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**Datasheet for the decision
of 14 July 2023**

Case Number: T 1744/20 - 3.2.03

Application Number: 12753569.8

Publication Number: 2742299

IPC: F25B9/12

Language of the proceedings: EN

Title of invention:

CRYOGENIC COOLING APPARATUS AND METHOD

Patent Proprietor:

Oxford Instruments Nanotechnology Tools Limited

Opponent:

Bluefors Oy

Headword:

Relevant legal provisions:

EPC Art. 54(2), 54, 113(1), 123(2), 56, 107
EPC R. 103(1) (a)

Keyword:

Reimbursement of appeal fee - substantial procedural violation
(no)

Admissibility of patent proprietor's appeal - entitlement to
appeal

Amendments

Late-filed objection - circumstances of appeal case justify
admittance (no)

Novelty - public prior use (yes) - public prior use (no) -
insufficient evidence - public prior use - obligation to
maintain secrecy (yes)

Inventive step

Decisions cited:

T 0906/01, T 0245/88

Catchword:



Beschwerdekammern

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Case Number: T 1744/20 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 14 July 2023

Appellant: Oxford Instruments Nanotechnology Tools Limited
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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
29 June 2020 concerning maintenance of the
European Patent No. 2742299 in amended form.**

Composition of the Board:

Chairman C. Herberhold
Members: B. Goers
D. Prietzel-Funk

Summary of Facts and Submissions

- I. European patent No. 2 742 299 relates to a cryogenic cooling system, a method of operating a cryogenic cooling system, in which a target region for receiving a sample is cooled by a dilution refrigerator, and to a computer program product adapted in use to perform the method of operating a cryogenic cooling system.
- II. With the impugned decision, the opposition division concluded that the patent as amended on the basis of auxiliary request 3 submitted during the oral proceedings complies with the requirements of the EPC.
- III. This decision was appealed by both the patent proprietor and the opponent, which are referred to as such in the following for the sake of simplicity.
- IV. At the end of the oral proceedings before the Board the final requests - as far as relevant for the present decision - were as follows. For the course of the proceedings reference is made to the minutes.

The patent proprietor requested that the decision under appeal be set aside and that the patent be maintained as granted, or that the patent be maintained in amended form according to one of auxiliary requests 1 to 20 submitted with the letter dated 19 May 2021, or according to one of auxiliary requests 21 to 31 submitted with the letter dated 16 June 2023.

The opponent requested that the decision under appeal be set aside and that the European patent be revoked in its entirety, that the patent proprietor's appeal be held inadmissible, that auxiliary requests 6 to 14 and

16 to 31 not be admitted into the proceedings, and that the opponent's appeal fee be reimbursed due to a substantial procedural violation by the opposition division.

V. The following evidence is relevant for this decision.

- D1: US 4,672,823 (Benoit et al.)
- D2: WO 2010/106309 A2
- D4: L.M. Hernandez, A.M. Goldman: Bottom-loading dilution refrigerator with ultrahigh vacuum deposition capability, *Review of Scientific Instruments*, vol. 73, no. 1, January 2002
- D7: P.H.P. Reinders and M. Springford: A Novel Top-Loading 20 mK / 15 T Cryomagnetic System, *Proc. 18th Int. Conf. on Low Temperature Physics, Kyoto, 1987, Japanese Journal of Applied Physics*, vol. 26 (1987) Supplement 26-3
- D8: Operator's Handbook, Triton²⁰⁰ Cryofree® Dilution Refrigerator, Issue 2.2, copyright 2009 Oxford Instruments NanoScience, 2009
- D9: Triton²⁰⁰ Cryofree® Dilution Refrigerator, Liquid-Helium-Cooled Top-Loading-Probe, Operator's Handbook, Issue V1.0
- D12: BF-LD250 Cryogen-Free Dilution Refrigerator System, User manual, v. 1.3.0, December 2010
- D13: Witness statement by Dr Vladimir Manucharyan
- D14: Witness statement by Dr Thomas Keller
- D15: Email attaching quote for cooling systems to be supplied to Harvard University; 19 June 2009
- D23: Order review form for system to be supplied to Max Planck Institute
- D31: List of BlueFors LD250 customers
- D32: Pro Forma Invoice for Model BF-LD250 CFDR system to Princeton, 28 January 2011, Princeton-BF 111809-JRS-B-Proforma

- D33: Invoice No. 11503720 (by Beweship) for shipping of Model BF-LD250 CFDR system to Princeton, 3 February 2011, Princeton
- D34: Purchase Order for Model BF-LD250 CFDR system to Princeton, 28 January 2010, Princeton-Petta-PO
- D43: Letter and legal opinion of US Patent attorneys David Crosby and Susanna Benn
- D44: Legal opinion prepared by US patent attorney Michael Greenbaum; 13 September 2019
- D47: Microscopic Properties of the Fractional Quantum Hall Effect, a dissertation presented by Angela Kou, Harvard University, Cambridge, Massachusetts, September 2013 (excerpts)
- K20: BF-LD Series cryogen-free dilution refrigerator - User manual

VI. Wording of the claim requests insofar as it is relevant for the decision

- (a) Independent claims 1, 15 and 25 of the main request (patent as granted) read as follows:

Claim 1:

"A method of operating a cryogenic cooling system (1), in which a target region for receiving a sample (50) is cooled by a dilution refrigerator (15) containing an operational fluid, the method characterized by performing the following steps (a) to (e) in order:

- (a) removing (103,104) the operational fluid from the dilution refrigerator;*
- (b) moving (105-108) target apparatus (51) comprising the sample from a high temperature location to the target region;*
- (c) pre-cooling (109) the target apparatus in the target region to a first temperature using a mechanical refrigerator (2);*

- (d) *providing (111) the operational fluid to the dilution refrigerator; and*
- (e) *operating (112) the dilution refrigerator using the operational fluid so as to cool the target apparatus in the target region to a second temperature that is lower than the first temperature."*

Claim 14:

"A cryogenic cooling system (1) comprising: a dilution refrigerator (15) arranged to use operational fluid to cool a target region at which target apparatus (51), comprising a sample (50), is positioned when in use; and a pre-cool system, comprising a mechanical refrigerator (2), for cooling the target apparatus in the target region; characterized by a control system (38) configured to remove the operational fluid from the dilution refrigerator before the target apparatus is received at the target region, to operate the precool system so as to pre-cool the target apparatus in the target region to a first temperature using the mechanical refrigerator, to provide the operational fluid to the dilution refrigerator and to operate the dilution refrigerator using the operational fluid so as to cool the target apparatus in the target region to a second temperature that is lower than the first temperature."

