuel flowing into the bypass loop, see paragraph [0022].
CSV valve 16 has
- three windows 101, 103, 104,

- a housing having a high pressure side, a low pressure side, a first inlet connected to the first pump 11, a first outlet annulus (gallery) 101 connected to the bypass loop 26, a first flow passage connected between the first inlet and the first outlet annulus 101, a second inlet annulus 102 connected to the second pump 12, a second outlet annulus (gallery) 103 connected to the bypass loop 26, a second flow passage connected between the second inlet annulus 102 and the second outlet annulus 103, a third outlet annulus (gallery) 104 connected to main fuel flow path 32, a third flow passage connected between the second inlet annulus 102 and the third outlet annulus 104,
- a spool 19 having a first, second and third metering edge, wherein the first outlet annulus 104 and the first metering edge define the first window, the second outlet annulus 103 and the second metering edge define the second window, the third outlet annulus 104 and the third metering edge define the third window,
- a spring PS disposed between the low pressure side of the housing and a low pressure end of the spool 19.

It appears to be common ground that the subject-matter of claim 1 differs from the fuel flow system of O3 in comprising a fuel-oil heat exchanger and in that the first inlet is an annulus.
Moreover, the CSV appears to be a triple window valve, not a dual window valve as claimed. Contrary to the view of the Appellant, the Board sees a difference between the term "dual window valve" employed in claim 1 and a feature like "valve comprising (at least) two windows". The first one appears to have exactly two metering windows in contrast to the second one, which alone would also encompass the CSV.
Furthermore, as indicated by the Respondent, the windows are not defined by the inlets, but by the

outlets of the CSV.

O5 appears to show in figure 1 a fuel system similar to that of O3 and having the same differences with regard to that of claim 1.

In O6, figure 1, a fuel metering unit FMU 115 and a fuel diverter valve unit 140 appear to regulate excess fuel flow from a single main stage 113 in a bypass loop G, H which leads to a fuel conduit D downstream of a fuel-oil heat exchanger 107 (FOHE, see page 3, line 49 - page 4, line 47).
Fuel diverter valve unit 140 comprises in a diverter valve 701 a single inlet 705 connected to an outlet 706 of single main pump stage 113 and a single outlet connected to the bypass loop at 137 in figure 1, see figure 5a and page 6, lines 40-58. It also comprises a spool 716 having three edges, which define three metering windows in a fuel spill control valve 702, see figures 5c and 5d (the outlet on the left side to conduit J, FOHE INLET appears to be always fully open). Only one window seems to be at a first inlet annulus connected to the main pump stage via the fuel metering valve (FMU SPILL), but not connected to a fuel passage leading to the bypass loop H.

It appears thus that none of the documents O1, O3, O5 and O6 discloses a dual window valve as claimed. Consequently, no combination of any of these documents with any other could directly lead to the subject-matter of claim 1.

In particular, the PRV 74 of O1, figure 1 can apparently not be simply replaced by the combining spill valve 16 and poppet valve 145 of O3, which would need separate inlets from the two pumps 48, 50, not a

common one as in O1. Even when integrating these valves, this would not result in the fuel flow system as claimed for the reasons indicated in point 3.2, above.

Starting from O3 as closest prior art, changing the design of the CSV 16 so that it conforms with claim 1 does not seem to be an obvious option.
An inlet annulus does not appear to be a trivial alternative for the high pressure inlet from main fuel flow path 32 as suggested by the Appellant. The inlet serves as high pressure side of the housing acting on the high pressure end of the spool 19, a function, which an inlet annulus could hardly take over.
There seems neither to be a motivation in the cited prior art for changing the outlet window control into an inlet window control and reducing the number of metering windows to two, nor does the CSV seem to be able to fulfill its function in such a configuration.

As indicated in paragraph [0004] of O3, fuel is conventionally used as a cooling medium for other engine systems, so that the integration of a fuel-oil heat exchanger in a fuel system appears to be a conventional measure, indeed one of the reasons for keeping fuel temperature low in the fuel system. It does, however, not seem to be obvious for the skilled person to isolate the single aspect "upstream of the bypass loop" from the completely different and complicated design of O6 with its various flow paths without hindsight.

For the above reasons, the subject-matter of claim 1 according to the main request appears to involve an inventive step in the light of the cited prior art.
This seems to apply mutatis mutandis for the method of

claim 10, which also includes the dual window valve."

