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Bezeichnung der Erfindung: Electronic balance
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : G01G 23/48

ENTSCHEIDUNG / DECISION

vom / of / du 30 November 1989

Anmelder / Applicant / Demandeur : Shimadzu Corporation

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : "Inventive step (no)"

Leitsatz / Headnote / Sommaire

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Case Number : T 124/89 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 30 November 1989

Appellant : Shimadzu Corporation
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Decision under appeal : Decision of Examining Division 036 of the European Patent Office dated 12.10.1988 refusing European patent application No. 84 300 803.8 pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : K. Lederer
Members : E. Turrini
L. Mancini

Summary of Facts and Submissions

I. European patent application No. 84 300 803.8 (publication No. 0 118 231) was refused by decision of the Examining Division.

II. The decision under appeal was based on Claims 1 to 4 received at the EPO on 2 November 1987, of which Claim 1 reads as follows:

"An electronic balance devised so as to weigh a load by means of an electromagnetic force transducer (1) accompanied by an electronic transducer-control circuit (10) for controlling said electromagnetic force transducer (1) so as to make the same counterbalance the load acting thereon through a weiging (read "weighing") tray (7) and a force transmitting means (5), characterized by a constant-temperature casing (2) enclosing said electromagnetic force transducer (1) and provided with a through hole (6) at the bottom through which hole said force transmitting means (5) emerges from the casing; a heater (3) for heating said constant-temperature casing (2) to a predetermined constant temperature higher than room temperature; a temperature sensor (4) for detecting the temperature in the inside space of said constant-temperature casing (2); and an electronic heater control circuit (10) for controlling said heater (3) according to the output signal from said temperature sensor(4)."

Claims 2 to 4 are dependent on Claim 1.

III. The main reason given for the refusal was that the subject-matter of independent Claim 1 lacked an inventive step within the meaning of Article 56 EPC in view of documents FR-A-2 374 622 (D) and US-A-3 883 715 (B).

IV. The Appellant lodged an appeal requesting that the decision of the Examining Division be set aside and a patent granted on the basis of the set of Claims 1 to 4 filed on 2 November 1987.

V. After a Board's communication in which objections were mainly raised concerning Article 123(2) EPC, in particular with respect to the subject-matter of Claim 1 extending beyond the content of the application as filed, and Article 56 EPC, in particular with respect to subject-matter of Claim 1 lacking inventive step, the Appellant expressed his willingness to re-instate in Claim 1 the original missing features, leaving otherwise the claim unchanged.

VI. The Appellant submitted the following reasoning.

It is admitted that electronic balances having the features of the preamble of Claim 1 are known from the state of the art and that it is also known that ambient temperature variations can lead to measurement errors. Finally it is accepted that controlled temperature enclosures in technical fields different from that of the invention in suit, are part of the background art.

However, this was known many years before the date of filing of the invention in suit and nobody had the idea of solving the problem of ambient temperature variations in the case of an electronic balance by controlling and keeping at a constant value the temperature inside an enclosure in which the main electro-magnetic components of the balance are positioned.

On the contrary, in the prior art related to the electronic balances it was merely suggested to solve said problem by minimising the effects of the thermal expansions as

e.g. indicated in document D. This solution leads away from the idea of controlling the temperature.

Thus, the raised objections of obviousness are affected by an ex-post facto analysis and the subject-matter of the present set of claims should be considered as involving an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. The Appellant in his letter of response to the official communication agrees to include in the wording of current Claim 1 the feature that "the electromagnetic force-transducer consists of a magnetic circuit and an electro-magnetic force-coil kept movable in the static-magnetic field made by the magnetic circuit". Said feature will therefore be considered hereinafter as part of the wording of Claim 1. With this amendment there are no more objections on formal grounds to the modified wording of Claim 1, said wording being based on the application documents as originally filed as required by Article 123(2) EPC.