Claim 25:

"A computer program product characterized by program code means adapted in use to perform the steps (a) and (c) to (e) of the method of any of claims 1 to 13."

- (b) **Independent method claims 1 of auxiliary requests 1 to 6** have the following additional features or

amendments, the latter marked in bold, compared with the main request:

Auxiliary requests 3 and 4:

[1.A] "*without bringing the target region to atmospheric conditions*"

Auxiliary requests 5 and 6:

[1.B] "*a plurality of spatially disposed stages (11, 12, 13, 16, 17) to which parts of a mechanical refrigerator (2) and the dilution refrigerator are coupled, wherein one or more of the plurality of stages has an aperture (25) for receiving a target apparatus (51) and wherein the said one or more apertures defines a bore (57) through which the target apparatus is caused to pass when in use*"

Auxiliary request 6:

step b'): "*moving (105-108) **the** target apparatus (51) comprising the sample from a high temperature location to the target region **using the loading assembly;***"

[1.C] "*a loading assembly (53)*"

(c) **Independent device claims 14** of auxiliary requests **1 to 6** have the following additional features or amendments, the latter marked in bold, compared with the main request:

Auxiliary requests 1 and 3:

[14.A] *"wherein the cryogenic cooling system is configured when in use to perform the method according to any of claims 1 to 13"*

Auxiliary requests 2 and 4 to 5:

[14.B] *"a plurality of spatially disposed stages (11, 12, 13, 16, 17) to which parts of the mechanical and dilution refrigerators (2, 15) are coupled, wherein one or more of the plurality of stages has an aperture (25) for receiving the target apparatus (51) and wherein the said one or more apertures defines a bore (57) through which the target apparatus is caused to pass"*

Auxiliary request 6:

[14.B'] *"a plurality of spatially disposed stages (11, 12, 13, 16, 17) to which parts of the mechanical and dilution refrigerators (2, 15) are coupled, wherein one or more of the plurality of stages has an aperture (25) for receiving the target apparatus (51) and wherein the said one or more apertures defines a bore (57) through which the target apparatus is caused to pass **using the loading assembly**"*

[14.C] *"a loading assembly (53)"*

- (d) **The independent computer program product claim**
(claim 25 of the main request) has been deleted from all the auxiliary requests 1 to 6.

The further auxiliary requests are not relevant for this decision.

VII. The patent proprietor's arguments, insofar as they are relevant to the present decision, can be summarised as follows.

- (a) The patent proprietor was entitled to appeal and its appeal was admissible. It was negatively affected by the non-allowability of the main request.
- (b) The Harvard, MPI and Princeton public prior uses (Harvard PU, MPI PU, Princeton PU) and the corresponding documents D8, D9 and D12 were not part of the state of the art under Article 54(2) EPC. The sales of such systems usually included secrecy terms, which was also demonstrated by the accompanying evidence D15, D20 and D23. The opponent also did not provide the sale terms for the Princeton PU and there was also no evidence that D12 was indeed the version of the manual accompanying the sale, although the evidence was fully within its sphere. Despite the alleged public availability of the manual D12, the opponent took great care to keep an almost identical version of this manual secret, i.e. excluded it from file inspection in the proceedings before the Finnish Market Court (indicated here as "K20") as well as in the appeal proceedings, which was highly inconsistent behaviour. With regard to the sample loader (MPI PU(2)), it appeared that the sale had not been terminated at all.
- (c) The subject-matter of claim 1 of the main request and auxiliary requests 1 and 2 was novel over D8, which did not disclose operation under non-atmospheric conditions.

- (d) Claim 14 of auxiliary request 3 did not extend the subject-matter beyond the content of the application as filed. The claim wording did not require step b) to be carried out by the system, i.e. automatically, even if such automation was a common measure and was also encompassed by the application as filed.
- (e) The subject-matter of claim 14 of auxiliary requests 4 and 5 was novel over D8, which did not disclose apertures forming a bore suitable for the target apparatus with the sample. The apertures in Figures 3 and 4 were intended for other purposes.
- (f) Auxiliary request 6 was admissible since it was a legitimate response to the opponent's arguments with respect to the previous requests. It also complied with the requirements of Article 123(2) EPC.
In the general part of the description, the loading assembly was not disclosed in combination with further features or functions.
- (g) The inventive step objection against claims 1 and 14 starting from D8 in combination with D9 was not to be admitted as it was filed late, only during the oral proceedings, and without any special circumstances.
- (h) The subject-matter of claims 1 and 14 of auxiliary request 6 was inventive over all the combinations of documents used.

VIII. The opponent's arguments, insofar as they are relevant to the present decision, can be summarised as follows.

- (a) The patent proprietor's appeal was not admissible since the patent proprietor was not entitled to appeal.
- (b) The Harvard PU, MPI PU and the Princeton PU and the corresponding documents D8, D9 and D12 formed part of the state of the art under Article 54(2) EPC. No confidentiality agreements were in place in order to keep the alleged prior uses secret. With regard to the alleged lack of terms of sale for the sale to the Princeton PU, they were not existing at all because BlueFors (the opponent), at that time was a kind of garage-operated small firm and simply did not have any.
- (c) The subject-matter of claim 1 of the main request and auxiliary requests 1 and 2 was not novel at least over D8. The claims were not limited to operation under non-atmospheric conditions and disassembly of the nested heat radiation shields for changing a sample was within the scope of the claims.
- (d) The subject-matter of claim 14 of auxiliary request 3 was non-allowably extended since step b), by way of the back-reference to claim 1, was included in the control of the apparatus itself, which was not originally disclosed.
- (e) The subject-matter of claim 14 of auxiliary requests 4 and 5 was not novel over D8. The apertures in the heat radiation shields shown in

Figure 4 were suitable for a target apparatus with a sample to pass through.

