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Datasheet for the decision of 27 May 2025

Case Number: T 0677/22 - 3.4.02

Application Number: 12704972.4

Publication Number: 2671065

IPC: G01N15/14

Language of the proceedings: EN

Title of invention:
PARTICLE SORTING APPARATUS AND METHOD

Patent Proprietor:
Cytonome/ST, LLC

Opponent:
Blum, Erwin

Headword:

Relevant legal provisions:
EPC Art. 54, 56, 100(a), 100(b)
RPBA 2020 Art. 12(4), 12(6)

Keyword:
Novelty - main request (no) - auxiliary requests (no)
Amendment to case - admissibly raised and maintained (yes) - amendment admitted (yes)
Inventive step - auxiliary requests (no)

Decisions cited:

Catchword:

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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

Case Number: T 0677/22 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 27 May 2025

Appellant: (Opponent)	Blum, Erwin An den Gärten 7 51491 Overath (DE)
Representative:	Godemeyer Blum Lenze Patentanwälte Partnerschaft mbB - werkpatent An den Gärten 7 51491 Overath (DE)
Respondent: (Patent Proprietor)	Cytonome/ST, LLC 9 Oak Park Drive Bedford, MA 01730 (US)
Representative:	Tombling, Adrian George Withers & Rogers LLP 2 London Bridge London SE1 9RA (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 20 January 2022 rejecting the opposition filed against European patent No. 2671065 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	R. Bekkering
Members:	C. Kallinger
	A. Bacchin

Summary of Facts and Submissions

I. The appellant (opponent) has lodged an appeal against the decision of the opposition division rejecting the opposition against European patent No. 2 671 065.

II. The opposition filed by the opponent against the patent was based on the grounds for opposition under Article 100(b) EPC for lack of sufficient disclosure and under Article 100(a) together with Articles 52(1), 54 and 56 EPC, for lack of novelty and lack of inventive step, respectively.

III. In the decision under appeal the opposition division held that none of the grounds for opposition raised by the opponent prejudiced the maintenance of the patent as granted.

IV. With the statement setting out the grounds of appeal the opponent requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

V. With its letter of reply to the statement of grounds of appeal dated 12 October 2022 the respondent (patent proprietor) requested that the appeal be dismissed (main request) or that the patent be maintained in amended form on the basis of the claims of one of auxiliary requests 1 to 7 filed with the letter of reply.

VI. In a reply to the patent proprietor's submission the opponent provided observations with respect to the main request and auxiliary requests 1 to 7.

VII. The board summoned to oral proceedings and, in a communication pursuant to Article 15(1) RPBA, set out its preliminary, non-binding views on certain aspects of the case.

VIII. In a reply to the board's communication the opponent provided observations with respect to the main request and auxiliary requests 1 to 7.

IX. Oral proceedings were held on 27 May 2025.

X. The parties' final requests were as follows.

The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed (main request) or, in the alternative, that the patent be maintained in amended form on the basis of the claims of one of auxiliary requests 1 to 7, filed with the reply to the statement of grounds of appeal.

XI. This decision refers to the following document:

D6 US 2008/0255705 A1

XII. Claim 1 of the main request (patent as granted) reads as follows:

"1. A method of sorting particles comprising the steps of:
a. delivering a fluid stream containing particles to an inspection zone and interrogating the particles at the inspection zone with a source of electromagnetic radiation wherein each interrogated particle produces a pulse of emitted or reflected electromagnetic radiation;
b. detecting the emitted or reflected pulse of electromagnetic radiation for each of the interrogated particles and, for each of the interrogated particles, producing at least one signal representative of an interrogated particle characteristic;
c. comparing the at least one signal to a trigger threshold to determine the occurrence of a particle event;
d. generating an event memory map having event windows; each of the event windows associated with an expected formation of a droplet of fluid;
e. coordinating each particle event to one of the event windows in the event memory map;
f. determining measured pulse parameters for each particle event from the at least one signal;
g. classifying particles based upon the measured pulse parameters;
h. determining event parameters for each event window;
i. applying a sort logic to make a sort decision based on the event parameters and particle classifications associated with each event window;
j. sorting particles within each event window according to the respective sort decisions; and
k. collecting at least one population of sorted particles."

