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**Datasheet for the decision  
of 12 May 2021**

**Case Number:** T 0730/18 - 3.4.02

**Application Number:** 05758458.3

**Publication Number:** 1766334

**IPC:** G01D5/36, G01D5/38

**Language of the proceedings:** EN

**Title of invention:**  
SCALE READING APPARATUS

**Patent Proprietor:**  
Renishaw plc

**Former Opponent:**  
DR. JOHANNES HEIDENHAIN GmbH

**Headword:**

**Relevant legal provisions:**  
EPC 1973 Art. 56

**Keyword:**  
Inventive step - (yes)

**Decisions cited:**

**Catchword:**



**Beschwerdekammern**  
**Boards of Appeal**  
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Case Number: T 0730/18 - 3.4.02

**D E C I S I O N**  
**of Technical Board of Appeal 3.4.02**  
**of 12 May 2021**

**Appellant:** Renishaw plc  
(Patent Proprietor) New Mills  
Wotton-under-Edge  
Gloucestershire GL12 8JR (GB)

**Representative:** Dunn, Paul Edward  
Renishaw plc  
Patent Department  
New Mills  
Wotton-under-Edge, Glos. GL12 8JR (GB)

**Decision under appeal:** **Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
8 January 2018 concerning maintenance of the  
European Patent No. 1766334 in amended form.**

**Composition of the Board:**

**Chairman** R. Bekkering  
**Members:** H. von Gronau  
G. Decker

## **Summary of Facts and Submissions**

- I. The appeals of the patent proprietor and the (former) opponent are directed against the interlocutory decision of the opposition division concerning maintenance of the European patent No. 1766334 in amended form. The opposition division was of the opinion that the patent in amended form according to the then third auxiliary request met the requirements of the EPC.
  
- II. The following document is relevant for the present decision:  
  
E1: WO 02/084223 A1
  
- III. The appellant-patent proprietor requested with the statement setting out the grounds of appeal as a main request that the patent be maintained as granted, i. e. that the opposition be rejected, as a first auxiliary request that the patent be maintained with the claim set titled "First Auxiliary Request" filed with the statement setting out the grounds of appeal, or as a second auxiliary request that the patent be maintained with the claim set titled "Second Auxiliary Request" filed with the statement setting out the grounds of appeal, or as a third auxiliary request that the patent be maintained as allowed by the opposition division. All requests correspond to the respective requests underlying the contested decision.
  
- IV. The appellant-opponent withdrew its opposition and appeal with a letter dated 17 May 2018.

- V. In a communication pursuant to Article 15(1) RPBA 2020 the board expressed its provisional opinion that *inter alia* the subject-matter of claim 1 of the main request and the first auxiliary request was not new in view of document E1 and that the subject-matter of independent claim 1 of the second auxiliary request was considered to be new and to involve an inventive step.
- VI. With a letter dated 15 April 2021 the patent proprietor withdrew the current main request and first auxiliary request, and promoted the current second auxiliary request to be the new main request and the current third auxiliary request to be the new first auxiliary request. With a letter dated 6 May 2021 the patent proprietor also filed amended pages of the description for the new main request.
- VII. Claim 1 of the main request reads as follows:
- "An incremental encoder apparatus for measuring displacement between two members, comprising:  
a scale (10) on one of the members having periodic scale markings (12) forming an incremental pattern and at least one reference mark (14) embedded in the incremental pattern;  
a read head provided on the other member;  
periodic diffraction means (22) provided in the readhead for interacting with a light pattern modulated by the incremental pattern on the scale to produce interference fringes having movement relative to said readhead responsive to said displacement, wherein an up/down count is produced in response to the detection of said movement of said interference fringes;  
first detecting means (24) configured to detect said movement of said interference fringes;

imaging means (26) provided in the readhead configured to image the reference mark onto second detecting means (28) which is configured to detect said image of the reference mark, the imaging means (26) comprising a Fresnel zone plate;  
wherein the imaging means is located between the scale and the second detecting means."

### **Reasons for the Decision**

1. The appeal is admissible.
2. Main request - novelty and inventive step (Articles 54(1) and 56 EPC 1973)
  - 2.1 The board shares the opinion of the opposition division that document E1 discloses an incremental encoder apparatus for measuring displacement between two members (see document E1, page 1, lines 10 and 11), comprising:

(M1): a scale 18 on one of the members having periodic scale markings 20 forming an incremental pattern and at least one absolute position mark embedded in the incremental pattern (see document E1, Figure 1D and page 5, lines 32 to page 6, line 15);

(M2): a read head 54 provided on the other member (see Figure 8 and page 10, lines 13 and 14);

(M3): periodic diffraction means 52 provided in the read head 54 for interacting with a light pattern modulated by the incremental pattern on the scale to produce interference fringes having movement relative to said read head responsive to said displacement (see

Figure 8 and page 10, lines 14 to 16), wherein an up/down count is produced in response to the detection of said movement of the interference fringes;

(M4): first detecting means 50 for detecting said movement of said interference fringes (see Figure 8 and page 10, lines 14 to 16);

(M5): imaging means 25 provided in the read head 54 configured to image the absolute position mark onto second detecting means 26 which is configured to detect said image of the absolute position mark (see Figure 8 and page 10, lines 17 to 19);

(M6): wherein the imaging means 25 is located between the scale 18 and the second detecting means 26 (see Figure 8 and page 10, lines 17 to 19: imaging lens 25 is located between the scale 18 and the detector 26).

2.2 Document E1 discloses an encoder apparatus with a hybrid absolute and incremental scale and a read head that is able to read the hybrid scale as if it was a purely incremental scale (see E1, page 11, lines 6 to 13). Therefore, the apparatus of document E1 has not only the function of encoding absolute positions but also encoding incremental positions. The board does not share the view of the appellant-patent proprietor that an absolute encoder that includes an incremental scale is solely an absolute encoder. The hybrid encoder comprises an absolute position encoder in addition to the incremental encoder. Therefore, document E1 also discloses an incremental encoder even if it works together with the absolute position encoder to form a hybrid encoder.

With respect to the argument that document E1 determined the phase of the interference fringe and did not produce an up/down count in response to the detection of movement of the interference fringes as defined in claim 1, the board is of the opinion that document E1 discloses determining the incremental position in the read head by producing fringes at a detector in the form of a sinusoidal wave and each fringe at the detector being produced by many points on the scale. The filtering read head is able to read the hybrid absolute and incremental scale as if it was a purely incremental scale (see document E1, page 10, line 29 to page 11, line 13). An incremental scale is normally read by the read head not only by detecting the movement of the interference fringes but also by counting the interference fringes. The board is therefore of the opinion that document E1 discloses implicitly in the feature M3 that the read head is adapted to produce an up/down count in response to the detected movement of the interference fringes.

- 2.3 The board shares therefore the view of the opposition division that document E1 discloses all features of claim 1 but the imaging means 26 comprising a Fresnel zone plate.
- 2.4 The appellant-patent proprietor was of the opinion that the problem to provide an "alternative to the imaging lens" as stated by the opposition division was based on hindsight, because the problem included at least a partial pointer to the solution (i.e. replacing the imaging lens with something else) and it did not take into account the actual technical effect of using a Fresnel zone plate.  
A technical effect of using a Fresnel zone plate in place of a refractive cylindrical lens was that the



focal length of the imaging means could be controlled more accurately; it was easier and cheaper to make diffractive features accurately because they were merely binary features which could be made via lithography, compared to a refractive lens, the entire curved shape of which having to be formed very precisely. Also, when a Fresnel zone plate was used, both the imaging means for imaging the reference mark and the periodic diffraction means for producing the interference fringes could be formed using the same manufacturing process. In contrast, if a refractive cylindrical lens was used, then the imaging means for imaging the reference mark and the periodic diffraction means for producing the interference fringe had to be made via different manufacturing processes, and then they subsequently had to be brought together (e.g. the cylindrical lens and the periodic diffraction means had to be aligned and glued together). These additional steps entailed additional manufacturing cost and complexity, and could also lead to inaccuracies and degradations in the optical performance of the encoder. Accordingly, the technical effect of using a Fresnel zone plate in place of a refractive cylindrical lens was an improved encoder apparatus. Therefore, the objective technical problem was to provide an improved encoder.

- 2.5 The board agrees with the patent proprietor that the objective technical problem to be solved is to provide an improved incremental encoder apparatus because the Fresnel zone plate provides advantages over the lens even if not stated explicitly in the patent in suit.
  
- 2.6 In order to find a solution to the above problem the person skilled in the art would consider the available prior art documents. The board agrees with the view of

the opposition division that Fresnel zone plates were generally known at the priority date of the patent, but none of the prior art documents suggests to provide an alternative to the imaging lens of the encoder of document E1 and to take an imaging means that comprises a Fresnel zone plate in an incremental encoder apparatus as the one disclosed in document E1. Document E1 merely suggests to have a microlens array for achieving a smaller working distance (see page 11, lines 21 to 28). For the person skilled in the art, confronted with the objective technical problem to provide an improved incremental encoder apparatus, it is not evident to look for an improved imaging means in document E1 and to propose a Fresnel zone plate for the lens. The Fresnel zone plate has the particular advantage that it can be manufactured by the same process steps as the periodic diffraction means in the read head which leads to a considerable simplification of the manufacturing process. This improvement is not suggested by the available prior art.

- 2.7 The board comes therefore to the conclusion that the subject-matter of claim 1 involves an inventive step.
3. The claims of the current main request are clear and their subject-matter is originally disclosed. The description has been adapted to the amended claims.

The application documents of the current main request therefore meet the requirements of the EPC.

## **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 as amended in the following version:

Description:

Columns 1 to 5 filed with the letter dated 6 May 2021

Claims:

No. 1 to 9 of the main request filed as second auxiliary request with the letter dated 16 May 2018

Drawings:

Figures 1 to 9 of the patent specification.

The Registrar:

The Chairman:



L. Gabor

R. Bekkering

Decision electronically authenticated