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**Datasheet for the decision
of 15 June 2021**

Case Number: T 2335/16 - 3.4.02

Application Number: 10000459.7

Publication Number: 2207006

IPC: G01B5/012, G01B7/012

Language of the proceedings: EN

Title of invention:
Surface sensing device

Patent Proprietor:
Renishaw PLC

Opponent:
TESA Sàrl

Headword:

Relevant legal provisions:

EPC Art. 54(1)
EPÜ Art. 56, 84

Keyword:

Novelty - main request (no) - second auxiliary request (yes)

Claims - clarity - first auxiliary request (no)

Inventive step - second auxiliary request (yes)

Decisions cited:

Catchword:



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Case Number: T 2335/16 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 15 June 2021

Appellant I: Renishaw PLC
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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
11 August 2016 concerning maintenance of the
European Patent No. 2207006 in amended form.**

Composition of the Board:

Chairman R. Bekkering
Members: H. von Gronau
T. Karamanli

Summary of Facts and Submissions

- I. The appeals of the patent-proprietor and of the opponent are directed against the interlocutory decision of the opposition division concerning maintenance of the European patent No. 2207006 in amended form. The opposition division was of the opinion that the patent as amended according to the then third auxiliary request met the requirements of the EPC.
- II. The following documents are relevant for the present decision:
- E4: WO 90/07097 A1
E6: WO 89/07745 A1
E7: EP 1 659 363 A1
E12: US 2006/0010969 A1
E12e: Product Manual IRB 140, ABB Robotics Products AB publication, article number: 3HAC 7564-1, rev. 1, issue M2000
E13: US 2006/0191328 A1
E14: JPS 55133303 U, with English translation E14a.
- III. With its statement setting out the grounds of appeal dated 21 December 2016, appellant I (patent proprietor) requested that the decision of the opposition division be set aside and that the opposition be rejected, i.e. the patent be maintained as granted (main request), or, as an auxiliary measure, that the patent be maintained as amended according to one of a first to seventh auxiliary request filed with its statement setting out the grounds of appeal.

- IV. With its statement setting out the grounds of appeal dated 18 December 2016, appellant II (opponent) requested that the decision of the opposition division be set aside and that the patent be revoked.
- V. In the alternative, both parties requested that oral proceedings be held.
- VI. In a communication pursuant to Article 15(1) RPBA 2007, 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 E12, that claim 1 of the second and third auxiliary requests was not clear, and that the subject-matter of claim 1 of the fourth auxiliary request involved an inventive step.
- VII. With letter dated 14 May 2021, appellant I (patent proprietor) filed claims of a new first auxiliary request with a correction in dependent claim 2, replacing claims of the previously filed first auxiliary request and amended description pages 2 and 3 corresponding to each of the first to fourth, sixth and seventh auxiliary requests.
- VIII. The oral proceedings took place on 15 June 2021. During the oral proceedings, appellant I (patent proprietor) withdrew its main request, third and fifth to seventh auxiliary requests so that the former first, second and fourth auxiliary requests became the main request, first and second auxiliary requests, respectively. Appellant I also filed amended description page 2 of the second auxiliary request replacing the corresponding description page of the second auxiliary request filed as fourth auxiliary request.

The parties stated their final requests as follows:

Appellant I (patent proprietor) requested that the decision under appeal be set aside and that the European patent be maintained as amended on the basis of the claims of the main request filed as a first auxiliary request by letter dated 14 May 2021, or, as an auxiliary measure, on the basis of the claims of the first auxiliary request filed as a second auxiliary request with its statement of the grounds of appeal dated 21 December 2016, or on the basis of the claims of the second auxiliary request filed as a fourth auxiliary request with its statement of the grounds of appeal dated 21 December 2016.

Appellant II (opponent) requested that the decision under appeal be set aside and that the European patent be revoked.

At the end of the oral proceedings the chairman announced the board's decision.

