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**Datasheet for the decision
of 27 November 2019**

Case Number: T 1054/16 - 3.2.04

Application Number: 11155766.6

Publication Number: 2410184

IPC: F04D19/04, F04D29/66, F16F15/02

Language of the proceedings: EN

Title of invention:
Vibration damper for vacuum pumps

Patent Proprietor:
Agilent Technologies, Inc.

Opponent:
Edwards Limited

Headword:

Relevant legal provisions:
EPC Art. 54(2), 56, 100(b), 100(c)

Keyword:

Grounds for opposition - insufficiency of disclosure (no) -
added subject-matter (no)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:



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Case Number: T 1054/16 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 27 November 2019

Appellant: Edwards Limited
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 1 March 2016
rejecting the opposition filed against European
patent No. 2410184 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman A. de Vries
Members: G. Martin Gonzalez
T. Bokor

Summary of Facts and Submissions

- I. The opponent lodged an appeal, received on 28 April 2016 against the decision of the Opposition Division posted on 1 March 2016 rejecting the opposition filed against European patent No. 2410184 pursuant to Article 101(2) EPC, and simultaneously paid the appeal fee. The statement setting out the grounds of appeal was received on 11 July 2016.
- II. Opposition was filed against the patent as a whole on the grounds of lack of novelty and inventive step under Article 100(a) EPC, lack of sufficiency of disclosure under Article 100 (b) EPC and added subject-matter under Article 100(c) EPC.

The Opposition Division rejected the opposition having regard *inter alia* to the following documents:

- (D1) EP 1 533 560 A1
- (D4) GB 25,802
- (D5) Modern Vacuum Practice, ed Nigel Harris, 3rd edition 2007, ISBN-10: 0-9551501-1-6, pages 288-295
- (D6) Edwards Instruction Manual, ISO Flanges and Clamps , C100-07-880 Issue D, 2008
- (D7) Edwards Vacuum Products catalogue, 1981
- (D10) US 5,516,122

- III. The appellant-opponent requests that the decision under appeal be set aside, and that the European patent No. 2 410 184 be revoked.

The respondent-proprietor requests that the appeal be dismissed, i.e. that the opposition be rejected and the patent be upheld as granted (main request) or,

alternatively, that the decision under appeal be set aside and the patent be maintained in an amended form on the basis of one of the 1st to 6th auxiliary requests filed with the response to the grounds of appeal dated 10 January 2017, re-filing requests filed earlier in the opposition proceedings.

IV. Oral proceedings before the Board were duly held on 27 November 2019.

V. Independent claim 1 according to the main request (as granted) reads as follows:

"Vibration damper (101; 201; 301; 401; 501), intended to be arranged between a vacuum pump (210) and a vacuum chamber (220), comprising at least:

a first cylindrical hollow component (103; 203; 303; 403; 503), arranged for being associated at a first end thereof to said vacuum pump; and a second cylindrical hollow component (105; 205; 305; 405; 505), aligned to said first element (103; 203; 303; 403; 503) in the axial direction along a symmetry axis (S) and arranged for being associated at a first end thereof to said vacuum chamber; wherein

said first component (103; 203; 303; 403; 503) comprising, at the end opposite to said first end, a toroidal semi-seat (115; 115'; 315) and connecting means (111; 311) suitable for axially binding said first component to said second component, either directly or indirectly through the interposition of one or more possible intermediate components (119; 419,431), and said second component (105; 205; 305; 405; 505) comprising, at the end opposite to said first end, a toroidal semi-seat (117; 117'; 317) and connecting means (113; 313) suitable for axially

