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**Datasheet for the decision
of 16 July 2013**

Case Number: T 0419/10 - 3.2.07
Application Number: 03023080.9
Publication Number: 1435400
IPC: C23C 14/32, C23C 14/50,
C23C 14/54, C23C 16/458,
H01J 37/32

Language of the proceedings: EN

Title of invention:

Film deposition system and film deposition method using the same

Patent Proprietor:

KABUSHIKI KAISHA KOBE SEIKO SHO

Opponent:

Hauzer Techno Coating BV

Headword:

-

Relevant legal provisions:

EPC Art. 54(1), 56, 84
RPBA Art. 13(1)

Keyword:

"Novelty (main request - no)"
"Inventive step (auxiliary request 1 - no)"
"Clarity (auxiliary requests 2-4 - no)"
"Admissibility (auxiliary requests 1a - 4a, 5 - no)"

Decisions cited:

T 1685/07

Catchword:

-



Case Number: T 0419/10 - 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 16 July 2013

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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
On 17 December 2009 concerning maintenance of
European patent No. 1435400 in amended form.

Composition of the Board:

Chairman: H. Meinders
Members: G. Patton
I. Beckedorf

Summary of Facts and Submissions

I. Appellant I (patent proprietor) lodged an appeal against the interlocutory decision of the Opposition Division maintaining European patent N° 1 435 400 in amended form.

Appellant II (opponent) likewise lodged an appeal against this interlocutory decision.

II. In the opposition proceedings, appellant I filed a main request (with only claims 1-10 of the patent as granted) and two auxiliary requests during the oral proceedings held on 17 November 2009. The Opposition Division held that the subject-matter of the main request did not fulfil the requirements of Article 54(1) EPC; the version of the product according to the first auxiliary request was found to meet the requirements of the EPC.

III. With its statement of grounds of appeal dated 27 April 2010 appellant I requested the maintenance of the patent on the basis of the main request (with only claims 1-10 of the patent as granted) as discussed in the impugned decision or of the auxiliary requests 1 to 4 and, auxiliarily, oral proceedings.

IV. In the course of the appeal proceedings, the Board provided its preliminary non-binding opinion annexed to the summons for oral proceedings that the claims of the requests of appellant I did not fulfil the requirements of the EPC in view of Articles 54(1), 56 and/or 84 EPC. The Board also gave its preliminary opinion that, on one hand the admission of late-filed document E4 in the proceedings was properly assessed by the opposition

division, on the other hand documents E6 and E7, which were not admitted in the proceedings, should have been admitted.

In reaction, appellant I filed with the letter of 12 June 2013 additional new auxiliary requests 1a, 2a, 3a and 4a.

During the oral proceedings held on 16 July 2013, the following issues, *inter alia*, were discussed:

- admission into the proceedings of documents E6 and E7;
- novelty of the subject-matter of claim 1 of the patent as granted over document E6;
- inventive step of the subject-matter of claim 1 according to the auxiliary request 1 in view of document E3 in combination with documents E1, E2 and E4;
- admission into the proceedings of auxiliary requests 1a, 2a, 3a and 4a;
- clarity of claim 1 according to each of the auxiliary requests 2, 3 and 4;
- admission into the proceedings of the set of claims filed by appellant I as auxiliary request 5 during the oral proceedings.

The present decision was announced at the end of the oral proceedings.

- V. Appellant I requests that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of claims 1 to 10 of the patent as granted, or, alternatively, that the patent be maintained in amended form on the basis of one of the

sets of claims filed as auxiliary requests 1 to 4 with letter of 27 April 2010, as auxiliary requests 1a, 2a, 3a and 4a with letter of 12 June 2013, and as auxiliary request 5 during the oral proceedings and that the appeal of appellant II be dismissed insofar as it concerns the revocation of the patent in a form according to one of the aforementioned requests.

VI. Appellant II requests that the decision under appeal be set aside, that the European patent be revoked and that the appeal of appellant I be dismissed.

VII. Claim 1 of the main request reads as follows:

"A film deposition system comprising:
a vacuum chamber;
an evaporation source for forming a film on a work in said vacuum chamber; and
a cooling device for cooling the work, said cooling device being provided within said vacuum chamber, wherein the work has an internal space communicating with the outside through an opening part, and said cooling device is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside."

Claim 1 of auxiliary request 1 reads as follows (in bold the amendments with respect to claim 1 of the main request; emphasis added by the Board):

"A film deposition system comprising:
a vacuum chamber;
an evaporation source **provided within said vacuum chamber** for forming a film on a work in said vacuum

chamber; and
a cooling device for cooling the work, said cooling device being provided within said vacuum chamber, wherein the work has an internal space communicating with the outside through an opening part, and said cooling device is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside,
wherein there is a clearance between an inner surface of the work and an outside surface of said cooling device."

Claim 1 of auxiliary request 2 reads as follows (in bold the amendments with respect to claim 1 of the main request; emphasis added by the Board):

"A film deposition system comprising:
a vacuum chamber;
an evaporation source **provided within said vacuum chamber** for forming a film on a work in said vacuum chamber; **and**
a cooling device for cooling the work, said cooling device being provided within said vacuum chamber; **and a rotating means for rotating the work around said cooling device,**
wherein the work has an internal space communicating with the outside through an opening part, and said cooling device is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside,
wherein there is a clearance between an inner surface of the work and an outside surface of said cooling device,
wherein said cooling device is not rotatable."

