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Datasheet for the decision of 13 July 2012

Case Number: T 2474/09 - 3.2.01

Application Number: 04749172.5

Publication Number: 1646536

IPC: B60R 21/0132

Language of the proceedings: EN

Title of invention:
A Crash Sensor arrangement

Patentee:
AUTOLIV DEVELOPMENT AB

Opponent:
Conti Temic microelectronic GmbH

Headword:
-

Relevant legal provisions (EPC 1973):
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 2474/09 - 3.2.01

D E C I S I O N
of the Technical Board of Appeal 3.2.01
of 13 July 2012

Appellant: (Patent Proprietor)	AUTOLIV DEVELOPMENT AB SE-447 83 Vargarda (SE)
Representative:	Parry, Simon James Mewburn Ellis LLP 33 Gutter Lane London EC2V 8AS (GB)
Respondent: (Opponent)	Conti Temic microelectronic GmbH Abt. Patente & Lizenzen Sieboldstr. 19 D-90 411 Nürnberg (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted 20 October 2009 revoking European patent No. 1646536 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman: G. Pricolo
Members: H. Geuss
T. Karamanli

Summary of Facts and Submissions

I. The appeal of the patent proprietor is directed against the decision of the opposition division posted on 20 October 2009, by which European patent No. 1646536 was revoked.

The opposition division decided that the subject-matter of claim 1 as granted and of claim 1 according to the auxiliary requests 1 and 2 lacked inventive step.

II. Oral proceedings before the board were held on 13 July 2012.

The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of claims 1 to 18, according to the sole request filed during these oral proceedings.

The respondent (opponent) requested that the appeal be dismissed. It raised the objection of lack of inventive step (Article 56 EPC 1973) of the subject-matter of independent claim 1. Its arguments relied on the documents

WO 97/22009 A (**D2**),
DE 101 42 272 A (**D4**).

The respondent declared during the oral proceedings that it no longer relied on documents D7 (DE 2151399) filed with the respondent's reply and D8 (JP 11-183504A), filed with letter of 4 March 2010 in connection with the request under consideration.

At the end of the oral proceedings the parties declared that they were in favour of a remittal to the department of first instance for adaption of the description.

III. Claim 1 according to the sole request reads as follows:

A crash sensor arrangement in a motor vehicle (1), the crash sensor arrangement including a first set of sensors comprising respective sensor (3,4,13,14,42,43) on each side of the vehicle, each sensor being an accelerometer having a predetermined sensing axis (5,7, 15,17,44,45), each sensor being mounted on the vehicle close to the outer skin of the vehicle and at a first longitudinal position such that the sensing axis of each sensor makes a predetermined angle to the longitudinal axis (6) of the vehicle, the predetermined angle being between 30° and 60°, or between -30° and -60°, the sensing axes being mirror symmetrical to each other relative to the longitudinal axis of the vehicle, so that at the said first longitudinal position there are only said two respective sensors, the sensing axes of the two sensors extending in different directions, the arrangement comprising no accelerometer located in a central part of the vehicle, wherein the vehicle (1) is additionally provided with a second set of sensors comprising two further crash sensors (18,19,46,47), mounted on respective sides of the vehicle at a second longitudinal position spaced from the first longitudinal position and wherein each further crash sensor (18,19,46,47) of the second set of sensors is an accelerometer located close to the outer skin of the vehicle (1), the sensing axes (20,21,48,49) of the sensors of the second set of sensors being mirror symmetrical to each other relative to the longitudinal axis (6), but also extending in directions which differ

from the directions of the axes (15,17,44,45) of the sensors (13,14,42,43) of the first set of sensors.

IV. The appellant's submissions may be summarized as follows:

Claim 1 consists of the features of claims 1, 8 and 10 as granted and a clarification that the arrangement comprises no accelerometer located in a central part of the vehicle as disclosed in the description as originally filed on page 5, lines 21 et seq.

The subject-matter of claim 1 is inventive over the teaching as disclosed in documents D4 and D2.

Only document D4 discloses in fig. 3 a second set of sensors at a second longitudinal position spaced from the longitudinal position of the first set of sensors.

Nevertheless, document D4 is silent on symmetries of sensing axes and the fact that the direction of the sensing axes of the second set of sensors differs from the direction of the axes of the sensors of the first set. Fig. 3 of D4 shows that the sensing axes of all sensors are aligned with the Y-direction. Consequently D4 teaches adjusting the sensing axes of all sensors in the same direction, namely in the Y-direction. Furthermore, an angle of between 30° and 60° for the sensing axes of the first set of sensors cannot be derived from D4.

These distinguishing features improve the sensitivity of the arrangement for detecting an impact.

Document D2 does not disclose two sets of sensors which are located at different longitudinal positions, but a

first set of two-dimensional sensors at a first longitudinal position. A two-dimensional sensor cannot be regarded as two one-dimensional sensors having sensing axis in different directions in the sense of the claim, since they have the same longitudinal position. It is clearly pointed out in the description that the first and the second set of sensors are at a different longitudinal position in the vehicle. Finally, neither D4 nor D2 disclose symmetry of sensing axes.

For the same reason, document D2 does not provide an adequate starting point for an inventive step analysis. If a skilled person were to improve the sensitivity of an arrangement according to D2 with a second set of sensors, he would rather consider providing two-dimensional sensors for the second set at the second longitudinal position. Again, the skilled person would not obtain any hint to arrange the sensor's sensing axes symmetrically and with a different orientation for the sensors of the first and the second set.

V. The respondent replied to the afore-mentioned arguments as follows:

Document D2 discloses all the features of the contested claim besides the feature that the sensing axes are mirror symmetrical to each other. Each sensor of the arrangement according to D2 has two sensing axes, spanning an angle of 90°. This two-dimensional sensor can be regarded as two one-dimensional sensors having their sensing axes in different directions, as defined in the claim for the first and the second set of sensors. Since the distance between the first and the second longitudinal position of the respective sets of sensors has been specified neither in the claim nor in the

description, also a very small distance defines two longitudinal positions spaced apart in the sense of the respective feature of the claim, for instance between two one-dimensional sensors on the same printed circuit board within the two-dimensional sensor's housing.

Moreover, D2 explains that the sensing axes are not confined to either the longitudinal or the lateral axis of the vehicle. However, a skilled person would know from his general knowledge that an angle between the longitudinal axis of the vehicle and the sensing axis of the sensor is preferably 45° since the value of sine 45° is the same as for cosine 45°.
Additionally, it would be obvious to a skilled person to provide symmetry between the sensors of the vehicle´s right and left sides. Consequently, the subject-matter of claim 1 is not inventive over D4 in combination with the general knowledge of a skilled person.

Additionally, the subject-matter of claim 1 lacks inventive step in view of the combination of documents D4 and D2. The embodiment according to fig. 3 of document D4 shows two sets of sensors at a different longitudinal position. According to the description (cf. D4, col. 1, lines 61 to 64, col. 2, lines 11 to 14) the direction of the sensing axes may be inclined at an angle of 30° to 45°, which would be applied by the person skilled in the art to the first set of sensors. Moreover, the skilled person would derive from document D2 that a perpendicular arrangement of the sensing axis is advantageous and would also know from his general knowledge that it is preferable for the axes to be mirror symmetrical between the right and the left side of the vehicle.

Reasons for the Decision

1. The appeal is admissible.

2. Claim 1 combines the features of granted claims 1, 8 and 10 and further includes the feature, disclosed in the application as originally filed (see page 5, lines 21 et seq.) in a general context, that the arrangement comprises no accelerometer located in the central part of the vehicle.

   Dependent claims 2 to 18 correspond to granted claims 2 - 7, 11-21, respectively, with adapted references to previous claims. In all claims reference signs in parentheses have been added.

   Thus, the amendments made to the claims do not give rise to objections under Article 84 EPC 1973 or Article 123(2) and (3) EPC. This was not disputed by the respondent.

3. The subject-matter of claim 1 is inventive (Article 56 EPC 1973) in view of the documents D2 and D4 for the following reasons:

3.1 The subject-matter of claim 1 differs from the arrangement of D4 by the following features:

   (a) the arrangement comprises no accelerometer located in a central part of the vehicle,

   (b) the sensing axes of the first set of sensors being mirror symmetrical to each other relative to the longitudinal axis of the vehicle and extending in different directions,

(c) the sensing axes of the second set of sensors being mirror symmetrical to each other relative to the longitudinal axis of the vehicle, and

(d) the sensing axes of the second set of sensors extending in directions which differ from the directions of the axes of the sensors of the first set of sensors.