- (f) Auxiliary request 6 was not to be admitted as it was filed late and was *prima facie* not allowable. *Inter alia*, it included an unallowable intermediate generalisation.

- (g) Auxiliary request 6 was not allowable under Article 123(2) EPC since the loading assembly was originally disclosed only in combination with further features that had been omitted which resulted in a non-allowable intermediate generalisation.

- (h) The subject-matter of claims 1 and 14 of auxiliary request 6 was not inventive over any of the following combinations:
 - D8 in combination with the teaching of D9,
 - D8 in combination with the teaching of D2,
 - D1 in combination with common general knowledge,
or
 - D4 in combination with common general knowledge.

- (i) The opponent's appeal fee was to be reimbursed since the appealed decision was based on substantial procedural violations. In particular, the opponent's right to be heard was not respected with respect to the public status of MPI PU and to specific arguments used for the first time in the opposition division's written decision with respect to the combination of D8 or D12 with D2.

Reasons for the Decision

1. Admissibility of the patent proprietor's appeal

The patent proprietor is entitled to appeal under Article 107 EPC and its appeal is admissibly raised.

1.1 The opponent requested that the patent proprietor's appeal be rejected as inadmissible under Rule 101(1) EPC since the patent proprietor was not adversely affected by the appealed decision and, therefore, was not entitled to appeal, as stipulated by Article 107, first sentence, EPC.

1.2 The Board does not agree.

According to Article 107, first sentence, EPC any party to the proceedings adversely affected by a decision may appeal. A patent proprietor is adversely affected if a higher-ranking request is found not to be allowable.

In the case at hand the opposition division concluded that the patent proprietor's highest-ranking request was not allowable and only auxiliary request 3 was found to be allowable. For this reason alone the patent proprietor is negatively affected by the appealed decision. This conclusion is irrespective of the type of amendments made to auxiliary request 3 or their factual effect e.g. on the extent of the subject-matter claimed.

Therefore, contrary to the opponent's view, it is also irrelevant that the patent proprietor argued that the amendments made to independent claims 1 and 14 of

auxiliary request 3 had no limiting effect on the subject-matter compared with the main request.

2. State-of-the-art status under Article 54(2) EPC of the alleged public prior uses and the related documents D8, D9 and D12

The opponent raised objections of lack of patentability, which were, *inter alia*, based on different allegedly public prior uses (sales to different institutions) as well as on documents allegedly being made public in the context of these sales.

The prior uses relate to the following sales of cryogenic refrigeration systems to different academic institutions:

- (a) **"MPI PU"**: Cryogenic refrigeration system provided by the patent proprietor to the Max Planck Institute for Solid-State Physics, Department FRM II, including:
 - MPI PU(1): sale of a Triton²⁰⁰ Cryofree® dilution refrigerator (with corresponding user manual D8)
 - MPI PU(2): alleged sale of a "liquid-helium-cooled top-loading-probe" of a Triton²⁰⁰ (with corresponding user manual D9)
- (b) **"Harvard PU"**: Cryogenic refrigeration system sold by the patent proprietor to the Department of Physics at Harvard University including:

- the features and the operation of this device in the institution as described solely in D13, a witness statement by Dr Vladimir Manucharyan

(c) "**Princeton PU**": Cryogenic refrigeration system provided by the opponent to Princeton University including:

- user manual D12 allegedly supplied to the customer with the delivery

The patent proprietor argued that patentability was not to be challenged based on this evidence, because none of these prior uses and of the documents involved was state of the art under Article 54(2) EPC.

2.1 According to Article 54(2) EPC, the state of the art will be held to comprise everything made available to the public *inter alia* by use before the date of filing of the patent application. Therefore, it needs to be established first which of the prior uses was made available to the public before the objections of lack of patentability based thereon can be considered.

Since technical descriptions (such as the manuals D8, D9 and D12) sent out to clients with the unconditional sale of a product cannot be regarded as secret information as such (cf. Case Law of the Boards of Appeal, 10th edition, 2022, 3.4.3), the public availability of documents D8, D9 and D12 is linked to the public availability of the systems of the corresponding sales.

2.2 Princeton PU, D12 - insufficient evidence of public availability

The Princeton PU relates to the sale of the BF-LD250 cryogenic cooling system to Princeton University by the opponent. D12 is a user manual for a device supplied by the opponent ("BF-LD250").

2.2.1 The system BF-LD250 and the manual D12 were sold to Princeton University. The knowledge of the details of this sale lies in the sphere of the opponent because as the vendor it was party to the sales contract with Princeton University, a fact uncontested as such.

In such a case, the highest standard of proof applies in order to establish an unbroken chain of evidence and the Board's full conviction is necessary to establish the public availability of the prior use.

2.2.2 In the appealed decision the opposition division came to the conclusion that D12 was part of the state of the art under Article 54(2) EPC. In its reasoning it relied on documents D31 to D34, which related D12 to a sale to the Princeton University (and also further sales of the BlueFors system referred to by the opponent in document D31) and demonstrated, in its view, that this sale was made without any confidentiality obligations. It concluded that D12 (the user manual in version 1.3.0) was the document valid on the sale dates and was also the document included when the systems were shipped to the customers.

2.2.3 Contrary to the opposition division's conclusion the Board is not fully convinced that the Princeton PU in particular D12 (and the further sales mentioned in D31) were made publicly available before the date of filing.

Although the Board, in its preliminary opinion, tended to agree with the opposition division's opinion that the Princeton PU and D12 were made publicly available, the Board decided to no longer follow this view after having heard the parties at the oral proceedings.

In particular, the patent proprietor cast enough doubts on the absence of **any** terms of sale and **any** confidentiality agreements between the opponent and Princeton University or declarations related to them that the Board's full conviction could not be established. For these reasons it was not established up to the hilt:

- that the version of the manual D12 was indeed the version sent together with the ordered systems and
- that no confidentiality agreements were in place.