IX. Claim 1 of the main request filed as first auxiliary request by letter dated 14 May 2021 reads as follows:

"An apparatus for measuring a surface of a workpiece, the apparatus comprising:
a support, the support being an articulating probe head (7);
an attachment means (1) for attaching the probe head (7) to the moveable arm of a position determining machine;
a unidirectional probe (4) for sensing the surface of a workpiece;
the probe head (7) having a first member (2, 20) rotatable relative to the attachment means (1) about a

first axis of rotation (1A), actuatable by a first motor (M1), and a second member (22) rotatable relative to the first member (2, 20) about a second axis of rotation (2A), actuatable by a second motor (M2), wherein the second axis of rotation (2A) is transverse to the first axis of rotation (1A) and wherein the unidirectional probe (4) is attachable to the second member (22) for rotation therewith; wherein a rotation means (6) is provided for allowing rotation of the unidirectional probe (4) with respect to the probe head (7) about a third axis of rotation (4A); characterised in that the unidirectional probe (4) is a contact probe, which senses a surface in a direction transverse to the third axis of rotation (4A)."

Claim 1 of the first auxiliary request filed as a second auxiliary request with its statement of the grounds of appeal reads as follows:

"An apparatus for measuring a surface of a workpiece, the apparatus comprising:
a support, the support being an articulating probe head (7) which is rotatable about two mutually orthogonal axes;
a coordinate measuring machine comprising a moveable arm;
an attachment means (1) attaching the probe head (7) to the moveable arm of the coordinate measuring machine, the arm of the coordinate measuring machine being moveable in three directions x,y,z relative to a table on which the workpiece is supported;
a unidirectional probe (4) for sensing the surface of a workpiece;
the probe head (7) having a first member (2, 20) rotatable relative to the attachment means (1) about a

first axis of rotation (1A), actuatable by a first motor (M1), and a second member (22) rotatable relative to the first member (2, 20) about a second axis of rotation (2A), actuatable by a second motor (M2), wherein the second axis of rotation (2A) is orthogonal to the first axis of rotation (1A) and wherein the unidirectional probe (4) is attachable to the second member (22) for rotation therewith; wherein a rotation means (6) is provided for allowing rotation of the unidirectional probe (4) with respect to the probe head (7) about a third axis of rotation (4A); characterised in that the unidirectional probe (4) is a contact probe, which senses a surface in a direction transverse to the third axis of rotation (4A)."

The independent claims 1 and 11 of the second auxiliary request filed as a fourth auxiliary request with its statement of the grounds of appeal read as follows:

"1. An apparatus for measuring a surface of a workpiece, the apparatus comprising:
a support (7);
an attachment means (1) for attaching the support (7) to the moveable arm of a machine;
a unidirectional probe (4) for sensing the surface of a workpiece;
the support (7) having a first member (2, 20) rotatable relative to the attachment means (1) about a first axis of rotation (1A), actuatable by a first motor (M1), and a second member (22) rotatable relative to the first member (2, 20) about a second axis of rotation (2A), actuatable by a second motor (M2), wherein the second axis of rotation (2A) is transverse to the first axis of rotation (1A) and wherein the unidirectional probe

(4) is attachable to the second member (22) for rotation therewith;
wherein a rotation means (6) is provided for allowing rotation of the unidirectional probe (4) with respect to the support (7) about a third axis of rotation (4A), wherein the third rotational axis (4A), about which the unidirectional probe (4) is rotatable, is the generally longitudinal axis of the unidirectional probe (4); characterised in that the unidirectional probe (4) is a contact probe, which senses a surface in a direction transverse to the third axis of rotation (4A)."

