

**Internal distribution code:**

- (A) [ - ] Publication in OJ
- (B) [ - ] To Chairmen and Members
- (C) [ - ] To Chairmen
- (D) [ X ] No distribution

**Datasheet for the decision  
of 6 November 2019**

**Case Number:** T 0120/17 - 3.2.04

**Application Number:** 08017845.2

**Publication Number:** 2048365

**IPC:** F04C18/12, F04C28/06, F04C28/28

**Language of the proceedings:** EN

**Title of invention:**  
Operation control device for vacuum pump and method for  
stopping operation thereof

**Patent Proprietor:**  
Ebara Corporation

**Opponent:**  
Edwards Limited

**Headword:**

**Relevant legal provisions:**  
EPC Art. 114(2), 123(2), 83, 54, 56

**Keyword:**

Amendments - added subject-matter (no)

Sufficiency of disclosure - (yes)

Novelty - (yes)

Inventive step - (yes)

Late-filed argument - admitted (no)

Late-filed document - admitted (no)

**Decisions cited:**

G 0009/91, T 0162/09, G 0002/93, T 0588/93

**Catchword:**



**Beschwerdekammern**

**Boards of Appeal**

**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0  
Fax +49 (0)89 2399-4465

Case Number: T 0120/17 - 3.2.04

**D E C I S I O N**  
**of Technical Board of Appeal 3.2.04**  
**of 6 November 2019**

**Appellant:** Edwards Limited  
(Opponent) Manor Royal  
Crawley  
West Sussex RH10 9LW (GB)

**Representative:** Norton, Ian Andrew  
Edwards Limited  
Innovation Drive  
Burgess Hill  
West Sussex RH15 9TW (GB)

**Respondent:** Ebara Corporation  
(Patent Proprietor) 11-1 Haneda  
Asahi-cho  
Ohta-ku  
Tokyo 144-8510 (JP)

**Representative:** Carstens, Dirk Wilhelm  
Wagner & Geyer Partnerschaft mbB  
Patent- und Rechtsanwälte  
Gewürzmühlstraße 5  
80538 München (DE)

**Decision under appeal:** **Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
21 November 2016 concerning maintenance of the  
European Patent No. 2048365 in amended form.**

**Composition of the Board:**

**Chairman**           A. de Vries  
**Members:**         J. Wright  
                      W. Van der Eijk

## **Summary of Facts and Submissions**

- I. The appeal was filed by the appellant (opponent) against the interlocutory decision of the opposition division finding that the patent in suit (hereinafter "the patent") in an amended form according to the main request before the opposition division met the requirements of the EPC.
- II. Oral proceedings were held on 6 November 2019 before the Board.
- III. The appellant-opponent requested that the decision under appeal be set aside and that the patent be revoked.
- IV. The respondent (patent proprietor) requested that the appeal be dismissed and the patent thus be maintained as upheld by the opposition division (main request) or that the patent be maintained on the basis of one of auxiliary requests 1-5, as filed with letter of 8 August 2016, or auxiliary requests 8 or 9, as filed with letter of 4 October 2019.
- V. The independent claims of the main request reads as follows:
  1. "A vacuum pump for evacuating a gas containing constituents that solidify or liquefy by lowering of temperature, comprising:  
a casing (2) having an inlet and an outlet; a pump rotor (1) rotatably disposed in the casing (2); a motor (3) to rotate the pump rotor (1);  
a pump rotor control section (15) for controlling a rotation of the pump rotor (1), the pump rotor control section (15) having a timer (16);

an operation stop switch connected to the pump rotor control section (15);  
wherein the pump rotor control section (15) implements a pump stop control pattern to repeat a cycle of de-energizing the vacuum pump for a period of time t1 after a pump stop action is taken, then energizing the vacuum pump for a preset period of time t2, when operation of the vacuum pump is to be stopped by operating the operation stop switch, characterized in that the period of time t1 is preset."