2.2.4 The patent proprietor argued that it was highly unusual and surprising that a high-tech company such as the opponent allegedly did not use any terms of sale when the sale was concluded, and that a highly scientific product like the one concerned would have been produced in a garage-like firm. In addition, the patent proprietor stressed that in the ongoing infringement proceedings before the Finnish Market Court the opponent itself requested that a substantially identical manual ("K20") submitted in these proceedings be treated there as confidential and be excluded from the file inspection, which was granted. The opponent did not dispute that the content of K20 and D12 was substantially identical.

In response the opponent simply stated that the products in question were generally sold on the open

market and no confidentiality agreements were concluded when selling the product to the purchasers. The same was allegedly true for the products sold and delivered in the Princeton PU context.

2.2.5 The Board agrees with the patent proprietor that the alleged complete lack of any terms of sale is indeed highly unusual given the technical complexity and the prices of the products involved. The Board further agrees that it appears somewhat inconsistent to require an allegedly public document such as K20 to be exempt from file inspection in court proceedings. There was no explanation whatsoever of the reasons why the allegedly public document D12 had to be kept secret in the Finnish Market Court proceedings.

2.2.6 As a consequence, the burden of proof is with the opponent, since the patent proprietor raised reasonable doubts regarding what the "normal" circumstances and terms of such a sale of this kind would be; however, the opponent simply stated that, at the time, no terms of sale existed at BlueFors at all, without offering any further evidence to prove the alleged facts.

Although it is true that so-called negative facts can hardly be proven *per se*, after the patent proprietor in its reaction to the Board's preliminary opinion insisted strictly on its argument that confidentiality agreements were customarily made with customers in the technological field of cryogenic systems, there was a certain need for the opponent to provide evidence to the contrary.

In view of the high standard of proof required in these circumstances, it would have been incumbent on the

opponent to provide further evidence for the alleged facts.

2.2.7 To do so would have been entirely possible, for example, by filing affidavits by possible witnesses confirming the alleged absence of any terms of sale at the time of the sale as well as the absence of any specific confidentiality agreements.

In the same way, further proof could and should have been provided that the manual D12 was indeed the version accompanying the sale (e. g. affidavits by the drafters of the manual, evidence that this manual was packaged from the list of shipped goods, or similar).

2.2.8 In the absence of any supporting evidence also the conclusions on confidentiality for sales to academic research institutes in the presence of only general secrecy terms below (see point 2.3.3) cannot be invoked in support for the public availability of the PU Princeton and D12.

2.2.9 The Board concludes that the alleged facts have not been proven to the high standard of proof required in these circumstances. The public availability of Princeton PU (and the corresponding sales of the opponent's system) is thus not sufficiently established. In conclusion, neither the Princeton PU nor D12 is part of the state of the art under Article 54(2) EPC.

2.3 Sales MPI PU and PU Harvard - alleged confidentiality agreements

According to established case law a single sale is sufficient to render the sold article available to the

public within the meaning of Article 54(2) EPC (cf. Case Law of the Boards of Appeal, 10th edition, 2022, I.C.3.3.1) unless there is a specific confidentiality agreement.

For the Board it is sufficiently established that the sales MPI PU(1) and Harvard PU, which both became final, are normal sales under no confidentiality bar as explained in the following paragraphs. MPI PU(2) is not a normal sale as will be explained further below (see point 2.4).

2.3.1 The patent proprietor, in both sales the vendor, challenged the fact that the sales of the cryogenic refrigeration system to MPI and Harvard corresponded to a normal sale, given the complexity and level of necessary customisation for such systems. Moreover, the patent proprietor argued that the sales were concluded under a confidentiality bar and therefore were not part of the state of the art under Article 54(2) EPC, as was apparent from the confidentiality terms in D15, page 15 (Harvard PU) and D23, page 12 (MPI PU).

2.3.2 This is not persuasive.

The cryogenic systems involved in the sales MPI PU(1) and Harvard PU were sold to academic research institutions. A major purpose of an academic research institution is the scientific exchange and publication of research results in order to make them available to the scientific community. Such institutions are *per se* obliged to publish their research results even if certain research projects (e.g. together with third parties) being conducted under the bounds of secrecy. Publishing research results usually also requires the laboratory equipment and methods (bought and) used to

be disclosed in the material and methods part of the publication. Thus it appears highly unlikely that research institutes like MPI or Harvard would let bind themselves by acknowledging general terms of sale that would exclude them from publishing their research results.

- 2.3.3 Only unspecific general terms are included under the heading "Intellectual property and confidentiality" in D15 and D23 (terms and conditions of quotation and sale). The wording "confidentiality" is only used when pointing out: "Purchaser shall not seek to abstract from the Goods any confidential information regarding their design, construction or otherwise". Such general terms of business cannot be interpreted as preventing the particular academic institutions from further distributing the information provided within the normal operation of the cryogenic system.

To the contrary: Confidentiality of the sold method and apparatus disclosed by a normal sale to an academic institution would require the confidentiality terms to be clearly specified.

- 2.3.4 The Board agrees with page 2 of the legal opinion D43 according to which "proper and reasonable steps" are necessary "to include a confidentiality or non-disclosure provision in the terms and conditions and some indication of which documents [and parts of the device] are subject to the non-disclosure provisions". In the counter-opinion D44, the author concluded that D43 "misinterprets the law, which only requires that the precautions taken to secure trade secrets be reasonable". However, in the case at hand it appears reasonable if not necessary for the enforcement of a secrecy agreement to precisely define what is subject

to secrecy, e. g. by way of an individually concluded agreement outside general terms of sale. Since this is not the case, the Board cannot assume that there were confidentiality agreements concluded and in force.

- 2.3.5 This conclusion is further supported by an example in the case at hand. The dissertation D47 (related to the Harvard PU) relies *inter alia* on experiments carried out at Harvard University using the cryogenic refrigeration systems provided by the patent proprietor.

