Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 25 February 2021

Case Number: T 2074/18 - 3.4.02

Application Number: 07705199.3

Publication Number: 1989504

IPC: G01B5/00, B23Q11/00, B23Q11/14

Language of the proceedings: EN

Title of invention:
ARTICULATING PROBE HEAD APPARATUS AND METHOD

Patent Proprietor:
Renishaw plc

Opponent:
TESA Sàrl

Relevant legal provisions:
EPC 1973 Art. 54(1), 56

Keyword:
Novelty and inventive step (yes)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 2074/18 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 25 February 2021

Appellant: (Patent Proprietor)	Renishaw plc 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)
Appellant: (Opponent)	TESA Sàrl Bugnon 38 1020 Renens (CH)
Representative:	P&TS SA (AG, Ltd.) Avenue J.-J. Rousseau 4 P.O. Box 2848 2001 Neuchâtel (CH)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 7 June 2018 concerning maintenance of the European Patent No. 1989504 in amended form.**

Composition of the Board:

Chairman	R. Bekkering
Members:	F. J. Narganes-Quijano
	B. Müller

Summary of Facts and Submissions

I. The patent proprietor and the opponent each lodged an appeal against the interlocutory decision of the opposition division finding European patent No. 1989504 as amended according to the third auxiliary request then on file to meet the requirements of the EPC.

The opposition filed by the appellant against the patent as a whole was based on the grounds for opposition of added subject-matter (Article 100(c) EPC), insufficiency of disclosure (Article 100(b) EPC), and lack of novelty and of inventive step (Article 100 (a), together with Articles 52(1), 54(1) and 56 EPC).

II. During the appeal proceedings the parties have referred, among other documents, to the following documents considered during the first-instance proceedings:

E1: WO 2004/096502 A1
E3: EP 0690286 A1
D2: WO 03/008898 A1.

In its decision the opposition division held *inter alia* that

- the subject-matter of claim 1 of the patent as granted (then main request) was not new in view of document E1;

- the subject-matter of claim 1 of the then first auxiliary request did not extend beyond the content of the application as originally filed (Article 123 (2) EPC), but was not new in view of document E1;

- the subject-matter of claim 1 of the then second auxiliary request was not new in view of document E1; and

- the then third auxiliary request complied with the requirements of the EPC; in particular, the subject-matter of claim 1 was new (Article 54(1) EPC), and involved an inventive step over a combination of document E1 with document D2, and also over a combination of document E1 with document E3, and over a combination of document E3 with document E1 (Article 56 EPC).

III. With its statement setting out the grounds of appeal dated 16 October 2018 the patent proprietor submitted claims according to, among other requests, a first auxiliary request.

IV. With its statement setting out the grounds of appeal the opponent requested that the decision under appeal be set aside and the patent be revoked.

V. The patent proprietor and the opponent filed further submissions in their respective letters of reply.

VI. In reply to a communication annexed to the summons to oral proceedings, the patent proprietor and the opponent filed further submissions.

VII. Oral proceedings before the board were held on 25 February 2021. The patent proprietor submitted amended pages 2, 3 and 6 of the description of the patent.

The patent proprietor requested that the decision under appeal be set aside and that the case be remitted to the department of first instance with the order to

maintain the patent in amended form in the following version:

- Claims: Nos. 1 to 26 of the main request filed as first auxiliary request with the statement of grounds of appeal dated 16 October 2018.

- Description: Pages 4, 5 and 7 to 9 of the patent specification, and pages 2, 3 and 6 of the description filed during the oral proceedings of 25 February 2021.

- Drawings: Pages 14 and 15 of the patent specification.

The opponent requested that the decision under appeal be set aside and that the European patent No. 1989504 be revoked.

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

VIII. Claim 1 of the main and sole request of the patent proprietor reads as follows:

"Apparatus for a co-ordinate positioning machine, the apparatus comprising an articulating probe head (10) having a base (20) that is attachable to the moveable arm (8) of a co-ordinate positioning machine (2), wherein the articulating probe head (10) is arranged to support a measurement probe (12) with one or more degrees of rotational freedom relative to the moveable arm (8), wherein the articulating probe head comprises at least one electric motor (40, 42) and the apparatus comprises heating means for generating heat in the articulating probe head, characterised in that the apparatus comprises temperature sensing means (46, 48) for determining temperature at the articulating probe head (10) and a temperature controller (36), the temperature controller being arranged to receive a

temperature signal from the temperature sensing means (46, 48) and to selectively activate the heating means so as to maintain the temperature sensed by the temperature sensing means (46, 48) within a first temperature range."

