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D E C I S I O N
of 19 May 2005

Case Number: T 1029/02 - 3.5.2

Application Number: 91110698.7

Publication Number: 0464694

IPC: H02J 7/14

Language of the proceedings: EN

Title of invention:
Power source unit for an automotive vehicle

Patentee:
DENSO CORPORATION

Opponent:
WABCO GmbH & Co. OHG

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1029/02 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 19 May 2005

Appellant: (Opponent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 14 August 2002 rejecting the opposition filed against European patent No. 0464694 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: F. Edlinger
E. Lachacinski

Summary of Facts and Submissions

I. The appeal is against the decision of the opposition division rejecting the opposition against European patent No. 464 694.

II. Claim 1 of the patent as granted has the following wording:

"A power source unit for an automotive vehicle, comprising
an alternator (1) having a field winding (5) and being driven by an engine,
a rectification means (30) for converting an alternating current output of the alternator (1) to a direct current output and outputting the direct current output through first and second output sections, said rectification means (30) including a lower level diode half-bridge having a common anode (3) and first (2) and second (4) higher level diode half-bridges each having a common cathode forming said first and second output sections,
first power accumulation means (7) connected in parallel with a first load (8) and arranged for receiving a power supply through the first output section, and
a second power accumulation means (9) connected in parallel with a second load (10) and arranged for receiving a power supply through the second output section,
said second higher level diode half-bridge (4) being a silicon controlled rectifier half-bridge,
an alternator output control means (6) being provided for adjusting an output of the alternator (1) depending

upon a terminal voltage of the first power accumulating means (7) to maintain the terminal voltage of the first power accumulating means (7), which receives power supply through said first output section, at a first predetermined voltage level, said first and second power accumulation means (7, 9) being parallely charged respectively through said rectification means (30) and a voltage control means (11) being provided for opening and closing said silicon controlled rectifier half-bridge (4) in response to a drop in a terminal voltage of the second power accumulation means (9) to a second predetermined voltage level, to permit a power supply to the second power accumulation means (9) through the second output section and to maintain the terminal voltage of the second power accumulation means (9) at a third predetermined voltage level."

Claims 2 to 14 are dependent on claim 1.

III. With the notice of opposition, the following two documents had been presented in support of the grounds for opposition lack of novelty and lack of inventive step:

E1: US 4 686 442 A and

E2: "BOSCH Technische Unterrichtung - Drehstromgeneratoren für Kraftfahrzeuge", printed in Germany by Robert Bosch GmbH, Stuttgart, 1970; pages 1 to 41.

IV. The main reasons given in the decision under appeal may be summarized as follows:

E1 represented the closest prior art. It did not disclose that the voltage control means maintained the terminal voltage of the second power accumulation means at a third predetermined voltage level, or that the first and second power accumulation means were parallely charged. The expression "parallely charged" in claim 1 of the opposed patent did not mean that charging was contemporary in duration, but had to be understood in the sense that the supply voltages were mutually distinct. This was not the case in the 24 V mode of E1 where the two power accumulation means were charged in series. E1 taught a person skilled in the art to maintain the relative magnitude of their terminal voltages at a predetermined level. Neither in the 24 V mode nor in the 12 V mode of E1 was the terminal voltage of the second power accumulation means maintained at a predetermined level. It was thus not obvious to a person skilled in the art starting from E1 to parallely charge the two power accumulation means at first and third predetermined voltage levels.

V. With the statement of grounds of appeal and with a further letter, the appellant opponent contested the opposition division's finding on novelty with respect to E1.

VI. In preparation for the oral proceedings which were held on 19 May 2005, the respondent patent proprietor, with a letter dated 10 May 2005, filed new claims according to auxiliary requests 1 to 3.

VII. The appellant opponent requested that the decision under appeal be set aside and that the European patent No. 464 694 be revoked.

VIII. The respondent patent proprietor requested that the appeal be dismissed and that the patent be maintained unamended (main request) or in amended form on the basis of one of the auxiliary requests filed with letter dated 10 May 2005.

IX. The appellant opponent essentially argued as follows:

The opposition division had misconstrued claim 1 regarding the feature which specified the power accumulation means as "being parallely charged". The usual meaning of parallel had to be one of these: either the power accumulation means were electrically connected in parallel, or they were contemporarily charged (in any suitable electrical circuit). The opposed patent did not mention this feature at all in the description. The power accumulation means were not electrically connected in parallel, as acknowledged by the respondent, because their terminal voltages were not identical. Therefore, parallely charged in the context of claim 1 meant that the power accumulation means were charged at the same time or during overlapping cycles. Since the opponent had always construed claim 1 in this way, this amendment to claim 1 as filed had not been objected to by the opponent as inadmissible. However, the opposition division in the decision under appeal, referring to mutually distinct supply voltages, chose a third meaning which was vague, inconsistent with the usual meaning of parallel electrical circuits (which have the same voltage) and not supported by the description of the opposed patent.