For the research project described in D47, the design of the loading assembly and the target apparatus ("bottom loading sample-holder and coldfinger") of the cryogenic system was developed further compared to the originally delivered system (see chapter A.2.2, page 91 ff). The dissertation shows, *inter alia*, detailed photos of the "Oxford original device" (see Figure A4 of D47) and of the redesigned parts. The patent proprietor did not submit any evidence or arguments to demonstrate that the disclosure in D47 was considered a breach of the confidentiality agreement in document D15.

Therefore, there was apparently no secrecy agreement on publishing details of the sold apparatus.

- 2.3.6 The case law cited by the patent proprietor in this context does not provide a different picture, either.

T 906/01 relates to the sale of a device in an "investigational status, being implanted and tested within the restricted area of an hospital" and "operating within the frame of an investigator's agreement provided with a clause of

confidentiality" (see point 3.5 of the Grounds). Such an investigational status cannot be established for the sales MPI PU(1) and Harvard PU. While complex laboratory equipment such as the cryogenic refrigeration system may often require further adaptation to the intended applications, the base unit as e.g. described in the manual D8 is considered a normal commercial product.

T 245/88 relates to a prior use in a non-public restricted area and not to a sale to an academic institution.

2.4 MPI PU and documents D8 and D9 - public availability

As regards the circumstances and the subject-matter of the MPI PU, the opponent relied on the witness statement D14 by Mr Keller and the manuals D8 and D9, delivered to Mr Keller according to D14.

2.4.1 The MPI PU is public as far as a sale is established. This is the case for sale MPI PU(1). Based on the evidence on file, the Board has no doubt that the cryogenic cooling system as described in D8 itself has been made publicly available by the sale to MPI.

2.4.2 However, this is not the case for the sale of the sample loader and its accompanying documentation (sale MPI PU(2), manual D9). The sample loader was ultimately not accepted by MPI (see D14, page 5: "*weil... der Probelademechanismus letzten Ende nicht abgenommen wurde*"). For this reason the load changer and its documentation (e.g. manual D9) does not form part of a normal sale. Document D9 and the method described by Mr Keller in D14 were made known to Mr Keller only as part of a procurement procedure. During the procurement

procedure, i.e. the offer phase of the sale and before it is finalised, secrecy obligations apply to the parties (see e.g. D20).

Mr Keller stating in D14 that the manual D9 was also delivered to him does not render D9 publicly available. Even though Mr Keller might have kept D9 after the sale of the sample loader was cancelled (this is not derivable from D14), it is also considered to be part of the non-finalized procurement procedure and, accordingly, to be confidential.

2.4.3 To conclude, D8 is considered to be part of the state of the art under Article 54(2) EPC, while D9 and the method described in D14 (MPI PU(2)) are not.

2.5 Harvard PU - public availability

The PU Harvard relates to the sale and use of a cryogenic cooling system provided by Oxford Instruments Nanotechnology Tools Limited in the Department of Physics at the Harvard University, USA (sale Harvard PU above).

2.5.1 To establish what was made publicly available by the sale to Harvard University, it has to be established what information was disclosed by the vendor (patent proprietor) to the university. Since the Harvard PU does not rely on documentary evidence of the sold product like the user manuals D8 and D9 available for MPI PU, the circumstances and the subject-matter of PU Harvard can only be derived from the declaration D13 by Mr Manucharyan, a former research fellow at Harvard University.

The facts as presented in D13 with respect to the features of the method and the apparatus were not challenged by the patent proprietor.

- 2.5.2 In the declaration D13 Mr Manucharyan explained in detail how the system was configured and used. He further stated that he was instructed by a technician at the patent proprietor at least with respect to the necessity to remove the working fluid (Mr Dent; see D13, page 4, point 5.3).

However, from the information in the declaration D13 alone, it cannot be established whether the method and the control functions of the device described in this declaration were (at least partly) developed by Mr Manucharyan or other members of the research group or whether they were disclosed to him in the context of the sale. This missing information would be essential for determining what was made publicly available.

If the method and the control features described in declaration D13 were developed by Mr Manucharyan himself, this method cannot be considered to be part of the state of the art under Article 54(2) EPC. In this case Mr Manucharyan was not part of the public for his own development, i.e. no disclosure took place. The other fellow researchers, to whom he (possibly) disclosed the method, are also not part of the public either, since knowledge shared within an academic research group internal to a particular university department is not considered part of the state of the art under Article 54(2) EPC either.

If the method was disclosed to Mr Manucharyan in full by Mr Dent, a technician at the patent proprietor, then this might be considered a public disclosure; however,

as Mr Manucharyan declared in point 1 of D13 that he had worked at the Institute until September 2011 (which is after the priority date of the patent), a disclosure before the priority date of the patent is not established.

The facts of what has been transferred as knowledge from Oxford instrument by means of the sale as well as the date and the content of the briefing with Mr. Dent could and should have been submitted already with the notice of opposition.

Therefore, it is in view of the Board not sufficiently proven that Harvard PU is prior art under Article 54(2) EPC.

3. Main request and auxiliary requests 1 and 2 - novelty

The subject-matter of claim 1 of the main request is not novel over the disclosure of D8.

Since this claim is identical to claim 1 of auxiliary requests 1 and 2 the subject-matter of claim 1 of each of auxiliary requests 1 and 2 lacks novelty for the same reasons.

- 3.1 D8 is an operator's handbook for a Triton²⁰⁰ Cryofree Dilution Refrigerator and is part of the prior art in itself under Article 54(2) EPC as explained above (see point 2.4). D8 describes the components, control functions and operation of the device and, as explained in the following paragraphs, discloses steps a) to e) in accordance with the sequence defined in claim 1. This is due to the fact that step b) of claim 1

encompasses operation methods wherein the sample is changed by disassembly of the heat radiation shields.

3.1.1 Step b):

D8 describes, *inter alia*, that the cryogenic system is disassembled for moving a sample into the target region (see page 39 and Figure 4 on page 23).

The patent proprietor argued that the normal meaning of the wording "operating a cryogenic cooling system" excluded any assembly and disassembly steps, and therefore implied that step b) was to be carried out under non-atmospheric conditions. Such conditions were not disclosed in D8.