Reasons for the Decision

1. Main request - Novelty

The main request concerns the patent as granted.

1.1 The opposition division held that the subject matter of claims 1 and 17 was novel over document D6.

It argued that an event memory in accordance with claim 1 was to be distinguished from a buffer according to document D6.

Although D6 (see paragraph [0044]) stated that the DMA buffer of the event/particle queue held a plurality of event frames, it was also stated that the event/ particle queue worked as a circular buffer. However, there was a fundamental difference between a memory as claimed (which may be a RAM) and a buffer because a buffer stored the data only temporarily, while a memory as claimed was a concrete storage technology capable of storing the data for a longer time.

1.2 The board does not agree with the opposition division's finding and is of the opinion that the subject-matter of claim 1 is not new in view of document D6.

It has never been disputed that document D6 discloses steps a), b), f), g) and k) of claim 1.

With respect to the remaining features of claim 1, the board is not convinced by the patent proprietor's and

the opposition division's arguments but agrees with the opponent.

1.2.1 Step c)

"c. comparing the at least one signal to a trigger threshold to determine the occurrence of a particle event;"

From the decision under appeal (see section 14.3.7.4, penultimate paragraph), the opponent's statement of grounds of appeal (see section 5.1, top of page 10) and the patent proprietor's reply to the appeal (see pages 6 to 8), it results that it has never been disputed that document D6 discloses step c) of claim 1.

However, in its reply to the board's communication under Article 15(1) RPBA the patent proprietor argued for the first time (see letter dated 29 July 2024, page 5) that feature c) was not disclosed by document D6 because document D6 was silent on how the acquisition electronic determined how an identifiable particle is encountered.

During the oral proceedings, this argument was no longer pursued by the patent proprietor, and feature c) was thus treated like the other undisputed features a), b), f), g) and k). Instead, the patent proprietor expressly maintained that features d), e), h), i) and j) were not disclosed in document D6.

In any case the board notes that the detection of a particle by the sensor (see paragraph [0049] of D6) necessarily involves the comparison of the detected signal to a trigger threshold. Therefore, step c) is disclosed in D6."

1.2.2 Step d)

"generating an event memory map having event windows; each of the event windows associated with an expected formation of a droplet of fluid;"

The board agrees with the opposition division and the patent proprietor that the claimed event memory map is a data structure that indicates how a memory is laid out.

Document D6 (see Figure 3C and paragraph [0048]) discloses a *"drop queue"* representing expected physical drops (including drops which do not contain particles) and that a *"memory is used to store the representation of the drop queue"*.

The patent proprietor argued that document D6 (see Figure 3A and paragraphs [0044] and [0047]) disclosed that a DMA (Direct Memory Access) buffer stored temporary data with respect to particles. According to document D6, data was written to the DMA buffer only when a particle was detected. In contrast to this, the "event windows" as recited in step d) were associated with an expected droplet of fluid, not with the individual particles. Specifically, an event window as recited in claim 1 might contain information associated with none, one, or more individual particles that are found within a given droplet. Hence, particle data might not be pertinent to an expected droplet.

The patent proprietor further argued that step d) of claim 1 defined to assign a specific part of a memory for each event window. In contrast to this, document D6 (see Figures 3A and 3C) disclosed two separate circular buffers, one to track particle events and one to track

droplets. In addition, Figure 3C only provided a representation of a drop queue but did not disclose a structured memory as claimed.

The patent proprietor argued in particular that the buffer known from document D6 had a structure, a function, and an operation different from a memory map as claimed: the circular buffers mentioned in document D6 operated such that that data was constantly being overwritten once the buffer was full. In contrast to this, the claimed memory map provided information on how the memory was structured. This allowed a processor to access the correct parts of memory at the correct time.