Claim 1 of auxiliary request 3 reads as follows (in bold the amendments with respect to claim 1 of the main request; emphasis added by the Board):

"A film deposition system comprising:
a vacuum chamber;
an evaporation source **provided within said vacuum chamber** for forming a film on a work in said vacuum chamber; **and**
a cooling device for cooling the work, said cooling device being provided within said vacuum chamber;
a rotating means for rotating the work around said cooling device; and
a moving means for revolving the work,
wherein the work has an internal space communicating with the outside through an opening part, and said cooling device is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside,
wherein there is a clearance between an inner surface of the work and an outside surface of said cooling device,
wherein said cooling device is not rotatable."

Claim 1 of auxiliary request 4 reads as follows (in bold the amendments with respect to claim 1 of the main request; emphasis added by the Board):

"A film deposition system comprising:
a vacuum chamber;
an evaporation source **provided within said vacuum chamber** for forming a film on a work in said vacuum chamber; **and**

a cooling device for cooling the work, said cooling device being provided within said vacuum chamber; **and a work holding device for attachably and detachably holding the work,** wherein the work has an internal space communicating with the outside through an opening part, and said cooling device is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside, **wherein there is a clearance between an inner surface of the work and an outside surface of said cooling device,** wherein said work holding device comprises a rotating table for rotating the work around a rotating shaft that is the axis of the internal space, and a revolving table for revolving the work held on said rotating table, wherein said cooling device is provided so as to revolve following the revolving of the work by said revolving table and not to be rotatable."

Claim 1 of auxiliary request 1a reads as follows (in bold the amendments with respect to claim 1 of the auxiliary request 1; emphasis added by the Board):

"A film deposition system **for forming a film on a work,** comprising:

a vacuum chamber;

an evaporation source provided within said vacuum chamber for forming **a the** film on **a the** work in said vacuum chamber; and

a cooling device for cooling the work, said cooling device being provided within said vacuum chamber **and**

exposed to the prescribed pressure reduced state of the vacuum chamber,

wherein the work has an internal space communicating with the outside through an opening part, and said cooling device is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside, wherein there is a clearance between an inner surface of the work and an outside surface of said cooling device."

Claim 1 of auxiliary request 2a reads as follows (in bold the amendments with respect to claim 1 of the auxiliary request 2; emphasis added by the Board):

"A film deposition system **for forming a film on a work,** comprising:

a vacuum chamber;

an evaporation source provided within said vacuum chamber for forming **a the** film on **a the** work in said vacuum chamber;

a cooling device for cooling the work, said cooling device being provided within said vacuum chamber **and exposed to the prescribed pressure reduced state of the vacuum chamber;** and

a rotating means for rotating the work around said cooling device,

wherein the work has an internal space communicating with the outside through an opening part, and said cooling device is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside,

wherein there is a clearance between an inner surface of the work and an outside surface of said cooling device

wherein said cooling device is not rotatable."

Claim 1 of auxiliary request 3a reads as follows (in bold the amendments with respect to claim 1 of the auxiliary request 3; emphasis added by the Board):

"A film deposition system **for forming a film on a work,** comprising:

a vacuum chamber;

an evaporation source provided within said vacuum chamber for forming **a the** film on **a the** work in said vacuum chamber;

a cooling device for cooling the work, said cooling device being provided within said vacuum chamber **and exposed to the prescribed pressure reduced state of the vacuum chamber;**

a rotating means for rotating the work around said cooling device; and

a moving means for revolving the work,

wherein the work has an internal space communicating with the outside through an opening part, and said cooling device is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside,

wherein there is a clearance between an inner surface of the work and an outside surface of said cooling device,

wherein said cooling device is not rotatable **around the rotating means rotating axis and is revolvable around the moving means revolving axis."**

Claim 1 of auxiliary request 4a reads as follows (in bold the amendments with respect to claim 1 of the auxiliary request 4; emphasis added by the Board):

"A film deposition system **for forming a film on a work,** comprising:

a vacuum chamber;

an evaporation source provided within said vacuum chamber for forming **a the** film on **a the** work in said vacuum chamber;

a cooling device for cooling the work, said cooling device being provided within said vacuum chamber **and exposed to the prescribed pressure reduced state of the vacuum chamber;** and

a work holding device for attachably and detachably holding the work,

wherein the work has an internal space communicating with the outside through an opening part, and said cooling device is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside,

wherein there is a clearance between an inner surface of the work and an outside surface of said cooling device,

wherein said work holding device comprises a rotating table for rotating the work around a rotating shaft that is the axis of the internal space, and a revolving table for revolving the work held on said rotating table,

wherein said cooling device is provided so as to revolve following the revolving of the work by said revolving table and not to be rotatable **around the rotating shaft."**

Claim 1 of auxiliary request 5 reads as follows (in bold the amendments with respect to claim 1 of the auxiliary request 4; emphasis added by the Board):

"A film deposition system comprising:

a vacuum chamber;

an evaporation source provided within said vacuum chamber for forming a film on a work in said vacuum chamber;

a cooling device for cooling the work, said cooling device being provided within said vacuum chamber; and a work holding device for attachably and detachably holding the work,

wherein the work has an internal space communicating with the outside through an opening part, and said cooling device **has a coolant vessel for passing a coolant in the inner part thereof, which** is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside,

wherein there is a clearance between an inner surface of the work and an outside surface of said cooling **device vessel,**

wherein said work holding device comprises a rotating table for rotating the work around a rotating shaft that is the axis of the internal space, and a revolving table for revolving the work held on said rotating table,

wherein said cooling ~~device~~ **vessel** is provided so as to revolve following the revolving of the work by said revolving table and not to be rotatable."

