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**Datasheet for the decision
of 23 January 2024**

Case Number: T 1374/21 - 3.4.02

Application Number: 12425022.6

Publication Number: 2623923

IPC: G01B3/00, F16F15/00

Language of the proceedings: EN

Title of invention:

Measuring machine provided with an improved transmission system

Patent Proprietor:

Hexagon Metrology S.p.A.

Opponent:

Carl Zeiss Industrielle Messtechnik GmbH

Relevant legal provisions:

EPC Art. 56, 100(a), 111(1)
RPBA 2020 Art. 11

Keyword:

Inventive step (main request: no)
Remittal for further prosecution (yes)



Beschwerdekammern

Boards of Appeal

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Case Number: T 1374/21 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 23 January 2024

Appellant: Carl Zeiss Industrielle Messtechnik GmbH
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Respondent: Hexagon Metrology S.p.A.
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 25 June 2021
rejecting the opposition filed against European
patent No. 2623923 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chair R. Bekkering
Members: F. J. Narganes-Quijano
B. Müller
C. Kallinger
C. Almberg

Summary of Facts and Submissions

- I. The opponent (appellant) lodged an appeal against the decision of the opposition division rejecting the opposition against European patent No. 2623923.

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

- II. Among the documents considered during the first-instance proceedings, the following documents have *inter alia* been referred to by the parties during the appeal proceedings:

E3: US 6 176 018 B1

E4: "Modeling and Adaptive Control of a Coordinate Measuring Machine", A. Y. Orbak; Proceedings of the 2004 American Control Conference, Boston (2004); one bibliographic page and pages 2889 to 2894.

- III. In the decision under appeal the opposition division held that the subject-matter of the claims of the patent as granted was new and involved an inventive step over the documents considered during the opposition proceedings (Article 100 (a), together with Articles 52 (1), 54 (1) and 56 EPC).

- IV. With its letter dated 17 March 2022 filed in reply to the appellant's statement of grounds of appeal the

patent proprietor (respondent) filed claims according to auxiliary requests 1 to 10.

- V. Oral proceedings before the board were held on 23 January 2024.

The appellant requested that the decision under appeal be set aside and that the patent be revoked.

The respondent requested that the appeal be dismissed (main request) or, alternatively, that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the claims of one of auxiliary requests 1 to 10, all filed with the letter dated 17 March 2022.

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

- VI. Claim 1 of the patent as granted (main request) - with the feature labelling "1" to "9" in square brackets used during the proceedings being inserted by the board - reads as follows:

" [1] A measuring machine (1) comprising:
[2] at least one member (5; 11) mobile along an axis (Y; X);
[3] a motor (15; 73);
[4] a transmission system (14; 70) co-operating with the motor (15) for displacing the mobile member (5; 11) along said axis (Y; X); and
[5] a control system (44) for controlling said motor (15),
[6] said transmission system (14) including at least one flexible coupling (35; 76) comprising elastic

means deformable in a direction parallel to said axis (Y; X),

said measuring machine being **characterized in that**

[7] the flexible coupling (35; 76) is configured so as to filter the vibrations transmitted to the mobile member (5; 11) in the direction of said axis (Y; X) and [8] to minimize the forces acting on said mobile member (5; 11) in a direction transverse to said axis (Y, X), and

[9] in that said control system (44) is configured so as to control the position of said mobile member (5) by controlling said motor (15; 73) to minimize the position errors of the mobile member (5) along said axis (5) resulting from the deformations of said elastic means (43; 76)."

Reasons for the Decision

1. The appeal is admissible.
2. *Main request (Patent as granted) - Ground for opposition of lack of inventive step (Article 100 (a), together with Article 56 EPC) - Document E3 as closest prior art in combination with document E4*
 - 2.1 In its decision the opposition division held *inter alia* that the measuring machine defined in claim 1 as granted involved an inventive step over the machine disclosed in document E3 in combination with document E4 (Article 56 EPC).
 - 2.2 Distinguishing features over document E3

- 2.2.1 In its decision the opposition division held that the measuring machine defined in granted claim 1 differed from the machine disclosed in document E3 in features 5 and 9.