"11. A method for using an apparatus for measuring a surface of a workpiece, the apparatus comprising:
a support (7);
an attachment means (1) for attaching the support (7) to the moveable arm of a machine;
a unidirectional probe (4) for sensing the surface of a workpiece;
the support (7) having a first member (2, 20) rotatable relative to the attachment means (1) about a first axis of rotation (1A), actuatable by a first motor (M1), and a second member (22) rotatable relative to the first member (2, 20) about a second axis of rotation (2A), actuatable by a second motor (M2), wherein the second axis of rotation (2A) is transverse to the first axis of rotation (1A) and wherein the unidirectional probe (4) is attachable to the second member (22) for rotation therewith; and
a rotation means (6) for allowing rotation of the unidirectional probe (4) with respect to the support (7) about a third axis of rotation (4A), wherein the third rotational axis (4A), about which the unidirectional probe (4) is rotatable, is the generally longitudinal axis of the unidirectional probe (4);

wherein the unidirectional probe (4) is a contact probe, which senses a surface in a direction transverse to the third axis of rotation (4A); and wherein the method comprises the following step: rotating the rotation means (6) to orientate the unidirectional probe (4) relative to the support (7)."

Reasons for the Decision

1. The appeals are admissible.
2. Main request - claim 1 - novelty (Article 54(1) EPC)
 - 2.1 In the view of appellant II, the device disclosed in document E12 anticipated all the technical features of claim 1 (see reply to appeal dated 12 May 2017, sections 3.8 - 3.17). In the oral proceedings before the board, appellant II emphasised that the claim wording was sufficiently clear and that it was not justified to interpret the claim in view of the description. It was submitted that appellant I would read the claim more restrictively than the literal meaning of the claim features justified. The axes defined in the claim were geometrical axes and not physical axes. Axes 3, 4 and 5 shown in Figure 1 on page 3 of the reply dated 12 May 2017 corresponded to the first, second and third axis of the claim. The robot arm could theoretically be divided anywhere in a probe head and a movable arm and therefore it could be divided somewhere between axis 2 and axis 3 and the attachment means being an element there between.
 - 2.2 Appellant I presented in its grounds of appeal examples where an articulated probe head was a separable unit and not an integrated part of a robot arm as in

document E12 (see corresponding section from page 5 to page 9). During the oral proceedings before the board, appellant I pointed out that document E12 disclosed a robot arm and not an articulating probe head. The robot arm could not be divided artificially into a probe head and a machine arm. Axis 3 in the figure on page 3 of the reply of appellant II dated 12 May 2017 was part of the lower arm and the upper arm comprised only Axes 4 to 6. From document E12 (see also E12e, page 73) it became clear that the wrist of the robot arm was controlled by the lower arm including the first three axes and that the upper arm comprised Axes 4, 5 and 6. The upper arm was attached to the lower arm at the elbow portion at Axis 3. The lower arm had to be seen as one block and the only reasonable interpretation was that the first part of the upper arm was attached to the lower arm at Axis 3 and that therefore Axis 6 corresponded to the third axis of the claim. The subject-matter of claim 1 was new because Axis 6 was not transverse to the direction in which the contact probe sensed a surface, as could be seen from the figure on page 3 of the reply of appellant II dated 12 May 2017.

- 2.3 The board does not share the view of appellant I. The claim does not further specify how the articulating probe head and the attachment means look like and whether the probe head is separable from the movable arm. Therefore, any portion of the robot arm of document E12 can be regarded as the articulating probe head, in particular a portion including Axes 3 and 4 mentioned above. Any portion of the robot arm connecting Axis 3 of the robot arm to the lower portion of the robot arm can be regarded as the attachment means. Thus, document E12 discloses an apparatus for measuring a surface of a workpiece (see e.g. paragraph

[0002], "testing surface finishes"), the apparatus comprising:

a support, the support being an articulating probe head (see e.g. Figure 3, an upper portion of arm 2);

an attachment means for attaching the probe head to the moveable arm (a lower portion of arm 2) of a position determining machine (the portions of the arm 2 are attached to each other);

a unidirectional probe (see e.g. Figure 3, probe 3 with stylus 6) for sensing the surface of a workpiece;

the probe head having a first member rotatable relative to the attachment means about a first axis of rotation (see explanatory figure on page 3 of the reply of appellant II dated 12 May 2017, "Axis 3"), actuatable by a first motor (the presence of a motor is inherent in the nature of a articulated robot), and a second member rotatable relative to the first member about a second axis of rotation ("Axis 4"), actuatable by a second motor,

wherein the second axis of rotation is transverse to the first axis of rotation and wherein the unidirectional probe 3 is attachable to the second member for rotation therewith;

wherein a rotation means is provided for allowing rotation of the unidirectional probe 3 with respect to the probe head about a third axis of rotation ("Axis 5");

wherein the unidirectional probe 3 is a contact probe with a stylus 6, which senses a surface in a direction transverse to the third axis of rotation (see e.g. Figure 3).