Claim 1 of the opposed patent did not specify the third predetermined voltage level. In combination with the second predetermined voltage level, this merely referred to a well-known on-off control of the silicon controlled rectifier half-bridge, for maintaining the second power accumulation means at an unspecified voltage level.

The subject-matter of claim 1 of the opposed patent lacked novelty because, in the 24 V mode of E1, the first and second power accumulation means were also charged at the same time. Although electrically connected in series in E1 (Figure 1), each power accumulation means developed a mutually distinct and independent voltage across its terminals because the silicon controlled rectifier half-bridges allowed for charge equilibration to provide additional charge to whichever battery was subjected to a heavier load. The terminal voltage of the second power accumulation means was thus maintained at a third predetermined level.

E2 (pages 25 and 27; Figure 55) disclosed a power source unit for an automotive vehicle comprising an alternator, rectification means, first power accumulation means and an alternator output control means. The terminal voltage of the first power accumulation means was maintained at a predetermined voltage level by on-off control. Starting from the prior art disclosed in E2, a person skilled in the art merely had to provide a second power accumulation means and a silicon controlled rectifier half-bridge, and to control the voltage of the second power accumulation means as generally known. The subject-matter of claim 1 constituted an obvious modification of this prior art

and did not involve an inventive step because it was already known, eg from E1, to use a second power accumulation means in automotive vehicle electrical circuits.

X. The respondent patent proprietor essentially argued as follows:

The structure of the power source unit disclosed in E1 was completely different from that specified in claim 1 of the opposed patent. In the 24 V mode of E1 the power accumulation means were charged in series by the same current. The series connection of the first and second power accumulation means formed a common load which was connected to a single supply voltage in the 24 V mode, and the sum of the individual terminal voltages was maintained at a first predetermined voltage level by adjusting the output of the alternator. The terminal voltage of the second power accumulation means was maintained at the level of the actual voltage of the first power accumulation means which was not a predetermined voltage level.

Claim 1 of the opposed patent did not specify that the power accumulation means were electrically connected in parallel. The expression "parallely charged" implied that the power accumulation means had to be electrically connected to a common power source (the alternator) so that they could be charged in parallel and independently from each other, as stated in the description, column 3, lines 2 to 9, and shown eg in Figure 1 of the patent specification. The patent specification disclosed electrical circuits for driving a plurality of mutually distinct kinds of loads

independently and in parallel. The first and second power accumulation means represented one kind of these loads which meant that they were parallely and independently charged from the alternator. The third predetermined voltage level could thus be freely selected, and the voltage control means maintained the terminal voltage of the second power accumulation means at this level independently of the voltage of the first power accumulation means.

E1 disclosed serial charging of the two power accumulation means and gave no hint at the completely different structure of the opposed patent. E2 merely disclosed general knowledge in the technical field of electrical circuits for automotive vehicles. E2 did not mention a second power accumulation means. A person skilled in the art would have arranged a power source unit in the manner disclosed in E1 if he had wanted to add a second power accumulation means to that of E2.

Reasons for the Decision

1. The appeal is admissible.

2. The expression "parallely charged", used in claim 1 of the opposed patent, is not explicitly disclosed in the application as filed or in the description of the patent specification. The meaning of the expression in the context of claim 1 was at the centre of the debate in this appeal.

2.1 Claim 1 specifies rectification means for converting an alternating current (AC) output of the alternator to a

direct current (DC) output. The rectification means has first and second output sections. The first power accumulation means (and a first load) receives power supply through the first output section (via the common cathode of the first higher level diode half-bridge). The second power accumulation means (and a second load) receives power supply through the second output section (via the common cathode of the second higher level diode half-bridge). The terminal voltage of the first power accumulation means (or "accumulating" means, as it is worded in claim 1 in this context) is maintained at a first predetermined voltage level by adjusting the alternator output. The terminal voltage of the second power accumulation means is maintained at the third predetermined voltage level by opening and closing the silicon controlled rectifier half-bridge.

2.2 It is implicit in this context that each of the DC to AC current paths from the power accumulation means back to the alternator output is completed via a (or the) common anode of the lower level diode half-bridge. The rectification means as specified in claim 1 thus has a common AC input (output of the alternator) and first and second DC current paths which are electrically separated by the diodes of an upper and a lower half-bridge each. Therefore, the feature of claim 1 "first and second power accumulation means (7, 9) being parallely charged respectively through said rectification means (30)" refers to separate DC paths ("respectively") which are connected to the same AC source voltage. As a consequence, the first and second power accumulation means are elements of two electrical loads which are connected in parallel as seen from the AC side (the common AC input). They are possibly, but

not necessarily, charged at the same time. In this sense they are charged from supply voltages which are "mutually distinct" (provided at the different output sections), as the decision under appeal has put it. In such a circuit, a power accumulation means may be charged independently from the actual terminal voltage of the other power accumulation means because the terminal voltage of the second power accumulation means is regulated by the voltage control means and maintained at a (selectable) third predetermined voltage level. In other words, "parallely charged" may be considered as implying a circuit structure of a parallel connection of two (AC) loads and its consequence for the charging of the power accumulation means in the separate (DC) branches. Charging at the same time is covered as a possible case which can be inferred from the circuit structure, but it is not what is specified by "parallely charged" in the context of claim 1.

2.3 This meaning of "parallely charged" is supported by, and fully consistent with, the description of the patent specification (and corresponding passages in the application as filed). The description (column 1, lines 7 to 15; column 2, line 48 to column 3, line 8; column 11, line 45 to column 12, line 6) and Figures 1, 5 and 6 disclose the parallel supply (as seen from the AC side) of mutually distinct supply voltages to a plurality of loads from a single alternator. The distinct kinds of load and the power accumulation means (batteries) can be driven (or charged) independently. For example, the terminal voltages of the first and second power accumulation means can be maintained at the same predetermined voltage level, or the third

predetermined voltage level may be lower than the first predetermined voltage level, by controlling the duty cycle of the silicon controlled rectifier half-bridge (column 5, lines 10 to 12; column 9, lines 3 to 7 and lines 24 to 27). It is also explained that a series connection of batteries to be charged, as in the prior art, is undesirable (column 2, lines 18 to 22).

3. The appellant has contested the novelty of the subject-matter of claim 1 when compared with the power source unit operating in the 24 V mode in E1. However, the first and second power accumulation means in E1 (batteries 38 and 42) are connected in series and form a single DC path between the common cathode of a higher level diode half-bridge (28) and the common anode of a lower level diode half-bridge (30); see E1, Abstract and Figure 1. It is the sum of the terminal voltages of the series connected power accumulation means which is maintained at a first predetermined voltage level by adjusting an output of the alternator (E1, column 2, lines 62 to 68; Figure 1). Neither of the individual terminal voltages of the first and second power accumulation means is maintained at a predetermined voltage level. The silicon controlled rectifier half-bridges (50, 52, 54; 60, 62, 64) are controlled to provide additional charge to only one battery which is subjected to a heavier load. The relative time periods or pulse widths are varied as a function of the relative magnitudes of the voltages across the batteries to provide for balanced battery voltages with unbalanced loading (E1, column 1, lines 37 to 56; column 1, line 61 to column 2, line 8; column 10, lines 40 to 42; Figure 2). Therefore, E1 does not disclose that the first and second power accumulation

means are parallely charged as specified in claim 1 of the opposed patent, nor is the terminal voltage of the second power accumulation means maintained at a third predetermined voltage level. This holds true when the power source unit of E1 operates in the 12 V mode because the silicon controlled rectifier half-bridges are then alternately and sequentially gated conductive as a function of the relative magnitudes of the voltages across the first and second power accumulation means (E1, column 4, lines 58 to 68; Figure 2). The subject-matter of claim 1 is thus novel with respect to the prior art disclosed in E1.

4. Concerning inventive step, the appellant has chosen to start from generally known power source units for an automotive vehicle having only one battery, as disclosed in E2 (pages 25 and 27; Figure 55). E2 was published in 1970. Twenty years later, at the relevant date of the opposed patent, dual voltage power source units for an automotive vehicle were generally known to the person skilled in the art (see E1, column 1, lines 4 to 27; patent specification, column 1, line 17 to column 2, line 44). Given these circumstances, the board is not convinced that it was obvious to add a silicon controlled rectifier and a second power accumulation means to the generally known power source unit in E2, and to control the voltages of the two power accumulation means as specified in claim 1 of the opposed patent. The evidence on file (E1 and other similar series circuits of two batteries) tends rather to point to the contrary. Even if the person skilled in the art had combined the teachings of E2 and E1, the obvious thing to do would have been to retain the electrical connections as disclosed in E1 because of

these two documents, only E1 refers to problems arising with dual voltage electrical systems.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Sauter W. J. L. Wheeler