Therefore, step d) was not disclosed in document D6.

The board is not convinced by these arguments but agrees with the opponent for the following reasons:

The board agrees with the patent proprietor that document D6 discloses (see e.g. Figure 3A and paragraph [0044]) an *"event/particle queue 304"* implemented in a DMA memory buffer such that each element ("event frames 310") of the buffer corresponds to a particle event.

However, document D6 (see Figure 3C and paragraph [0048]) also discloses the use of a drop queue 342 which is *"a representation of the physical drops that will be broken off"* and that a *"memory [is] used to store the representation of the drop queue".* Therefore, document D6 explicitly discloses a memory that is structured (e.g. via the drop index 348) according to the expected formation of drops. A map representing this structured memory necessarily has to be generated, as otherwise the individual events (associated with

expected droplets) could not be associated with their dedicated parts of the memory, as otherwise it would not be possible to associate the individual events (associated with expected droplets) with the parts of the memory used for storing the corresponding droplets of the drop queue.

Document D6 (see paragraph [0048]) also discloses that *"Events/particles 346 do not necessarily line up one per drop"*, i.e. that a memory section associated with an event window may contain information associated with none, one, or more individual particles that are found within a given droplet.

The fact that document D6 further defines that the memory *"may be treated as a circular buffer"* (see paragraph [0048]) does not change the fact that document D6 discloses the use of a (not further defined) structured memory as claimed. The patent proprietor's arguments with respect to the effects associated with memory mapping are not convincing, as these effects do not follow necessarily from step d) as claimed.

Therefore, step d) is known from document D6.

1.2.3 Step e)

"coordinating each particle event to one of the event windows in the event memory map;"

Document D6 (see paragraph [0048], last sentence) discloses that as *"each event's location is computed within the event's absolute drop index, a map of all the events and their locations is created for the drop queue."* This coordination of particle events to

expected drops (i.e. event windows) is also illustrated by the arrows in Figure 3C.

Therefore, step e) is known from document D6.

1.2.4 Step h)

"determining event parameters for each event window"

The patent proprietor argued that referring to different passages of document D6 (in particular Figure 8 together with paragraph [0069] versus Figure 3C and paragraph [0048]) was *"improperly mixing various embodiments of D6"*. Therefore, step h) of claim 1 was not disclosed, as paragraph [0064] failed to disclose the memory structure of step d).

The board is not convinced by these arguments but agrees with the opponent for the following reasons:

Document D6 discloses a complete method for sorting particles and provides details of various aspects of the disclosed method: Figure 3C and paragraph [0048] illustrate and define the drop queue which is used by the sorting software as explained in Figure 8 and paragraph [0069]. Therefore, these figures and paragraphs do not relate to separate, unrelated embodiments as alleged by the patent proprietor.

As discusses above, document D6 (see paragraph [0048]) discloses step d) of claim 1 by defining a drop queue and its storage in a memory. Document D6 refers again to this drop queue and explains its use by the sorting software (see paragraph [0069]). There, it is explained that the *"drop queue contains entries for each drop"* and that *"Each drop entry may contain a variety of*

information such as drop ID (identification), the drop time, number of positive particles for the drop". These parameters correspond to the *"event parameters"* of the patent, which can be e.g. the droplet number, droplet time stamp, etc. (see claim 11).

Therefore, step h) is known from document D6.

1.2.5 Steps i) and j)

"applying a sort logic to make a sort decision based on the event parameters and particle classifications associated with each event window;
sorting particles within each event window according to the respective sort decisions;"

The patent proprietor argued again that the passages referred to by the opponent did not relate to a single embodiment. As paragraphs [0054] and [0056] of document D6 failed to disclose the event windows of the event memory map (as defined in step d)), they could not disclose steps i) and j) which also related to these event windows.