The main request also includes claims 2 to 26 all referring back to the apparatus of claim 1.

Reasons for the Decision

1. The appeal of the patent proprietor and the appeal of the opponent are both admissible.

2. *Main request - Amendments*

Claim 1 of the present main request is based on claim 1 as granted, together with the features defined in dependent claim 5 as granted, these features corresponding to the features defined in dependent claim 5 of the application as filed. Dependent claims 2 to 26 of the main request correspond to dependent claims 2 to 4 and 6 to 27 as granted, respectively, these dependent claims corresponding to the respective dependent claims 2 to 4 and 6 to 27 of the application as filed.

The amendments made to the description relate to the adaption of its content to the invention as defined in the present claims (Rule 42 (1) (c) EPC).

The board is therefore satisfied that the patent as amended according to the present main request meets the requirements of Articles 123(2) and (3) EPC, it being noted that no objection in this respect was raised by the opponent during the appeal proceedings as regards the mentioned request (see also point 5 below).

3. *Main request - Novelty*

3.1 The claims of the present main request correspond to the claims of the first auxiliary request underlying the decision under appeal. In its decision the opposition division held that the subject-matter of claim 1 was not new in view of document E1. In particular, the opposition division was of the opinion that the passage of document E1 on page 79, lines 15 to 18, reading "Thermal monitoring: the control software 382 monitors the thermocouples 180 and adapts the kinematic parameters to their temperatures; this has the advantage of keeping the temperature of the Robot CMM Arm within limits in different environmental conditions, whilst minimising the impact on the duty cycle time." disclosed a temperature controller as claimed.

During the appeal proceedings the patent proprietor contested this view of the opposition division and submitted that the passage of document E1 mentioned above did not disclose - contrary to the opponent's submissions - a temperature controller as required by claim 1.

3.2 The "Robot CMM Arm" disclosed in document E1 (see Fig. 1A to 1C and 2, and Fig. 8E, together with the corresponding description) comprises an articulating

probe head attachable to the moveable arm of a co-ordinate measurement machine and arranged to support a measurement probe. The articulating probe head comprises electric motors which, during operation, generate heat (see, for instance, page 37, lines 7 to 9), and therefore they constitute, or comprise, heating means as claimed - as is also the case in some of the embodiments disclosed in the patent specification, see for instance paragraphs [0010] and [0020]. In addition, the articulating probe comprises thermocouples (page 68, lines 8 to 16) constituting temperature sensing means as claimed.

3.2.1 Document E1 further discloses the provision of different technical means for minimizing the operating temperatures of the motors (page 37, lines 18 to 20), maximising the transfer of heat by convection from the motors (page 37, lines 18 to 31), minimizing the transfer of heat between the components of the arm (page 37, lines 7 to 17), and cooling by convection the interior of the arm (using, in particular, air-blowing cooling means, see Fig. 13A together with page 37, lines 21 to 31; see also page 84, lines 23 to 28). Furthermore, the document discloses means for compensating the thermal effects on the operation of the apparatus in different thermal environments (see page 65, lines 18 to 22; see also page 84, lines 15 to 33), and in particular by adjusting the parameters of the kinematic model of the arm according to the changes in temperature detected by the thermocouples and on the basis of a finite element thermal modelling of the arm of the apparatus (page 68, lines 7 to 20).

3.2.2 All these technical measures are directed to a thermal monitoring of the articulating probe head and to a compensation of the thermal effects on the operation of

the articulating probe head. In this respect, the first sentence of the passage of document E1 on page 79, lines 15 to 18, mentioned above and reading "Thermal monitoring: the control software 382 monitors the thermocouples 180 and adapts the kinematic parameters to their temperatures" does not go - as submitted by the patent proprietor - beyond the compensation of the thermal effects on the operation of the articulating probe head mentioned above, and in particular does not go beyond an adaptation of the parameters of the kinematic model according to variations of the temperature sensed by the thermocouples to take account of the thermal effects of the temperature variations on the Robot CMM Arm (page 68, lines 7 to 20).

