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**Datasheet for the decision
of 5 December 2022**

Case Number: T 0531/20 - 3.2.04

Application Number: 07114905.8

Publication Number: 1895123

IPC: F02C7/047, F02C7/14

Language of the proceedings: EN

Title of invention:

De-icing of turbine engine inlet and cooling of lubricant

Patent Proprietor:

GENERAL ELECTRIC COMPANY

Opponent:

Raytheon Technologies Corporation

Headword:

Relevant legal provisions:

EPC Art. 123(2)

Keyword:

Amendments - extension beyond the content of the application
as filed (yes)

Decisions cited:

Catchword:



Beschwerdekammern

Boards of Appeal

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Case Number: T 0531/20 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 5 December 2022

Appellant: GENERAL ELECTRIC COMPANY
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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
18 December 2019 concerning maintenance of the
European Patent No. 1895123 in amended form.**

Composition of the Board:

Chairman C. Heath
Members: S. Hillebrand
S. Oechsner de Coninck

Summary of Facts and Submissions

I. The appeals were filed by the Patent Proprietor and 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 (now 4) met the requirements of the EPC.

In particular, the Opposition Division held that claim 1 of auxiliary request 2 (now 4) was clear and its subject-matter did not extend beyond the content of the application as filed.

II. In a communication pursuant to Rule 15(1) RPBA dated 17 August 2022 the Board expressed the preliminary opinion that claim 1 of all requests then on file (main request and auxiliary requests 1 - 9a) did not seem to meet the requirements of Article 123(2) EPC.

III. On 5 December 2022 oral proceedings were held before the Board in the presence of all parties. At the end of the oral proceedings, the Proprietor withdrew their appeal.

IV. The Appellant (Opponent) requests that the decision under appeal be set aside and that the patent be revoked.

The Proprietor (Respondent) requests that the Opponent's appeal be dismissed and the patent be maintained in the amended form as upheld by the Opposition Division (now auxiliary request 4).

V. The independent claim according to auxiliary request 4 (as upheld by the Opposition Division) reads as follows (amendments with regard to the granted version highlighted by the Board):

A heat transfer system for a turbine engine, the heat transfer system comprising:

an annular inlet cowling (14);

a plurality of heat pipes (28), each of the plurality of heat pipes (28) having at least a section thereof disposed in contact with an interior of the annular inlet cowling (14), the heat pipes (28) being thermally coupled to a heat source, such that heat from the heat source can be transferred through the heat pipe (28) to the annular inlet cowling (14);

each of the plurality of heat pipes (28) including a generally axially-extending aft section (30), and a forward section (32), the forward sections (32) of the plurality of heat pipes (28) being disposed within the annular inlet cowling (14) in a circumferential array; ~~characterised in that~~ wherein:

the forward sections (32) have a shape conforming to the shape of the annular inlet cowling (14);

each of the plurality of heat pipes (28) further comprises a transition section (33) interconnecting the forward section (32) and the aft section (30);

wherein the transition section (33) of one or more of the plurality of heat pipes (28) extends at least partially in a circumferential direction, the

transition section (33B) being relatively long and arcuate for a heat pipe (28B) whose forward section (33B) is remote from the circumferential position of the heat source in contrast to the transition section (33A) of a heat pipe (28A) whose forward section (32A) is near to the circumferential position of the heat source."

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

D1: EP 1 760 291 A2.

VII. The Appellant's arguments can be summarised as follows: A conformity in shape of forward sections and inlet cowling is only disclosed for a specific embodiment described in paragraphs [0011] - [0016] and shown in figures 1 - 4 of the original application. Here both, the forward sections and the cross-section of the inlet cowling are U-shaped. As claim 1 includes other shapes, its subject-matter extends beyond the content of the application as originally filed.

The Respondent's arguments can be summarised as follows:

A literal basis for the "conformity"-feature added to claim 1 can be found in paragraph [0014] of the original application in general terms.

A skilled person would interpret the claimed conformity as relating to the cross-section of the inlet cowling.

Reasons for the Decision

1. The appeal is admissible.

2. The patent and its technical background

2.1 The patent deals with gas turbine engines comprising heat pipes. Heat pipes transfer heat extracted from lubricants of e.g. bearings to specific parts of the engine cowling, thereby cooling the hot lubricants and heating the cowling. The heat transferred to the cowling can be used for anti-icing, in particular at the region of air intake openings.

