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Datasheet for the decision of 27 January 2021

Case Number: T 1702/18 - 3.2.04

Application Number: 12183361.0

Publication Number: 2568177

IPC: F04B43/04, F04B45/047

Language of the proceedings: EN

Title of invention:
Fluid control device

Patent Proprietor:
MURATA MANUFACTURING CO., LTD.
Omron Healthcare Co., Ltd.

Opponent:
TSENG, HSIEN-JEN

Headword:

Relevant legal provisions:
RPBA 2020 Art. 13(2)
EPC Art. 56

Keyword:
Amendment after summons - taken into account (yes)
Inventive step - main request (no) - auxiliary request (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 1702/18 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 27 January 2021

Appellant: (Opponent)	TSENG, HSIEN-JEN 4F., No.5, Ln. 8, Daguan Rd,. Xindian Dist., New Taipei City 231 (TW)
Representative:	2K Patentanwälte Blasberg Kewitz & Reichel Partnerschaft mbB Schumannstrasse 27 60325 Frankfurt am Main (DE)
Respondent: (Patent Proprietor 1)	MURATA MANUFACTURING CO., LTD. 10-1, Higashikotari 1-chome Nagaokakyo-shi, Kyoto 617-8555 (JP)
Respondent: (Patent Proprietor 2)	Omron Healthcare Co., Ltd. 53, Kunotsubo Terado-cho Muko-shi Kyoto 617-0002 (JP)
Representative:	Reeve, Nicholas Edward Reddie & Grose LLP The White Chapel Building 10 Whitechapel High Street London E1 8QS (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 24 May 2018 concerning maintenance of the European Patent No. 2568177 in amended form.**

Composition of the Board:

Chairman	A. de Vries
Members:	S. Oechsner de Coninck
	T. Bokor

Summary of Facts and Submissions

I. The opponent appeals against the interlocutory decision of the Opposition Division of the European Patent Office posted on 24 May 2018 concerning maintenance of the European Patent No. 2568177 in amended form. The notice of appeal was filed on 2 July 2018, the appeal fee paid on the same day, and the statement of grounds was filed on 19 September 2018.

II. The opposition was based on the grounds of Article 100(b) and (a) EPC in combination with lack of novelty and inventive step. In its written decision the Opposition Division held that the patent as amended according to a main request complied with the requirements of the EPC, having regard in particular to the following documents:

OD7 WO 2004/090335 A1
OD9 US 2011/070109 A1

III. The Board issued a communication in preparation for oral proceedings and setting out its provisional view on the relevant issues.

IV. Oral proceedings were held on 27 January 2021.

V. The appellant requests that the decision under appeal be set aside and that the patent be revoked.

VI. The respondent requests maintenance of the patent on the basis of the following requests in this order: the main request as filed in the oral proceedings before the Board, auxiliary request 1 as on file, auxiliary requests 2 to 8 as filed at 14.32 hours before the

Board, and auxiliary request 9 to 17 filed with the response to the grounds of appeal on 6 February 2019.

VII. The wording of the independent claim 1 of the requests relevant to this decision reads as follows:

Main request

"A fluid control device (101, 201, 301, 401, 501) comprising:
a vibrating plate (141) including a first main surface and a second main surface;
a driver (142) that is provided on the first main surface of the vibrating plate and vibrates the vibrating plate; and
a plate (151, 451) that faces the second main surface of the vibrating plate; and
a base plate (191) that is bonded to the plate and includes an opening (192),
wherein
the plate comprises:
a movable portion (154) facing the opening of the base plate, and arranged to bend and vibrate and including a hole (152); and
a fixing portion (155, 455) fixed to the base plate;
characterised in that:
either the vibrating plate includes a projection (143, 243,15 343A,343B,543) formed integrally with the vibrating plate or the movable portion (154) is used as a projection (154), the projection projecting in a direction between the hole and a region of the vibrating plate facing the hole, the projection is positioned between the hole and the region of the vibrating plate facing the hole."