This is not persuasive. The operation of the system as defined in method claim 1 encompasses a step b) of "moving the target apparatus comprising the sample into the target region", i.e. a step of placing a sample in the target region. Claim 1 does not define whether this is done manually by dismantling the heat radiation shields (as e.g. in D1) or by using a loading assembly (as e. g. in D2).

The wording "from a high temperature location to the target region" does not make any difference in that respect either, since the temperature of the target region during the moving step is not specified and can still be room temperature.

Since the claim language is clear as such in that it does not specify the sample loading method in greater detail, it is, in accordance with established case law, not appropriate to read any further limitations, such as non-atmospheric conditions, into the claim even if

according to the description this is the preferred embodiment (cf. Case Law of the Boards of Appeal, 10th edition, 2022, II.A.6.3.4).

To conclude, changing the sample according to D8 is part of the operation of the device and falls within the scope of claim 1.

3.1.2 Step a):

D8 describes that, **before** disassembling the system (in order to carry out step b), the system has to be warmed up to room temperature (see "quick guide" on pages 94 and 95, points 36 to 50). During this procedure the operational fluid of the dilution refrigerator ("mixture", point 36) is evaporated and returned to the dump (see pages 71 and 72, chapters "Collect the mixture" and "Warm-up").

The patent proprietor disputed that step b) of claim 1 required the operational fluid to be intentionally removed from the dilution refrigerator; however, the sequential order of steps a) and b) defined in claim 1 excludes the operational fluid being simply "boiled off" by insertion of a "hot" sample.

Contrary to the patent proprietor's view, also step a) does not require the sample to be changed under non-atmospheric conditions either. On the contrary, removal of the operational fluid is inherently necessary before dismantling the heat radiation shields. This means that the target region is also exposed to ambient conditions such as ambient temperature.

3.1.3 Step c):

Once the sample is placed in the target region and the system is re-assembled, a "pre-cooling mode" is performed (page 70, chapter "Pre-cooling") using a pulse tube refrigerator ("PTR").

3.1.4 Steps d) and e):

The pre-cooling is followed by providing the operational fluid into the dilution refrigerator and the dilution refrigerator starts to cool down the target region to a second, lower temperature (page 71: chapter "Condensing").

Therefore, all the steps of claim 1 of the main requests and of auxiliary requests 1 and 2 are disclosed in D8. This means that D8 takes away the novelty from claims 1 of these requests. Therefore, these requests are not allowable.

4. Auxiliary request 3 - Article 123(2) EPC

Claim 14 of auxiliary request 3 does not comply with the requirements of Article 123(2) EPC.

4.1 Compared with claim 14 as granted (main request), claim 14 of auxiliary request 3 additionally includes a functional back-reference to the features of claim 1 (feature [14.A]: "wherein the cryogenic cooling system is configured when in use to perform the method according to any of claims 1 to 13").

4.2 Contrary to the patent proprietor's argument and the conclusion in the appealed decision, feature [14.A]

does not simply define the suitability of the device for carrying out the method in claim 1 such that a user can perform the method while using the system. The wording "the ... system is configured ... to perform the steps" in claim 1 implies that **the system itself** is capable of actively performing the steps, i.e. it implies an (automatic) control system capable of carrying out these steps.

4.3 However, step b) ("moving target apparatus comprising the sample from a high temperature location to the target region") was not disclosed in the application as filed as being performed by the device itself. This is also apparent from claim 25 as originally filed, in which step b) is specifically **not** included in the functions of the computer program.

4.4 The patent proprietor's argument, that allowing such an objection would put all the functional definitions in system claims at stake is not persuasive. Indeed, it is possible on the basis of the claim language alone to distinguish between mere (passive) suitability (in the sense of a "system suitable to be used in the method") and the (active) capability to "perform" the functions ("configured to perform the method").

4.5 It is also not an interpretation by a mind willing to misunderstand and thus to destroy the patent. The automation of step b) is in principle a technically feasible alternative. The patent proprietor even argued that an automated operation of step b) was not excluded for the system disclosed in the patent and that robotic sample changers were well known in the art.

However, the fact that such automation of step b) would be technically feasible is not relevant for the

question of extension of the subject-matter. It is decisive that a configuration of the system for this step is not disclosed in the application as filed. Therefore, the inclusion of step b) in the control of the system extends the subject-matter beyond the content of the application as filed.

5. Auxiliary requests 4 and 5 - novelty

The subject-matter of independent claim 14 of auxiliary request 4 is not novel. Since independent claim 14 of auxiliary request 5 is identical, this conclusion applies to both requests.

5.1 D8 and the apparatus it describes are made available to the public during a sale (MPI PU(1)) as discussed above. Although the specification of D8 and the device it describes do not include a loading assembly, this document comprises the added technical features of claim 14 (feature [14.B]), even though they are not explicitly described being intended for a loading device.

5.2 Figures 4 and 5 of D8 disclose a plurality of spatial stages and a number of aligned apertures forming a bore as required by feature [14.B]. Furthermore, in Figure 4 an aligned port with a flange is provided in the upper lid. The feature "wherein the said one or more apertures defines a bore through which the target apparatus is caused to pass" defines a mere suitability. The target apparatus itself is not part of the subject-matter of claim 14 and neither is a control function for passing a target apparatus through the apertures.

The aligned apertures disclosed in D8 are suitable for allowing a loading assembly with a target apparatus designed and dimensioned for this purpose to pass through. To conclude, the functional feature cannot establish novelty over D8.

- 5.3 While the patent proprietor did not challenge the fact that aligned apertures are visible e.g. in Figure 4 of D8, it argued that such apertures could be intended for cables or other connections, as shown in the top view in Figure 3, and not necessarily for sample loading; however, these further possible uses of the aligned apertures do not contradict the fact that the apertures are also suitable for passing a target apparatus through the apertures in accordance with feature [14.B].

6. Auxiliary request 6 - admittance

Auxiliary request 6 is admitted into the appeal proceedings.

Auxiliary request 6 was submitted for the first time with the patent proprietor's reply to the opponent's appeal. This is an amendment according to Article 12(4) RPBA 2020 and its admittance is at the Board's discretion.

The Board considers the inclusion of the loading assembly as a technical feature (see feature group [1.B']) to be an appropriate further specification of feature group [1.B] of auxiliary request 5 which merely describes the adaptation of the system to render it suitable for a loading assembly, but does not include the loading assembly itself in the claimed subject-

matter. This is not a substantial change to the subject-matter and thus not to the appeal case.

The objection of *prima facie* non-allowability of the amendment under Article 123(2) EPC as raised by the Board in its preliminary opinion and to which the opponent made reference is not maintained. Contrary to the preliminary opinion, when seen in combination, features [1.B] and [1.C] and step b') link the loading assembly to the target apparatus, the sample and the target region.

7. Auxiliary request 6 - Article 123(2) EPC

The subject-matter of claims 1 and 14 of auxiliary request 6 does not extend beyond the content of the application as filed.

Contrary to the opponent's view, no unallowable intermediate generalisation results from the omission of details of the loading assembly such as the function of releasing the loading apparatus from the target apparatus and retracting it.

Indeed, claim 12 as originally filed is not the only basis for the added features. The most general disclosure of a loading assembly is to be found in the paragraph bridging pages 5 and 6 of the application as filed. The releasing and retraction functions are disclosed as optional here ("it is preferable").

The feature of thermally connecting the target apparatus to the target region is a feature of the target apparatus as such and is implicit in steps b), c) and e) in order to allow for heat conduction;

however, the passage on pages 5 and 6 does not define that the connection is established via particular components of the loading assembly.

8. Auxiliary request 6 - inventive step

The opponent maintained the following objections of lack of inventive step against the subject-matter of claims 1 and 14 of auxiliary request 6:

- D8 in combination with the teaching of D9,
- D8 in combination with the teaching of D2,
- D1 in combination with common general knowledge and
- D4 in combination with common general knowledge.

However, in view of these objections the subject-matter of claims 1 and 14 of auxiliary request 6 involves an inventive step.

8.1 Admittance of the objection "D8 in combination with D9"

The objection of lack of inventive step with D8 as the starting point in combination with the disclosure of D9 is not admitted under Article 13(2) RPBA 2020.

This objection was raised for the first time at the oral proceedings before the Board. Therefore, it constitutes an amendment to the opponent's appeal case under Article 13(2) RPBA 2020.

8.1.1 According to Article 13(2) RPBA 2020, any such amendments will, in principle, not be taken into account unless there are exceptional circumstances,

which have been justified with cogent reasons by the party concerned.

The opponent did not put forward any such reasons. For this reason alone, the new objection is not admitted.

8.1.2 It is also noted that even when additionally considering the criteria set out in Article 13(1) RPBA 2020 for the admittance of this objection, the Board does not come to a different conclusion. As explained above (see point 2.4), it is not established that D9 (prior use MPI PU(2)) was in the public domain. Therefore, the new objection is not relevant *prima facie* anyway.

8.2 D8 as the starting point in combination with the disclosure of D2

8.2.1 Distinguishing features

It is undisputed that the handbook D8 does not disclose a sample loading assembly (features [1C]/[14C]) suitable for causing the target apparatus to pass through the apertures in the plurality of spatially disposed stages (step b' in claim 1 and feature[14B'] in claim 14).

The use of a sample changer for moving the target apparatus into the target region in accordance with claims 1 and 14 allows for more procedural options at sample insertion compared to a system in which the sample is placed in the target region by disassembling and re-assembling the heat radiation shields. In particular, the sample can be moved to and rested at different locations in the system for pre-cooling and

may be at different temperatures when coming into contact with the target region. Because of this and contrary to the opponent's view, the order of the steps a) to e) in claim 1 and the corresponding control features in claim 14 are no longer pre-determined by the system design as such, as was the case for a system which had to be dismantled. The pre-cooling step is thus not necessarily applied in the target region (step c) and the operational fluid does not necessarily have to be removed (steps a and d) before the target apparatus is moved to the target region (see also D7, page 1730, left-hand column, second paragraph).

8.2.2 Objective technical problem

The objective technical problem suggested by the opponent was to make it possible to change of the sample more rapidly. This can in principle be agreed to be the objective technical problem since the use of a sample changer avoids the necessity of bringing the cryogenic cooling system completely to ambient (temperature) conditions when the sample is changed.

However, it is to be considered that claims 1 and 14 provide a specific solution to this technical problem, according to which not only is a loading assembly used but the target apparatus is also then pre-cooled in the target region.

8.2.3 D2 indeed addresses the above objective technical problem (see page 1, last paragraph). The Board agrees with the opponent insofar as the skilled person would learn from D2 to implement a sample load assembly suitable for moving the target apparatus comprising the sample from a high temperature location to the target region and through the apertures in the spatially

disposed stages (D2: "heat radiation shields"). Contrary to the conclusion in the appealed decision, the Board also cannot see any obstacle to a skilled person routinely adapting the dimensions of the apertures and the loading assembly so that the devices in D8 and D2 would fit together.

However, the opponent's argument that, in view of the teaching of D2, the selection of the sequence of method steps a) to e) of claim 1 and the corresponding control features in claim 14 was a one-way street is not persuasive.

8.2.4 D2 discloses different sequences for pre-cooling the sample on the target apparatus at different "cold bodies":

- by releasably coupling the target apparatus to a cold body or several (consecutive) cold bodies so as to pre-cool the sample (see page 2, lines 14 to 24) and
- by initially establishing a weak thermal connection to the cold body for pre-cooling followed by strengthening the connection so the sample cools to the desired final temperature (see page 3, lines 20 to 25).

None of these disclosed sequences includes or inevitably requires that the pre-cooling is performed in the target region and that the operational fluid is removed prior to this, as required by steps a), c) and d) of claim 1. On the contrary, on page 8, lines 16 to 19, pre-cooling is explained as being performed before the loading assembly ("rod assembly") is brought to the target region ("pushed to their final position"). In

other words, D2 teaches pre-cooling the sample **before** it is in the target region.

8.2.5 Contrary to the opponent's view, also the passage on page 11, lines 19 to 23 does not teach pre-cooling in the target region. This passage states that "as an alternative to pre-cooling at progressively lower temperatures at radiation shields" the loading assembly with the target apparatus ("the sample and carrier") can also be "pre-cooled by making a weaker thermal contact to a colder temperature body, such as the coldest body"; however, the "coldest body" is not disclosed as corresponding to the target region of a system with a dilution refrigerator having an operational fluid. A dilution refrigerator for cooling to a second, lower temperature is only disclosed as an optional piece of equipment in D2 (see page 3, lines 17 to 20). The passage therefore cannot directly and unambiguously teach steps a) and d) either.

8.2.6 The opponent's argument that it was inevitable to remove the operational fluid before bringing a sample (even if pre-cooled) into the target region of a system in D2 including a dilution refrigerator is not convincing either.

The Board agrees with the opponent's view that possibly boiling-off the operational fluid at the still and the dilution chamber (target region) of a dilution refrigerator if contacted with a "warm" target apparatus is within the common general knowledge of the skilled person; however, it was not convincingly demonstrated that it is always necessary to remove the operational fluid. As one counter-example, reference is made to D7, which discloses that, under the specific circumstances explained in this document (and not

excluded by the independent claims), "it is not necessary to remove the ^3He - ^4He mixture from the dilution unit" "during a topload procedure" (D7, page 1730, left-hand column).

Therefore, removing the operational fluid before bringing a sample into the target region is not an implicit feature of the method disclosed in D2.

- 8.2.7 The opponent's further argument that even just the step of fixing the target apparatus in the target region introduces so much thermal energy that further pre-cooling is necessary is not supported by any evidence.

Even if the skilled person accepts the possibility that the operational fluid is boiled off when the target apparatus contacts the target region, they would, in view of the teaching of D2, not implement a sequence of steps a), c) and d) as in claim 1. Instead of directly providing the target apparatus in the target region D2 discloses pre-cooling the target apparatus in a step-wise manner before the sample is finally lowered into the target region. Hence, the teaching of D2 leads the skilled person away from the claimed solution.

- 8.3 D1 as the starting point in combination with common general knowledge

D1 discloses a cryogenic cooling system using cryogen (liquid helium) for the pre-cooling and a dilution refrigerator for cooling the target region to a second lower temperature.

- 8.3.1 Distinguishing features

It is common ground that D1 does not disclose a mechanical cooler.

Contrary to the opponent's view, D1 does not disclose a sample loading assembly either. It is indeed confirmed in D1 that loading assemblies were known in the art (column 1, lines 37 to 45: "sample changer"); however, it is also stated here that such systems have certain drawbacks. A sample changer is not considered in the embodiments. Instead, the disclosed system is dismantled in order to change samples (see column 4, lines 50 to 59).

For this reason, the objective technical problem is not solely to select another pre-cooling method.

Moreover, for the sake of the argument, even if the skilled person were to consider a mechanical pre-cooling and a sample changer for the system disclosed in D1 using the common general knowledge, this would not teach the order of method steps a) to e) of claim 1 and the corresponding control features of claim 14, as already discussed for the combination of D8 and D2 above.

Therefore, D1 in combination with common general knowledge cannot successfully be held against auxiliary request 6 under Article 56 EPC.

8.4 D4 in combination with common general knowledge

D4 discloses a cryogenic cooling system with a dilution refrigerator using a cryogenic fluid (liquid nitrogen) for pre-cooling. As shown in Figure 1 the system also comprises a loading assembly ("transfer stick") which can move a target apparatus ("sample transfer siphon")

through apertures in a plurality of spatially disposed stages ("series of doors").

D4 at least does not disclose a mechanical cooler for pre-cooling.

This distinguishing feature addresses the technical problem of providing an alternative pre-cooling method.

While it is true that mechanical pre-coolers are known in the art for pre-cooling (cf. e. g. D2, page 1, lines 23 to 27) and could indeed be considered as an alternative, it is not apparent that the skilled person would have considered this for the system disclosed in D4. The device is intended for a specific purpose, namely for growing ultrathin films under "highly controlled" conditions.

The system developed by the authors for this purpose relies on wet pre-cooling. A redesign would require the components of the mechanical cooler to be included in the nested shields, which would require a complete redesign of the system not only for cryogenic cooling in general, but also for the intended application.

It is thus not apparent what would prompt the skilled person to implement the alternative pre-cooling system. In addition, such a redesign goes beyond what can be expected from the skilled person when performing routine adaptations as part of the common general knowledge.

To conclude, the subject-matter of claims 1 and 14 of auxiliary request 6 is not obvious to the person skilled in the art and thus involves an inventive step.

9. No reimbursement of the appeal fee

9.1 The opponent requested that the appeal fee be reimbursed. They argued that the decision under appeal, namely to maintain the patent based on auxiliary request 3, was based on a substantial procedural violation. In its view its right to be heard under Article 113(1) EPC was violated as it had no opportunity to comment on the following issues:

(a) The opposition division did not take a position on the public status of the MPI PU during the oral proceedings (reference was made in this context to D14). Nevertheless, the decision contained conclusions with respect to the novelty of the MPI PU based on technical considerations on which the opponent had no opportunity to comment.

(b) In the decision on inventive step with respect to the combination of D8 or D12 with D2, reference was made in the written decision to technical features such as the size and location of the openings in the radiation shields, which had never been discussed in the proceedings before.

9.2 As outlined above (see point 4.), auxiliary request 3 falls under Article 123(2) EPC. Therefore, the issues of alleged procedural violations (a) and (b) are not causally linked to it being concluded that this request is not allowable.

The Board's deviation from the appealed decision with respect to the conclusion on the allowability of auxiliary request 3 is thus only related to an "error of judgement" and not to a substantial procedural violation. For this reason alone, the reimbursement of

the appeal fee under Rule 103(1) a) EPC is not equitable.

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 with the following claims and a description to be adapted:
 - claims 1 to 22 filed as auxiliary request 6 with the letter dated 19 May 2021.
3. The request for reimbursement of the appeal fee is rejected.

The Registrar:

The Chairman:



C. Spira

C. Herberhold

Decision electronically authenticated