The board is not convinced by these arguments but agrees with the opponent for the following reasons:

As discussed above (see section 1.2.4), document D6 discloses a complete method for sorting particles and provides details of various aspects of the discloses method: Figure 3C and paragraph [0048] illustrate and define the drop queue which is later on used by the sorting software as illustrated and explained in Figures 5A and 8 and paragraphs [0054] and [0064]. Therefore, these figures and paragraphs do not relate

to separate, unrelated embodiments as alleged by the patent proprietor.

Document D6 discloses (see paragraph [0064] and Figure 8) that the sorting software creates *"the drop queues [...] with each event's tentative sort decision indicated in the drop queue. The drop queues [...] are then used to make the sort/no-sort decision"*. According to D6 (see paragraph [0054]) *"the final sort decision is per drop"*. In addition (see paragraph [0069]),*"each drop entry 816 [of the drop queue] may contain* a *variety of information such as a drop ID (identification), the drop time, number of positive particles for the drop, the number of negative particles (contaminants) for the drop"*.

The board is therefore convinced that particles are sorted according to a final sort decision which is taken for each drop and that the sorting is based on the sort decision.

Therefore, steps i) and j) of claim 1 are known from document D6.

1.3 In conclusion, the board is of the opinion that document D6 discloses all steps of the method of sorting particles according to claim 1 and that the subject-matter of claim 1 is therefore not new in view of document D6.

Therefore, the ground for opposition under Article 100(a) together with Article 54(1) EPC prejudices the maintenance of the patent as granted.

2. Auxiliary requests 1 to 5

These auxiliary requests were filed with a letter dated 27 July 2021 during the first-instance opposition proceedings. Since the patent was maintained as granted, there was no need for the opposition division to decide on them.

The board therefore finds that these requests have been admissibly raised and maintained by the opponent and are therefore not to be regarded as an amendment but are part of the appeal proceedings (Article 12 (4) RPBA).

2.1 Auxiliary request 1 - Novelty

Claim 1 of auxiliary request 1 is identical to claim 1 of the main request. In comparison to the patent as granted, only the description has been amended.

For the same reasons as set out above for the main request, the board therefore finds that the subject-matter of claim 1 is not new in view of document D6.

Thus, taking into consideration the amendments in auxiliary request 1, the patent and the invention to which it relates do not meet the requirements of Article 54 EPC.

2.2 Auxiliary request 2 - Novelty

In comparison to claim 1 of the main request, step d) of claim 1 of auxiliary request 2 has been amended as follows (amendment marked by the board):

"d. generating an event memory map having event windows; each of the event windows associated with an expected formation of a droplet of fluid containing zero or more particles;"

Document D6 (see paragraph [0048]) discloses that *"Events/particles 346 do not necessarily line up one per drop. Multiple events/particles may appear in a single drop, one event/particle may appear in a single drop, or no events/particles may appear in a single drop"*.

The board agrees with the opponent that the added feature that a droplet can contain zero or more particles is also known from document D6.

Therefore, the subject-matter of claim 1 is not new in view of document D6.

Thus, taking into consideration the amendments in claim 1 of auxiliary request 2, the patent and the invention to which it relates do not meet the requirements of Article 54 EPC.

2.3 Auxiliary request 3 - Novelty

Claim 1 of auxiliary request 3 is identical to claim 1 of auxiliary request 2.

For the same reasons as set out above for auxiliary request 2, the board therefore finds that the subject-matter of claim 1 is not new in view of document D6.

Thus, taking into consideration the amendments in auxiliary request 3, the patent and the invention to

which it relates do not meet the requirements of Article 54 EPC.

2.4 Auxiliary request 4 - Novelty

In comparison to claim 1 of the main request, step j) of claim 1 of auxiliary request 4 has been amended as follows (amendment marked by the board):

"j. sorting particles represented by particle events within each event window according to the respective sort decisions;"

Document D6 (see Figure 3C and paragraph [0048]) refers to *"EVENTS (PARTICLES) 346"* and *"events/particles"* and thus makes clear that events relate to particles.

The board agrees with the opponent that the added feature that particles are represented by particle events is also known from document D6.

Therefore, the subject-matter of claim 1 is not new in view of document D6.

Thus, taking into consideration the amendments in claim 1 of auxiliary request 4, the patent and the invention to which it relates do not meet the requirements of Article 54 EPC.

3. Auxiliary requests 6 and 7

3.1 Admittance

The patent proprietor submitted auxiliary requests 6 and 7 for the first time with its reply to the opponent's statement of grounds of appeal.

The opponent requested not to admit these auxiliary requests because the arguments relating to the amendments ("*random access memory, RAM, of a field programmable gate array, FPGA*") were already brought forward and discussed during the first instance proceedings (see patent proprietor's reply to the notice of opposition dated 26 October 2020, page 13 and minutes of the oral proceedings, section 8.1). Therefore, these auxiliary requests should have been submitted in the proceedings leading to the appeal (Article 12(6) RPBA).

The patent proprietor requested admittance of these requests according to Article 12(4) RPBA as the amendments were a direct response to arguments presented at the oral proceedings (see minutes of the oral proceedings, section 8.1 and decision under appeal, section 14.3.10.1) and brought forward by the opponent for the first time in writing in the grounds of appeal (see statement of grounds of appeal, page 27) relating to the type of memory that was claimed. Thus the circumstances of the appeal case justified admittance of these auxiliary requests (Article 12(6) RPBA).

The board is not convinced by the opponent's arguments but agrees with the patent proprietor for the following reasons:

Auxiliary requests 6 and 7 were not part of the decision under appeal (Article 12(2) RPBA) and were not admissibly raised during the opposition proceedings. Therefore, they are to be regarded as an amendment, which may be admitted only at the discretion of the board (Article 12(4) RPBA).

The features "circular buffer", "random access memory (RAM)" and "field programmable gate array (FPGA)" were discussed during the proceedings leading to the appeal. The patent proprietor immediately reacted to those arguments with the reply to the notice of opposition, by filing counterarguments. Since the opposition division's preliminary opinion (see summons to oral proceedings dated 20 September 2021), as later confirmed in the decision taken at the end of the oral proceedings, was in favour of the patent proprietor, the latter had no reason to file further auxiliary requests in the course of the first-instance opposition proceedings. The fact that the patent proprietor *could* have filed claim amendments in reaction to those arguments does not necessarily mean that, under the present circumstances, it also *should* have filed them during first-instance opposition proceedings. Moreover, the board finds that the objection was made clear for the first time at the oral proceedings before the opposition division, rather than already in the notice of opposition. Therefore, the board is satisfied that the circumstances of the appeal case, including the arguments raised at the oral proceedings which lead to the decision under appeal and those presented with the statement of grounds of appeal, justify admittance of auxiliary requests 6 and 7 (Article 12(6), second sentence, RPBA).

Furthermore, the patent proprietor clearly identified the amendments and their basis and provided reasons for submitting them in the appeal proceedings. In view of the low complexity of the amendments, the board exercises its discretion in admitting these requests (Article 12(4) and (6) RPBA) and deal with them in substance.

3.2 Auxiliary request 6 - Inventive step

In comparison to claim 1 of the main request, step d) of claim 1 of auxiliary request 6 has been amended as follows (amendment marked by the board):

"d. generating, in a random access memory, RAM, an event memory map having event windows; each of the event windows associated with an expected formation of a droplet of fluid;"

3.2.1 The patent proprietor argued that document D6 did not disclose a RAM and that this difference allowed storage and access in parallel processing which was not possible with the circular buffer used in document D6. The circular buffer of document D6 had a fixed and limited size and would be overwritten eventually. In contrast to this, in the patent there was no need to overwrite as there were as many event windows created as needed.

The technical effects deriving from this were the provision of a longer storage time of the data and the possibility of parallel processing.

Based on this, the objective technical problem was to improve the data storage and increase the sort rate.

3.2.2 The opponent argued that the distinguishing feature between claim 1 of auxiliary request 6 and document D6 was the use of a random access memory (RAM), but that no further technical effect could be derived from it, so that the objective technical problem could be formulated as the provision of an alternative memory.

Starting from document D6, the use of a RAM was one possible option, available to the skilled person from the common general knowledge so that it would have been obvious to realise the memory disclosed in D6 by way of a RAM and thereby arrive in an obvious way at the claimed subject-matter.

3.2.3 The board agrees with the opponent and is not convinced by the patent proprietor's line of argument for the following reasons:

Claim 1 differs from document D6 in that it defines that the event memory map is generated in a RAM.

The technical effects alleged by the patent proprietor cannot be attributed to this difference, as the claim is silent about parallel processing, memory size and storage times.

The board agrees with the opponent that the problem to be solved is to provide an alternative to the memory disclosed in document D6.

The skilled person is aware of different memory technologies and in particular a RAM is well known and one of the most commonly used memory types in electronic measurement systems and methods. The use of a RAM as the concrete type of memory to be used for the

electronic implementation of the steps of the claimed method, i.e. also for step d), does therefore not involve an inventive step.

In conclusion, taking into consideration the amendments in claim 1 of auxiliary request 6, the patent and the invention to which it relates do not meet the requirements of Article 56 EPC as the subject-matter of claim 1 lacks an inventive step starting from document D6 in combination with the common general knowledge.

3.3 Auxiliary request 7 - Inventive step

In comparison to claim 1 of auxiliary request 6, step d) of claim 1 of auxiliary request 7 has been amended as follows (amendment marked by the board):

"d. generating, in a random access memory, RAM, of a field programmable gate array, FPGA, an event memory map having event windows; each of the event windows associated with an expected formation of a droplet of fluid;"

3.3.1 The patent proprietor argued that the distinguishing features between claim 1 of auxiliary request 7 and D6 was the use of a RAM of a field programmable gate array (FPGA), together with the other features of step d). The technical effect deriving from this difference was the provision of a longer storage of the data so that the objective technical problem could be formulated as the provision of an improvement in data storage and an increase of the sort rate.

As document D6 neither disclosed a RAM nor an FPGA, let alone a RAM of an FPGA, and contained no hint towards

their use, the subject-matter of claim 1 was inventive over document D6.

3.3.2 The opponent argued that document D6 (see paragraphs [0063] and [0064]) already disclosed an FPGA and that therefore the distinguishing feature was only the use of a random access memory (RAM).

Therefore, for the same reasons as set out above for auxiliary request 6, the subject-matter of claim 1 of auxiliary request 7 did not involve an inventive step.

3.3.3 The board agrees with the opponent and is not convinced by the patent proprietor's line of argument for the following reasons:

As discussed above for the main request (see section 1.2.5), document D6 discloses (see paragraph [0064]) that *"the sorting software creates the drop queues for each stream with each event's tentative sort decision indicated in the drop queue"*, i.e. that the sorting software generates the event memory map as defined in step d).

In addition, document D6 (see paragraph [0063]) discloses that the sorting software *"may also be burned onto a firmware device such that the software is stored and executed on the firmware device. One example of a firmware device is a Field Programmable Gate Array (FPGA) device burned to run the software sorting program."*

Thus, document D6 already discloses the use of an FPGA as now claimed and the remaining difference between claim 1 of auxiliary request 7 and document D6 is the

use of a RAM. In addition, there is no surprising or synergistic effect in the use of a RAM of an FPGA.

Therefore, for the same reasons as discussed for claim 1 of auxiliary request 6, the subject-matter of claim 1 lacks an inventive step starting from document D6 in combination with the common general knowledge and, taking into consideration the amendments in claim 1 of auxiliary request 7, the patent and the invention to which it relates do not meet the requirements of Article 56 EPC as.

4. Conclusion

Taking into consideration the amendments made by the proprietor of the European patent, the patent and the invention to which it relates do not meet the requirements of the EPC (Article 101(3)(b) EPC).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

K. Boelicke R. Bekkering

Decision electronically authenticated