binding said second component to said first component, either directly or indirectly through the interposition of one or more possible intermediate components (119; 419,431), at least a toroidal ring (126; 326; 426; 526) made of an elastic material being arranged between said first and said second component (103; 203; 303; 403; 503 / 105; 205; 305; 405; 505) of said damper, said toroidal ring made of an elastic material passing from a first resting configuration if subjected to a compression force directed along said symmetry axis (S) lower than a pre-set threshold to a second compressed configuration if subjected to a compression force directed along said symmetry axis (S) greater than said pre-set threshold, characterized in that said connecting means (111; 311 / 113; 313) guarantee the axial connection between said first and said second component (103; 203; 303; 403; 503 / 105; 205; 305; 405; 505) when said elastic toroidal ring (126; 326; 426; 526) is in said first resting configuration; and in that said toroidal ring (126; 326; 426; 526) made of an elastic material is deformed and guarantees the vacuum-tight axial connection between said first and said second component and prevents any contact between said connecting means of said first and said second component when said elastic toroidal ring is in said second compressed configuration."

VI. The appellant-opponent argued as follows:

The granted patent contains added subject-matter. The patent does not sufficiently disclose the invention as claimed. The subject-matter of granted claim 1 is not new or not inventive having regard to documents D1, D4,

D5, D6, D7, D10 and to the internally acknowledged prior art of the patent specification.

VII. The respondent-proprietor argued as follows:

The granted patent does not contain added subject-matter. It further discloses the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The cited prior art neither anticipates the subject-matter of granted claim 1 nor renders it obvious.

Reasons for the Decision

1. The appeal is admissible.
2. Background

The invention is concerned with a vibration damper to be used in vacuum systems and interposed between a vacuum pump and a vacuum chamber for preventing transmission of vibrations generated by the pump, see specification paragraphs [0001]-[0002]. The main object of the invention is to provide a vibration damper comprising a limited number of components and having a reduced axial size, see paragraph [0013]. To this end, the damper is made of two tubular parts (cylindrical hollow components in the language of the claim) and connecting means axially binding said tubular parts. Vacuum tightness and vibration damping at the connection are effected by an interposed toroidal ring of elastic material, see specification paragraph [0016]. Vacuum generated inside the vacuum system produces a compression force at the connection. The damping function is achieved by the claimed damper being so structured that when the compression force

generated by the vacuum condition is above a pre-set threshold, the elastic ring deforms into a compressed configuration that prevents any contact between the connecting means of the first component and the second component. Thus, when the vacuum pump is operated, the two hollow components are kept separated only by the compressed elastic toroidal ring, with damping properties. Higher vibrations transmission paths are broken, due to the required absence of contact between the rigid components of the connecting means, see specification paragraphs [0019]-[0021].

3. Added subject-matter - Main request

3.1 The appellant-opponent contests the findings of the Opposition Division that the granted patent does not extend beyond the content of the original application, see written decision section 11. In its communication in preparation for the oral proceedings, see paragraph 4, the Board gave its preliminary opinion on this issue as follows:

"4. Main request - added subject-matter

The statement that D1 "is considered as the closest prior art to the subject-matter of claim 1" was added during examination to paragraph [0003] of the specification. This statement may convey, at most, the information that the drafter considers D1 as the most promising starting point for an obvious development leading to the claimed invention, see Case Law of the Boards of Appeal, 8th Edition 2016 (CLBA), I.D.3.1 or Guidelines for Examination (November 2016) G-VII.5.1. The criteria for such selection include considerations such as similarity of purpose, minimum modification required or similarity of technical problems.

Therefore, this does not amount to an acknowledgement that the pre-characterising features of the claim are as disclosed in D1, so adding new features from D1, as put forward by the Appellant-Opponent.

Thus the acknowledgement of D1 as closest prior art does not appear to add subject-matter in the sense of Article 100(c) EPC."

- 3.2 At the oral proceedings before the Board, both parties merely referred to their written submissions and refrained from submitting further comments on the Board's preliminary opinion, except stating that this issue may also have a bearing on claim interpretation for the purposes of novelty and inventive step. Absent any further submissions from the parties regarding the substance of the objection, the Board sees no reasons for deviating from its provisional opinion.

The Board thus concludes that the subject-matter of the granted European patent does not extend beyond the content of the application as filed.