3.2.3 In the opinion of the board the second sentence of the passage of document E1 under consideration reading "this has the advantage of keeping the temperature of the Robot CMM Arm within limits in different environmental conditions, whilst minimising the impact on the duty cycle time." indicates, in its technical context, that the mentioned thermal compensation has the additional effect of maintaining the temperature of the articulating probe head within some limits, but not that the thermal compensation, and in particular the adaption of the kinematic parameters to the temperatures sensed by the thermocouples, would be carried out by the control software in a selective way by reference to the mentioned "limits" to actively control heat production so as to maintain the temperature sensed by the thermocouples within the mentioned limits.

More particularly, although the mentioned passage may imply - as held by the opposition division in its decision - the reduction of the motor velocity, and

thus the production of less heat, when the temperature is too high, and this operation would constitute, at least to some extent, a control of the temperature, the skilled person would not derive from the passage a selective activation of the motors to the extent of actively controlling and maintaining the temperature being monitored by the thermocouples within a first temperature range as claimed.

In addition, there is no passage in the extensive and detailed disclosure of document E1 in support of construing the mentioned passage as disclosing a control of the temperature as claimed. In particular, as submitted by the opponent, document E1 discloses that "the angular velocities of the joints [in the Exoskeleton] during operation are programmed to avoid the motors [...] overheating" (page 37, lines 19 and 20), and that "[s]ome of the parameters in the 45-parameter kinematic model of the Internal CMM Arm are then adjusted in proportion to changes in temperature measured by the thermocouples 180 in each housing in ways predicted by the finite element thermal modelling" (page 68, lines 16 to 18); however, none of these passages go beyond the thermal monitoring and the compensation of the thermal effects on the operation of the articulating probe head mentioned in points 3.2.1 and 3.2.2 above, and in any case, and contrary to the opponent's submissions, none of them imply that the temperature itself is controlled or regulated, or that the angular velocities of the joints and/or the parameters of the kinematic model are selectively adjusted or adapted so as to maintain the temperature sensed by the thermocouples within a first temperature range.

3.2.4 For these reasons, the board is of the opinion that the motors of document E1 constitute heating means as claimed, but that document E1 does not disclose that the motors are selectively activated to control the temperature as claimed.

3.3 In view of the above considerations, the board concludes that the subject-matter of claim 1 is new over the disclosure of document E1 in that it requires a temperature controller arranged to receive a temperature signal from the temperature sensing means and to selectively activate the heating means so as to maintain the temperature sensed by the temperature sensing means within a first temperature range.

The opponent's objection of lack of novelty of the subject-matter of claim 1 of the present main request relied only on document E1, and the board is satisfied that the subject-matter of claim 1 is also new over the remaining documents considered during the appeal proceedings.

Therefore, the board concludes that the subject-matter of claim 1 of the main request, and therefore also that of claims 2 to 26 referring back to claim 1, is new within the meaning of Article 54 (1) EPC 1973.

4. *Main request - Inventive step*

4.1 The opponent considered document E1 to represent the closest state of the art and submitted that the subject-matter of claim 1 was obvious in view of the disclosure of document E1 and the teaching of document D2. In particular, the opponent submitted that document E1 already disclosed the measurement of the temperature

of the arm and maintaining the temperature within limits, that the technical problem solved by the claimed invention was to maintain the temperature of the arm within a predetermined range in a more effective way, that document D2 taught the selective activation of heating means in a co-ordinate measuring device, and that the application of this teaching to document E1 would result in an obvious way in the claimed subject-matter.

4.1.1 Document D2 discloses a co-ordinate measuring device having a heat-emitting element - in particular, a heat resistor 34 coupled to a motor 32, see Fig. 2 and the corresponding description - selectively activated to provide an additional supply of heat such that the total power dissipated by the motors and the heat-emitting element and affecting the device remains substantially constant (see abstract, and page 5, third and fourth paragraphs). In addition, the document discloses that no measurement of the temperature is required (page 2, second paragraph), and specifies that a constant or nearly constant temperature is achieved (see claims 3 and 11) in terms of the substantially constant value of the total power (page 2, third paragraph, to page 3, second paragraph).

