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Datasheet for the decision of 29 October 2019

Case Number: T 2749/17 - 3.2.01

Application Number: 10712858.9

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IPC: B64D45/02, F16B4/00, F16B19/05

Language of the proceedings: EN

Title of invention:
FASTENERS WITH CONFORMING SLEEVES

Patent Proprietor:
Arconic Inc.

Opponent:
LISI AEROSPACE

Headword:

Relevant legal provisions:
EPC Art. 56, 100(a), 84

Keyword:
Inventive step - main request (no)
Clarity - auxiliary requests I-VI (no)

Decisions cited:

Catchword:

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Beschwerdekammern

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Case Number: T 2749/17 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 29 October 2019

Appellant: (Patent Proprietor)	Arconic Inc. 201 Isabella Street Pittsburgh, PA 15212 (US)
Representative:	Trinks, Ole Meissner Bolte Patentanwälte Rechtsanwälte Partnerschaft mbB Postfach 10 26 05 86016 Augsburg (DE)
Respondent: (Opponent)	LISI AEROSPACE 42/52 quai de la Râpée 75012 Paris (FR)
Representative:	Lavoix 2, place d'Estienne d'Orves 75441 Paris Cedex 09 (FR)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 30 October 2017 concerning maintenance of the European Patent No. 2414236 in amended form.**

Composition of the Board:

Chairman	W. Marx
Members:	S. Mangin
	A. Jimenez

Summary of Facts and Submissions

I. The appeal was filed by the patent proprietor (appellant) against the interlocutory decision of the opposition division finding that, on the basis of the auxiliary request VII, the patent in suit (hereinafter "the patent") met the requirements of the EPC.

II. The extent of the opposition was limited to claims 1, 3 and 4. The opposition division decided that the subject-matter of the main request (corresponding to the patent as granted) did not involve an inventive step in view of A2 in combination with A3 and A6 (Article 100(a) EPC) and that the subject-matter of claims 1 of auxiliary requests I-V was not clear according to Article 84 EPC. Furthermore the opposition division did not admit auxiliary request VI filed during oral proceedings as prima facie not clear according to Article 84 EPC.

III. Oral proceedings before the Board took place on 29 October 2019.

IV. The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or alternatively on the basis of one of auxiliary requests I-V filed with letter dated 21 July 2017 or auxiliary request VI filed on 27 September 2017 during oral proceedings before the opposition division.

V. The respondent (opponent) requested that the appeal be dismissed.

VI. The decision refers to the following documents:
A2: EP 1 903 221 A2

A3: US 3 983 304 A
A6: US 3 953 906 A
Affidavit of 9 March 2016 of Hasim Mulazimoglu
Affidavit of 21 July 2017 of Hasim Mulazimoglu
A11: "Recent Developments in Techniques to Minimize Lightning Current Arcing Between Fasteners and Composite Structure" from Hasim Mulazimoglu and Luke Haylock, Aerospace Engineering Magazine, Oct. 14 2009.

VII. Claim 1 of the main request including the feature analysis of the opponent reads as follows:

R1.1 A sleeve interference fastener adapted to be installed in a hole of a composite structure comprising:

R1.2 a) a conformable sleeve having a head at one end and a tubular portion, wherein the tubular portion has an inner diameter and an outer diameter, wherein the outer diameter of the tubular portion is less than an inner diameter of the hole of the composite structure, and

R1.3 wherein the conformable sleeve is comprised of at least one first material having a hardness of X; and

R1.4 b) a pin member, wherein the pin member has at least a pin head at one end, a locking portion at an opposite end of the pin head, and a shank portion therein between, wherein the shank portion, located below the pin head, has a diameter greater than the inner diameter of the tubular portion of the conformable sleeve, and characterized in that

R1.5 the pin member is comprised of at least one second material having a hardness of Y,

R1.6 wherein X is sufficiently less than Y so that, in an installed position, at least a portion of the at least one first material of the conformable sleeve conforms to a contour of an inner surface of the hole so as to create a continuous electrical contact at an interface

between the inner surface of the hole of the structure and the conformable sleeve,

R1.7 wherein, upon a pressure from the shank portion of the pin member, the conformable sleeve is adapted to expand radially over the inner surface of the hole to form an interference fit between the outer diameter of the sleeve and the hole of the composite structure so as to provide the installed position, and

R1.8 wherein, to facilitate a movement of the pin member through the conformable sleeve, the fastener further comprises a lubricant,

R1.9 wherein the lubricant comprises a conductive solid film material.