4. Sufficiency of disclosure - Main request

The appellant-opponent contests the positive findings of the Opposition Division, see section 12 of the impugned decision. The appellant submits that the skilled person would not be able to carry out the invention across the entire breadth of scope of claim 1. As variously stated in case law, the objection of lack of sufficient disclosure presupposes that there are serious doubts, substantiated by verifiable facts that the skilled person would be unable to carry out the invention, see Case Law of the Boards of Appeal, 9th edition 2019 (CLBA), II.C.9.

The appellant in particular objects to the alleged breadth of scope of the connecting means and of the compression state and also to the lack of one single example of a suitable material for the toroidal ring.

- 4.1 As regards the connecting means, contrary to the submissions of the appellant-opponent, the claim does not imply that the term "prevents any contact ... in said second compressed configuration" must be construed as necessarily achieving contact in the "first resting configuration". Thus it is apparent that the connecting means of the embodiments of figures 1 and 2 fulfil the claimed feature of "preventing contact ... in the second compressed configuration, as is depicted in e.g. figures 1E or 1F. Moreover, this embodiment clearly teaches at least one way to carry out such connecting means with the claimed functionality. The Board also holds that the allegedly broad formulation of the feature "connecting means", does not present in itself an undue burden for the skilled person when selecting which possible embodiments or variants within the whole scope of said claimed feature are workable or not. The skilled person is an engineer involved in the design and development of vibration dampers for vacuum pumps who has common general knowledge at his immediate disposal. In Figures 1E to 1F they are presented with a concrete example showing how, practically, the claimed functional features can be realized. These will serve as a starting point, a springboard so to speak, from which they can develop further solutions for connecting means other than the bayonet coupling of the disclosed examples, including any variants involving alternative connection means (e.g. nuts and bolts). Beyond stating that several working examples ought to have been provided by the patentee, the appellant has failed to

provide any concrete arguments which might have demonstrated to the Board that some aspects of carrying out the invention would have put excessive burden on the the skilled person. Moreover, where the skilled person in routine design effort might conceive of a variant that does not directly lead to the desired effect, then that variant does not fall within the scope of the claim.

- 4.2 In respect of the material for the toroidal ring, the appellant-opponent submits that the invention would be based on a key or special damping characteristic or damping factor of the elastic material of the toroidal ring when subjected to the higher compression state. That key damping characteristic cannot be that of known, conventional O-ring materials as then the claimed subject-matter must lack novelty. Since no example of such special packing material is given in the specification, the skilled person is not in a position to carry out the invention.

The Board however notes that the invention is not based on any unusual special damping feature of the elastic material, but rather on the selection of a material with appropriate elastic properties in conjunction with connection means that must be adapted or arranged such that any contact between the two is prevented when the ring is in the second compressed configuration. Indeed, as explained in paragraph [0045] of the specification, the higher damping effect is achieved by the gap that separates the teeth of the (respective connecting means of the) two components and that results from the deformation under elastic compression of the toroidal ring. The compression force is produced by the vacuum condition. The hollow components are then in contact only through the toroidal ring, see paragraph [0046],

that is indirectly. In the absence of any direct metal-to-metal contact vibrations are effectively attenuated, i.e. damped, as explained in paragraph [0048].

These passages indicate to the skilled person to select an appropriate degree of elastic deformation of the toroidal ring to obtain the required gap for each particular connecting means shape and dimensions. The Board is in no doubt that the skilled person, a mechanical engineer with an understanding of elasticity of structures and materials, will know exactly how to find the appropriate parameters, i.e. toroidal ring dimensions and selection of a material with the appropriate elastic modulus, to provide this effect. They would, for example, use straightforward mechanical analysis and calculations, or, alternatively, routine trial and error. The different elastic properties of materials needed for the material selection, and in particular of the standard elastic materials available for producing packing elements, are customarily known properties that are readily available to the skilled person either from the material manufacturer or by standard routine testing. The lack of a specific example of a material in the patent specification does thus not represent any obstacle to putting these teachings into practice.