The respondent submitted that features 7 and 8 of claim 1 as granted were also new over the machine of document E3.

- 2.2.2 The board first notes that document E3 discloses a measuring machine (abstract and Fig. 1, together with the corresponding description) comprising a mobile member R, a servo motor 1 (column 2, lines 52 and 53), and a transmission system for displacing the mobile member. The transmission system comprises a pre-stressed flexible rope having a high modulus of elasticity (abstract and column 2, lines 25 to 37) - and therefore being elastic with a relatively low degree of elasticity in the direction of movement of the mobile member - coupled to a pre-tensioning spring 7 (column 1, lines 50 to 55). Therefore, the assembly constituted by the rope and the spring constitutes a flexible coupling as claimed. The board notes in this respect that, as submitted by the respondent, document E3 discloses that the rope is given a pre-stress greater than the maximum force encountered when accelerating during the transmission operation and that the transmission from the driving motor can be achieved without play and stiffness in the transmission direction (column 1, lines 39 to 50, column 2, lines 26 to 34, and column 3, lines 1 to 4). However, the assembly constituted by the rope and the pre-tensioning spring would - as submitted by the appellant - inevitably present a predetermined degree of flexibility and a predetermined degree of elasticity and claim 1 - as also submitted by the appellant -

contains no restriction as to the degree of flexibility of the flexible coupling and as to the degree of elasticity of the elastic means.

In addition, the linear arrangement of the transmission system with respect to the mobile member (see Fig. 1, and column 3, lines 1 to 11, and lines 47 to 64, in particular item "(7)") is such that the flexible coupling would filter, at least to a predetermined degree, the vibrations transmitted to the mobile member in the direction of movement of the member within the meaning of feature 7 and would also minimize, at least to some extent, the forces acting on the mobile member in a direction transverse to the direction of movement within the meaning of feature 8.

The respondent submitted that the machine of document E3 comprised a clamping device (71 in Fig. 1) between the rope and the spring for the purpose of obtaining a rigid fastening of the rope (column 3, lines 17 to 22), and that for this reason the spring had no effect on the transmission system and features 7 and 8 were not fulfilled by the machine of document E3. The board, however, cannot follow this argument because the provision of the clamping device is explicitly disclosed in document E3 only as constituting an alternative embodiment of the machine represented in Fig. 1 (column 1, lines 55 to 62, and column 3, lines 12 to 17, together with Fig. 1 and 2 in which the clamping device is represented as a dashed block 71) and, therefore, as submitted by the appellant, as optional.

Therefore, as held by the opposition division in the contested decision, neither feature 7 nor feature 8 is new over the machine disclosed in document E3.

2.2.3 The board also notes that the arrangement disclosed in document E3 by reference to Fig. 1 implicitly requires means for controlling the servo motor so as to move the mobile member back and forth along the direction of movement of the member, and in the board's view the mentioned means constitutes a control system as defined in feature 5. Therefore, feature 5 of granted claim 1 is, contrary to the opposition division's view, disclosed in document E3.

2.2.4 In view of these considerations, the board concludes that the measuring machine defined in claim 1 as granted differs from the machine of document E3 only in that the control system is configured as defined in feature 9.

2.3 Inventive step

2.3.1 Distinguishing feature 9 has the effect of compensating adverse effects inherent in the driving arrangement of document E3, such as oscillations, vibrations, etc., caused by the presence of the flexible coupling comprising the elastic means, the mentioned effects being detrimental to the precision with which the mobile member can be driven towards a desired position (see patent specification, paragraphs [0027] to [0029], and Fig. 4, together with the corresponding description, in particular paragraph [0044]).

The objective technical problem solved by distinguishing feature 9 can therefore be seen in improving the precision in the positioning of the mobile member.