Thus all features of claim 1 are known from E12.

- 2.4 The board comes therefore to the conclusion that the subject-matter of claim 1 is not new in view of document E12.

3. First auxiliary request - claim 1 - clarity (Article 84 EPC)
 - 3.1 Appellant II was of the opinion that it was not clear whether the table was part of the claimed apparatus (see reply to appeal dated 12 May 2017, section 4.8). In the oral proceedings before the board the appellant II added that it was also not clear from the claim whether the table was in fixed relationship to the apparatus and where it was located relative to the apparatus. According to the description of the patent, paragraph [0003], the table could be movable, and without a precise definition of the relationship between table and coordinate measuring machine the claim was unclear.
 - 3.2 Appellant I argued in the oral proceedings before the board that claim 1 was clear. According to the Guidelines for Examination, it was allowed to define an apparatus in relation to another entity. In the present case the machine was in reach of the work piece on the table and the person skilled in the art had no difficulty to understand that the table was in fixed relationship with the machine. It was also clear from paragraph [0002] of the description of the patent that the table was in fixed relationship and the claim did not specify that the table was moving.
 - 3.3 The board shares the view of appellant II. It is not clear from the claim wording where the table is located and whether the table is in a fixed relationship with the apparatus. It is also not defined in the claim whether the table is part of the claimed apparatus. It may be allowable to define the dimensions and/or shape of a first entity in an independent claim by general

reference to the dimensions and/or corresponding shape of a second entity which is not part of the claimed first entity but is related to it through use only where the size of the second entity is in some way standardised or in cases where the skilled person would have little difficulty in inferring the resultant restriction of the scope of protection for the first entity (see Guidelines for Examination in the European Patent Office, March 2021, Part F - Chapter IV, 4.14.2). However, in the present case the table and its location are not standardised and without having a definition whether the table is in a particular relationship with the apparatus the person skilled in the art cannot conclude which restrictions are imposed on the apparatus.

- 3.4 The board comes therefore to the conclusion that claim 1 does not meet the clarity requirements of Article 84 EPC.
- 4. Second auxiliary request - claim 1 - novelty and inventive step (Article 54(1) and 56 EPC).
 - 4.1 Claim 1 is a combination of granted claims 1 and 4.
 - 4.2 The opposition division considered the additional feature that the third rotational axis about which the unidirectional probe was rotatable was the general longitudinal axis of the unidirectional probe, to be a feature that rendered the subject-matter of claim 1 new and inventive (see decision, section 18.6 - 18.8).
 - 4.3 Appellant II argued that document E12 also disclosed that "*probe 3 includes telescoping, rotating, and/or revolving joints (or a combination thereof) to provide additional operational flexibility (e.g. degrees of*

rotational or movement freedom) for accurate and reliable manipulation of stylus 6" (see paragraph [0040]). The rotation axis of probe 3 could only be the longitudinal axis R of probe 3 or axis 6 as shown in its figure 3 on page 7 of the grounds of appeal (see grounds of appeal dated 18 December 2016, sections 5.19, 5.20). The rotational axis, which is generally the longitudinal axis of the elongated probe, provided a rotational degree for the positioning of the stylus. This could also be seen from Figures 4 and 5 of document E12.

If document E12 did not disclose that the third rotational axis was the general longitudinal axis of the unidirectional probe, this feature was trivially obvious for a person skilled in the art or document E13 or document E7 suggested this feature in an obvious way. Furthermore, a combination of documents E6 and E13 or E6 and E14 and similarly a combination of document E4 with document E13 or E14 suggested the claimed invention (see grounds of appeal dated 18 December 2016, section 6).