- 4.3 With respect to the compression state, the appellant-opponent submits that the skilled person cannot put into practice the invention in all pressure differential conditions, e.g. atmospheric pressure inside the vacuum chamber and high external air pressure.

The Board is not convinced by the argument. The skilled person, reading the claim with synthetical propensity

and a mind willing to understand, immediately realises that the claimed damper is not intended for working other than in vacuum conditions. Indeed, the claim defines a vibration damper intended to be arranged "between a vacuum pump and a vacuum chamber" and that the elastic material of the toroidal ring "guarantees the vacuum-tight axial connection" in the second compressed configuration. The alleged insufficiently disclosed embodiments are therefore outside the scope of the claim. They cannot thus be used to establish a lack of sufficiency of the invention as claimed.

4.4 The Board therefore concludes that the patent specification discloses the invention, as claimed, in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art in the sense of Article 100(c) EPC.

5. Novelty - Main request

The appellant-opponent challenges the finding of the Opposition Division that the subject-matter of claim 1 is new over D5, D6, D7 and D10, see sections 14 and 15 of the impugned decision.

5.1 It is not in dispute that the documents D5-D7, D10 describe different types of flanged connections for vacuum equipment. They thus disclose two hollow components, each with connecting means for axially binding them and a toroidal ring interposed between them for guaranteeing a vacuum-tight axial connection. There is however no mention of any vibration damping characteristic or possible use as vibration damper. It thus remains to be decided whether such a characteristic and such a use, if not expressly mentioned, are then at least implicit in those

teachings, as a necessary and inevitable consequence of the features that are expressly described there.

- 5.2 It is in particular contested by the respondent-proprietor whether the cited prior art discloses the claimed feature that the toroidal ring prevents any contact between the first and second connecting means in the second compressed state. As regards the interpretation of this feature, the Board notes that the skilled person, who reads a claim with a mind willing to understand in order to make technical sense of it (see CLBA, 9th edition, 2019, II.A.6.1), using normal reading skills considers claim features not in isolation but in context, as integral parts of the inventive concept defined by the entirety of claim features and their interrelationships.
- 5.3 In this regard, claim 1 requires a toroidal ring "arranged between said first and said second component", see claim 1, lines 39-43, "said toroidal ring made of an elastic material passing from a first resting configuration... to a second compressed configuration if subjected to a compression force directed along said symmetry axis (S)", see claim 1, column 10, lines 44-52. That is, the claim defines an element, the toroidal ring, that reduces the separation distance between the flanges of the hollow components when compressed in vacuum conditions. In this context, the characterising portion of the claim further requires that the connecting means "guarantee the axial connection" when in the uncompressed configuration and that the toroidal ring in the compressed configuration (vacuum condition) "prevents any contact between said connecting means of said first and said second component".

The skilled person reading the contested claim 1 according to the general principle of claim interpretation above, immediately understands that these claim limitations are causally and structurally linked. They jointly define the functional limitation that, as a consequence of the reduction of the separation distance produced by the vacuum condition, the contact between the (metal parts of the) connecting means is broken, i.e. a gap is formed and is also maintained between them, since it is required that any contact is prevented. Such a functional limitation implies that the relevant connecting means are adapted to ensure that a gap is created and maintained in the compressed state of the toroidal ring, so that effectively any contact, whether it being pressure contact or loose contact, is prevented. Thus as noted they are adapted so that there is no direct contact between the two components in the compressed state.