VIII. Claims 1 of auxiliary requests I-VI have at least the additional feature R.1.10 "wherein the conformable sleeve is designed to conform to machine-induced micro-texture inherent in fastener holes drilled in composite material".

Reasons for the Decision

1. Main request - Inventive step - Article 100(a) EPC

The subject-matter of claim 1 does not involve an inventive step according to Article 100(a) EPC.

1.1 In agreement with the parties, A2 dealing with sleeved interference fasteners for composite material is considered as the closest prior art.

1.2 The subject-matter of claim 1 differs from A2 in that:
i)- the hardness of the sleeve material is less than the hardness of the pin material
ii)- the lubricant comprises a conductive solid film material.

1.3 Similarly to the patent in suit, document A2, paragraphs [0022], [0050] and [0072], discloses the elimination of gaps between the fastener and the workpiece structures, providing good electrical conductivity and reducing the potential for electrical sparks. Although in A2 the hardness of the materials used for the sleeve and the pin (first identified difference) is not directly and unambiguously disclosed, neither explicitly nor implicitly, the intended effect, namely the conforming of the sleeve to holes in composite materials is achieved. But while A2 does not directly and unequivocally infer that the hardness of the sleeve is lower than the hardness of the pin, it is common general knowledge that softer material will be more malleable than harder material. It is therefore obvious for the skilled person to choose a material with a lower hardness for the sleeve than for the pin in an interference fastener to eliminate the gaps between the fastener and the workpiece structure or, in other words, to have the sleeve conforming to the surface of the hole.

1.4 Several effects have been identified in the patent in suit for the second identified difference. The lubricant comprising a Conductive Solid Film (CSF) decreases or eliminates the internal arcing between the pin and the sleeve according to paragraph [0074] of the patent and improves the surface properties of the substrate, in particular corrosion resistance, wear resistance and scratch according to paragraph [0077] of the patent. The objective technical problem can thus either be defined as to decrease or eliminate the internal arcing between the pin and the sleeve, or to improve corrosion and wear resistance.

1.5 Galvanic corrosion is a well-known problem in interference fasteners as disclosed in document A3 (column 1, lines 1-36) dealing with interference fasteners in aluminum structures. A3 (column 2, lines 18-26) discloses as coating material an aluminum-containing (i.e. a conductive solid containing) organic base giving greater corrosion protection and very high abrasion resistance and is characterised by good lubricity and relatively low friction rendering it especially suited for use with interference-fit fasteners. Thus the skilled person starting from the interference fastener disclosed in A2 and looking to improve the corrosion resistance and the wear resistance would apply the teaching of A3 and arrive at the subject-matter of claim 1. It is to be noted that the use of the aluminum-containing organic base will have the extra effect of increasing the conductivity between the sleeve and the pin of the interference fastener thereby decreasing or eliminating the internal arcing between the pin and the sleeve. This bonus effect though cannot confer an inventive step on the obvious solution for improving corrosion and wear resistance.

1.6 Claim 1 therefore does not involve an inventive step in view of document A2 in combination with common general knowledge and document A3.

1.7 The proprietor has identified four differences between the subject-matter of claim 1 and document A2, namely:
i) The fastener is provided with a conformable sleeve (R1.2, see also R1.7).
ii) The conformable sleeve of the fastener is comprised of at least one first material having a hardness of X, and the pin member of the inventive fastener is

comprised of at least one second material having a hardness of Y (R1.3 and R1.5).
iii) X is sufficiently less than Y so that, in an installed position, at least a portion of the at least one first material of the conformable sleeve of the fastener conforms to a contour of an inner surface of the hole so as to create a continuous electrical contact at an interface between the inner surface of the hole of the structure and the conformable sleeve (R1.6).
iv) The fastener comprises a lubricant, wherein the lubricant comprises conductive solid film material (R1.9).

1.8 While it is acknowledged that A2 does not disclose materials for the pin and the sleeve and thus not necessarily a difference in material hardness, A2, paragraph [0022], discloses that "gaps between the fastener and the structure are eliminated thereby providing good electrical conductivity between components" and paragraph [0047] discloses that "During installation (...) the sleeve expands radially to a desired interference fit with the walls of the holes 125, 130 through workpieces 105, 110 as the pin shank is inserted into the sleeve member 20 as depicted in FIG. 8". The sleeve in A2 according to the two above passages thus corresponds to the conformable sleeve as defined in claim 1 by the features R1.6 "the conformable sleeve conforms to a contour of an inner surface of the hole so as to create a continuous electrical contact at an interface between the inner surface of the hole of the structure and the conformable sleeve" and R1.7 "the conformable sleeve is adapted to expand radially over the inner surface of the hole to form an interference fit between the outer diameter of the sleeve and the hole of the composite

structure (...)". Thus A2 discloses an interference fastener with a sleeve which is conformable in the sense of claim 1. Therefore, the only distinguishing features of granted claim 1 over A2 are feature R1.9 and the difference in material hardness claimed.