The Appellant refrained from further comment regarding the attacks starting from O3 and O1. The Board therefore sees no reason to depart from its provisional view for these attacks, which it hereby confirms.

6.2 At the oral proceedings before the Board the Appellant provided further arguments why the subject-matter of claim 1 would lack inventive step starting from O5. The arguments do not convince for the following reasons:

6.2.1 O5 as noted previously discloses in figure 1 a fuel flow system similar to that of O3. In more detail, see also paragraphs [0014]-[0021], that fuel flow system comprises:
- nozzles 34 of a combustion chamber,
- an actuator (fed via flow washed filter 24 and control line 28)
- a first pump 16 and a second pump 18 which supplements fuel from the first pump,
- a check valve 23
- a main fuel path 20,
- a boost pump 10,
- a filter 12,
- a minimum pressure and shut-off valve 32,
- a bypass loop (exiting on the left side of the valve 38 and joining low pressure line 14),
- a metering valve 26,
- a dual window valve 38 for regulating the amount of excess fuel flowing into the bypass comprising
- two windows,
- a housing having a high pressure (top) side, a low pressure (bottom) side, a first (top-side) inlet connected to the first pump 16, a first (upper) outlet annulus connected to the bypass, a first flow passage

connected between the first inlet and the first outlet annulus, a second (middle) inlet annulus connected to the second pump 18, a second (lower) outlet annulus connected to the bypass loop, a second flow passage connected between the second inlet annulus and the second outlet annulus
- a spool slidably received within the housing and having a (top) high pressure end proximate the high pressure side of the housing, a (bottom) low pressure end proximate the low pressure side of the housing , a first and a second metering edge, wherein the first outlet annulus and the first metering edge define the first window, the second outlet annulus and the second metering edge define the second window,
- a spring disposed between the low pressure side of the housing and the low pressure end of the spool.
- the metering valve 26 being in communication with the second pump 18 when the second window is restricted.

6.2.2 It is common ground that the subject-matter of claim 1 differs from the fuel flow system of O5 in comprising a fuel-oil heat exchanger upstream of the filter and in that the first inlet is an annulus.

With regard to the windows, the Appellant argued that these were not limited by the wording of claim 1 to openings in the housing wall the size of which was defined by the metering edge of the spool engaging the inner surface of the housing. Thus, a cavity inside the housing defined by the spool with a metering edge and by an inlet could also be qualified as "window" in the sense of claim 1.

The Board is unable to share this view because the claimed windows are not defined by any inlets but specifically by inlet *annuli*, which form ring shaped

openings or windows in the housing wall. The windows are further defined by *metering edges* of the sliding spool according to claim 1, i.e. one-dimensional lines, which might limit two-dimensional openings, but not three-dimensional cavities.

Even when applying the Appellant's interpretation, the embodiment of figure 1 of O5 would not comprise the dual window valve of claim 1. The top inlet line branching from the high pressure line 20 supplied by the first pump 16 does not "define" the upper cavity or "first window" of the valve 38, but joins it centrally. On its opposite side, this upper cavity or "first window" is defined by the top *high pressure end* of the spool, which is a claim feature clearly different from the spool's *first metering edge*. Since the size of the middle cavity, which in this interpretation would correspond then to the "second window", is invariably determined by the spool geometry in O5, it cannot be *restricted* as claimed.

The subject-matter of claim 1 therefore differs additionally from the fuel flow system according to O5 in that both windows are defined by *inlet* annuli in communication with the first and second pump, respectively, whereas in O5, both windows are defined by (upper and lower) *outle*t annuli leading to a bypass.

6.2.3 It is undisputed that a dual window valve with all features of claim 1 is not disclosed in any of the cited prior art. This was already indicated in the otherwise uncontested provisional opinion of the Board, see section 6.1 above.
The Appellant now argues that these differences would represent obvious modifications of minor constructional details of O5's dual window valve 38 that could be

realized using alternative inlets and outlets well-known to the skilled person. Thus, in order to provide an alternative valve design in O5, the first inlet could be modified into a first inlet annulus, if the housing would be closed at its high pressure top side by a cover and a stop for the spool be foreseen either at the inside of the housing cover or at the top end of the spool. O3 for example in figure 3 shows a high pressure inlet annulus 104. Metering windows could also be formed by inlet annuli instead of outlet annuli if the housing and the spool body with its metering edges would be redesigned accordingly.