4.1.2 Therefore, document D2 teaches the provision of additional heating sources for maintaining the production of heat constant. This approach is - as submitted by the patent proprietor - at variance with the approach followed in document E1 and consisting in minimizing both heat production and the transfer of heat within the apparatus, and performing thermal compensation by appropriately adjusting or adapting the parameters of the kinematic model, see point 3.2.1 above. For this reason, the skilled person would not

consider the application of the teaching of document D2 relating to the provision of additional heating sources to the apparatus disclosed in document E1 for the purposes of maintaining the temperature of the arm within a predetermined range in a more effective way. In any case, the provision of the additional heating sources disclosed in document D2 to the apparatus of document E1 would not result in the claimed apparatus because neither document E1 nor document D2, nor the combination of both documents, suggest the selective activation of heating means so as to maintain the temperature being detected within a predetermined temperature range as claimed. In particular, and as submitted by the patent proprietor, the approach of document D2 - as explicitly disclosed in the document, see page 2, second paragraph - does not even require the measurement of temperature and, therefore, it does not suggest controlling the temperature as claimed and the thermal stability of the articulating probe head achieved by the claimed invention (paragraph [0013] of the patent specification).

4.1.3 Therefore, in the board's opinion the subject-matter of claim 1 does not result in an obvious way within the meaning of Article 56 EPC 1973 from document E1 and the teaching of document D2.

4.2 In an alternative line of argument, the opponent submitted that the claimed invention was obvious in view of document E1 and the common general knowledge relating to the use of thermostatic or feedback-loop temperature regulation means for maintaining the temperature of the arm within a predetermined range.

However, although temperature regulation is commonly used in different technical fields, there is no

evidence on file relating to the use of temperature regulation means in co-ordinate positioning machines of the type under consideration. In addition, as submitted by the patent proprietor, the provision of means for regulating the temperature in the apparatus of document E1 would require the additional production of heat, and this approach - as already noted in point 4.1.2 above - goes against the disclosure of document E1. In any case, in the event that the skilled person would have considered following this approach, he would then immediately have been confronted with the subsequent problem of how a temperature regulation of the apparatus could be integrated in the complex thermal monitoring and thermal compensation system disclosed in document E1 and how this thermal compensation, and more particularly the adaption of the parameters of the kinematic model, would then have to be re-adapted.

Therefore, in the board's opinion the subject-matter of claim 1 does not result in an obvious way from document E1 and the common general knowledge mentioned by the opponent.

4.3 In addition, none of the remaining documents considered during the written proceedings suggest modifying the apparatus of document E1 so as to result in the claimed subject-matter. In particular, document E3 - also considered by the opposition division in its decision - discloses a heat control management system arranged to regulate the amount of heat generated within a probe head - in particular, by using high-frequency electrical signals fed to a motor and converted into heat and not into mechanical energy, see column 5, lines 14 to 18 - in order to provide thermal stability to the probe head (abstract, together with column 3, lines 31 to 36, and column 5, lines 1 to 18). However,

the document does not disclose or teach measuring the temperature and selectively activating the generation of heat so as to maintain the temperature being measured within a predetermined range.

4.4 In view of the above considerations, the board concludes that the subject-matter of claim 1 of the main request, and therefore also that of claims 2 to 26 referring back to claim 1, involves an inventive step within the meaning of Article 56 EPC 1973.

5. *Main request - Other requirements*

The objections initially raised by the opponent under Articles 100 (b) and 100 (c) EPC in respect of the patent as granted were not maintained during the appeal proceedings in respect of the patent amended according to the present main request, and the opponent confirmed at the end of the oral proceedings before the board that, except for the issues of novelty and inventive step addressed in points 3, 4.1 and 4.2 above, no further objection was raised in respect of the present main request. In addition, the board has no reason to question the compliance of the main request with the requirements of Article 123(2) EPC (see point 2 above) and Article 83 EPC 1973.

6. In view of the above considerations, the board concludes that the patent as amended according to the present main request and the invention to which it relates meet the requirements of the EPC within the meaning of Article 101 (3) (a) EPC, and that the appeal of the opponent is to be dismissed.

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 in amended form on the basis of the following documents:

   - Claims: Nos. 1 to 26 of the main request filed as first auxiliary request with the statement of grounds of appeal dated 16 October 2018.

   - Description: Pages 4, 5 and 7 to 9 of the patent specification, and pages 2, 3 and 6 of the description filed during the oral proceedings of 25 February 2021.

   - Drawings: Pages 14 and 15 of the patent specification.

The Registrar: The Chairman:

L. Gabor R. Bekkering

Decision electronically authenticated