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**D E C I S I O N**  
**of 1 October 2002**

**Case Number:** T 0259/01 - 3.2.1

**Application Number:** 94202281.5

**Publication Number:** 0641688

**IPC:** B60R 21/00

**Language of the proceedings:** EN

**Title of invention:**

Diagnostic circuit for a supplemental inflatable restraint system

**Patentee:**

DELCO ELECTRONICS CORPORATION

**Opponent:**

Robert Bosch GMBH

**Headword:**

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**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

"Inventive step (yes)"

**Decisions cited:**

-

**Catchword:**

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Case Number: T 0259/01 - 3.2.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.1  
of 1 October 2002

**Appellant:** Robert Bosch GmbH  
(Opponent) Postfach 30 02 20  
D-70442 Stuttgart (DE)

**Respondent:** DELCO ELECTRONICS CORPORATION  
(Proprietor of the patent) 700 East Firmin Street  
Kokomo  
Indiana 46902 (US)

**Representative:** Denton, Michael John  
Delphi Automotive Systems  
Centre Technique Paris  
117, avenue des Nations  
B.P 60059  
F-95972 Roissy Charles de Gaulle Cédex (FR)

**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 25 January 2001  
rejecting the opposition filed against European  
patent No. 0 641 688 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** S. Crane  
**Members:** J. Osborne  
M. Aúz Castro

## Summary of Facts and Submissions

- I. European patent No. 0 641 688 was granted on 25 November 1998 on the basis of European patent application No. 94 202 281.5.

Claim 1 of the granted patent reads as follows:

"A diagnostic circuit for measuring the resistance of an external deployment path containing a squib (14) of a supplemental inflatable restraint system, comprising a voltage sensing and monitoring circuit (18) connectable across the external deployment path (12); and supply means (26, 42) for supplying a predetermined current through the external deployment path and including a constant current source (26) connectable between a power source (22) and one side of the external path and a current limiting device (42) connectable in series with the constant current source (26) and the external path, the current limiting device (42) having a current limit less than that required to fire the squib; characterised in that the current limiting device (42) is a constant current sink (44, 46) connectable between the other side of the external path and ground, the current sink (44, 46) being capable of passing a current greater than the predetermined current but substantially less than that capable of firing the squib."

Dependent claims 2 to 4 relate to preferred embodiments of the circuit according to claim 1.

- II. The patent was opposed by the present appellants on the

ground that its subject-matter lacked inventive step with respect to the state of the art represented by DE-A-3 627 239 (henceforth document D5).

With its decision posted on 25 January 2001 the Opposition Division rejected the opposition. A notice of appeal against that decision, accompanied by a statement of grounds, was filed on 1 March 2001 and the fee for appeal paid at the same time.

III. Oral proceedings before the Board were held on 1 October 2002.

The appellants requested that the decision under appeal be set aside and the patent revoked. They argued substantially as follows:

Document D5 disclosed a diagnostic circuit corresponding to the preamble of granted claim 1 wherein, in correspondence with the claimed invention, the current supplied to the squib for the purposes of resistance measurement was determined by a constant current source and constant current sink.

The integrity of an inflatable restraint system for an automotive vehicle was a very significant safety factor, so that it would be advantageous to design the associated diagnostic circuit in such a way that it would not give false results or suffer permanent damage as a consequence of transient fluctuations in the output of the power source. In the context of the circuit of document D5 it was obvious to the person skilled in the art that this goal would be achieved by using a constant current sink which could pass a greater current than that delivered by the constant current source.

The respondents (proprietors of the patent) requested dismissal of the appeal, by way of auxiliary request with the proviso that the patent be maintained on the basis of claim 1 filed on 2 August 2002 and claims 2 to 4, the description and drawing as granted. In reply to the submissions of the appellants they argued that the contents of document D5 had been correctly interpreted by both the Examining Division, in granting the patent, and the Opposition Division, in rejecting the opposition. The appellants were using hindsight to read more into the document than was actually there.

### **Reason for the Decision**

1. The appeal complies with the formal requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is therefore admissible.
  
2. Supplemental inflatable restraints, commonly known as air bags, are used in automotive vehicles to cushion the driver or other occupant from injury during an impact. Such systems include a sensing and deployment module, a squib controlled by the module to fire when an impact is sensed, an inflatable bag, and an inflating device triggered by the squib to inflate the bag. The squib is outside the module in an external deployment path. The module includes a diagnostic capability for checking or monitoring the resistance of the external path, thereby verifying that the squib is operational.

A conventional diagnostic circuit for measuring the resistance in the external path is shown in Figure 1 of the contested patent. The circuit is supplied by the

vehicle battery and comprises in series connection between the battery and ground, a boost supply, a constant current source, the squib, a current limiting resistor and a transistor switch.

When the switch is turned on for a test a current of e.g 150 mA predetermined by the constant current source flows through the external deployment path and the voltage drop generated across the path is measured to determine its resistance. The current limiting resistor is necessary to limit current to a harmless value in the event that full battery voltage is inadvertently applied to the high end of the external path while the transistor switch is conducting and to this end the resistor is of the order of 100 Ohms. The test current of 150 mA will accordingly cause a voltage drop of 15 volts in this resistor and additional voltage drops in the constant current source, the squib and the transistor switch lead to a total voltage drop of 18 volts, as opposed to the typical battery voltage of 9 to 16 volts, thus making the boost supply necessary. This conventional circuit forms the basis for the preamble of granted claim 1.

The essential aim of the claimed invention is to provide an improved diagnostic circuit which does not require a boost supply (cf. column 2, lines 10 to 17, of the patent specification). This is achieved in that the current limiting resistor is replaced by a constant current sink which is capable of passing a current greater than the predetermined test current supplied by the constant current source but is substantially less than that capable of firing the squib, cf. the characterising clause of claim 1. In the preferred embodiment described, the constant current sink has a

capacity of 20 to 25 mA more than the test current, whereas about 1.8 A is required to fire the squib, so that the current through the external path is limited to about 10% of the firing current to provide a wide safety margin. With the current limiting resistor replaced by a constant current sink the total resistance of the test path is only of the order of five volts, well within the normal vehicle battery voltage range.

Document D5 relates to a circuit for the control and monitoring of a plurality of squib ignition circuits, each of the squibs being associated with a respective inflatable restraint system in an automotive vehicle. Amongst other functions the circuit is capable of detecting whether the resistance of a respective squib ignition circuit is too high or too low. The circuit comprises a source "ZKP-Quelle" capable of delivering a constant reference voltage (3.6 volts) and a selectable constant reference current (50 mA during testing of the squib, when the switching signal S1 is low). The constant reference voltage is applied to the high side of the squib and the test current through the squib is determined by low side constant current sinks (IZK1..n, MSA-Senke). The sink IZK1..n can pass 4mA which is the current through the squib for testing for too high resistance. The "MSA-Senke" is also capable of passing a selectable constant reference current (17.6 mA when the signal S1 is low) and this functions together with the IZK1..n sink when testing for too low resistance, resulting in a total current sink capacity of 21.6 mA. In both cases the voltage drop across the squib is the compared with respective presets thresholds.

Thus, although the known circuit of document D5 both

dispenses with a boost supply and incorporates constant current sinks on the low side of the squib, it can be seen that its principle of operation is fundamentally different to that of the claimed circuit, since in this prior art it is the constant current sinks which determine the test current through the squib, rather than as presently claimed the constant current source. As explained above, the current constant sink of the claimed invention is merely responsible for preventing a potentially harmful current being supplied through the squib in the event of there being some fault in the circuit. There is nothing in the basic requirements for safe operation of the type of circuit involved, as referred to by the appellant, which could encourage the person skilled in the art to reconfigure the circuit known from document D5 in such a way that it complied with the claimed invention. In this context it is to be noted that the respondents have not argued that the operational safety of the circuit of document D5 is inferior to that of their circuit, merely that the two circuits operate on different principles.

The Board therefore comes to the conclusion that the subject-matter of granted claim 1 is not obvious with respect to the state of the art and accordingly involves an inventive step (Article 56 EPC).

## **Order**

### **For these reasons it is decided:**

The appeal is dismissed.



The Registrar:

The Chairman:

S. Fabiani

S. Crane