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D E C I S I O N
of 26 April 2006

Case Number: T 0063/05 - 3.5.02

Application Number: 01109604.7

Publication Number: 1150429

IPC: H03K 17/687

Language of the proceedings: EN

Title of invention:

Load drive circuit having parallel-connected switch circuits

Applicant:

DENSO CORPORATION

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 56, 123(2)

Keyword:

"Request for a decision on the record"

"Inventive step of main, first and third auxiliary requests -
(no) "

"Second and fourth auxiliary requests - (inadmissible
amendment) "

Decisions cited:

-

Catchword:

-



Case Number: T 0063/05 - 3.5.02

D E C I S I O N
of the Technical Board of Appeal 3.5.02
of 26 April 2006

Appellant: DENSO CORPORATION
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Aichi-pref. 448-8661 (JP)

Representative: Winter, Brandl, Fürniss, Hübner Röss, Kaiser,
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 25 June 2004
refusing European application No. 01109604.7
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: J.-M. Cannard
C. Holtz

Summary of Facts and Submissions

I. The appellant contests the decision of the examining division to refuse European patent application No. 01 109 604.7. The reason given for the refusal was that the subject-matter of claim 1 filed with the letter dated 14 June 2002 did not involve an inventive step, having regard to the prior art known from

D1: US-A-5 777 377

and the general knowledge of the skilled man.

II. With the statement of grounds of appeal the appellant filed claims in respect of four auxiliary requests.

III. The appellant filed a letter dated 29 March 2006 containing the following statement:

"Our request for oral proceedings is withdrawn.

It is respectfully asked to decide on the record, on the basis of the Main Request and first through fourth Auxiliary Requests on file."

IV. According to the file, the appellant requests as the main request that the decision under appeal be set aside and that a patent be granted on the basis of the set of claims hitherto on file. These claims are claims 1 to 4 filed with the letter of 14 June 2002, of which claim 1 is worded as follows:

"A load drive circuit for an electric load (500) comprising:

a plurality of switching circuits (A, B, C) connected in parallel with each other to drive the load (500);

a first wiring conductor pattern (501) connecting on [sic] sides of the switching circuits (A, B, C) to an external power side; and

a second wiring conductor pattern (502) connecting another sides of the switching circuits (A, B, C) to a load side; wherein

the first wiring conductor pattern (501) has a first connecting portion (501a) connected to the external power side and disposed in the vicinity of one end of a parallel arrangement of the switching circuits (A, B, C), and

the second wiring pattern (502) has a second connection portion (502a) connected to the load side and disposed in the vicinity of another end of the parallel arrangement of the switching circuits (A, B, C);

characterised in that

width and thickness of the first wiring conductor pattern between the one sides of the switching circuits and the external power side are the same as those of the second wiring conductor pattern between the another sides of the switching circuits and the load side."

V. Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the characterising portion of the claim is worded as follows:

"said load drive circuit comprising said switching circuits (A, B, C) and said first and second wiring conductor patterns (501, 502) is formed as a semiconductor relay."

Claim 1 of the second auxiliary request differs from claim 1 of the first auxiliary request in that the characterising portion of the claim includes the following additional feature:

"and said first conductor pattern (501) and said second conductor pattern (502) are formed on a same plane."

Claim 1 of the third auxiliary request differs from claim 1 of the first auxiliary request in that the characterising portion recites the combination of the characterising features of the first auxiliary request and the main request.

Claim 1 of the fourth auxiliary request differs from claim 1 of the second auxiliary request in that the characterising portion recites the combination of the characterising features of the second auxiliary request and the main request.