1.9 The patent proprietor argues that the sleeve in A2 is deformable, while the sleeve in the patent in suit is conformable. It notes (also in view of definitions in dictionaries) that in contrast to the more generic term "deform" (which refers to an object's ability to be distorted without fracture on macro level), the term "conform" is the ability of a material to accommodate geometrical misalignment, irregular texture, or shape irregularities. Furthermore the patent proprietor explains that the term "conformable" in the patent in suit is to be understood as conformable in a microscopic scale according to paragraph [0026], which takes into account the roughness of machine-induced micro texture. Finally it submitted two affidavits from Mr. Hasim Mulazimoglu and document A11 to prove its point.

1.10 These lines of argument cannot be followed.

1.10.1 The term "conformable sleeve" in claim 1 is broad and relative and cannot be considered as a distinguishing feature over the sleeve in A2. The conformability of the sleeve will depend not only on the sleeve but also on the hole and its texture as well as the nature of the composite material, which makes the "conformable sleeve" relative to an entity which is not part of the subject-matter of claim 1. Furthermore, there is no reason to limit the conformability at a micro level such as the sleeve's interaction with carbon fibers. The term conformable although broad is clear to the

skilled person. There is therefore no need in the present case to refer to the description to interpret the term "conformable".

1.10.2 In the affidavit of 21 July 2017, M. Mulazimoglu explains the difference between deformable and conformable materials.
While this difference is acknowledged the Board considers the material of the sleeve in A2 to be both deformable and conformable similarly to the patent in suit as explained above. In A2 neither the term "conformable" nor the term "deformable" is used to describe the sleeve, but from paragraphs [0020], [0047], [0050] and [0072] it is unambiguously clear that the sleeve has the same properties as the sleeve of the invention and is therefore conformable as required by the wording of claim 1.

1.10.3 Moreover, in the affidavit of 9 March 2016, M. Mulazimoglu explains that in the newly developed fastener system disclosed and claimed by the patent in suit the sleeve outside diameter is plated with low hardness but highly conductive materials such as gold, silver or nickel in order to increase the level of conformity.
The Board does not put into question the effect of plating the sleeve with a low hardness but highly conductive material but this invention corresponds to independent claim 5 and not to independent claim 1. The sleeve material in claim 1 is neither plated nor limited to a certain hardness or to specific conductive materials.
Furthermore M. Mulazimoglu explains how the conformable sleeve excavates sealant during installation, bringing the sleeve in intimate contact with the composite

structure. But again the sealant is not defined in claim 1.

1.10.4 Finally document A11, chapter "2.3.3 sleeved fasteners" discloses how sleeved interference fit minimises the air gap between the fastener and the structure and may thereby reduce or prevent arcing between the fastener and the internal wall of the structure. However, this paragraph is silent about the nature of the material used for the pin and the sleeve as well as their hardness.
A11, chapter "3.3.5 Conforming fasteners" discloses advantages of the newly developed fastener system comprising a pin and a conformable sleeve, being plated with low hardness but highly conductive materials such as gold, silver or nickel. Similarly to the second affidavit, the conforming fasteners in paragraph 3.3.5 do not correspond to the ones defined in independent claim 1, but to those defined in independent claim 5.

1.11 The patent proprietor is of the opinion that the identified differences all contribute to the same effect, namely as stated in the patent in suit paragraphs [0050] to [0054] and [0074] to improve the current transfer from the fastener to the composite structure in order to minimize or eliminate arcing. In its view the conformable sleeve and the lubricant comprising a conductive solid film both contribute in a synergetic manner in this respect, the conformable sleeve providing excellent gap filling which allows for more efficient current transfer and the conductive film material of the lubricant improving the current carrying capability of the fastener.