2.3.2 Document E4 discloses a two-dimensional mathematical model of a measuring machine (Fig. 1) in which the stiffness of the belt drive transmitting the motor torque to the machine is approximated, in particular at low frequencies, as a spring with a damper (Fig. 2, together with section II, in particular page 2890, left column, first paragraph). Document E4 proposes on the basis of the mentioned model a "stable adaptive controller", and in particular a "full state feedback" single-input adaptive control of the measuring machine for compensating "the presence of uncertainties and unknown disturbances" (abstract, together with section "C." on pages 2893 and 2894).

In the board's opinion, and as submitted by the appellant, the skilled person confronted with the objective technical problem identified above and aware of the disclosure of document E4 would have considered the incorporation of the control system disclosed in document E4 into the measuring machine of document E3 in order to improve the precision in the positioning of the mobile member.

The respondent contested this view and submitted that according to document E3 the rope had a high modulus of elasticity and was given a pre-stress greater than the maximum force encountered when accelerating during the transmission operation and the transmission from the driving motor could be achieved without play and stiffness in the direction of movement of the mobile member (column 1, lines 39 to 50, column 2, lines 26 to 34, and column 3, lines 1 to 4), so that there was no need for control means for the correction of effects caused by the elastic means. An analogous argument was presented by the opposition division in its decision in support of its view that the skilled person would have

no motivation to combine document E3 with document E4. The opposition division also noted in this respect that document E3 referred to achieving a machine "free of vibrations" (column 3, lines 47 to 57) and that the document did not mention position errors due to the pre-tensioned spring.

The board, however, is not convinced by these arguments. Document E3 refers in column 3, lines 1 to 4, to the transmission from the motor being "achieved without play and stiffness" in the direction of movement, and in column 3, lines 47 to 57, item "(6)", to achieving "Quiet operation - free of vibrations", but only as results to be achieved, and there is no disclosure in the document that would allow the conclusion that no play at all would occur or that the vibrations would be completely cancelled. In particular, even under consideration of the high modulus of elasticity of the rope of document E3 and the pre-stress given to it, the assembly constituted by the rope and the pre-tensioning spring would, as already noted in point 2.2.2 above, first paragraph, inevitably present a predetermined degree of elasticity adversely affecting the control of the positioning of the mobile member and therefore the precision of the machine of document E3.

The respondent also submitted that the modelling of coordinate machines disclosed in document E4 was only valid for low frequencies and that, as already mentioned, the machine of document E3 was arranged to operate under pre-stress and without play in the transmission. Consequently, the skilled person had no incentive to consider the application of the teaching of document E4 to the machine of document E3.

However, the board is not convinced by these arguments either. The structural configuration of the machine disclosed in document E3 is such that, depending on how it is operated and in particular on the driving regime, it would generally be prone to disturbances (vibrations, oscillations, etc.) within a relatively broad spectrum of frequencies not excluding low frequencies. In addition, document E4 mentions in the passage on page 2890, left column, first paragraph, that the coordinate machine modelling based on approximating the belt drive as a spring with a damper is "a good approximation at low frequencies", and that "at high frequencies the above-approximated stiffness of the belt in the longitudinal direction is less compared to the one that is perpendicular to this direction". In the board's view the person skilled in the technical field under consideration would have understood from the mentioned passage that the model would present some limitations at high frequencies, but would not have understood the mentioned passage in the sense that the disclosure of the document, and in particular the control system disclosed therein, would exclusively be applicable to machines presenting low frequency disturbances.

- 2.3.3 The respondent also submitted that the claimed invention was - contrary to the prior art - based on the intentional incorporation in the transmission system of a flexible coupling comprising elastic means (paragraphs [0022] and [0026] of the patent specification) and on the provision of control means for specifically minimizing the position errors of the mobile member caused by deformations of the intentional elastic means. In this context, feature 9 required specific control means or a subroutine configured or designed to specifically minimize the position errors

resulting from the deformations of the elastic means, and the control system defined in feature 9 went beyond the mere provision of a feedback or closed-loop position control system of the type disclosed in document E4. The incorporation of the control system of document E4 in the machine of document E3 would therefore not have resulted in the claimed control system.