3. **Novelty**

3.1 Document US-A-4 372 406 (E) refers to an electronic balance (title of the document) devised so as to weigh a load by means of an electromagnetic force transducer (1,2,4) (column 1, lines 7 to 10), the electromagnetic force transducer consisting of a magnetic circuit (1,2) and an electromagnetic force coil (4) kept movable in the

static magnetic field made by the magnetic circuit (column 2, lines 24 to 46). The electromagnetic force transducer (1,2,4) is accompanied by an electronic transducer control circuit (5 to 14) for controlling said electromagnetic force transducer so as to make the same counterbalance the load acting thereon through a weighing tray (the upper part of 3) and a force transmitting means (the remaining part of 3) (column 2, line 47 to column 3, line 38).

Thus, document E describes an electronic balance as defined in the preamble of Claim 1.

Contrary to the subject-matter of Claim 1, document E does not mention the characterising features of Claim 1, i.e. a constant temperature casing enclosing the electromagnetic force transducer, a heater for heating said casing, a temperature sensor for detecting the temperature inside the casing and an electronic heater control circuit for controlling the heater.

3.2 Document D describes an electronic balance devised so as to weigh a load by means of an electromagnetic force-transducer (page 1, lines 1 to 6) the electromagnetic force transducer consisting of a magnetic circuit (page 2, lines 21 to 24; Figure 1, references 10,12,14,16 and 18) and an electromagnetic force coil (26) kept movable in the static magnetic field made by the magnetic circuit (page 2, lines 24 to 26; Figure 1, reference 26). The electromagnetic force transducer is accompanied by an electronic transducer control circuit (page 2, lines 27 to 29) for controlling said electromagnetic force transducer so as to make the same counterbalance the load acting thereon through a weighing tray (60) and a force transmitting means (page 3, lines 5 to 14; Figure 1, references 54,64,30).

Thus, also document D describes an electronic balance as defined in the preamble of Claim 1 and none of the features of the characterising portion of Claim 1 is mentioned in said document.

3.3 Document B discloses a device (Fig. 4) including electronic circuits in general (column 1, lines 4 to 6), said device comprising a constant-temperature casing (thermally insulating housing 16) enclosing the electronic circuits (column 3, line 23). The device furthermore comprises a heater (50) for heating said constant-temperature casing to a predetermined constant temperature higher than the room temperature (column 5, lines 39 to 52), a temperature sensor (column 4, line 51; Fig. 8, reference 70) for detecting the temperature in the inside space of said constant-temperature casing, and an electronic heater control circuit for controlling said heater according to the output signal from said temperature sensor (column 5, lines 39 to 43).

Contrary to the subject-matter of Claim 1, document B does not refer to an electronic balance, i.e. it does not disclose the features of the preamble of Claim 1. Furthermore the constant-temperature casing is not provided with a through hole at the bottom.

3.4 The remaining documents cited in the search report and in the application in suit do not come closer to the subject-matter of Claim 1.

3.5 For the above reasons, the subject-matter of Claim 1 is considered to be novel within the meaning of Article 54 EPC.

4. Inventive step

4.1 As shown in paragraph 3.1 above, Claim 1 can be based on document E, which discloses all the features of the preamble of Claim 1. Similarly, Claim 1 can also be based on document D, which also discloses an electronic balance as defined in the preamble of the claim (paragraph 3.2 above). These two documents are, in the Board's view, the nearest prior art.

4.2 Starting from one of the two prior art documents E or D, the man skilled in the art is faced with the objectively assessed technical problem of minimising errors due to ambient temperature variations, while at the same time keeping the electronic balance of a relatively simple structure.

Indeed, document E suggests merely a solution concerning temperature variations inside the balance due to coil heating (column 1, lines 16 to 25), but not to ambient temperature variations, and document D gives only a partial solution to the above-mentioned problem, said solution being limited to errors due to the thermal expansion of the structure.

4.3 According to the present invention, said problem is solved by enclosing the electromagnetic force transducer in a casing kept at constant temperature by suitable means as claimed in the characterising portion of Claim 1.

4.4 The identification of the problem does not contribute to assess the presence of an inventive step, since said problem is known per se, e.g. from document D (page 1, lines 8 and 9).

4.5 As far as the solution to the problem is concerned, the skilled man would realise that document D merely indicates how to reduce errors caused by the thermal expansion (cf. paragraph 4.2 above) (document D, page 1, lines 10 to 12) and that the solution proposed in document D leads to a complex mechanical structure (cf. Figures 1 and 2; page 5, lines 2 to 12). He would therefore as a matter of course look at other prior art documents which could suggest to him complete and effective solutions.

In searching a suitable document, he would not limit his search to the weighing apparatus field but he would take into consideration any relevant art in a broader general field of which the specific field is part, and where a similar problem can arise. This is considered normal practice for the average technician as discussed in the decision T 176/84, OJ EPO 1986, 50-56, para. 5.3.1. The skilled person would therefore take into consideration document B, which refers to the problem of avoiding errors in electronic circuits in general due to ambient temperature variations.

The latter document would suggest to him (cf. paragraph 3.3 above) to enclose the electromagnetic force transducer of the balance, which is the most temperature sensitive electronic part of the balance, in a casing and to provide the balance with a heater for heating the constant temperature casing to a predetermined constant temperature higher than room temperature, with a temperature sensor for detecting the temperature in the inside space of the casing, and with an electronic heater control circuit for controlling the heater according to the output signal from the temperature sensor.

In order to adapt the casing of document B to the balance disclosed in documents E or D and correspondent to the preamble of Claim 1, the skilled man has still to provide the casing with a through hole e.g. at the bottom, through which hole said force transmitting means is enabled to emerge from the casing. The skilled man would be led to do so, because he would realise that on one hand the weighing tray is unusable if enclosed in the casing and on the other hand, if the weighing tray is positioned external to the casing, a through hole is necessary to connect the weighing tray with the electromagnetic force transducer.

It is true that the through hole could lead to a loss of heat due to convection through it but this further problem would not deter the skilled technician, since a suitable amount of additional power for compensating the heat loss would be automatically delivered by the electronic heater control circuit without any further modification of it, said circuit being controlled by a sensor detecting the temperature inside the casing.

He would therefore, without inventive ingenuity, obtain the subject-matter of Claim 1.

4.6 The Appellant's allegations in support of the presence of an inventive step are not convincing.

While it is agreed by the Board that both electronic balances corresponding to the preamble of Claim 1 and controlled temperature enclosures including electronic circuits in general were known a few years before the filing date of the application in suit, such restricted period of time and the lack of clear indications concerning a long felt want do not point in the direction of the presence of an inventive step.

Also the Appellant's remark that the disclosure of document D "directs attention away from any idea of controlling the temperature" does not help, in the Board's opinion, in giving a positive answer to the question concerning the inventive step of the subject-matter of Claim 1.

Firstly, document D does not clearly lead away from the solution of the application in suit in as much as it suggests merely a partial solution to the problem of errors due to ambient temperature variations, i.e. a solution limited to errors due to differential thermal expansion. The skilled man would therefore try to obtain more satisfactory solutions.

Secondly, the teaching of one document even presenting a solution opposite to that of the present invention could not be considered as a hint that the prior art in general points away from the invention in suit.

Finally, the Board of Appeal cannot share the Appellant's opinion that a temperature in the inside space of the casing higher than the room temperature, would lead to "a substantial problem arising from convection currents which flow out of the enclosure". As before mentioned, there is no need of further regulation means to control the temperature in the casing in case of heat losses due to convection currents.

4.7 For the above reasons, the subject-matter of Claim 1 is not considered to involve an inventive step within the meaning of Article 56 EPC.

4.8 Claim 1 accordingly is not allowable under Article 52(1) EPC.

Dependent Claims 2 to 4 are referred back to unallowable Claim 1 and are, therefore, not allowable either.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: **The Chairman:**

M. Beer **K. Lederer**