1.12 The Board cannot follow this line of argument in particular because the conformable sleeve of claim 1 is

not seen as a difference over the sleeved fastener disclosed in A2. The only difference which can be acknowledged is the difference in hardness between the sleeve and the pin since it cannot be considered as being implicitly disclosed in A2 following the gold standard, but as stated above it is clearly obvious to choose a material for the sleeve with a lower hardness than for the pin.
As for the lubricant comprising the conductive solid film, while decreasing or eliminating internal arcing between the pin and the sleeve may be seen as the associated objective technical problem to be solved following paragraph [0074], other effects are associated with the lubricant comprising a conductive film, for example improving corrosion resistance, which therefore may be an equally valid objective technical problem (reference is made to paragraph [0077] of the patent).

1.13 The patent proprietor is of the opinion that the skilled person would not combine the teaching of A2 with A3 to arrive at the subject-matter of claim 1. In its view, unlike A2 and the contested patent, A3 deals with fastening/joining workpieces made of metal, where there is no problem of arcing. A3 is silent about lightning protection of composite structure.
Furthermore, the patent proprietor is of the opinion that even if the skilled person would take into account the teaching of A3, they would not adapt or modify the fasteners known from A2 because there is nothing in A3 which would have invited them to do so in the hope of solving the objective technical problem or in expectation of some improvement or advantages.
Finally, even if A3 discloses in column 2, line 59 - column 3, line 28, coating mixtures comprising powdered metal or metallic derivative, it is not applied to a

sleeved fastener and it is not used to improve lightning current carrying capabilities.

1.14 The above lines of argument cannot be followed for the following reasons:

1.14.1 Firstly, it should be noted that the problems of corrosion and arcing between the pin and the sleeve depend on the materials of the pin and the sleeve and not on the nature of the workpiece (metal or composite material). So the fact that A2 deals with joining composite materials while A3 deals with joining metals workpieces will not dissuade the skilled person to look into the teaching of A3 and combine it to A2.

1.14.2 Secondly, A3 (column 1, lines 9-13) relates to protective coatings for fasteners against corrosion or deterioration. The object of the invention in A3 is to provide a protective coating to improve corrosion resistance (column 2, lines 3-9), wear resistance (column 2, lines 6-7) as well as lubricity making it particularly applicable to interference-fit fasteners (column 2, lines 14-17). The skilled person starting from A2 with the objective technical problem to improve corrosion and wear resistance between the pin and the sleeve is therefore incited to look into the teaching of A3, especially as A3 discloses on column 2, lines 17-40, that the coating according to the invention possesses "very high abrasion resistance and is characterised by good lubricity and relative low friction, rendering it especially suited for use with interference-fit fasteners" as well as "corrosion resisting qualities".

1.14.3 Thirdly, the protective coating in A3 is not limited to interference-fit fasteners without a sleeve. A3

discloses (column 2, lines 28-39) the use of the coating in various types of interference-fit fasteners. While a sleeve interference fastener is not specifically disclosed in A3, the skilled person starting from the teaching of A2 [0042] where a low friction coating is applied between the sleeve and the pin of an interference fastener would, applying the teaching of A3, use the protective coating of A3 instead to improve corrosion and wear resistance and arrive at the subject-matter of claim 1.

2. Auxiliary requests I-VI

2.1 The feature introduced in claims 1 of auxiliary requests I-VI, namely "wherein the conformable sleeve is designed to conform to machine-induced micro-texture inherent in fastener holes drilled in composite material" introduces non-compliance with Article 84 EPC.

2.2 The assessment of the opposition division is correct, in particular the skilled person cannot reliably determine whether the introduced feature (referring to another entity which does not belong to the claimed subject-matter) is satisfied or not for the following reasons:

2.2.1 Firstly, the "machine-induced micro texture inherent in fastener holes drilled in composite material" is very much dependent on the type of composite material, the nature and diameter of the fibers and the nature of the resin as well as the machine-induced hole in the composite material. The same sleeve interference fastener may thus conform to certain holes in certain type of composite materials but not to others.

2.2.2 Secondly, although the skilled person may take pictures to visualise the boundary between the sleeve and the composite material, claim 1 does not specify how much the sleeve should conform to the composite material, e.g. whether the micro gaps should be fully filled or only partially. Claim 1 does not define to what extend the sleeve should conform to the micro texture of the drilled holes in the composite material.

2.2.3 Thirdly, while the patent proprietor argues that there is no better way to define the invention without unduly restricting the scope of claim 1, as the micro texture of the hole will depend on the composite material such as the diameter of the carbon fibers, the introduced feature is defined in such a way that the skilled person cannot determine whether they are working within the scope of claim 1. Claims 1 of auxiliary requests I-VI are therefore unclear.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Vottner W. Marx

Decision electronically authenticated