- 5.4 This understanding is further confirmed by the description, e.g. in paragraph [0020]. This passage describes that when the toroidal ring is in compressed condition "said components are not in contact and are wholly separated by said elastic toroidal ring". This is described in greater detail in paragraphs [0045]-[0048] in reference to figures 1E and 1F. These illustrate the absence of any direct metal-to-metal contact (i.e. absence of contact between connecting means) due to the gaps and resulting in attenuation of vibration in the illustrative embodiment.
- 5.5 Such a functional limitation is not disclosed by any of the documents D5, D6, D7 or D10. These documents describe different standard flanged connections for vacuum systems, that are sealed with O-rings and which have customary connecting means, such as clamps, claw

clamps or nuts and bolts. There is no disclosure of the degree of deformation of the sealing O-ring under vacuum conditions. There is no specific disclosure of the bolt or clamp tightening force. There is, more importantly, no disclosure of any constructional means in the connection elements that might in use lead to the formation of a gap between connecting elements under vacuum conditions, such that there is no direct contact.

It may well be that with a proper selection of a low initial tightening force of the connecting means, as put forward by the appellant-opponent, the connecting means become loose under vacuum conditions. However, "loose" is not synonymous with the absence of any direct metal to metal contact. In the example of a loose nut and bolt, or a loose clamp (see e.g. D5, figures 12.3a to c) the respective connecting means are not necessarily prevented from contacting each other. Though it may be that there is some vibration damping, as demonstrated by the tests of the appellant submitted with the grounds of appeal, nevertheless due to the continuing possibility of contact there will still be a residual transmission of vibrations compared to the configuration claimed where any contact is prevented in the compressed state. Leaving aside the fact that the tests do not specify the exact conditions under which they were carried out, they do not suggest, let alone conclusively prove the absence of any direct metal to metal contact of the connecting parts under vacuum. They demonstrate some level of vibration reduction most likely due to loosened connecting bolts as is to be expected, but they provide no insight into the exact state of contact of the connecting parts.

That in the loosened condition a user can, if they so wish, remove the connecting means altogether, so that ultimately the respective parts connect only via the O-ring is not relevant. The prevention of contact in this case is achieved only by the purposive intervention of the user. It is not a function or result of the damping mechanism, in particular of some adaptation of the connecting means itself.

5.6 Therefore the alleged known flanged connections for vacuum equipment do not anticipate the claimed feature that compression of the toroidal ring above the pre-set threshold prevents any contact between the connecting means in the sense of the contested claim. The Board thus concludes that the subject-matter of granted claim 1 is new in the sense of Article 54(2) EPC over the cited prior art.

6. Inventive step - Main request

The appellant-opponent challenges the findings of the Opposition Division that the subject-matter of claim 1 involves an inventive step, see section 16 of the impugned decision.

6.1 Any of documents D1, D10 or the internally acknowledged prior art of the patent specification, disclosing a damper and vacuum fittings for vacuum systems, are considered by the appellant-opponent as appropriate starting points for assessing inventive step.

The appellant-opponent submits objections based on combinations of any of the above pieces of closest prior art with the teachings of D4. D4 is directed to improvements relating to the closing of jars or bottles for food, see D4, page 1. In the Board's view, the

skilled person starting from D1, D10 or the internally acknowledged prior art of the patent specification, concerned with vacuum system fittings, would not as a matter of obviousness consider teachings of the rather different field of closing jars or bottles for food of D4 to modify any of the fittings taught by D1, D10 or the internally acknowledged prior art of the patent specification. D4, the main focus of which is the use of a bayonet connection, is also not concerned with vibration damping nor does it show sealing ring G preventing contact between connecting means C and B of the bayonet fitting. Consequently, even if the skilled person were to look toward D4 (the Board believes they would not), they would not find the claimed solution there. Even if they then did combine these teachings they would not arrive at the claimed subject-matter.

Consequently, this attack against inventive step fails.

- 6.2 The Board thus holds that the subject-matter of granted claim 1 involves an inventive step within the meaning of Article 56 EPC in the light of the cited prior art.
7. As the appellant's arguments against the findings of the decision of the Opposition Division fail to convince the Board that those findings were in error, it confirms the decision of the Opposition Division.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



G. Magouliotis

A. de Vries

Decision electronically authenticated