VIII. The following documents of the opposition proceedings are of relevance for the present decision:

- E1 US-B1-6 224 726
- E2 US-B1-6 231 726
- E3 US-A-5 439 715
- E4 Kienel G. and Röhl K., "Vakuumbeschichtung 2 - Verfahren und Anlagen" VDI Verlag, Düsseldorf, 1995, pages 1-6, 94-106, ISBN: 3-18-401312-X
- E6 US-A-5 228 501
- E7 DE-A-100 39 644

IX. Appellant I argued in substance essentially as follows:

Admission of late filed documents E4, E6 and E7

E4 does not deal with the subject-matter of the contested patent and does not disclose or encourage further development of E1 or E3.

E6 deals only with flat wafers and does not address the technical problem of the contested patent to cool a work with an internal space in communication with the outside through an opening part.

E7 discloses a method for forming a shadow mask, i.e. a subject-matter not related to a film deposition system as claimed. Furthermore, in view of the relative thickness of the edge portion with respect to that of the central portion, the rimmed wafers of E7 cannot be regarded as having an internal space in accordance with the meaning of the contested patent.

In view of the above, documents E4, E6 and E7 are *prima facie* not relevant and, hence, should not be admitted in the proceedings.

Main request

The film deposition system of E6 is only adapted for flat wafers so that it would not function with non-flat wafers. Therefore, it is not suitable for having the cooling device insertable to and drawable from an internal space of a work, such as a cup-like work. The wafers shown in E7 are to be regarded as flat in view of the relative dimensions between edge and central portions. In any case, if used in the system of E6, their edge portion will inevitably be hit by the platen when coming up from below so that the cooling device, which is provided in the platen, would not be inserted in the central portion. Thus, E6 does not disclose that the work has an internal space communicating with the outside through an opening part and that the cooling device is insertable to and drawable from said internal space to cool the work from the inside. The subject-matter of claim 1 is therefore novel over E6.

Auxiliary request 1

There are more distinguishing features of claim 1 over the system of E3 than just an evaporation source for forming a film on a work, said evaporation source being provided within the vacuum chamber. Cooling by radiation at the pressure level of the vacuum chamber and the cooling device insertable to and drawable from an internal space of the work are also not disclosed in E3. There is further no clearance between an inner

surface of the work and an outside surface of the cooling device in the apparatus of E3. In view of the distinguishing features inventive step should be acknowledged.

Auxiliary requests 2 to 4

In view of the embodiments according to figures 3 and 5 and the other features of the claim the cooling device in each claim 1 of auxiliary requests 2 to 4 can only be interpreted as being the cooling vessels. Therefore, each claim 1 of auxiliary requests 2 to 4 is clear.

Auxiliary requests 1a to 4a

Even though there is no *verbatim* support, a basis is given in the application as originally filed for the added features, in particular that the cooling device is "exposed to the prescribed pressure reduced state of the vacuum chamber", introduced in each claim 1 of auxiliary requests 1a to 4a. The amendments were done in response to the preliminary opinion of the Board provided with the annex to the summons for oral proceedings and enable to clearly distinguish the claimed subject-matter from E3. Furthermore, the new requests are convergent with the requests on file so that they should be admitted in the proceedings.

Auxiliary request 5

Claim 1 of auxiliary request 5 is based on claim 1 of auxiliary request 4 in which the cooling device has been clarified as being the coolant vessel. The objection of lack of clarity raised against claim 1 of

auxiliary request 4 is therefore overcome and, hence, auxiliary request 5 should be admitted in the proceedings.

X. Appellant II argued in substance essentially as follows:

Admission of late filed documents E4, E6 and E7

E4 provides background information about the CVD and PVD techniques and their similarities. It has relevance when discussing transferring practice from one technique to the other.

E6 and E7 were filed in the opposition proceedings as a reaction to new auxiliary requests with amended claims 1 comprising a feature taken from the description. Since this represents new facts, they are not regarded as late filed and could only be not admitted if they were clearly not relevant.

E6 concerns a film deposition system comprising said feature.

E7 is linked to E6 in the sense that it proves that rimmed wafers exist and could be used in the film deposition system of E6.

In view of the above, documents E4, E6 and E7 are *prima facie* relevant and, hence, should be admitted in the proceedings.

Main request

E6 discloses all the features of the system of claim 1 except that the work referred to has an internal space communicating with the outside through an opening part. However, the work is not part of the claimed system and, hence, its shape cannot distinguish the claimed system from E6. In addition, the cooling device of E6 is unambiguously suitable for being inserted to and drawn from an internal space of a work and would also function with wafers with a cavity in their bottom part, in particular of the type disclosed in E7. All features of claim 1 are therefore considered to be known from E6 and, hence, its subject-matter is not novel over E6.

Auxiliary request 1

Document E3, which can be regarded as the closest prior art, discloses all the features of the system of claim 1 except an evaporation source for forming a film on the work, said evaporation source being provided within the vacuum chamber. Faced with the problem of choosing how to produce the gas/vapour to be used for forming the film, the person skilled in the art would immediately think of this solution since it is usual and broadly applied, as also illustrated by documents E1 or E2. As a result, starting from E3 the skilled person using his common general knowledge, or the teaching of E1 or E2, would arrive at the claimed subject-matter in an obvious manner.