6.2.4 The Board is not convinced that, apart from the inlet annulus 104 communicating with the first pump 11, O3, figure 3 suggests any of the other modifications of O5's housing and the spool (cover, stop) that would be necessary to arrive at the claimed subject-matter. Even if these further modifications were known to the skilled person, they would not apply them to the fuel system of O5. This is because its inlet and outlet annuli have specific functions, which would no longer be fulfilled if they were modified in this manner. For instance, the valve 38 has an open position, in which some fuel is allowed to pass to the bypass line, and a closed position, in which the first upper and second lower windows are closed by the spool urged upwardly by the spring, see paragraphs [0020], [0021]. The first inlet communicating with the first pump, however, always need to be open, since high pressure fuel from the first pump provides a constant control force on the high pressure end of the spool. Consequently, the first inlet cannot simply define the first metering window, which is closed in the closed position of the valve 38, instead of the first outlet in valve 38 as disclosed in O5. On the contrary, implementing the differing

features in the valve 38 would require redesigning the entire fuel flow system of O5. This goes far beyond the routine skills and knowledge of the skilled person looking for an alternative design solution for the dual window valve 38 of O5.

7. **Reimbursement of appeal fee**

7.1 In point 5 of its communication, the Board had addressed the issue of reimbursement as follows:

"*The Appellant claims that the Opposition Division did not take into account a combination of O3/O5 and O6 in their reasoning, which is therefore insufficient, Rule 111(2) EPC. This constituted a substantial procedural violation justifying the reimbursement of the appeal fee, see CLBA 2019 V.A.9.5.9.*

The Appellant appears to have presented the "reverse combination" of O3/O5 with O1 for the first time during oral proceedings. According to the minutes, pages 4, fourth paragraph, they additionally "briefly referred to O6" in this context with regard to different positions for the heat exchanger. When asked by the Chairman, whether D6 was to be considered as disclosing general knowledge, the Appellant stated that a combination of O3/O5 with O6 was "also possible for integration of the heat exchanger into the return pump" (see last paragraph on page 4 of the minutes). Apart from this statement there is no indication in the uncontested minutes that this combination was discussed at the oral proceedings in any detail.

It therefore appears that the combination O3/O5 with O6 was not substantiated at the oral proceedings. Moreover this attack appears to have only been presented as

subsidiary or even analogous to the main lines of attack, which were fully discussed at the oral proceedings and considered in detail in the decision under appeal.

Under these circumstances, it seems unreasonable to expect the Opposition Division to provide a complete reasoning on this line of attack. Indeed they were not in a position to rebut this combination as no case had been made. Such reasoning might even risk to violate the Appellant's right to be heard.

Moreover, the Opposition Division has considered O6 in the "reverse combination" of O3/O5 with O1 "on top of O3 and O1", see section 8.3.6 of the decision under appeal. They argued, why the subject-matter of claim 1 did still not involve an inventive step even when taking into account the teaching of O6. The Board is presently satisfied that this reasoning applies obviously also for a combination of O3 and O6 alone and is adequate and sufficient in view of the statement made by the Appellant during oral proceedings.

A procedural violation due to unsufficient reasoning, which would justify reimbursement of the appeal fee, does therefore not seem to have occurred in opposition proceedings."

7.2 The Appellant refrained from further comment on the provisional opinion either in writing or during oral proceedings. Accordingly, the Board sees no reason deviate from it and confirms that the requirements for reimbursement of the appeal fee according to Rule 103(1)a) EPC are not met.

8. **Conclusion**

The Board concludes that the new main request (former auxiliary request 4) meets the requirements of the EPC, in particular those of clarity, original disclosure and inventive step, Articles 84, 123(2), 56 EPC. The Respondent requests maintenance the patent according to that request, i.e. in a different amended form than that of the request upheld in the decision under appeal. Therefore the Board must set that decision aside and maintain the patent in amended form according to the main request. The Board is satisfied that the description has been properly adapted to this request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Opposition Division with the order to maintain the patent as amended in the following version:

Description:
Paragraphs 1-3,6-34 of the patent specification,
Paragraphs 4,5 filed during the oral proceedings before the Board,

Claims:
No. 1 to 12 of the main request, filed as Fourth Auxiliary Request with the reply to grounds of appeal dated 5 August 2020,

Drawings:
Figures 1,2A,2B of the patent specification.

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated