BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

A		B	X	C	

File Number: T 0705/91 - 3.4.2

Application No.: 85 201 262.4

Publication No.: 0 171 123

Title of invention: Load sensor

Classification: G01L 1/22, G01L 5/16

D E C I S I O N
of 27 April 1993

Applicant: Hatamura, Yotaro

Opponent: Flygtekniska Försöksanstalten

Headword:

EPC Art. 54, 56

Keyword: "Request for maintenance of the patent as granted after voluntary limitation (yes); interpretation of the claims through the description and drawings (yes); obscure document (disregarded); novelty (yes); inventive step (yes)"

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 0705/91 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 27 April 1993

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Decision under appeal :
Decision of the Opposition Division of the European Patent Office dated 18 July 1991 rejecting the opposition filed against European patent No. 0 171 123 pursuant to Article 102(2) EPC.

Composition of the Board :

Chairman : E. Turrini
Members : M. Chomentowski
J-C. Saisset

Summary of Facts and Submissions

I. Claims 1 and 8 of European patent No. 0 171 123, which was granted on the basis of European patent application No. 85 201 262.4, read as follows:

"1. A load sensor comprising a block (2), a parallel plate structure composed of three or more thin-walled plates formed by two or more through holes extending in the same direction through the block, and detection means placed in prescribed locations at the thin-walled plates, characterized in that said block comprises a second parallel plate structure of the same type as the first parallel plate structure, the first and the second parallel plate structures in combination forming a further parallel plate structure composed of two sets of three or more thin-walled plates ($36a_1$-$36d_1$, $36a_2$-$36d_2$; $36a_1$, $36b_1$'-$36d_1$', $36a_2$, $36b_2$'-$36d_2$') formed respectively by a plurality of through-holes ($35a_1$-$35c_1$, $35a_2$-$35c_2$; $35a_1$, $35b_1$', $35c_1$', $35a_2$, $35b_2$', $35c_2$') arranged on two straight lines symmetrical relative to the (read "a" in accordance with the text approved by the Applicant) central axis extending through a point to which forces are applied."

"8. A load sensor comprising a block, a parallel plate structure composed of three or more thin-walled plates formed by two or more through holes extending in the same direction through the block, and detection means placed in prescribed locations at the thin-walled plates, characterized in that the said block comprises a second parallel plate structure of the same type as the first parallel plate structure, with the thin-walled plates ($82f_1$-$82f_5$) associated with the first parallel plate structure extending in a direction substantially

perpendicular to the direction of the thin-walled plates ($83f_1$-$83f_5$) associated with the second parallel plate structure."

Claims 2 to 7 and 9 are dependent claims.

II. The Appellant (Opponent) filed an opposition against the European patent on the grounds that the subject-matter of Claim 1 lacked novelty having regard to

D2 = Windtunnel strain gauge balance reference book, October 1983, (in Chinese), pages 48, 59, 67, or
D3 = US-A-4 107 986,

that the subject-matter of Claim 8 was known by this same D2, and that the subject-matter of the dependent claims did not involve an inventive step having regard further to the disclosure in i.a.

D4 = FFA Memo 122, Stockholm 1983, pages 8-1, 8-2 and 8-4 and
D5 = Epsilonics, Vol.III, Issue 3, December 1983, page 4.

D1 = US-A-3 180 139 was cited in relation to the technique of sensors with parallel plates.

III. The opposition was rejected. The decision is based on the grounds that the devices shown in Fig. 3.30 or Fig. 3.56 of D2 show a circular symmetry with which it is not possible to make through holes therein, that Fig. 4 to 6 of D3 do not show a block with through holes, that no device composed with two or more thin-walled plates is derivable from D4, that D5 does not disclose a device with three or more thin-walled plates, and that, thus, the subject-matter of the main claims is novel; moreover,

in order to improve the stiffness of the construction of Fig. 4 of D5, the skilled person would be incited to make the plates thicker and not to add parallel thin-walled plates; in relation with the sections d-d and e-e of Fig. 3.56 of D2, they indicate different parts so that there is no hint for using a single block; the feature of thin-walled plates formed by through holes is only given in Fig. 4 of D5 and moreover with two thin-walled plates and the further prior art does not lead to the feature of the through holes in an obvious manner; therefore, the main claims also involve an inventive step.

IV. The Appellant (Opponent) filed an appeal against this decision and requested that it be set aside and that the patent be revoked.

V. The Respondent (Proprietor) filed sets of claims for maintaining the patent in amended form and requested oral proceedings auxiliarily.

VI. In the communication accompanying the invitation to oral proceedings, the Board expressed the opinion that the claims appeared to be ambiguous and also not consistent with embodiments of the description and the drawings of the patent in suit, and thus to lack clarity. Moreover, it was noted that D2 consisted in isolated drawings from a book without the corresponding text and a translation of the relevant text locations from the Chinese.

VII. Then, the Respondent requested that the patent be maintained in the form as granted or, auxiliarily, according to amended sets of claims.

VIII. The Appellant filed the text locations of D2 corresponding to the drawings already on file and a translation thereof.

IX. Oral proceedings were held during which the Respondent filed one main request (the patent as granted) and six auxiliary requests.

X. In support of his request, the Appellant submitted that for any of the following reasons, Claims 1 and 8 in suit are not patentable:

D2 is a basic reference book on windtunnel balances and its figures are self-explanatory for persons skilled in the art of load sensors. The most likely configurations of the construction shown in Fig. 3.30 of D2 have no circular symmetry and can be achieved by making through holes in a block, thereby anticipating Claim 1 in suit. In Fig. 3.56, section d-d, of D2, the function of the parallel plates is the same as in Claim 1 and the structure in dispute can be obtained in an obvious way. The parallel plate structures of cross sections c-c and p-p of Fig. 3.56 of D2 are arranged exactly as in Claim 8 in suit and thus it is either known therefrom or, if the term through hole is to be interpreted as meaning that the plates in cross section should extend from surface to surface, it results from an obvious constructional modification of the plates because, as in the patent in suit, the two parallel plate structures c-c and p-p (which consist of several pieces of beams which are parallel to vertical or horizontal longitudinal planes) measure two perpendicular forces, in this case the side force and the normal force. Moreover, the skilled person wanting to increase the stiffness of the device of Fig. 4 of D5 and aware of the existence of parallel plate structures having three or more plates will not use thicker plates because the measurement signal decreases proportionally to the increase of the thickness raised to the second power, but will obviously add plates as known

per se from D1 because then the stiffness increases in a comparable proportion but the measuring signal decreases only inversely proportional thereto for added plates of the same dimensions. Further, since the five-component strain gauge balance of D3 can be machined from a single piece of material, this implies that the parallel plates thereof are formed by through holes.

In relation to the balance of D4, which comprises two parallel plate structures A and B and a single element T (A, B and T being handwritten additions) positioned therebetween with the strain gauges measuring the axial force being located thereon, it is to be noted that it is made by machining of a single piece.

Lastly, any plate or any structure composed of plates can allow to measure forces; thus, an arrangement of 6 plates is obvious, the exact configuration being only a question of convenience or routine, and the further features not providing any inventive contribution.

XI. The Respondent argued as follows in support of his main request:

DE-A-2 552 170 is acknowledged and represents the closest prior art because it discloses a load sensor with through holes which, in the sense of the patent in suit, are narrow passages with clearly defined sideboards through a block.

D2 is obscure; it does not include any reference numeral and thus it is not clear which are the parts of the drawings which are referred to in the translation of the text; the teaching which can be derived therefrom is not definite by itself alone and parts disclosed can be

identified as being features of the load sensor in dispute only by hindsight; for instance, in relation with Claim in dispute, the Y and Z force measuring parts in the middle part of the main elements, which consists of several pieces of beams which are parallel to vertical and horizontal longitudinal planes, mentioned in the translation, and the parts shown in Fig. 3.56, section d-d, cannot be unambiguously derived as being the same because other sections show similar parts and the text does not refer to definite sections; moreover, there is no indication that Fig. 3.30 is not a sectional view of a device because, although it is not hatched as apparently the case in other figures of D2, the reason can be that there the whole drawing should be hatched; thus, the shown device can be of circular symmetry so that, contrary to Claim 1 in suit, there are no through holes; in this respect, Fig. 3.56, sections p-p, c-c, does not show through holes either, but solid elements connected by flexible beams.

In the balance of Fig. 4 to 6 of D3, there is no through hole, but space between flexible beams.

In Fig. 8.1.1 of D4, only two forces and one moment are shown; in Fig.8.2.1, there is a 6 force and moment component but without through holes.

D5 is concerned with robots and does not belong to the same technical field; thus, there is no reason to combine it with D1, which relates to load sensors.

Thus, the subject-matter of the main claims is novel and inventive.

Reasons for the Decision

1. The appeal is admissible.

2. Main request

2.1 During the appeal procedure, the Respondent had submitted amended claims and then at the oral proceedings he requested as main request to maintain the patent unamended. According to the decision T 123/85, EPO OJ 1989, 336 (see point 3.1.1, third paragraph), in requesting that his patent be maintained in a limited form a patentee is merely trying to delimit his patent to meet objections expressed by the EPO or the opponents and he does not, by virtue of such limitation, irrevocably surrender subject-matter covered by the patent as granted but not by the request as thus limited. Thus, the Respondent's submission with reference to said decision to maintain the patent with the claims as granted and maintained unamended by the Opposition Division is accepted.

3. Interpretation of the claims

3.1 In relation to the parallel plate structures of the load sensor in dispute, it is to be noted that it is composed of thin-walled plates formed by through holes extending in the same direction through a block. Through holes are not defined in the main claims. In accordance with the decision T 23/86, EPO OJ 1987, 316 (see the headnote), the claim as granted should be understood as it stands, having regard if necessary to the description and drawings. Indeed, in the description (see page 2, lines 13 to 19; see also page 12, lines 37 to 53), through holes of devices are indicated as being bored

through the block; moreover, as declared by the Respondent during the oral proceedings, the through hole in the sense of the patent in suit is a narrow passage with clearly defined sideboards through a block, and all the embodiments of the invention illustrated in the patent in suit correspond to this definition. Therefore, the term "through hole" in the sensor in dispute is to be interpreted in this sense.

4. State of the art

4.1 The Appellant has cited D2 as a prior document against the patentability of the load sensor in dispute submitting for instance that the vertical elements of the structure for free motion due to axial force (X) known from Fig. 3.30 of D2 constitute thin-walled plates and the spaces therebetween are through holes. However, as credibly argued by the Respondent, the content of D2 is obscure; D2 does not include any reference numeral and thus it is not clear which are the parts of the drawings which are referred to in the text; although cross sections in the devices shown are designated by reference signs such as c-c, d-d, p-p, the text does not refer to these signs to designate parts but indicates for instance only "the middle part of the main elements", whereby plural sections containing elements of the type mentioned, i.e. vertical and horizontal longitudinal, could be meant; the information derivable from the drawings is such that, for instance, there is no indication that Fig. 3.30 is not a sectional view of a device because, although it is not hatched as apparently the case in other figures of D2, the reason can be that here the whole drawing should be hatched. As also credibly argued by the Respondent, a drawing provided by the Appellant with the written statement of grounds of

appeal for interpreting the structure shown in Fig. 3.30 is technically incorrect in the sense that said drawing shows a narrowing of the central part of the device which does not correspond to any part of Fig. 3.30. It is also to be noted that there are no indications concerning arrows perpendicular to the longitudinal axis of the device and designated as P or P/2 in Fig. 3.30. In this respect, it is not unambiguously derivable whether the left part and right part of Fig. 3.30 represent side views in different directions of the same device, or different devices of the same type. Having regard to Fig. 3.56a the Appellant's interpretation of the cross section d-d and of the structure of the adjacent planes thereof in the corresponding portion of the drawing is not unequivocally derivable from the text. Thus, the text does not clarify what is shown in the drawings and although from a comparison of D2 with the patent in suit common features could possibly be seen, however, this is a procedure by hindsight which does not allow to conclude that the skilled person at the relevant date would have been able to derive unambiguously said teaching. The Appellant's argument in support of the relevance of D2 that said document had been accepted during the Opposition procedure is not convincing because his further arguments concerning the incorrect evaluation of the content of the document in the decision under appeal and the above-mentioned error in the submitted drawing are an indication about the multiple possible interpretations of the teaching of D2. Therefore, D2 is disregarded.

5. Novelty

5.1 Claim 1

5.1.1 The content of DE-A-2 552 170 merely covers the statement of Claim 1. None of the features of the characterising portion is disclosed in said prior art document.

As submitted by the Appellant D3 (see column 2, lines 3 to 36; column 3, line 27 to column 5, line 51; Fig. 4 to 6) discloses a five component strain gauge balance which is of simple construction, allowing it to be machined from a single piece of material; in particular the spaces between the parallel beams (32, 33, 31) of the material of the balance constitute through holes. However, in the structure of the balance of D3 the block of material of the balance is machined in such a way that there is an arrangement of the side beam (32) and flexures (33) on each side of the balance, with no balance material in the space between said two arrangements, i.e. with no definite sideboards at said central location. Thus, in the device of D3, there are no through holes in the sense of the patent in suit.

The Appellant has also submitted that the balance of D4 (see Fig. 8.2.1) comprises two parallel plate structures indicated by him as A and B and a single element T positioned therebetween with the strain gauges measuring the axial force being located thereon; he has further mentioned that this type of balance is made by machining of a single piece. However, as credibly argued by the Respondent, it is not derivable from the submitted content of D4 that the parallel plates are formed by through holes in the sense of the patent in suit.

The other prior art documents do not come closer to the subject-matter of Claim 1 of the patent in suit.

Therefore, the subject-matter of Claim 1 in dispute is novel in the sense of Article 54 EPC.

5.2 Claim 8

5.2.1 The same reasoning is valid, mutatis mutandis for Claim 8. Indeed, no device comprising all the features of Claim 8 in dispute is known from the prior art and, therefore, its subject-matter is novel.

6. Inventive step

6.1 Claim 1

6.1.1 As mentioned in the patent in suit (see page 3, lines 12 to 15; Fig. 1A to 1C), the statement of Claim 1 in suit is known from DE-A-2 552 170, which is considered by the Board as the most relevant document in evaluating the inventive step. An object of the invention in dispute (see page 3, lines 8 to 11 and 17 to 29) is to provide a load sensor which can solve the problems of detecting large forces without enlargement of its dimensions and without displacement of the point of application of said force in a direction perpendicular to the direction of said force.

This problem is credibly solved by the parallel plate structure of the sensor of Claim 1 in dispute (see also page 3, lines 35 to 40) which is constructed of two parallel plate structures arranged symmetrically to each other, the free ends of the two structures being connected to each other, thus credibly preventing a

displacement of the point of application of the force in a direction perpendicular to the direction of said force and resulting in a detection of the highest accuracy; moreover, this structure is essentially very rigid to any kind of load components except to a force along its standard axis.

There is no suggestion from the prior art concerning devices with through holes, for instance from D1 (see Fig. 7), for a symmetrical structure. The indications in the prior art concerning symmetrical structures relate to structures without through holes in the sense of the patent in suit and thus of a different type; this is in particular the case of the balance of D3 (see Fig. 4 to 6) which, although it can be machined from a single piece of material, has openings between the beams (30 to 33) with no definite sideboards and which thus cannot be considered as through holes.

The Appellant has submitted that it is possible to measure forces with any plate or any structure composed of plates; 6 plates is an obvious possibility; arranging these plates is a question of convenience or routine; the further features of the device in dispute providing no inventive contribution. However, although each of the features of the claim in dispute may be known or obvious, the particular way in which they are combined and associated, i.e. the symmetrical association of through holes in a block, is not suggested in the prior art in relation with the intended object.

Therefore, the subject-matter of Claim 1 in dispute involves an inventive step in the sense of Article 56 EPC.

6.2. Claim 8

6.2.1 Starting from DE-A-2 552 170 which also in this case is considered the most relevant document, there is no indication in the prior art to modify the structure into two sets of parallel plates formed by through holes extending in perpendicular directions in a block for achieving the above mentioned object of in particular increasing the rigidity of the known load sensor.

The Appellant has submitted that the skilled person wanting to increase the stiffness of the device of Fig. 4 of D5 and aware from D1 (see Fig. 7) of structures of load sensors with parallel plate structures having three or more plates, will not use thicker plates because the measurement signal decreases proportionally to the increase of the thickness raised to the second power, but will obviously add plates as known per se from D1 because then the stiffness increases in a comparable proportion but the measuring signal decreases only inversely proportional thereto for added plates of the same dimensions. However, as credibly argued by the Respondent, D5 is concerned with robots and does not belong to the same technical field. It is thus not obvious to start therefrom to arrive at a load sensor or to look for solutions of problems of rigidity of robot parts in the field of load sensors, for instance in D1.

Therefore, the subject-matter of Claim 8 in dispute involves an inventive step.

7. Therefore, since the other claims in dispute are dependent claims, the grounds of opposition mentioned in Article 100 EPC do not prejudice the maintenance of the patent unamended (Art. 102(2) EPC).

8. Auxiliary requests

8.1 Since the main request is allowable, it is not necessary to consider the auxiliary requests.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

P.Martorana E.Turrini