Auxiliary requests 2 to 4

Each claim 1 of auxiliary requests 2, 3 and 4 comprises the feature that the cooling device is not rotatable. This is, however, in contradiction with the cooling device shown in the embodiments according to the invention (figures 3 and 5), rendering each claim 1 unclear.

Auxiliary requests 1a to 4a

These auxiliary requests were filed after the sending of the summons for oral proceedings. The amendments introduced in claim 1 of each of these auxiliary requests do not enable to overcome the objection raised against the previous respective auxiliary requests 1 to 4 and, in addition, lead to new objections on the basis of Articles 84 and 123(2) EPC and Rule 80 EPC. In addition, they are divergent with respect to the previous requests. Since this is contrary to the requirement of procedural economy, they should not be admitted in the proceedings.

Auxiliary request 5

This auxiliary request 5 was filed during the oral proceedings and is based on auxiliary request 4. However, inconsistencies still remain between claim 1 and the description so that claim 1 is still unclear. Since this is contrary to procedural economy, auxiliary request 5 should not be admitted in the proceedings.

Reasons for the Decision

1. Admission in the proceedings of documents E4, E6 and E7

1.1 The opposition division has applied its discretion in accordance with Article 114(2) EPC for deciding on the admission in the proceedings of late filed documents E4, E6 and E7. Using the criteria of *prima facie* relevance, it came to the conclusion of admitting E4 but not E6 and E7 (see impugned decision, point II-3, pages 3-4 and the minutes of oral proceedings, page 1, fourth and fifth complete paragraphs).

1.2 Document E4

The Board shares the opposition division's view that E4 is *prima facie* relevant since it provides background information, i.e. common general knowledge, about the CVD and PVD techniques and their similarities.

Appellant I considers that E4 is not relevant since it does not deal with the subject-matter of the contested patent and does not disclose or encourage further development of E1 or E3.

The Board cannot follow this. E4 is a standard textbook in the technical field of vacuum coating and is clearly *prima facie* relevant in view of the discussion of transferring practice from the PVD technique to that of CVD, and vice-versa.

1.3 Documents E6 and E7

1.3.1 With respect to E6 and E7 the Board considers that they should have been admitted by the opposition division since they can be considered a reaction to the new auxiliary requests filed by appellant I two months before the oral proceedings, more particularly to the feature "vertically movably provided" taken from the description and introduced into claim 1 of some auxiliary requests.

Indeed, E6 discloses the newly introduced feature of a "vertically movable" cooling device in a PVD apparatus since the cooling tube (13) is linked with the vertically movable platen (110) (column 7, lines 41-55; figure 1) which cools the wafer to be cooled.

E7 is linked to E6 in case the argument centres around the question whether there are in fact rimmed wafers, into which the cooling system of E6 could be introduced.

Since there is a reason for their filing they cannot be regarded as late filed. They could only be not admitted if they were clearly not relevant.

1.3.2 This is, however, not the case since the work is **not** considered to be part of the claimed system (see also the summons for oral proceedings of the opposition division dated 20 November 2008, page 3, first paragraph).

Even though E6 only deals with flat wafers and does not address the technical problem of the contested patent to cool a work with an internal space communicating

with the outside though an opening part, it is considered relevant since it discloses a "vertically movable" cooling device in a PVD apparatus so that the disclosed device could be seen as **suitable for** being inserted in and drawn from a work with an internal space (see also contested patent, [0005], [0006] and [0008]).

1.3.3 Concerning E7, appellant I is of the opinion that it is not relevant since it only discloses a method for forming a shadow mask, i.e. a subject-matter not related to a film deposition system as claimed. Furthermore, in view of the relative thickness of the edge portion (18) with respect to that of the central portion (16) of the rimmed wafers (10) ([0025] and [0027]), the wafers of E7 cannot be regarded as having an internal space in accordance with the meaning of the contested patent of cylindrical works as shown in the figures.

The Board can, however, not share this view since the disclosure of E7 is not used in itself to contest novelty and/or inventive step of the claimed subject-matter but rather to prove that rimmed wafers exist. Furthermore, no dimensions are specified in the claimed system, neither for the work nor for the internal space and there is nothing in E7 or E6 which would prevent the use of the rimmed wafers of E7 in the PVD film deposition system of E6.

1.4 As a result, documents E4, E6 and E7 are in the proceedings.

2. Main request (claims 1-10 as granted)

2.1 The features of claim 1 of the main request are as follows:

- (a) A film deposition system comprising:
- (b) a vacuum chamber;
- (c) an evaporation source for forming a film on a work in said vacuum chamber; and
- (d) a cooling device for cooling the work,
- (e) said cooling device being provided within said vacuum chamber,
- (f) wherein the work has an internal space communicating with the outside through an opening part, and
- (g) said cooling device is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside.

2.2 Appellant II contests the novelty of the subject-matter of claim 1 of the main request over E6 (Article 54(1) EPC).

2.2.1 E6 discloses a PVD apparatus, i.e. a film deposition system, comprising a vacuum chamber, an evaporation source for forming a film on a work (wafer, 15) in said vacuum chamber, and a cooling device (cooling tube, 13) for cooling the work (15). The cooling device (13) is provided in the wafer support assembly (10) which is vertically movably provided and lifts the work (15) into the vacuum chamber. The cooling device (13) of the apparatus of E6 is therefore provided in the vacuum chamber and is **suitable for** being inserted to and drawn from an internal space of a work so that it would be

cooled from the inside (column 6, line 34 to column 8, line 33; figures 1, 3).