Auxiliary request 1

Emphasis added to indicate amendments by ~~omission~~ or addition vis-a-vis claim 1 of the main request

"A fluid control device (101, 201, 301, 401, 501) comprising:
a vibrating plate (141) including a first main surface and a second main surface;
a driver (142) that is provided on the first main surface of the vibrating plate and vibrates the vibrating plate; and a plate (151, 451) that faces the second main surface of the vibrating plate; and a base plate (191) that is bonded to the plate and includes an opening (192), wherein
the plate comprises:
a movable portion (154) facing the opening of the base plate arranged to bend and vibrate and including a hole (152); and
a fixing portion (155, 455) fixed to the base plate;
characterised in that:
at least one of either the vibrating plate or the plate includes a projection (143, 243,115 343A, 343B, 154, 543) formed integrally with the vibrating plate or the plate ~~or the movable portion (154) is used as a projection (154)~~and projecting in a direction between the hole and a region of the vibrating plate facing the hole, the projection is positioned between the hole and the region of the vibrating plate facing the hole;
wherein if the vibrating plate includes the projection a distance between the surroundings of the hole (152) provided in the movable portion (154) of the plate and a region of the vibrating plate (141) facing the movable portion (154) is narrower than a distance

between the fixing portion of the plate and a region of the vibrating plate facing the fixing portion; and
wherein if the plate includes the projection a distance between the movable portion (154) of the plate and the region of the vibrating plate (141) facing the movable portion (154) is narrower than a distance between the base late (191) and the region of the vibrating plate (141) facing the base plate (191)."

Auxiliary Request 2

Emphasis again added to indicate amendments by ~~omission~~ or addition vis-a-vis claim 1 of the auxiliary request 1.

"A fluid control device (101, 201, 301, 401, 501) comprising:
a vibrating plate (141) including a first main surface and a second main surface;
a driver (142) that is provided on the first main surface of the vibrating plate and vibrates the vibrating 5 plate; and a plate (151, 451) that faces the second main surface of the vibrating plate; and a base plate (191) that is bonded to the plate and includes an opening (192),
wherein
the plate comprises:
a movable portion (154) facing the opening of the base plate, and arranged to bend and vibrate and including a hole (152); and
a fixing portion (155, 455) fixed to the base plate;
characterised in that:
~~at least one of~~ either the vibrating plate ~~or the plate~~ includes a projection (143, 243,343A, 343B, ~~154,~~ 543) formed integrally with the vibrating plate or the movable portion (154) is used as a projection (154),

the projection ~~and~~ projecting in a direction between the hole and a region of the vibrating plate facing the hole, the projection is positioned between the hole and the region of the vibrating plate facing the hole; wherein, if the vibrating plate includes the projection, a distance between the surroundings of the hole (152) provided in the movable portion (154) of the plate and a region of the vibrating plate (141) facing the movable portion (154) is narrower than a distance between the fixing portion of the plate and a region of the vibrating plate facing the fixing portion; ~~and~~ wherein, if the plate includes the projection, a distance between the movable portion (154) of the plate and the region of the vibrating plate (141) facing the movable portion (154) is narrower than a distance between the base plate (191) and the region of the vibrating plate (141) facing the base plate (191); and wherein the projection includes an end (547) having a thickness that becomes thinner towards a peripheral edge of the projection."

VIII. The appellant argues as follows:

- Non-admission of the new main request is requested as added subject matter in respect of the second variant according to figure 14 embodiment had always been at issue.

- The subject-matter of claim 1 of the main request and auxiliary request 1 lacks an inventive step for the skilled person starting from OD9 applying routine manufacturing methods.

- The subject-matter of claim 1 according to auxiliary request 2 lacks an inventive step starting from OD7 with straightforward adaptation of the teaching of OD9

and routine modification abilities of the skilled person.

IX. The respondent argues as follows:

- New argumentation with respect to added subject-matter first presented at the oral proceedings justifies the late filing of the new main request.