During the oral proceedings before the board, appellant II emphasised that the subject-matter of claim 1 differed from the disclosure of document E12 in that the third rotational axis about which the unidirectional probe was rotatable, was the general longitudinal axis of the probe. The objective technical problem was therefore to be able to reach other surfaces. To solve this problem, the person skilled in the art would consider document E13 which was of the same technical field and solved this problem by providing a probe 5 that was rotatable around its longitudinal axis to turn the tip into a desired direction. For a person skilled in the art it was evident that not all features of document E13 had to be

transferred to the apparatus of document E12 but just the teaching that allowed to increase the freedom degree of a surface probe as shown in Figures 8A - 8C of document E13. This would also work with the v-block 8 shown in Figures 4 and 5 of document E12. The person skilled in the art would not stop with the six degrees of freedom provided in the machine of document E12 but would add another freedom degree by rotating the probe along its longitudinal axis as disclosed in document E13. With respect to the v-block of document E12, the person skilled in the art would only combine those pieces that were necessary to solve the problem. The person skilled in the art would realise that the probe of document E12 could be rotated to work also horizontally as disclosed in document E13.

- 4.4 Appellant I argued essentially that paragraph [0040] of document E12 did not suggest rotation of probe 3 relative to the arm, but telescoping, rotating or revolving of the stylus relative to the probe. This rotating of stylus 6 could not be a rotation at the longitudinal axis of probe 3 (see reply dated 12 May 2017, page 9, third paragraph to page 12, second paragraph).

With respect to inventive step starting from document E12 and the difference of the rotation axis at the longitudinal axis of the probe, the advantage was to enable the probe to follow a complex surface. Starting from document E12, the invention solved the problem of improving the versatility of the apparatus of document E12 for the measurement of complex workpiece surfaces. To solve this problem, document E12 proposed a rotatable part holder (see paragraphs [0018], [0044] and [0045]), which did not provide the claimed solution

(see reply of 12 May 2017, page 12, third paragraph, to page 16, second paragraph).

Furthermore, the person skilled in the art would not combine document E13 with document E12, because E13 disclosed a skidless (unsupported) probe, whereas E12 had the stylus in a probe housing that provided a reference for measuring. In document E13 the reference was provided by the linear drive. Because of the different concepts the person skilled in the art would not combine the two documents (see reply of 12 May 2017, pages 16 to 18).

Similar arguments applied for the combination of documents E12 and E7, because E7 provided a very specific solution and the person skilled in the art would not depart from the solution of E12 (see reply dated 12 May 2017, corresponding section on page 18).

Document E6 could not be considered as closest prior-art document, because it disclosed a multi-directional probe, and the subject-matter of claim 1 involved an inventive step starting from document E4 (see reply dated 12 May 2017, corresponding sections on page 19).

During the oral proceedings before the board, appellant I added that the robot arm of the apparatus of document E12 already provided at least six degrees of freedom and a rotatable surface holder or a further robot arm. This was enough to reach all possible surfaces of the workpiece. The person skilled in the art had no incentive to add another degree of freedom to the apparatus and to consider document E13. In addition, the apparatus of document E12 was designed to provide the necessary robustness to survive harsh industrial environments which was not true for conventional

coordinate measuring machines as stated in paragraph [0006] of E12. In particular, in combination with the relatively long robot arm it was not possible to compensate for vibrations during measuring without the v-block 8 on the measuring surface. A skidless (unsupported) probe in E12 would suffer from vibrations. The person skilled in the art would therefore not consider document E13 without hindsight to solve the problem, and it would not be reasonable to combine the disclosures of documents E12 and E13.

- 4.5 The board shares the opinion of the opposition division and of appellant I that document E12 does not disclose to rotate probe 3 along its longitudinal axis as suggested by appellant II. The v-block 8 is stationary on the surface of the workpiece when a surface finish measurement is taking place (see document E12, paragraph [0049]). Paragraph [0040] referred to by appellant II is teaching that an internal rotating joint can be provided for use once the robot arm has been locked in place with the probe 3 positioned on the workpiece surface. This enables a lateral "swiping" motion of stylus 6 during measurement, which is independent of axis 6 of the robot arm itself. The wording of this passage in paragraph [0040] clearly states that the probe may be provided with a joint for "manipulation of stylus 6". In other words, the purpose of the joint is for manipulation of stylus 6 within or relative to probe 3, rather than for manipulation of probe 3 relative to the robot arm.

The differing feature solved according to appellant I the problem of improving the versatility of the apparatus of E12 for the measurement of complex workpiece surfaces and according to appellant II the problem of being able to reach other surfaces. As

confirmed by the parties during the oral proceedings before the board these problems are substantially identical.

Starting from document E12 with one of these problems in mind, the person skilled in the art had to find out how the apparatus could be improved to reach other surfaces while keeping the resistance to vibration induced interference. One option suggested by document E12 is to increase further the number of axes of the robot arm (see paragraph [0021]), or to have a rotatable part holder or a further robot arm as a part fixture (see paragraphs [0018], [0044] and [0045]).

When looking for a solution to one of the substantially identical problems, the person skilled in the art would not have considered document E13 or E7 because they follow different concepts. Document E13 is an example of a measuring machine, specifically adapted for measuring surface texture, having just two linear axes coupled to a surface texture measurement probe. It comprises a detector 5, a detector rotation unit 4 for rotating the detector 5, an x-axis drive unit 3 for dragging detector 5 with high linear accuracy along the surface, and a z-axis drive unit 2. The person skilled in the art would have regarded apparatus of document E13 to provide much less degrees of freedom for positioning the detector tip and to fall into the category of machines "not possessing the necessary robustness to survive harsh industrial environments" (see document E12, paragraph [0006]), since it relates to a surface finish tester having an unsupported stylus with requirements on accuracy (see e.g. paragraph [0003] of E13) that is intended to operate in controlled environments. Document E7 discloses a similar arrangement where a rotating

workpiece is measured by a detector 31. The supporting mechanism of the detector has less degrees of freedom and the detector comprises likewise an unsupported (skidless) measuring tip.

Document E6 is not considered to be a suitable closest prior art. Document E6 discloses a surface sensing device with a multidirectional probe (see page 2, lines 6-8; e.g. Figure 1). But even taking document E6 as a starting point, no convincing argument could be seen to replace the multidirectional probe by a unidirectional probe and adding the rotational axis so that the probe is rotatable about the longitudinal axis of the unidirectional probe as defined by claim 1. Hence, without hindsight, the person skilled in the art would have had no motivation to arrive at the claimed subject-matter by combining the teachings of E6 with those of E13 or even E14. The same considerations apply for document E4 as a starting point, which also discloses a multidirectional probe (see e.g. Figures 2 or 9).

- 4.6 The board comes therefore to the conclusion that the subject-matter of claim 1 involves an inventive step.
5. Independent method claim 11 of the second auxiliary request defines a method to use an apparatus corresponding to the apparatus of claim 1 of the second auxiliary request and therefore also meets the requirement of Article 56 EPC.
6. Claims 2 to 10 and 12 to 14 of the second auxiliary request are dependent on claim 1 or claim 11 and therefore also involve an inventive step.

7. The description has been adapted to the amended claims and the relevant prior art is cited in the description.
8. The board is of the opinion that the patent as amended according to the second auxiliary request and the invention to which it relates 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 department of first instance with the order to maintain the patent as amended in the following version:

Description:

Page 2 filed at the oral proceedings of 15 June 2021;
Page 3 filed by letter dated 14 May 2021;
Pages 4 to 6 of the patent specification.

Claims:

Nos. 1 to 14 of the second auxiliary request filed as a fourth auxiliary request with the statement of the grounds of appeal dated 21 December 2016.

Drawings:

Pages 11 to 21 of the patent specification.

The Registrar:

The Chairman:



L. Gabor

R. Bekkering

Decision electronically authenticated