VI. The appellant's arguments may be summarized as follows.

According to the description (page 15, lines 5-6) the wiring conductor patterns of the present application were thin layers of copper, which, in the described

embodiment, were formed within a semiconductor substrate of a semiconductor relay (see page 3, lines 7-14). The connecting portions connected to the external power side and the load side, respectively, were formed in the same planes as the respective conductor patterns. In D1, Figures 5A and 5B, referred to in the decision under appeal, were only schematic representations; the structure of the bus bar was shown in Figures 4A and 4B. There the first and second conductor patterns were shown to be massive copper plates arranged in a stack manner, which could hardly be said to fall within the meaning of the wiring conductor patterns of the present application. The plates of D1 were designed to reduce inductance, not to equalise the current flowing through the transistors by equalising the resistances of the respective current paths. Many patents relied on the appropriate dimensioning of something, so the finding in the decision under appeal that the characterising features of claim 1 of the main request were obvious normal design work undertaken by the skilled person was surprising.

Concerning the auxiliary requests, D1 did not say anything about a semiconductor relay. It was characteristic of a semiconductor relay that the switching circuit and the wiring conductor patterns were formed on a same single plane.

Reasons for the Decision

1. The appeal is admissible.

2. The Board interprets the appellant's letter of 29 March as a request for a reasoned decision on the basis of the file as it stood at that date, that is, the appellant does not want to receive a substantive communication from the Board, or file any more comments. In these circumstances, the decision may of course be based on arguments necessary to refute the points made in the appellant's grounds of appeal, but which were not previously communicated to the appellant. It is equally self-evident that the Board may reach a decision adverse to the appellant. The request for a decision on the record and the withdrawal of the request for oral proceedings were submitted of the appellant's own free will (*volenti non fit injuria*).

3. Document D1 cited by the examining division discloses a load drive circuit according to the pre-characterising portion of claim 1 of all the requests. In particular:

D1 discloses at column 5, line 26, to column 8, line 41, with reference to its Figures 4A, 4B, 5A and 5B, a load drive circuit (DC to AC converter) for an electric load (AC motor) comprising:

a plurality of switching circuits (transistors t7, t8, t3, t4) connected in parallel with each other to drive the load;

a first wiring conductor pattern (+ plate 94, 198) connecting one side of each of the switching circuits to an external power side (122, + INPUT); and

a second wiring pattern (C-E plate 92, 196) connecting the other sides of the switching circuits to the load side; wherein

the first wiring conductor pattern has a first connecting portion (122) connected to the external power side and disposed in the vicinity of one end of a parallel arrangement of the switching circuits, and

the second wiring pattern has a second connecting portion (158) connected to the load side (via output plate 96) and disposed in the vicinity of the other end of the parallel arrangement of the switching circuits.

- 3.1 It is noted that the pre-characterising portion of claim 1 of all the requests does not specify any feature which could distinguish the conductor patterns (501, 502) from the plates 92 and 94 shown in Figure 4A of D1, which have patterned shapes and perform the function of wiring conductors.

4. *Main request*

- 4.1 As pointed out by the appellant, it is true that D1 does not disclose the characterising feature of claim 1 of the main request, namely that the width and thickness of the first wiring conductor pattern (+ plate) between the one sides of the switching circuits and the external power side are the same as those of the second wiring conductor pattern (C-E plate)

between the other sides of the switching circuits and the load side.

4.2 Nevertheless, D1 does make it clear that Figures 4A, 4B, 5A and 5B show a preferred embodiment and that other arrangements are possible. At column 3, lines 39 to 43 and column 8, lines 34 to 41, the advantage of equal path lengths promoting equal current sharing among the transistors is mentioned (see also the discussion of the problem to be solved, at column 3, lines 37 to 62). In the judgement of the Board the skilled person would understand that the general diagrammatic representation of the wiring shown in Figures 5A and 5B could be implemented in other physical forms than the particular one shown in Figures 4A and 4B and that the advantage could be optimised by giving the first and second wiring conductor patterns the same dimensions.

4.3 It follows from the above considerations that the load drive circuit according to claim 1 of the main request is obvious to a person skilled in the art and cannot be considered as involving an inventive step within the meaning of Article 56 EPC.

5. *First auxiliary request*

5.1 As pointed out by the appellant, it is true that D1 does not mention a semiconductor relay at all. However, the term "semiconductor relay" does not clearly and unambiguously imply that the switching transistors and the wiring conductor patterns are formed on a same single plane within a single monolithic semiconductor substrate. The term "semiconductor relay" may also be applied to arrangements in which an individual

semiconductor switch, or a plurality of discrete semiconductor switches connected in parallel, is/are arranged to operate as a relay.

5.2 Nevertheless, as pointed out in paragraph 4.2 above, Figures 4A, 4B, 5A and 5B of D1 show a preferred embodiment and other arrangements are possible within the general teaching of D1. In the judgement of the Board a person skilled in the art would understand that the general diagrammatic representation of the wiring shown in Figures 5A and 5B could be employed in other apparatus than the particular DC to AC converter shown in Figures 4A and 4B, in particular in apparatus for converting AC power to DC power (see D1, column 1, lines 18 to 27), to obtain the advantage of equal path lengths promoting equal current sharing among the transistors. If a DC motor was to be driven (as described in the present application) instead of an AC motor (as in the preferred embodiment of D1), it would be obvious to a person skilled in the art to employ the wiring conductor scheme shown in Figure 5B of D1 for the connections to the transistors. In such a case, the transistors would be acting as a semiconductor relay.

5.3 It follows from the above considerations that the load drive circuit according to claim 1 of the first auxiliary request is obvious to a person skilled in the art and cannot be considered as involving an inventive step within the meaning of Article 56 EPC.

6. *Second auxiliary request*

6.1 Claim 1 of the second auxiliary request contains the feature that said first conductor pattern and said

second conductor pattern are formed on a same plane. As support for this feature the appellant pointed to Figure 4 as originally filed.

6.2 However, Figure 4 of the present application is a plan view from which it is impossible to tell whether or not the first and second conductor patterns are on the same plane. This is not mentioned anywhere in the application as filed.

6.3 It follows that claim 1 of the second auxiliary request contravenes Article 123(2) EPC and that a patent cannot be granted on the basis of this request.

7. *Third auxiliary request*

7.1 Claim 1 of the third auxiliary request recites the combination of the characterising features of the first auxiliary request and the main request.

7.2 As pointed out in paragraph 5.2 above, Figures 4A, 4B, 5A and 5B of D1 show a preferred embodiment and other arrangements are possible within the general teaching of D1. In the judgement of the Board a person skilled in the art would understand that the general diagrammatic representation of the wiring shown in Figures 5A and 5B could be employed in other apparatus than the particular DC to AC converter shown in Figures 4A and 4B to obtain the advantage of equal path lengths promoting equal current sharing among the transistors. In particular, if a DC motor was to be driven instead of an AC motor, it would be obvious to a person skilled in the art to employ the wiring conductor scheme shown in Figure 5B of D1 for the

connections to the transistors. In such a case, the transistors would be acting as a semiconductor relay. Furthermore, as pointed out in paragraph 4.2 above, a person skilled in the art would see that the advantage of equal path lengths promoting equal current sharing among the transistors could be optimised by giving the first and second wiring conductor patterns the same dimensions.

7.3 It follows from the above considerations that the load drive circuit according to claim 1 of the third auxiliary request is obvious to a person skilled in the art and cannot be considered as involving an inventive step within the meaning of Article 56 EPC.

8. *Fourth auxiliary request*

8.1 Claim 1 of the fourth auxiliary request contains the feature that said first conductor pattern and said second conductor pattern are formed on a same plane.

8.2 Claim 1 of the fourth auxiliary request contravenes Article 123(2) EPC for the same reason as given above for the second auxiliary request. It follows that a patent cannot be granted on the basis of the fourth auxiliary request.

9. Since none of the versions of claim 1 according to the requests on file meets the requirements of the EPC, the appeal has to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

U. Bultmann

W. J. L. Wheeler