8. "A method for stopping operation of a vacuum pump for evacuating a gas containing constituents that solidify or liquefy by lowering of temperature, the vacuum pump having a casing (2) having an inlet and an outlet, a pump rotor (1) rotatably disposed in the casing (2), a motor (3) to rotate the pump rotor (1), a timer (16) and an operation stop switch, comprising: de-energizing the vacuum pump for a preset period of time t1 after a pump stop action is taken, when operation of the vacuum pump is to be stopped by operating the operation stop switch; energizing the vacuum pump for a preset period of time t2 after the period of time t1; repeating the de-energizing and the energizing alternately."

- VI. In the present decision, reference is made to the following documents:  
D1: EP 1 556 614 B and  
D3: EP1900943 A, which was filed with the appellant-opponent's grounds of appeal.

VII. The appellant-opponent's arguments can be summarised as follows:

The independent claims of the main request add subject matter extending beyond the application as filed. The invention according to these claims is also insufficiently disclosed. D1 and D3 take away novelty of the independent claims. The subject matter of the independent claims lacks inventive step starting from D1 combined with the skilled person's general knowledge.

VIII. The respondent-proprietor's arguments can be summarised as follows:

Late filed amendments to the appellant's case are not justified and should not be admitted into the proceedings. The impugned decision was correct in finding the patent as amended according to the main request met all the requirements of the EPC.

### **Reasons for the Decision**

1. The appeal is admissible.

2. Background

The invention (see published patent specification, paragraph [0001] and [0002]) relates to an operation control device for a vacuum pump and a method for stopping the operation of the vacuum pump. Such pumps are widely used in semiconductor manufacturing.

The patent explains (see published patent specification, paragraphs [0004] and [0005]) that when

the vacuum pump is stopped and cools, some gas constituents solidify or liquefy. Furthermore, the pump rotor and casing contract, reducing clearance gaps. Solid/liquid gas constituents accumulated in these gaps may prevent the pump from restarting. The idea of the invention is to repeatedly energize and de-energize the pump for respective periods of time upon activation of the pump operation stop switch to remove any products that may have formed in the gaps, cf. specification paragraph [0014].

3. Admissibility of certain late filed submissions

3.1 In the present case, in its grounds of appeal, the appellant-opponent's arguments regarding added subject matter were, firstly, that the claims as granted picked features from several different embodiments and, secondly, that the term "characterized in that the period of time t1 is preset" (cf. claim 1 of the main request and the impugned decision, reasons, point 3.3) had no basis in the application as filed. The first of these arguments pertains to unspecified features and is therefore not substantiated; therefore the Board can only consider the second argument.

The appellant-opponent also argued in its appeal grounds that the patent was insufficiently disclosed because it does not give examples of the times t1 and t2, nor say what pump is used, for what processes and under what circumstances. The appellant concluded that the skilled person would not know how to choose suitable times for t1 and t2.

3.2 In its letter of 18 September 2019, just a few weeks before the scheduled oral proceedings, the appellant-opponent presented arguments regarding a contention of



added subject-matter (t1 preset), not substantiated in its statement of grounds and also raised several new issues ("timer", "de-energizing", "stepwise"), none of which were mentioned in the impugned decision. It also raised fresh issues of insufficiency of disclosure concerning dependent claims. Although the appellant-opponent has alleged that some of these were discussed at the oral proceedings before the opposition division, they are not mentioned in the minutes of those proceedings (see points 3.1 to 3.9), which have not been contested. These new submissions thus constitute amendments to the appellant-opponent's case, the admission of which is subject to the discretion of the Board under Art 13(1) and (3) RPBA.

- 3.3 No justification for the late filing of these submissions has been given, nor is any apparent to the Board. In the Board's view, the proper time to have raised these issues was in opposition proceedings, or, at the very latest, with the grounds of appeal. By not doing so until shortly before the oral proceedings, the appellant-opponent's procedural behaviour has impeded the fair and timely conduct of the appeal proceedings.
- 3.4 For these reasons, the Board decided to exercise its discretion under Articles 12(4) and 13 RPBA, with Article 114(2) EPC, by not to admitting all these late filed issues of added subject matter and insufficiency of disclosure into the appeal proceedings. In other words, the Board decided to deal only with issues of added subject matter and sufficiency of disclosure which were substantiated in the appellant-opponent's grounds of appeal.

4. Interpretation of the feature *period of time t1 is preset*, in claim 1
  - 4.1 Before dealing with particular substantive issues, the Board considers it useful to explain how it interprets this important claim feature.
  - 4.2 Amongst other things, claim 1 defines (as summarised by the Board) a pump rotor control section that implements a pump stop control pattern to repeat a cycle of de-energizing the vacuum pump for a preset period of time t1 after a pump stop action is taken, then energizing the vacuum pump for a preset period of time t2.
  - 4.3 The skilled person reads the claim giving terms their usual meanings. The usual meaning of "preset" (see Oxford English dictionary online) is: "Set or determined in advance; (of apparatus, etc.) adjusted before use or operation". Thus both t1 and t2 are time periods that are set in advance and, according to claim 1, define a repeated cycle of alternate de-energising and energising of the vacuum pump. Because the cycle is repeated, each de-energisation time period t1 has the same duration. This is the Board's and - after clarification during the oral proceedings - the parties' common understanding of the characterising feature of claim 1 (t1 is preset). Therefore, pump stop control patterns explained in the patent which have pump de-energised periods that are not constant (see for example published patent specification, figure 8), do not fall within the ambit of claim 1.
  - 4.4 By the same token, in independent claim 8, the feature of t1 being preset (and repeated) has the same meaning as in claim 1 (de-energisation periods t1 are predetermined and of equal duration). Thus, pump-stop

control methods where this is not the case (cf. the published patent specification, figure 8) are not covered by claim 8.

5. Added subject matter, Article 123(2) EPC

According to established jurisprudence, an amendment does not add subject-matter extending beyond the content of the application as filed when it is directly and unambiguously derivable from the application as filed.

In the present case, the feature "period of time t1 is preset" was added to claim 1 during the opposition proceedings. In its grounds of appeal, the appellant-opponent argued that the feature had no basis in the application as filed. The Board disagrees.

The Board notes that original claim 1 defined that, after a pump stop action is taken, the pump rotor is rotated according to a "predetermined timing pattern". According to claim 3, this predetermined timing pattern is set to repetitively start and stop the pump rotor at specific time intervals.

In the present case, the Board sees no difference between a timing pattern that is predetermined and one that is preset. As explained above, the OED explains the term *preset* as meaning *determined* in advance. Thus, the skilled person reads *preset* and *predetermined* as synonymous. Therefore, the appellant-opponent's argument that *predetermined* means something determined in advance by different factors whereas *preset* means "set in stone", is moot. It follows that the combination of original claims 1 and 3 discloses a preset and repeated timing pattern of starting and

stopping the pump rotor at specific repeated intervals, in other words pump stop (and start) time periods are *preset*.

It is true that claim 1 of the main request now defines the pattern in terms of de-energising (rather than stopping) the pump for a preset period of time, and uses the term *t1*, whereas original claims 1 and 3 did not. The usual meaning of "energise", in the context of a machine such as a pump (see OED, reference 4) is: To supply (a device, machine, etc.) with energy, esp. in the form of electricity; to cause (a device, machine, etc.) to begin operating by doing this; to power up; to activate. Thus, a pump that is de-energised is not operating, in other words it is stopped or off. Thus, using the term "de-energised" instead of "stop the operation of the pump" (cf. original claim 3), does not add subject matter. The terms "energise" and "de-energise" are indeed used in this very sense in paragraph [0040] describing the embodiment of figure 9, which has the corresponding pump operation states marked on the y axis as "PUMP ON" and "PUMP OFF".

The description and figures confirm this. There (see for example paragraph [0033] with figure 4), the repeated stop periods are defined as *t1* and illustrated as equal time periods, designated "pump off".

From this it follows that the feature "period of time *t1* is preset" for designating the repeated de-energisation time periods, has a basis in the application as filed. By the same token, the corresponding "preset period of time *t1*" feature of claim 8 also has an original basis.

Therefore, the independent claims meet the requirements of Article 123(2) EPC.

6. Sufficiency of disclosure, Article 83 EPC

Article 83 EPC requires that the European patent application shall disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. In accordance with established jurisprudence, as summarised in G 2/93, point 4, "in order to meet the requirements of Article 83 EPC, a European patent application must therefore contain sufficient information to allow a person skilled in the art, using his common general knowledge, to perceive the technical teaching inherent in the claimed invention and to put it into effect accordingly."

6.1 In their grounds of appeal, the appellant-opponent argued that, because the patent does not disclose examples of the times  $t_1$  and  $t_2$ , nor say what pump is used, for what processes and under what circumstances, the skilled person would not know how to choose suitable times for  $t_1$  and  $t_2$ .

Furthermore, the skilled person would not know when the desired internal temperature drop had occurred for the stop control operation to be ended. According to the appellant-opponent, finding these parameters out would put an undue burden on the skilled person, and therefore the invention is insufficiently disclosed. The Board disagrees.

- 6.2 When carrying out the invention, i.e. putting it into practice, the skilled person will know what vacuum pump they are using and under what circumstances. For example, they will know the starting temperature at which the pump stop control pattern is initiated and the ambient temperature. Therefore, the skilled person will know, and can easily measure, the pump's cooling profile. They will also know the properties of the gas being pumped. Therefore, the question of sufficiency is not to be considered from the perspective of a skilled person who knows no starting parameters as the appellant-opponent has suggested, but rather from that of one who knows all relevant starting parameters.
- 6.3 From this perspective, the Board holds that the skilled person would be able to experimentally determine suitable energising and de-energising times that would allow the pump to cool without getting clogged by deposits (cf. published patent specification, paragraph [0005]).
- 6.4 The Board is not convinced that such experimentation would be unduly burdensome for the skilled person. Nor, contrary to how the appellant-opponent has argued, does the skilled person need to select values for  $t_1$  and  $t_2$  which achieve a superior result compared to the prior art, they must merely enable the invention to work.
- 6.5 The technical teaching inherent in the claimed invention boils down to repeatedly de-energising and energising the pump with respective constant time periods ( $t_1$  and  $t_2$ ), chosen such that solid or liquid deposits do not clog it. In the Board's view, the skilled person, who would have experience of this known clogging phenomenon, would quickly be able to select times for  $t_1$  and  $t_2$  that give a satisfactory result.

- 6.6 Moreover, since the skilled person would know the cooling profile of the pump and the process concerned and could easily measure the pump's actual temperature, they would be able to select a suitable time for ending the stop control operation.
- 6.7 The Board concludes that, from the patent specification and their general knowledge, the skilled person would have all the necessary information for carrying out the invention according to the independent claims, so the requirements of Article 83 EPC are met.
7. Admissibility of document D3
- 7.1 The appellant-opponent has cited D3 under Article 54(3) EPC as being prejudicial to novelty of the independent claims. It was filed for the first time with the grounds of appeal and thus outside the opposition period. Therefore, it is late filed and its admittance is subject to the Board's discretion, Article 114(2) EPC with Article 12(4) RPBA.
- 7.2 According to settled jurisprudence of the Boards of appeal, admissibility of late filed evidence and associated arguments depends, amongst other things, on whether they are prima facie highly relevant so that their admittance would be likely to change the outcome of the proceedings, see CLBA IV.C.4.5.1, in particular T 1002/92, grounds for the decision, point 3.3.
- 7.3 D3 discloses a vacuum pump. As explained in paragraph [0015] with figure 1, it comprises a multistage roots pump 11A and a single stage roots pump 11B.

- 7.4 In its grounds of appeal (see section bridging pages 1 and 2) the appellant-opponent argued that de-energising the vacuum pump could mean that the pump turned at a lower speed, and the multistage roots pump 11A, with its rotors 23 through 32 demonstrated such a "de-energisation". In this regard, it referred to D3, paragraph [0042] with figure 4, trace G2.
- 7.5 Remembering that the Board interprets the term "de-energising the vacuum pump" to mean that it is off, this argument is moot. Thus it is not, prima facie, relevant, so need not be admitted, Article 12(4) RPBA.
- 7.6 At oral proceedings before the board, the appellant-opponent introduced a new argument, namely that the single stage pump shown at the top of figure 1, with its rotors 51, 52, did indeed disclose a pump that is de-energised, that is off, for a repeated, preset time period as claimed (cf. claim 1, t1). In this regard the appellant-opponent referred, for the first time, to the trace G3 shown in figure 3 and paragraph [0040], according to which the rotors 51, 52 of the single stage root pump 11B are temporarily stopped.
- 7.7 This new argument constitutes an amendment to the appellant's case in accordance with article 13 (1) RPBA. Furthermore, it is subject to the stricter admissibility criteria laid out in article 13(3) RPBA.
- 7.8 In the present case, there have been no developments in proceedings that could justify such a late amendment to the appellant-opponent's case: the claims of the main request have not been amended. Moreover, the Board considers that admitting such a new argument at the very last stage of the proceedings would be incompatible with the fair conduct of proceedings and



procedural economy. In particular, the Board holds that the new issue could not fairly be examined without adjournment of proceedings to allow the respondent-proprietor time to formulate a proper response.

Therefore, the Board decided that these arguments could not be admitted under Article 13(3) RPBA.

7.9 Since none of the arguments based on D3 can be admitted, the Board decided to exercise its discretion under Article 114(2) EPC by not admitting D3 and associated arguments into the proceedings.

8. Novelty with respect to D1

8.1 In the Board's view, D1 does not take away novelty of claim 1.

8.2 D1 relates to a (dry) vacuum pump (see paragraph [0001]) and, like the patent, concerns the problem of preventing solidified gas constituents building up when the pump stops (see paragraphs [0004] and [0005]). It is not in dispute that the pump comprises a casing, a pump rotor and motor (see for example paragraph [0021] and figure 1).

8.3 D1's pump also has a control section configured to carry out a pump stop control operation (see for example paragraphs [0006] and [0008]). In this operation (see column 2, lines 3 to 11 - "ceasing operation of the pumping mechanism" and figure 4), the pump is energised for repeated fixed time periods, thus preset time periods (cf.  $t_2$  in claim 1). In the intervening time periods, the pump is de-energised.

8.4 In the Board's view, these periods of de-energisation are not preset as claimed (cf. claim 1, t1).

Rather (see D1, column 2, lines 6 to 11 and paragraph [0011]), the pump is energised each time the pump has cooled by a preset temperature interval (for example by 10°, see paragraph [0013]). Thus, the length of the periods for which the pump is de-energised depends on how much it has cooled, not the passage of time, as such.

8.5 It might well be that, as the appellant-opponent has argued, for the same starting and ambient temperature conditions, the pump would cool following the same cooling curve, and thus give the same temperature intervals in the same time. However, this would not make the intervals preset in the sense of claim 1.

Firstly, this is because, under different conditions, for example different ambient temperatures, cooling through the interval would take more or less time.

Secondly, bodies such as pumps do not cool in a linear fashion but according to Newton's law, that is temperature decays exponentially, not linearly. Therefore, de-energising the pump for periods of time in between which the pump has undergone the same preset temperature drop, does not lead to it being de-energised for equal periods of time as claimed, but for progressively longer periods as it cools. Indeed, such a relationship can clearly be seen in D1, figure 4. Put another way, even if one de-energisation period might be of similar duration to the preceding one, it will, in fact, always be longer.

8.6 Moreover, the Board is not convinced that the reference in paragraph [0015] to "the duration of the pulse" being a fixed time period is a disclosure of a preset de-energising time as claimed. Although "pulse" is used in the singular, the passage continues by explaining that "the method may be performed for a fixed time period". Thus, here *the pulse* appears to mean the entire pump stop control pattern, not an individual de-energisation period.

8.7 The Board concludes that the subject matter of claim 1 differs from D1 in that the de-energising period  $t_1$  is preset. Therefore, D1 does not take away novelty of claim 1.

8.8 The same applies to claim 8 which defines the corresponding feature of a preset time  $t_1$ .

9. Main request, inventive step starting from D1 with the skilled person's general knowledge

9.1 As just explained, the only difference in the subject matter of claim 1 and D1 is that the de-energising time period  $t_1$  is preset. That is, each de-energising time period  $t_1$  is predetermined and of the same duration.

9.2 The patent is silent as to any technical effect the differing feature ( $t_1$  preset) might have. The underlying goal of the invention (see patent specification, paragraph [0007]) is to effectively remove solidified or liquefied products as the pump is stopped. Although (see for example the published patent specification, paragraph [0014]) it is said that the invention effectively achieves this, it appears to attribute this to the intermittent operation of the pump as such and not to the idea of the de-energised

time t1 being preset and of constant length. D1 (see paragraphs [0006] and [0007]) appears to likewise achieve the same underlying effect by intermittently operating the pump as it cools, albeit with temperature determining the duration of its de-energisation periods.

In accordance with established jurisprudence (see CLBA, I.D.4.5 and the decisions cited, in particular T0588/93, reasons 6.1, second paragraph), when deciding the matter of inventive step using the problem-solution approach, there is no need to show that the problem to be solved is novel or that the claimed subject matter constitutes an improvement over the prior art. In other words the problem can be to find an alternative solution to a known underlying problem.

In the present case, the Board considers that the objective technical problem can be formulated as: how to modify the vacuum pump of D1 to provide an alternative pump-stop control arrangement for effectively removing solidified or liquefied products.

- 9.3 In the Board's view, it would not be obvious for the skilled person to arrive at the differing feature (t1 preset and, in the claim context, always equal) starting from D1 in combination with the skilled person's general knowledge.

The whole thrust of D1's teaching (see for example paragraphs [0006], [0008] and [0011]) is to provide a pump stop routine that frees the pump of solid constituents as it cools by energising it whenever it has passed through preset temperature-drop intervals.

- 9.4 In the Board's view, in seeking an alternative pump-stop control arrangement, the skilled person might realise that, if cooling conditions in the pump's environment were fairly constant, then its cooling curve (cf. figure 4) would be predictable. It might then be obvious for them to use the pump's timer (cf. D1, paragraph [0014]) to energise the pump at times at which it was predicted to have cooled through a predetermined temperature drop interval (for example 10°, cf. paragraph [0013] and figure 4), rather than actually measuring the temperature.
- 9.5 However, this would result in pump de-energisation periods which *increased* in duration as the pump cooled, because the cooling curve is exponential. Even if some de-energisation periods so derived might be of similar length, they would always get progressively longer (cf. D4, figure 4). Nor would the result be any different for light duty processes (where the pump stop control routine operates over a small overall drop in temperature). Whatever part of the cooling curve the skilled person might consider, it is exponential, not linear.
- 9.6 The further step of making all de-energisation periods of *equal* duration as claim 1 requires does not appear to be rendered obvious by D1 or the skilled person's general knowledge. D1 consistently teaches that temperature intervals should determine the duration of de-energisation periods. Nor has the appellant-opponent provided evidence proving that de-energising a pump for preset [equal] time periods is generally known.

9.7 It follows that the Board is not convinced by the appellant-opponent's arguments that the skilled person would arrive at the subject matter of claim 1, as a matter of obviousness, when starting from D1 and in the light of their general knowledge. Therefore, the combination does not demonstrate that claim 1 lacks an inventive step, Article 56 EPC.

9.8 These considerations likewise apply to independent claim 8, which has corresponding features to claim 1, albeit formulated in terms of method steps.

10. For the above reasons, the arguments of the appellant-opponent have not convinced the Board that the impugned decision was wrong in finding that the patent as amended according to the main request meets the requirements of the EPC.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:



G. Magouliotis

A. de Vries

Decision electronically authenticated