In the decision under appeal the opposition division held that the control system defined in feature 9 was to be interpreted as providing a control of the deformations resulting from forces acting on the mobile member during positive and negative accelerations, in particular in the sense that a target value was to be compared with an actual value and the motor was to be controlled so as to minimize the differences as far as possible. In addition, providing a closed-loop position control system did not mean that position errors caused by deformations of the flexible coupling were minimized.

However, in the board's view neither the opposition division's interpretation of feature 9 nor the respondent's submissions are supported by the actual formulation of feature 9. In particular, the functional formulation of feature 9 is - as submitted by the appellant - not restricted to the provision of the specific control system mentioned by the opposition division and by the respondent - let alone to the specific control system disclosed in the patent specification by reference to Fig. 3 -, and feature 9 does not require any specific technical feature of the control system that would distinguish it from a feedback or closed-loop control system of the type disclosed in document E4. More particularly, the stable

adaptive controller, and in particular the full state feedback single-input adaptive control disclosed in document E4 would, when incorporated into the machine of document E3, control the position of the mobile member by controlling the motor of document E3 and according to document E4 this control would compensate "the presence of uncertainties and unknown disturbances". Therefore, the mentioned full state feedback single-input adaptive control would, by virtue of its feedback control characteristics which make it possible to bring the mobile member into a desired position, automatically compensate for adverse effects, whatever their specific cause, and in particular would - as submitted by the appellant - automatically compensate for, and thus minimize at least to some extent, positional errors of the mobile member along its axis of movement resulting from deformations of the elastic means of the machine of document E3.

Therefore, in the board's opinion the incorporation of the control system disclosed in document E4 into the measuring machine of document E3 would, as submitted by the appellant, result in a machine comprising a control system configured as required by feature 9, i.e. "so as to control the position of said mobile member (5) by controlling said motor (15; 73) to minimize the position errors of the mobile member (5) along said axis (5) resulting from the deformations of said elastic means (43; 76)".

2.3.4 In view of all these considerations, the board concludes that the measuring machine defined in claim 1 of the patent as granted does not involve an inventive step in view of the combination of document E3 with document E4 (Article 56 EPC) and that, therefore, the

ground for opposition under Article 100 (a) EPC prejudices the maintenance of the patent as granted.

3. In view of the conclusion in point 2.3.4 above, there is no need, as far as the present main request is concerned, to address the ground for opposition of lack of novelty and the remaining objections of lack of inventive step raised by the appellant in respect of claim 1 as granted on the basis of the remaining documents considered during the proceedings.

4. *Auxiliary requests - Further prosecution*

The respondent, as an alternative to the main request, requested maintenance of the patent in amended form on the basis of the claims of one of auxiliary requests 1 to 10.

The board notes that the examination as to the allowability of the appeal carried out pursuant to Article 111 (1), first sentence, EPC has revealed that the appeal is allowable, because the decision under appeal cannot be upheld. The board, which, under the same provision, has now to decide on the appeal, "may either exercise any power within the competence of the department which was responsible for the decision appealed or remit the case to that department for further prosecution" (Article 111 (1), second sentence, EPC). At the same time, according to Article 11, first sentence, RPBA, "[t]he Board shall not remit a case to the department whose decision was appealed for further prosecution, unless special reasons present themselves for doing so."

The board notes in this respect that the decision under appeal was only based on the main request and that

addressing auxiliary request 1 and, if necessary, the remaining auxiliary requests 2 to 10 on appeal would require the board to go beyond the primary object of the appeal proceedings to review the appealed decision in a judicial manner (Article 12 (2) RPBA). In the board's view, this is a special reason within the meaning of Article 11 RPBA that justifies the remittal of the case for further prosecution.

In these circumstances, the board exercises its discretion by remitting the case to the opposition division for further prosecution (Article 111 (1), second sentence, EPC, together with Article 11 RPBA).

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 for further prosecution.

The Registrar:

The Chair:



L. Gabor

R. Bekkering

Decision electronically authenticated