D1 of the Proprietor applies this working principle at the air intake of an internal splitter 44, see Fig. 1.

2.2 Granted claim 1 distinguishes three sections of a heat pipe, namely a generally axially extending aft section, a forward section disposed in the annular inlet cowling and a transition section interconnecting the aforementioned aft and forward section. The independent claim as upheld defines more specifically the relative length and curvature of transition sections depending on the distance of their associated forward sections to a heat source.

3. Interpretation of claim 1 as upheld

3.1 According to claim 1 as granted and upheld, "the forward sections (32) have a shape conforming to *the shape of the annular inlet cowling (14)*".

It is not defined in claim 1 to which shape of the inlet cowling the term "the shape" is meant to refer. The only shape of the inlet cowling explicitly mentioned in claim 1 and repeated in the above

expression is "annular". Giving the claimed features their normal meaning, the Board concludes that forward sections conforming to *the annular shape* of the inlet cowling and having thus the shape of circular sections or extending circumferentially are at least encompassed by claim 1, if not representing the most straight-forward interpretation of this feature.

- 3.2 According to the Respondent, the wording of claim 1 itself already excluded such an interpretation, because the forward sections were defined as being "disposed within the annular inlet cowling (14) in a circumferential array" and only the transition sections, not the forward sections, were explicitly said to extend "at least partially in a circumferential direction". Moreover, the term "annular" was rather meaningless in the context of a turbine engine, in which all components apart from the axial shaft were of more or less annular or ring shape. "The shape" could in claim 1 therefore only refer to a particular cross-sectional shape of the inlet cowling.

The Board can, however, readily imagine forward sections in the form of discrete circular sections, each extending over e.g. 20° and being evenly distributed within the annular inlet cowling in a clock face manner. If many components of a gas turbine were "naturally" annular, such forward sections in the form of circular sections within the annulus of the inlet cowling would also appear to be a rather "natural" option for the skilled person. The fact that a *part of* the transition sections extends in a circumferential direction as well does not appear to lead to any incompatibility of both features. Each transition section could be L-shaped with a circumferential part connecting to the forward section and a generally

axially extending part connecting to the generally axial aft section of the respective heat pipe. A similar arrangement seems for example to be shown in figures 2 and 4 of D1.

- 3.3 The Respondent argues further that an interpretation of claim 1 in the light of the description excluded forward sections conforming to the annular shape of the inlet cowling. Since D1 was cited as prior art in paragraph [0008] of the patent, it was clear that only different heat pipes than disclosed in D1 with differently arranged sections should be encompassed by claim 1. From the disclosure of the patent as a whole it could be derived that the forward sections 32 extended *in contrast to* the other sections neither in a generally circumferential direction (as did the transition sections 33), nor in a generally axial direction (as did the aft sections 30), but conforming to the cross-sectional shape of the inlet cowling.

Albeit the definition of the inlet cowling's shape in claim 1 is broad and general, it does not lack clarity. The Board does therefore not see any necessity to fall back on the description in order to enable a technically meaningful interpretation of the feature in question. Moreover, paragraph [0008] of the patent cites D1 in a rather general way as relating "to a method and apparatus using localized heating for laminar flow" without indicating any specific "shortcomings ... addressed by the present invention" according to paragraph [0009]. This does not allow to draw any conclusion on any claimed feature. All further aspects of the three heat pipe sections invoked by the Respondent appear to solely emanate from the description of specific embodiments in conjunction with the figures, not from a general teaching of the

patent specification. They can thus hardly lead to an interpretation of the feature "the shape of the annular inlet cowling" in claim 1 which is more restricted than its literal meaning. This appears to be corroborated by the statement in paragraph [0029] of the patent, according to which the description of the embodiments is only illustrative and not limiting the invention, which is defined by the claims.

4. **Claim 1 as upheld - extended subject-matter**

- 4.1 In the Respondent's view, the "conformity"-feature added to claim 1 has a clear and literal basis in paragraph [0014] of the original application, which defines a general conformity of the shapes of the forward sections and of the inlet cowling. A U-shape was explicitly only disclosed for forward sections 32A as shown in figure 4.

The Board notes first of all that, other than claim 1, the statement in original paragraph [0014] does not emphasize a conformity to the shape of the *annular* inlet cowling, but reads "to the shape of the inlet cowling". Both the general conformity in shape and the U-shape appear to apply for all forward sections 32. The reference signs 32A, 32B are only introduced in paragraph [0016] for designating forward sections located at specific positions, i.e. near a bottom or "6 o'clock" position (32A) and near a top or "12 o'clock" position (32B) of the inlet cowling 14.

Taking into account not only the statement in paragraph [0014] in isolation, but the original disclosure as a whole, as required by the gold standard, the shape mentioned in paragraph [0014] can only be understood as being the *cross-sectional* shape of the inlet cowling

for the following reasons.

- 4.2 Paragraph [0014] starts with a reference to the drawings ("as illustrated"). According to paragraph [0011] the drawings, in particular figures 1 and 2, show an inlet cowling 14, which "has a generally "U"-shaped cross section with a curved portion defining an inlet lip 16 and inner and outer walls 18, 20, both extending aft of the inlet lip 16 in a generally axial direction". Paragraph [0014] uses features introduced in paragraph [0011] in order to describe an example of correspondence in shape "shown in figure 4", in which "each forward section 32 is generally "U"-shaped and has an inner leg 34 which lies against the interior of the inner wall 18, an outer leg 36 which lies against the interior of the outer wall 20, and a bend 38 which lies against the interior of the inlet lip 16."
- 4.3 Paragraph [0014] mentions two alternative options for the U-shape of the forward section 32. It can also "be configured in a "J" or "L" shape" for two reasons:
- "if *needed* to conform to the inlet cowling", which can only mean that another shape of the forward sections is *necessary* in order to conform to a *cross-sectional* shape of the inlet cowling other than a U-shape,
 - "or if it is *desired* to heat only a portion of it", which can only mean that another shape of the forward section might *optionally* be chosen in order to heat only a portion of it's U-shaped *cross-section*.
- In all these cases, the forward sections 32 still comprise the legs 34 and 36 extending along the inner and outer walls 18, 20 of the inlet cowling 14, i.e. in a generally *axial* direction, only the relative length of these legs being changed.

Due to these alternative options, the Board is not convinced by the Appellant's line of argument according to which a U-shape of both, the inlet cowling's cross-section and the forward sections, is disclosed in the original description and drawings as inextricably linked to the feature "conformity in shape".

Only in the hypothetical case (not in claim 1) that a U-shaped cross-section of the inlet cowling was claimed *in addition to a conformity in shape*, the forward sections might also have to be U-shaped, as claimed in original claim 2.

4.4 The other way round, the only section of a heat pipe originally disclosed as having actually a shape conforming to *the annular shape* of the inlet cowling is the transition section 33, not the forward section 32, see paragraph [0016], figures. The shape of the transition section 33 is here defined as "extending in circumferential direction to some extent" or "arcuate". "Circumferential" is employed in original paragraph [0014] in the context of the *disposition* of the individual forward sections within the annular inlet cowling "in a circumferential array", not with regard to their *shape*.

There is thus a clear distinction in the original disclosure between the forward sections and the transition sections based on their respective shapes, the first ones being defined with regard to the *cross section* of the inlet cowling, the latter ones with regard to their *circumferential extension along the annular inlet cowling*.

4.5 Consequently, not a general conformity of the forward sections to *any shape* of the inlet cowling including its annular shape is originally disclosed, but only a "desirable" (paragraph [0014]) conformity to its *cross-*

sectional shape.

Forward sections conforming to *the annular shape* of the inlet cowling are neither envisaged, nor suggested by the original disclosure.

Because claim 1 has been amended to include such forward sections, as set out in point 3 above, its subject-matter extends beyond the content of the application as originally filed, Article 123(2) EPC.

5. **Conclusion**

With their appeal, the Opponent successfully challenges the Opposition Division's findings that the subject-matter of claim 1 according to former auxiliary request 2 meets the requirements of the EPC, in particular that of original disclosure as defined in Article 123(2) EPC.

Consequently, the corresponding decision of the Opposition Division to maintain the patent in an amended form according to former auxiliary request 2 has to be set aside and the patent must be revoked.

Order

For these reasons it is decided that:

1. **The decision under appeal is set aside.**
2. **The patent is revoked.**

The Registrar:

The Chairman:



G. Magouliotis

C. Heath

Decision electronically authenticated