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D E C I S I O N
of 5 April 2006

Case Number: T 0772/04 - 3.4.03

Application Number: 96110765.3

Publication Number: 0790634

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Language of the proceedings: EN

Title of invention:
Electrostatic-magnetic lens arrangement

Patentee:
ADVANTEST CORPORATION

Opponent:
Carl Zeiss NTS GmbH

Headword:
Magnetic single-pole lens/ADVANTEST

Relevant legal provisions:
EPC Art. 56
RPBA Art. 10b

Keyword:
"Inventive step (no) "

Decisions cited:
-

Catchword:
-



Case Number: T 0772/04 - 3.4.03

D E C I S I O N
of the Technical Board of Appeal 3.4.03
of 5 April 2006

Appellant: ADVANTEST CORPORATION
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Respondent: Carl Zeiss NTS GmbH
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 23 April 2004
revoking European patent No. 0790634 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: R. G. O'Connell
Members: G. Eliasson
T. Bokor

Summary of Facts and Submissions

I. This is an appeal against the revocation of European patent 0 790 634 on the ground that the claimed subject matter lacked an inventive step.

II. In the opposition procedure the following documents, amongst others, were considered:

D2: WO 91 02 374 A;

E1: EP 0 333 018 B;

E2: Tsuno et al. "Immersion lenses for low voltage SEM and LEEM", Proc. SPIE vol. 2522, pages 243 to 251 (1995); and

E3: DE 42 36 273 A.

III. At oral proceedings before the board the parties made the following requests:

The appellant proprietor requested that the decision under appeal be set aside and a patent granted on the basis of the main request as filed during the oral proceedings, or alternatively on the basis of one of the auxiliary requests 1 to 4, all filed during the oral proceedings.

The respondent opponent requested that the appeal be dismissed.

IV. Claim 1 according to the main request reads as follows:

"1. Electrostatic-magnetic lens arrangement for focusing charged particles with a magnetic single-pole lens (61, 61', 61") and an electrostatic lens (62) situated within the magnetic lens,

characterised in that the electrostatic lens (62) generates a rotationally symmetrical electrical field and the charged particles are decelerated to a final beam energy with the aid of the electrostatic lens (62) which has at least two electrodes (62a, 61b)

which are held at different potentials such that the charged particles are decelerated in the field of the electrostatic lens from a first energy to a lower second energy

and further characterised by an additional control electrode (63) which is situated in the beam path between the electrostatic lens and a specimen and is connected to a variable potential for adjustment of the electrical field strength in the region of the specimen."

V. Claim 1 according to auxiliary request 1 differs from that of the main request in that the penultimate paragraph reads as follows (board's emphasis):

"which are held at different potentials such that the charged particles are decelerated in the field of the electrostatic lens from a first energy to a lower second energy **and in that the magnetic lens**

(61, 61', 61") is situated in the beam path above a specimen (8)"

VI. Claim 1 according to auxiliary request 2 differs from that of the main request in that the penultimate paragraph reads as follows (board's emphasis):

"which are held at different potentials such that the charged particles are decelerated in the field of the electrostatic lens from a first energy to a lower second energy **and in that the magnetic lens (61, 61', 61") has an inner pole piece as well as an outer pole piece"**

VII. Claim 1 according to auxiliary request 3 differs from that of auxiliary request 1 in that the penultimate paragraph reads as follows (board's emphasis):

"which are held at different potentials such that the charged particles are decelerated in the field of the electrostatic lens from a first energy to a lower second energy and in that the magnetic lens (61, 61', 61") is situated in the beam path above a specimen (8) **and wherein the first of the two electrodes is formed by a beam tube (62a) which is situated concentrically in an internal bore (61 a) of the single-pole lens,"**

VIII. Claim 1 according to auxiliary request 4 differs from that of auxiliary request 2 in that the penultimate paragraph reads as follows (board's emphasis):

"which are held at different potentials such that the charged particles are decelerated in the field

of the electrostatic lens from a first energy to a lower second energy and in that the magnetic lens (61, 61', 61") has an inner pole piece as well as an outer pole piece **and wherein the first of the two electrodes is formed by a beam tube (62a) which is situated concentrically in an internal bore (61 a) of the single-pole lens,**"

IX. The appellant proprietor presented essentially the following arguments relevant for the present decision:

- (a) Document E2 teaches on page 250 that a magnetic single pole lens cannot be used because of problems with electric discharges between the lens and the sample. Hence the skilled person would not consider using such a lens.
- (b) Document E3 discloses a magnetic single pole lens where the sample is situated in a cavity within the pole piece, whereas in the device of document E1 the sample is positioned outside of and below the magnetic pole piece. A skilled person faced with the task of improving the device of document E1 would not consider the structure of document E3.
- (c) Document D2 discloses an electrostatic-magnetic lens arrangement where the magnetic lens is of the single pole type. The electrostatic lens 10 is however of a special type using multiple disk-shaped electrodes in order to allow focusing of both negatively and positively charged particles. The skilled person seeking to improve the device of document E1 would therefore not take the teaching of document D2 into account.

X. The respondent opponent presented essentially the following arguments relevant to the present decision:

- (a) Contrary to the appellant proprietor's contention document E2 does not teach away from using magnetic single pole lenses. The statement in document E2 at page 250 referred to by the appellant proprietor merely states that the particular magnetic single pole lens could not be used for a working distance of 2 mm or less. It is on the other hand shown in Figure 9(c) of document E2 that at larger working distances, the magnetic single pole lens ("D") has the smallest aberration coefficients, and therefore better optical properties, than the magnetic bipolar lenses ("A" to "C").

Reasons for the Decision

1. The appeal is admissible.
2. *Late filed requests*

The appellant proprietor filed amended claims at the oral proceedings. The main request and auxiliary request 1 contain amendments with respect to claim 1 as granted which were proposed earlier by the appellant proprietor in the written appeal procedure. Furthermore, auxiliary request 3 adds the features of claims 2 and 4 as granted to claim 1 according to auxiliary request 1. Therefore, these requests, although filed at a late stage of the appeal procedure, concern amendments to

which the opponent has had the opportunity to prepare a response.

The added feature in auxiliary requests 2 and 4 that the magnetic lens has an inner and an outer pole piece, on the other hand, raises new questions whether it complies with Article 123(2) EPC without retaining the limitation over the prior art made in auxiliary request 1. Therefore, apart from the consideration that new issues are being raised regarding the allowability of the amendment at a late stage of the appeal procedure, the board cannot see how this request could be more successful than its preceding request in meeting the requirements of novelty and inventive step.

Accordingly in the exercise of its discretion pursuant to Article 10b of the Rules of Procedure of the Boards of Appeal the board rules that only the main request and auxiliary requests 1 and 3 are admitted.

3. *Novelty and inventive step - Main Request*

- 3.1 Document E1 is considered the closest prior art by the board, since it relates to an electrostatic-magnetic lens arrangement which serves the same purpose as that disclosed in the opposed patent, namely suitability for investigating specimens such as integrated circuits (cf. E1, column 1, lines 34 to 52; patent specification, paragraph [0003]). It discloses an electrostatic-magnetic lens arrangement for focussing charged particles (electrons) having a magnetic bipolar lens ML, and an electrostatic lens OE, UE situated within the magnetic lens ML (Figures 1 and 2; column 2, lines 13 to 44). The electrostatic lens OE, UE has two

electrodes OE and UE which are held at different potentials U_{OE} and U_{UE} and generate a rotationally symmetrical electrical field such that the charged particles are decelerated to a lower final beam energy with the aid of the electrostatic lens (column 2, lines 26 to 35).

An additional control electrode ST is situated in the beam path between the electrostatic lens and a specimen PR is connected to a variable potential U_{ST} for adjustment of the electrical field strength in the region of the specimen (column 3, line 49 to column 4, line 15).

3.2 The device of claim 1 according to the main request thus differs from that of document E1 only in that the magnetic lens is a magnetic single-pole lens whereas the device of document E1 uses a magnetic bipolar lens.

3.3 As acknowledged in the opposed patent, it is known in the art that in a magnetic single-pole lens the magnetic field is essentially generated outside the lens allowing a greater distance between the lens and the sample than with a magnetic bipolar magnetic lens (see patent specification, paragraph [0004]; application as published, column 1, lines 35 to 38).

The objective technical problem thus relates to increasing the working distance of the known electrostatic-magnetic lens arrangement.

3.4 The board cannot discern an inventive step in the replacement of the magnetic bipolar lens with a magnetic single pole lens for the purpose of increasing

the working distance, given that the latter are known in the art to allow a greater working distance than magnetic bipolar lenses.

- 3.5 The appellant proprietor argued in this connection that document E2 on page 250, last paragraph teaches away from using magnetic single pole lenses, and therefore, the skilled person would in the light of this disclosure refrain from using magnetic single pole lenses (see item IX(a) above).

The board is not persuaded by this argument, since firstly, it was known from documents E3 and D2 that magnetic single pole lenses could be used successfully in electrostatic-magnetic lens arrangements. Secondly, as the respondent opponent pointed out, the above-mentioned statement in document E2 does not rule out the use of magnetic single pole lenses (see item X above). It merely states that the single pole lens discussed could not be used at a working distance of 2 mm because of electrical discharges. Greater working distances could be chosen however at the price of having increased aberration.

Document E2 furthermore discloses in Figure 9(c) that as the working distance increases, the magnetic single pole lens (labelled "D") has smaller aberration coefficients than its dipolar counterparts "A" to "C". Magnetic single pole lenses would therefore be taken into consideration whenever a larger working distance is desired.

- 3.6 For the above reasons, in the board's judgement, the subject matter of claim 1 according to the main request

is not to be considered as involving an inventive step within the meaning of Article 56 EPC.

4. *Inventive step - Auxiliary Requests 1 and 3*

4.1 With respect to the main request, claim 1 according to auxiliary request 1 further specifies that the magnetic lens is situated in the beam path above a specimen. Claim 1 according to auxiliary request 3 adds to auxiliary request 1 the further specification that the first of the two electrodes of the electrostatic lens is formed by a beam tube which is situated concentrically in an internal bore of the single-pole lens.

4.2 Document E1 discloses that the magnetic lens ML is positioned above the sample PR (Figures 1 and 2). The first electrode OE of the electrostatic lens is formed as a beam tube situated concentrically in an internal bore of the magnetic single-pole lens ML (column 2, lines 26 to 35).

4.3 Given that, as shown above, the further features of auxiliary requests 1 and 3 are also known from document E1, the subject matter of claim 1 according to auxiliary requests 1 and 3 does not involve an inventive step within the meaning of Article 56 EPC for the same reasons as for the main request.

Order

For these reasons it is decided that:

The appeal is dismissed.

Registrar:

Chair:

S. Sánchez Chiquero

R. G. O'Connell