3.2 It is not disputed by the parties that these features are not disclosed by D4.
In the board's view it is not necessary to investigate whether there are further features distinguishing the subject-matter of claim 1 from the arrangement according to D4, besides said features a) to d). This applies in particular to the appellant's further submissions that an angle between 30° and 60° for the sensing axes of the first set of sensors cannot be derived from D4.

In fact, features b) to d) as a whole are sufficient to establish an inventive step of the subject-matter of claim 1 for the following reasons:

3.3 The problem, as is also agreed to by the parties, to be solved by features b) to d) is to improve the sensitivity and the resolution of the arrangement with respect to crash detection.

3.4 The respondent argued that fig. 3 of document D4 shows a sensor arrangement with two sets of sensors. Furthermore, a skilled person would derive from D2 a rectangular alignment of sensing axes of a two-dimensional accelerometer which can be regarded as two one-dimensional accelerometers. Consequently, the skilled person would consider, taking into account that the first set of sensors is inclined at a predetermined

angle of 30° to 45° as suggested by D4 (cf. col. 1, lines 61 to 64), arranging the sensing axes of the second set of sensors perpendicular to the axes of the first set. Finally, considering that a mirror symmetrical design of the sensing axes would be the nearest approach if no further restrictions have to be considered, the skilled person would arrive without any inventive activity at the combination of features of claim 1.

3.5 However, the board shares the view of the appellant that the sole detailed information which is provided in D4 with respect to the direction of the sensing axes of the first and the second set of sensors is to align all sensing axes with the Y-direction of the vehicle's system of co-ordinates, as shown in fig. 3.

In particular, in contradiction to the respondent's submission, it is not possible to interpret the rather cursory statement in D4 that accelerometers may be inclined at a predetermined angle of between 30° and 45° (cf. column 1, lines 61 to 64) as meaning that only a specific choice of the four sensors as shown in fig. 3 at an angle of between 30° and 45°, namely the first set of sensors must be inclined and that the second set of sensors is to be disregarded. The skilled person would have manifold possibilities to arrange the sensing axis of the four sensors of fig. 3 with the information that accelerometers may be inclined at between 30° and 45°.

Moreover, the respondent argues that for the second set of sensors the skilled person would apply the teaching of D2 to arrange axes to be perpendicular. This line of argument with respect to the direction of the sensing axes of the second accelerometers is based on hindsight

and cannot convince the board. In particular it is not clear from the respondent's arguments *why* the skilled person *would* change the design of the crash sensor arrangement according to D4 in the way brought forward by the respondent. In view of the combination of documents D2 and D4, the skilled person would rather consider implementing two-dimensional sensors not only for the first set of sensors but also for the second set of sensors.

3.6 Furthermore, the board does not agree with the respondent's line of argument that also starting from document D2 the skilled person would arrive at the subject-matter of claim 1 without inventive activity in order to solve the problem of improving sensitivity and resolution of a crash sensor system.

In particular the board does not follow the opinion that a two-dimensional sensor has to be regarded as two one-dimensional sensors with perpendicularly arranged sensing axes being spaced apart from each other on the sensor's printed circuit board, therefore as in fact two sets of sensors, which sets are at different longitudinal positions in the sense of the claim.

Even if the respondent's assumption with respect to the composition of the two-dimensional sensor in D2 is correct, it is clear from the patent specification that the first set and the second set of sensors with respect to the feature "at a second longitudinal position spaced from the first longitudinal position" are not located only at a distance of some millimetres on a common printed circuit board but at a distance which allows "more and quicker information about an impact than if" … "several sensors at the same locations are used", cf.

paragraph [0039].

For this reason alone, the board holds that D2 does not prompt the skilled person to consider the two-dimensional accelerometers as two one-dimensional accelerometers in the sense of the patent in dispute.

Furthermore the board shares the appellant's opinion that - starting from D2 - a skilled person would likely consider the provision of a second set of two-dimensional sensors in order to solve the given problem.

As a result, again the board holds that the respondent’s line of argument is based on hindsight and that the subject-matter of claim 1 is inventive over document D2 in combination with the general knowledge of a skilled person.

4. Since the sole request is allowable and both parties are in favour of a remittal to the department of first instance for adaption of the description (see point II, above), the board, exercising its discretionary power conferred to it by Article 111(1) EPC 1973, deems it appropriate to remit the case to the first instance for adaption of the description.

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 with the following claims and a description to be adapted:

   Claims 1 to 18 according to the sole request filed during oral proceedings of 13 July 2012.

The Registrar: The Chairman:

A. Vottner G. Pricolo