E6 does not disclose that the work has an internal space communicating with the outside through an opening part since the work is a flat wafer. However, the Board is of the same opinion as the opposition division that the work is not part of the claimed system in claim 1 and, hence, its shape cannot distinguish the claimed device from E6 (see also summons for oral proceedings of the opposition division, page 3, first paragraph).

As a consequence, all features of claim 1 are known from E6 and, hence, its subject-matter is not novel over E6 (Article 54(1) EPC).

2.2.2 Appellant I considers that the film deposition system of E6 is only adapted for flat wafers and, hence, is not suitable for having the cooling device insertable to and drawable from an internal space of a work. In the system of E6, the wafer (15) is pressed by the clamping ring (122) against the platen top surface (121) (column 6, lines 38-39 and column 7, lines 5-35). A contact is required between the wafer (15) and the platen top surface (121), proving clearly that the disclosed system would not function with a non-flat wafer such as a cup-like work as shown in the modified figure 1 of E6 filed by appellant II with its statement of grounds of appeal. In the system of E6 the work has to be flat for it to function.

Furthermore, the wafer (10) of E7 is to be regarded as flat in view of the small difference in thicknesses between the edge portion (18) - 300 to 1000 μm - and

the central portion (16) - 20 to 200 μm - (paragraphs [0025] and [0027]; claims 5 and 6). Consequently, E7 does not disclose a work with an internal space according to the claimed system of claim 1.

In addition, should the central portion (16) of the wafer (10) in E7 be regarded as an internal space, the radial dimension of its edge portion (18) is large as shown in the figures of E7 and required for handling the wafer ([0038]). Consequently, if used in the system of E6, the platen (110) would hit the edge portion (18) of E7 when coming up so that it would not be inserted in the central portion (16) of the wafer (10) of E7. Thus, the cooling device in the system of E6 is clearly not suitable for being inserted into and drawn from the central portion (16) of the wafer (10) of E7.

The Board cannot share appellant I's view since, as put forward by appellant II, the film deposition system of E6 would also unambiguously **function with a non-flat wafer**, in particular wafers as shown in E7. There is indeed in E6 no indication of the contrary and the construction is for instance illustrated by the modified drawing of figure 1 of E6 filed by appellant II mentioned above. As a matter of fact, the platen (110) which comprises the cooling device (13) in the film deposition system of E6 would move relative to the cup-like work which is fixed and placed on the wafer support fingers (133). The platen (110) would then enter the skirt-like internal space of the cup-like work till it comes in contact with the flat bottom of the cup-like work and lifts it such that it is pressed by the clamping ring (122) against the platen top surface (121).

In addition, the size of the internal space of the work is not specified in claim 1, the work itself being further not part of the claim. Consequently, the central portion (16) of the wafer (10) disclosed in E7 can be regarded as being an internal space according to claim 1. The drawings of E7 are schematic and not representative of the actual radial dimension of the edge portion which is also not explicitly disclosed in E7. As mentioned in paragraph [0038], the function of the edge portion (18) is to obtain a stable wafer, easy to manipulate. It is therefore clear that, in order not to waste valuable material, the material left in the edge portion will be minimised so that the radial dimension of the edge portion of the wafer will be set to the very minimum. Consequently, the wafer of E7 can indeed be seen as schematically drawn in the modified figure 1 of E6 filed by appellant II. As already explained above, when used in the system of E6 the cooling device will unambiguously be insertable into and drawable from the central portion (16) of the wafer (10) of E7.

3. Auxiliary request 1

3.1 Claim 1 of auxiliary request 1 corresponds to claim 1 of the main request with the additional features:

- (i) the evaporation source is provided within the vacuum chamber; and
- (ii) there is a clearance between an inner surface of the work and an outside surface of said cooling device.

- 3.2 Appellant II does not contest the novelty of the subject-matter of claim 1 of auxiliary request 1. It objects to lack of inventive step on the basis of a combination of E3 with any of the prior art documents (E1, E2) relating to PVD coating.
- 3.3 E3 relates to the CVD technique, which is close to the PVD technique according to claim 1, and aims at the same purpose as claim 1 of depositing a film onto a cylindrical substrate, i.e. a substrate with an internal space, said substrate of E3 being cooled from the inside similarly to present contested patent. E3 is indeed relevant due to the fact that the work - which does **not** form part of the claimed invention - has such an internal space. E3 can therefore be regarded as the closest prior art for the system of claim 1.
- 3.3.1 E3 discloses a film deposition system (microwave plasma chemical vapour deposition process; MW-PCVD process) (feature (a)) comprising (column 7, line 51 to column 10, line 3; column 14, lines 4-60; figures 1A, 1B, 2):
- a vacuum chamber (film forming chamber 101; exhaust pipe 104) (feature (b));
 - a source (gas feed pipes 107) for forming a film on a work (cylindrical substrate 105, 205) in said vacuum chamber (101); and
 - a cooling device (temperature controlling system 113, 213) for cooling the work (105, 205), said cooling device (113, 213) being provided within said vacuum chamber (101) (features (d) and (e)),
 - wherein the work (105, 205) has an internal space communicating with the outside through an opening part, which is inherent to its form as a cylindrical substrate (see also upper and lower auxiliary

substrates 211-1 and 211-2) (feature (f)), and said cooling device (113, 213) is insertable to and drawable from the internal space through the opening part of the work (105, 205) to cool the work from the inside (feature (g)).

E3, figure 2, further discloses a clearance between an inner surface of the work (105, 205) and an outside surface of said cooling device (113, 213) (feature (ii)). As correctly argued by appellant I, the cylindrical substrate holder (205') might indeed cool the cylindrical substrate (105, 205) by conduction. This is, however, a side effect, its function being to hold the substrate. The cooling device of E3 is in fact the temperature controlling system (113, 213) and has a clearance with the cylindrical substrate (105, 205).

3.3.2 As a consequence, the only features of claim 1 which are not disclosed by E3 are an **evaporation source** for forming a film on a work (feature (c)), said evaporation source being **provided within the vacuum chamber** (feature (i)).

Indeed, the generic gas source of E3 is not necessarily an evaporation source. As put forward by appellant II himself (see its letter of 22 November 2010, from the paragraph bridging pages 9-10 to first complete paragraph of page 13) the MW-PCVD technique of E3 starts from a material which is already in a gaseous state. An evaporation source is a specific source, namely one where a solid or liquid phase of a material is evaporated and transformed into a gaseous phase (E1, column 1, lines 16-25; E4, page 3, fifth paragraph).

A "gas supply" as exemplified by the opposition division, point II-4.2.3 of the impugned decision, therefore cannot be regarded as being an evaporation source. It is rather a "vapour source".

- 3.3.3 Appellant I considers that "cooling by radiation at a pressure level of the vacuum chamber is definitely not the solution proposed in E3", which teaches even against it (column 10, lines 42-46). Implicit from appellant I's arguments is that claim 1 is directed to cooling by radiation at the pressure level of the vacuum chamber.

The Board is of the opinion that these features cannot be regarded as distinguishing features over E3 since they are not in claim 1. Furthermore, the disclosed technique of E3, i.e. a substrate holder (205') in contact with the cylindrical substrate (105, 205) and a pressure in the internal space higher than in the vacuum chamber, are not excluded from present claim 1. Claim 1 is indeed not limited to a specific cooling technique, i.e. radiation, convection or conduction. In addition, a contact between a conductive part and the substrate like in E3 is also foreseen in present contested patent, [0043], i.e. cooling by conductive heat transfer.

- 3.3.4 Appellant I further considers that "the apparatus of E3 is not designed for any relative movement between the substrate holder (205') and the cylindrical substrate (105, 205) via such an opening part". Therefore, the cooling device in the apparatus of E3, which comprises the substrate holder (205'), is not insertable to and

drawable from an internal space of the work (feature (g)).

Contrary to appellant I's view, the Board is of the opinion that there is an obligatory movement when introducing the substrate holder into the substrate in E3. Furthermore, the substrate holder 205' has a divided wall structure, making it unambiguously "drawable from" the substrate (column 9, lines 6-24). In addition, in this respect a substrate holder as in E3 is not excluded from present claim 1. Further, as a contact between the cooling device and the substrate similarly to E3 is even foreseen in present contested patent, [0043], this would also prevent any relative movement. Therefore, a substrate holder located between the substrate and the cooling device like in E3 is not excluded from claim 1.

Finally, as already put forward under point 3.3.1 above, the Board shares the opposition division's view (point II-4.2.3 of the impugned decision) that the cooling device in E3 is the temperature controlling system (113, 213) which is unambiguously insertable to and drawable from the cylindrical substrate (105, 205).

- 3.3.5 Appellant I further argues that there is no clearance in the apparatus of E3 between an inner surface of the work and an outside surface of the cooling device (feature (ii)). This is the case irrespective of whether the substrate holder (205') is considered as being part of the cooling device or not. In the former case, the substrate holder (205') is in contact with the substrate (105, 205) and, hence, no clearance is provided between the two parts. It refers in particular

to column 9, lines 23-25, of E3 which explicitly discloses that the substrate holder (205') is vacuum-sealed by the substrate (205). In the latter case, the clearance is not provided between the inner surface of the substrate (105, 205) and the outside surface of the temperature controlling system (113, 213) but rather between the inner surface of the substrate holder (205') and the outside surface of the temperature controlling system (113, 213), due to the substrate holder (205') being located between the substrate (105, 205) and the temperature controlling system (113, 213).

As already mentioned above, the Board considers that the temperature controlling system (113, 213) is the cooling device in the apparatus of E3 and has a clearance with the substrate (105, 205). Furthermore, a substrate holder as in E3, i.e. located between the substrate and the cooling device, is not excluded from claim 1. Consequently, even with a holder placed between the substrate and the cooling device, a clearance in accordance with the wording of feature (ii) is still present in the system of E3.

Should the substrate holder (205') be considered as being part of the cooling device in the system of E3, a clearance still inevitably exists with the holder before starting the deposition process (column 19, line 32 onwards). This clearance is indeed needed for mounting the work onto the substrate holder. The possible disappearance of the clearance due to the vacuum-sealing to which appellant I refers relates in fact to the system in use, which is not claimed. Consequently, even in that case, feature (ii) would be considered to be known from E3.

Finally, the Board agrees with appellant II that feature (ii) refers to a clearance with a work which does not form part of the claimed system. Said feature (ii) should therefore be read as the outside surface of the cooling device being **suitable for** having a clearance with the inner surface of the work, which is also certainly the case in the apparatus of E3. For this reason as well, feature (ii) is considered to be known from E3.

3.3.6 As a result, the only distinguishing features of claim 1 over E3 are an **evaporation source** for forming a film on a work (feature (c)), said evaporation source being **provided within the vacuum chamber** (feature (i)).

3.3.7 The distinguishing features merely relate to the choice of the source and its location for producing the gas/vapour for forming the film on the work.

The objective technical problem may therefore be seen as how to produce the gas/vapour to be used for forming the film.

3.3.8 The person skilled in the art is fully aware of the different techniques for producing gases/vapours and would immediately think of an evaporation source in the vacuum chamber, which is a usual and broadly applied technique, as illustrated by documents E1 or E2 (E1, column 5, lines 1-30 and figure 1; E2, column 3, lines 54-61 and figure 1).

As a result, starting from E3 the skilled person using his common general knowledge, or the teaching of E1 or

E2, would arrive at the claimed subject-matter in an obvious manner (Article 56 EPC).

3.3.9 Appellant I considers that the skilled person would not combine the teaching of E2 with the system of E3 because the documents relate to different film forming techniques (E2, PVD; E3, MW-PCVD) and their respective substrates have different shapes (E2, flat substrate) (E3, cylindrical substrate).

He argues similarly for the combination of the teaching of E1 with the system of E3 (E1, PVD; E3, MW-PCVD). In addition, appellant I puts forward that the apparatus of E1 cools the cathode, not the substrate, contrarily to E3.

3.3.10 However, in view of the objective technical problem given above, the Board is of the opinion that the skilled person would certainly consider the documents E1 and E2 which, like E3, aim at forming a film on a substrate, and relate to the PVD technique, i.e. a technical field close to the one of E3. Indeed, as illustrated by the standard textbook E4, page 3, fifth paragraph, the skilled person is aware that PVD and CVD apparatuses have close similarities. Consequently, when faced with a technical problem in one technique, he will certainly not refrain from looking for solutions in the other technique. By doing so in the present case, he will find the solution in any of the documents E1 or E2 and will have no difficulty to apply it to the system of E3.

4. Auxiliary requests 2 to 4

Claim 1 of each auxiliary requests 2, 3 and 4 comprises the added feature that the **cooling device is not to be rotatable**.

The Board agrees with appellant II that this feature is in contradiction with the embodiments according to the invention shown in figures 3 and 5. Indeed, in both figures 3 and 5 the cooling device (4) is rotatable about an axis, i.e. shaft (22) ([0050], [0064]). Consequently, it is not clear what is actually meant by this feature and, hence, claim 1 of each auxiliary requests 2, 3 and 4 lacks clarity (Article 84 EPC).

Appellant I argues that the cooling means in claim 1 of auxiliary requests 2 to 4 should be seen in fact as being the cooling **vessels** (16) which are clearly not rotatable in the embodiments of figures 3 and 5. This is further to be understood from the fact that the cooling device in the claimed system is to be insertable to and drawable from the internal space of the work (feature (g)). The complete cooling device (4) with, for instance, the holding part (25), obviously cannot be insertable to and drawable from the internal space of the work and, hence, is not the cooling device specified in the claims. Therefore, the cooling device in the claimed system is to be considered as the cooling vessels (16), so that claim 1 of auxiliary requests 2 to 4 is clear.

The Board cannot share appellant I's view since claim 1 of said auxiliary requests does not even mention the cooling vessel. In addition, as stated in the

description of the contested patent, [0065], "*the rotating table 11 is rotatably supported by **the lower part of the cooling vessel 16** through a bearing of bearing means 31*". Therefore, the cooling vessel (16) is obviously at least partly not "insertable to and drawable from" the internal space of the work which is in contradiction with appellant I's arguments. Consequently, even in the embodiments according to the invention, the cooling vessel as such does not fulfil the requirements used by appellant I for further specifying what is actually meant by the cooling device in the claimed system.

5. Auxiliary requests 1a, 2a, 3a and 4a

5.1 Auxiliary requests 1a to 4a were filed by appellant I after oral proceedings have been arranged and were discussed for the first time at the oral proceedings before the Board.

Claim 1 of each of the requests 1a to 4a comprises *inter alia* the following amendments with respect to the respective auxiliary requests 1 to 4:

(iii) a film deposition system "**for forming a film on the work**"; and

(iv) the cooling device is "**exposed to the prescribed pressure reduced state of the vacuum chamber**"

In view of the discussion during the oral proceedings, the introduction of feature (iii) does not appear to be motivated by any ground(s) of opposition, contrary to Rule 80 EPC.

Feature (iv), as admitted by appellant I, has no *verbatim* support in the application as originally filed, especially for the expression "exposed to". For a basis to this amendment, appellant I refers to page 5, lines 7-11, page 6, lines 20-25, page 7, lines 6-10 and page 7, line 25 to page 8, line 4 and the figures of the application as originally filed. In its opinion, feature (iv) enables to formulate the distinguishing features over E3, i.e. cooling by radiation at the pressure level of the vacuum chamber. It motivates its choice of a process feature in an apparatus claim by the fact that there is no specific apparatus feature in the application as originally filed enabling to express the said distinguishing features.

As argued by appellant II, it is, however, not disclosed in the application as originally filed what is to be the actual pressure inside the cylindrical work (2) when starting or in steady state. The actual pressure in use - the claimed system not even being explicitly claimed "in use" - may indeed be higher or lower than in the vacuum chamber, contrary to what is intended to be meant by "exposed to", so that the amendment contravenes the requirements of Article 123(2) EPC.

As further argued by appellant II, feature (iv) does not enable to clarify what is actually meant by the cooling device in the claimed system as objected to under point 4 above for auxiliary requests 2 to 4. Thus, it remains unclear which part of the cooling device is actually "exposed to" the reduced pressure, e.g. only

the holding part (25) or the revolving table (21) (Article 84 EPC).

Finally, a definite article for the reduced pressure is used, i.e. **"the"** prescribed pressure, without prior defining in the claim what is actually meant by this prescribed pressure, in particular with respect to which level it is "reduced". Claim 1 of the auxiliary requests 1a to 4a is therefore unclear (Article 84 EPC).

Consequently, the amendments introduced in claim 1 of each auxiliary request 1a to 4a do not enable to overcome the objection raised against the previous respective auxiliary requests 1 to 4 and, in addition, lead to new objections on the basis of Articles 84 and 123(2) EPC and Rule 80 EPC at a late stage in the proceedings, contrary to the requirement of procedural economy. Thus, auxiliary requests 1a to 4a are not admitted in the proceedings according to Article 13(1) RPBA.

- 5.2 Appellant I argues that the amendments, in particular feature (iv), were done in response to the preliminary opinion of the Board provided with the annex to the summons for oral proceedings, point 5.1.5. It considers that the amendments enable to clearly distinguish the claimed subject-matter from E3. With feature (iv), cooling in the claimed system is unambiguously performed by radiation, while it is explicitly not possible in the system of E3 (column 10, lines 38-46). Furthermore, feature (iv) makes clear that the pressure at the cooling device is the same as in the vacuum chamber. In the system of E3, on the contrary, the pressure at the temperature controlling system (113,

213), i.e. inside the substrate holder, is higher than in the vacuum chamber, i.e. the discharge space (column 14, line 66 to column 15, line 3; column 15, lines 28-38; column 20, table).

- 5.3 The Board cannot accept that its preliminary opinion is the reason for introducing feature (iv) in the claims. Its preliminary opinion is not an invitation nor as such a justification for filing new requests. Should appellant I have been convinced that feature (iv) is an essential feature of the invention, as argued during the oral proceedings, it should have already included it in claim 1 of the auxiliary requests filed with its statement of grounds of appeal, or at the latest in reply to the appeal of appellant II. Document E3 has been in the proceedings since the very beginning of the opposition and appellant I should have been aware of the essential features of its invention at that stage. In this respect reference is made also to points 4.2 and 5.3 of the reasons of the impugned decision.

Moreover, newly introduced feature (iv) leads auxiliary requests 1a to 4a to diverge from the previous sets of claims filed during the opposition proceedings or with the statement of grounds of appeal (claims 1-10 as granted and auxiliary requests 1 to 4).

The emphasis is now put on the pressure applied and the way cooling is performed (by radiation). During the opposition proceedings, however, the "vertically movably" cooling device was seen by appellant I as the essential feature (see claim 1 of the patent of auxiliary request I as maintained by the opposition division); this is no longer present in the claims.

With the statement of grounds of appeal, the clearance between the cooling device and the substrate and/or the one-fold and/or two-fold rotation systems of the work were seen by appellant I as the essential features. The Board cannot see to which extent feature (iv) would converge with the latter requests in the sense that it would better define the clearance between the cooling device and the substrate. As a matter of fact, feature (iv) does not refer, neither explicitly nor implicitly, to the clearance.

Filing auxiliary requests which diverge in their technical subject-matter at such a late stage in the proceedings is neither seen as conducive to efficient proceedings (see in this respect also T 1685/07, reasons 6.5 to 6.8, not published in OJ EPO).

6. Auxiliary request 5

This auxiliary request was filed during the oral proceedings before the Board. It is based on auxiliary request 4 and the amendments aim at overcoming the objection of lack of clarity raised under point 4 above. In claim 1 of auxiliary request 5 the cooling device **has a coolant vessel for passing a coolant in the inner part thereof, which** is insertable to and drawable from the internal space through the opening part of the work to cool the work from the inside (see point VII above for the amendments).

The Board is of the opinion, however, that inconsistencies still exist between claim 1 of the auxiliary request 5 and the description, in particular paragraphs [0052] and [0065].

Appellant I argues that it is clear in paragraph [0052] what is meant by "the coolant vessel 16 performs the same rotation as the revolving shaft 22" in light of figure 3. The coolant vessel 16 revolves about the axis of shaft 22 while it does not rotate. The rotation mentioned in the cited passages refers only to the shaft 22.

The Board cannot share appellant I's view since in paragraph [0052] it is mentioned that "*the coolant vessel 16 performs the same **rotation** as the revolving shaft 22*". Therefore, the coolant vessel appears to be rotatable according to the description, whereas claim 1 states the opposite.

With respect to paragraph [0065], appellant I considers that claim 1 does not exclude that only a part of the cooling vessel 16 is insertable to and drawable from the internal space of the work so that there is no inconsistency.

In paragraph [0065] it appears, however, that "*the rotating table 11 is rotatably supported by **the lower part of the cooling vessel 16** through a bearing of bearing means 31*". Therefore, some part of the coolant vessel is obviously **not** "insertable to and drawable from" the internal space of the work, whereas claim 1 states that **the** coolant vessel, i.e. as a whole, is insertable to and drawable from the internal space of the work.

Consequently, inconsistencies still remain between claim 1 and the description leading to lack of clarity

of claim 1 (Article 84 EPC). In view of the stage of the proceedings further dealing with such a request is contrary to procedural economy. Auxiliary request 5 is therefore not admitted in the proceedings according to Article 13(1) RPBA.

Order

For these reasons it is decided that:

1. The appeal of appellant I (patent proprietor) is dismissed.
2. The decision under appeal is set aside.
3. The patent is revoked.

The Registrar:

The Chairman:

G. Nachtigall

H. Meinders