- The subject-matter of claim 1 of the main request defines two differences with respect to OD9, that the skilled person would not have obviously arrived at.

- Claim 1 of the auxiliary request 1 further specifies the location of the projection in the immediate surroundings of the hole, that OD9 does not disclose.

- The auxiliary request 2 further requires in claim 1 the projection to have a varying thickness. The skilled person would not have modified the thickness of the projection of OD7, as this would have been detrimental to the flexibility of the membrane.

Reasons for the Decision

1. The appeal is admissible.

2. Background

2.1 The present patent is concerned with a micro-pump for pumping small quantities of air for example used in electronic equipment (paragraph 006). The fluid pump generally comprises, as shown in figure 2 of the patent, a base plate 39, on which a flexible plate 35 is mounted, and a spacer 37 for creating a pumping space between the flexible plate and a vibrating plate

31 (paragraph 009; figure 2). The vibrating plate 31 and a piezoelectric element 32 form a fluid actuator 30 that once actuated vibrate at a certain frequency. The flexible plate can vibrate at the same frequency as the vibrating plate and includes a ventilation hole 35a at its center (paragraph 011) through which air is pumped (paragraph 012).

The patent seeks to improve increasing of the discharge pressure without decreasing the discharge flow rate (paragraph 017).

This is generally obtained by providing a central projection on the vibrating plate in the area facing the central hole of the flexible plate (first variant) or by using a central movable portion of the flexible plate used as a projection (second variant).

3. Main request and auxiliary request 2 - admission

3.1 These requests were filed at the oral proceedings before the Board, and amount to an amendment to the respondent proprietor's case in the sense of Article 13(2) of the Rules of Procedure of the Boards of Appeal (RPBA) in the applicable version of 2020. Any amendment to a party's appeal case shall, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned.

3.2 In their communication in preparation for the oral proceedings, point 3, the Board gave their preliminary opinion that the limitation in claim 1 as upheld (the then main request) of the projection being "formed integrally with the vibrating plate or the plate" did not appear to add subject-matter as held in the

decision under appeal. In the discussion during the oral proceedings before the Board it however emerged that this added feature did not have a clear basis in the application as filed for the variant in which a projection is integrally formed on (facing) plate 451. The figures and description disclosed plate 451 as being of uniform thickness and without any projection. This represented a shift in focus vis-a-vis previous arguments which concerned the question whether or not an embodiment with integrally formed projections on *both* vibrating and (facing) plates was originally disclosed. The Board agrees with the respondent proprietor's argument that this shift in focus and the resultant change in the preliminary assessment of allowability of the then main request was an unforeseeable and unexpected development to which the respondent proprietor should be given an opportunity to respond in an appropriate manner.

3.3 As explained by the respondent proprietor claim 1 according to the main request refines the definition of the second variant of claim 1 as upheld by replacing the objectionable part of the feature added in opposition by a formulation clarifying that the movable portion - of the flexible plate - is used as a projection. This amendment corresponds to the wording in the first sentence of paragraph 128 of the published application, and thus clearly and in straightforward manner overcomes the objection of added subject-matter pursuant Article 123(2) EPC raised against claim 1 of the then main request.

3.4 Claim 1 according to auxiliary request 2 addresses the same issue of added subject-matter by incorporating the same amendment concerning the plate used as a projection into claim 1 of the auxiliary request 2

filed in the respondent's reply to the appellant's grounds for appeal.

3.5 Otherwise, the amendment to claim 1 of either one of the main request or auxiliary request 2 does not change the substance of the debates concerning the other contentious issues at stake in the present case, especially inventive step which remains in the same framework and based on the same facts and evidence already familiar to the appellant and to the Board.

3.6 The Board considers the particular circumstances of this case as outlined above to be exceptional in the sense of Article 13(2) RPBA 2020, which the respondent proprietor justified with cogent reasons at the oral proceedings. For the above reasons, the Board decided to admit the main request and auxiliary request 2 into the proceedings.

4. Main request - inventive step

4.1 Claim 1 according to the main request only amends the second variant of claim 1 in which the central movable portion of the flexible plate is used as a projection, but retains the definition of the first variant which is formed as an integral projection on the vibrating plate.

4.2 It is common ground that OD9 represents a suitable starting point for assessing inventive step. OD9 discloses a piezoelectric microblower of the same type as defined in the preamble of claim 1. The embodiment relevant for the first variant of claim 1 is shown in figure 8 and described in paragraph 054. These disclose a piezoelectric microblower C, which "is substantially the same as the piezoelectric microblower A of the

first embodiment shown in figures 1 to 3, see also paragraph 038. The microblower is generally formed of a pump body 1 that comprises a top plate 10, a flow-passage-forming plate 20, a separator 30, a blower frame 40, and a vibrating plate 50 bonded between the blower frame 40 and the bottom plate 60 which together define a blower body 1, cf. figures 1 and 8 and the last two sentences of paragraph 038. The separator 30 is a flat plate having a through hole 31 (paragraph 040), and is designed to resonate (paragraph 048). A partition 33 according to the last sentence of paragraph 040 is defined by a ring-shaped protrusion and is attached to either a central portion of the separator 30 (as in figure 1) or the top surface of the diaphragm 51 (as in figure 8, paragraph 054) of the vibrating plate 50.

4.3 The respondent submits that the partition of OD9 is not positioned between the hole and the region of the vibrating plate facing the hole as required by claim 1, as it is ring shaped and lies outside of this area. The partition moreover serves to influence resonant frequency of the vibrating plate rather than increase the compression ratio by narrowing the distance between the vibrating plate and the (facing) plate across the region facing the hole. It thus serves a different purpose.

4.4 The Board disagrees. Claim 1 neither specifies the function of the projection nor does it require that the projection extend (laterally) across the entire region facing the hole. Claim 1 rather uses the same broad expression to define both the direction in which the projection projects into the pumping chamber and the region of the vibrating plate facing the hole. The Board is unable to infer any exact lateral extent of

this region from this formulation, much less that it implies that the projection must lie immediately opposite the hole 152 or be constrained to that area. In its view this formulation, which positions "*the* projection" - not part of it but its entirety - in the region rather defines a broad area extending between the plates surrounding the hole and in which the projection must be located. Indeed all embodiments, see figures 5, 8 and 14 in the patent, show the projection 143 or corresponding plate 154 extending laterally considerably beyond the hole 152, thus confirming such a broad reading of the feature. This broad reading also makes complete sense when referring to the direction of the projection, as it does not project only towards the hole but projects in a broader area surrounding the hole as is apparent again from the figures.

The partition 33 in figure 8 of OD9, which is positioned on the vibrating plage 50 in a the region where it faces the hole is also seen to be positioned in such a broad area as is confirmed by comparison with figure 5, 8 or 14 of the patent.

4.5 Thus the Board agrees with the opposition division, that the fluid control device defined in claim 1 differs from OD9 only in that the partition 33 considered as the projection is not formed integrally with the vibrating plate.

4.6 Apart from advantages associated with manufacturing by differential etching (e.g. half-etching of the region of link portion, last sentence of paragraph 067) the patent does not identify any further advantage of integrally forming a projection with the flexible plate. It even considers the alternative of forming them separately (paragraph 0147, last sentence). For

the above reason the Board disagrees with the formulation of the technical problem proposed by the opposition division to increase lifetime or ease of manufacturing, as this problem cannot be derived from the patent read in the light of the prior art. Instead, based on the patent itself presenting the two alternatives side by side, the Board formulates the objective technical problem as nothing more than providing an alternative manufacturing method for such projections.

4.7 In relation to manufacturing options, OD9 itself discloses in paragraph 059 that "the blower body is not limited to a structure in which a plurality of plate-shaped members are stacked and attached to one another, and may instead be formed in an integrated manner from a metal or resin..." As already established in item 4.2 the blower body is made of its component plates including the vibrating plate 50 and separator 30 stacked on each other. Contrary to the respondent's opinion, the Board considers that where OD9 considers forming the whole assembly of the blade body in an integrated manner, this applies also to any sub-stack or sub-assembly of the stack of plates. Nor does this pose any particular difficulty when the plates are made of metal or resin as suggested in paragraph 059 of OD9. Molding or etching this material to form holes or voids on a surface is a standard manufacturing process.Hence, the skilled person prompted by the suggestion in paragraph 059 would as a matter of obviousness realize the manufacture of the micropump of figure 8 of OD9 in an alternative manner by forming the main body including the vibrating plate with partition integrally. In so doing they would arrive at the subject-matter of claim 1 in the first variant without an inventive step.

4.8 Thus, contrary to the decision's findings in relation to the first variant, the Board concludes that the subject-matter of claim 1 according to the main request lacks an inventive step, on the basis of OD9 alone.

5. Auxiliary request 1 - Inventive step

5.1 Claim 1 according to auxiliary request 1 adds respective features for the two variants relating to the distance between the facing plates in the surrounding area of the hole. For the first variant the added part states that: " a distance between the surroundings of the hole (152) provided in the movable portion (154) of the plate and a region of the vibrating plate (141) facing the movable portion (154) is narrower than a distance between the fixing portion of the plate and a region of the vibrating plate facing the fixing portion". Thus, somewhere in the surrounding area of the hole between the vibrating plate and the moving portion of the plate facing it, the distance between the two should be less than in the fixing portion. In the embodiment of corresponding figure 5, the fixing portion is shown at 155 which, in relation to the projection 43, on the vibrating plate 140, is further outward.

5.2 Clearly, this statement is the direct consequence of providing a projection on the outer surface of a vibrating plate in the region of the hole inward of the fixing portion, where there is no projection. In OD9 this is also the case for the distance between the top of the partition 33 on vibrating plate 40 and the separator plate 30 facing it as compared to the distance between the vibrating plate 50 and the separator plate 30 where the latter is fixed to the

frame 40. Contrary to the respondent's opinion, the fact that the distance should be narrower at some position in the surroundings of the hole does not limit the scope of claim 1 to the immediate vicinity of that central hole. Just as with the term "region" the term "surroundings" is too unspecific. Therefore, the additions to claim 1 of auxiliary request 1 do not contribute to inventive step.

6. Auxiliary request 2 - Inventive step

6.1 Claim 1 of auxiliary request 2 includes the same clarifying formulation ("either the vibrating plate includes ... or the movable portion ... is used as a projection") added to claim 1 of the main request from the as filed application, see published version, paragraph 0128. This amendment addresses an added subject-matter issue arising from the amendment made to claim 1 as upheld (see section 3.2 above). The original amendment, when properly interpreted, covered an embodiment of a projection formed integrally on the facing plate not originally disclosed. By using the original formulation of paragraph 0128 it is made clear that the moving portion of the plate acts as a projection.

Claim 1 further adds the same last two features added to claim 1 according to auxiliary request 1 concerning the narrower distance for both variants as discussed here above. These features are based on a similar formulation in paragraph 0128 (for the second variant) and paragraph 0116 (for the first variant). In any case this feature of a narrower distance or gap is inherent in that of the projection projecting into the space between the two plates.

Finally, claim 1 also adds the features of granted claim 4 as its last feature as follows: "wherein the projection includes an end (547) having a thickness that becomes thinner towards a peripheral edge of the projection."

These amendments thus have a basis in the application as filed, Article 123(2) EPC.

6.2 The appellant challenges claim 1 on the grounds of inventive step starting from OD7 in combination with OD9 and the skilled person's knowledge.

6.3 OD7 discloses a gas flow generator with a steel membrane 4 attached to a steel disc 3 activated by a piezoelectric driver disc 2 (page 4, lines 6 to 14) and projecting therefrom. In the embodiment of figure 9 the vibrating membrane 4 is deformed at its centre to form a domed portion closely spaced from the membrane 5 corresponding to the flexible plate according to claim 1 (page 5, lines 3-5). This domed portion can be said to project from the vibrating plate and thus form a projection therefrom according to the first variant of claim 1. The embodiment according to figure 20a is particularly relevant for that first variant because the gas flow generator of figure 9 is further provided with a base in the form of a heat sink, which is mounted adjacent the membrane 5 (page 7, lines 1-5; "single heat sink" 32).

6.4 However, according to page 7, line 4, the arrangement is then spaced from the upper surface of the sink, so that the membrane 5 is then not bonded to the heat sink 32 shown in figure 20a. This represents a first difference with respect to the subject-matter of claim,

if the heat sink 32 is identified as the base plate of the claim.

6.5 It is common ground that the subject-matter of claim 1 further differs from the gas flow generator of OD7 by its last feature, namely that the projection includes an end having a thickness that becomes thinner towards a peripheral edge of the projection.

6.6 The description does not associate any effect with either difference. Indeed these appear to be unrelated and can be treated separately. The relevant passages for the thickness feature are paragraphs 0136 and 140 of the patent, which mention the tapered end 547 of the projection 543 but do not explain its function or purpose. The problem associated with the thickness feature may thus be formulated as suggested by the appellant, as realizing the flexing membrane 4 in an alternative manner.

6.7 The Board however disagrees with the appellant, that the skilled person would have obviously realized the domed portion in alternative fashion as a matter of routine manufacturing practice by a solid tapering projection. In the steel membrane 4 of OD7, the domed portion is formed by deformation (page 5, lines 3-5) realized using any of a number of known metal-working techniques. The result, as is apparent from figures, is that the membrane including its deformed portion maintains a more or less uniform thickness throughout, both in the central domed portion and surrounding flat (undeformed) region. The membrane consequently retains the properties of a membrane, allowing it to flex and vibrate under action of the driver disc or ring 2 to produce large vibration amplitudes obtained by mechanical resonance (page 4, lines 12-15) with tuned

bending modes shown in figure 8 (page 4, lines 22-23). These properties are primarily the consequence of the vibrating element being a membrane with the domed portion limiting the main area of vibration.

As argued by the respondent a vibrating plate with an integrally formed projection which is thinner towards its edges will exhibit very different vibrations. This is readily apparent for the embodiments where the projection is formed as a thicker plate or body on the thinner vibrating plate. Such a solid body must necessarily limit the plate's vibrations in that area, thus affecting the amplitude and shape of vibrations. Any thickness variation of the plate would alter the bending modes with associated substantial influence on the sought mechanical resonance. Given that the vibration properties would be radically changed by replacing the membrane with domed portion by a vibrating plate with integrally formed projection which is thinner towards its edges, the Board does not believe the skilled person would contemplate such a replacement as a matter of obviousness. Exactly because of these differences in vibration properties they would not see the two possibilities as true alternatives, and would not replace the one by the other as a matter or obviousness.

6.8 For this reason alone, and leaving aside whether or not bonding (the first difference) would be obvious or not, the Board concludes that the subject-matter of claim 1 of the auxiliary request 2 involves an inventive step.

6.9 The Board thus concludes that the subject-matter of claim 1 of the auxiliary request 2 fulfils the requirements of inventive step, Article 52(1) with Articles 56 EPC.

7. No other objections have been raised against claim 1 of the 2nd auxiliary request, nor are any apparent to the Board. But for necessary amendments to the description to bring it into accordance with the new definition of the invention, the patent as amended according to the claims of the auxiliary request 2 and the invention to which it relates, meet the requirements of the EPC, and the patent can be maintained in this amended form, Article 101(3)(a) EPC.

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 in an amended form on the basis of Claims 1-9 of the Auxiliary Request 2 filed in the oral proceedings before the Board at 14.32 hours and a description to be adapted to these claims.**

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated