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Datasheet for the decision of 15 April 2026

Case Number: T 0835/25 - 3.4.02

Application Number: 21151774.3

Publication Number: 3852261

IPC: H02M7/483, H02M7/49, H02M7/487

Language of the proceedings: EN

Title of invention:
Coupled inductors inverter topology

Applicant:
Solaredge Technologies Ltd.

Relevant legal provisions:
EPC Art. 56

Keyword:
Main request - inventive step - (yes)

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Boards of Appeal

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Case Number: T 0835/25 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 15 April 2026

Appellant: (Applicant)	Solaredge Technologies Ltd. 1 HaMada Street 4673335 Herzeliya (IL)
Representative:	V.O. P.O. Box 87930 2508 DH Den Haag (NL)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted/electronically transmitted on 10 December 2024 refusing European patent application No. 21151774.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Flyng
Members:	C.D. Vassoille
	P. Guntz

Summary of Facts and Submissions

I. The appeal of the applicant (appellant) lies from the decision of the examining division, with which European patent application No. 21 151 774.3 was refused.

II. The following documents are relevant for the present decision:

D1: US 2019/363644 A1
D7: WO 2019/092305 A1
D8: CN 105 024 575 A
D10: US 2016/268923 A1
D11: US 2018/191270 A1
D12: US 2019/393802 A1
D13: CN 106 129 957 A
D14: CN 201 075 363 Y
D15: CN 1 815 840 A

III. In the decision under appeal, the examining division concluded that the subject-matter of claim 1 of the main request did not involve an inventive step within the meaning of Article 56 EPC, starting from document D1 as closest prior art in combination with the common general knowledge or in combination with any of documents D7, D8 and D13 to D15.

IV. In the statement of grounds of appeal, the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the claims of the main request filed on 7 October 2024 or, if this was not possible, on the basis of a first auxiliary request comprising the claims filed as a second auxiliary request on 7 October 2024.

V. Claim 1 of the main request has the following wording:

"An apparatus, wherein the apparatus is a single-phase, three-phase, or multi-phase power converter, comprising:

a pair of input terminals (A,B) configured to receive a direct current, DC, voltage;

a first series connection comprising a first capacitor (C1) and a second capacitor (C2), wherein the first series connection is connected across the pair of input terminals, and the first capacitor is connected to the second capacitor at a first terminal (E);

a single-phase converter circuit (20; 11) coupled to the pair of input terminals and configured to convert the DC voltage to an alternating-current, AC, voltage at an output terminal (J) as one phase output of the single-phase, three-phase, or multi-phase power converter;

the single-phase converter circuit (20; 11) comprising:

a second series connection comprising a first switch (Sc1), a second switch (Sc2), a third switch (Sc3) and a fourth switch (Sc4), wherein the second series connection is connected across the pair of input terminals (A,B), wherein the first switch is connected to the second switch at a second terminal (C), wherein the second switch is connected to the third switch at a third terminal (F), wherein the third switch is connected to the fourth switch at a fourth terminal (D);

a first additional series connection, comprising two or more switches (M1,M2) of the first additional series connection across the second terminal (C) and the fourth terminal (D) and a first intermediate node (IN1) between the two or more switches of the first additional series connection;

a second additional series connection comprising two or more switches (M3,M4) of the second additional series connection across the second terminal (C) and the fourth terminal (D) and a second intermediate node (IN2) between the two or more switches of the second additional series connection;

a first leg comprising a first inductor (L4) and a first relay (R1), wherein the first leg is connected between the first intermediate node (IN1) and the output terminal (J); and

a second leg comprising a second inductor (L5) and a second relay (R2), wherein the second leg is connected between the second intermediate node (IN2) and the output terminal (J)."

Claims 2 to 14 are dependent on claim 1.

Reasons for the Decision

Main request - inventive step (Article 56 EPC)

1. The subject-matter of claim 1 of the main request involves an inventive step within the meaning of Article 56 EPC.

2. Document D1 was considered by the examining division as the closest prior art in the decision under appeal. The Board sees no reason to depart from this assessment.

3. As correctly identified in the decision under appeal, claim 1 of the main request differs from document D1 in that:

   - the first leg connected between the first intermediate node and the output terminal comprise not only a first inductor, but also a first relay, and

   - the second leg connected between the second intermediate node and the output terminal comprises not only a second inductor, but also a second relay.

4. Starting from document D1 and considering the distinguishing features, the examining division identified the objective technical problem as how to increase the safety of a multilevel converter. The appellant did not dispute this.

5. The examining division found that the person skilled in the art would have arrived at the claimed solution by combining document D1 with the common general knowledge

of the person skilled in the art or with any one of the documents D7, D8 and D13 to D15.

6. The Board does not share this assessment. None of the cited further documents discloses, in the context of a multilevel inverter topology as in document D1, the specific arrangement of individual relays associated with each leg as defined by the distinguishing features.

7. In particular, the Board concurs with the appellant that document D7 discloses, at most, the provision of a relay downstream of the phase output of an inverter (see figure 3c). Such an arrangement, which the appellant did not dispute formed part of the common general knowledge, does not correspond to the configuration defined in claim 1, which requires a first and a second leg of a phase each to comprise a dedicated relay.

8. The same applies to document D8. In particular, figure 1 of D8 discloses that circuit breakers QF2, QF3 and QF4 are provided only downstream of the respective phase outputs. Document D8 therefore does not suggest a configuration in which individual legs of a phase are each provided with a dedicated relay, as required by claim 1.

9. For the sake of completeness, the Board observes that documents D10, D11 and D12, relied upon *inter alia* in the examining division's communication of 18 March 2024, equally concern arrangements in which a relay or circuit breaker is provided downstream of the phase output. As with documents D7 and D8, these disclosures do not go beyond what belongs to the common general knowledge and do not lead to a configuration in

which a first and a second leg of an individual phase are each equipped with a dedicated relay, as required by claim 1.

10. Accordingly, even taking into account the common general knowledge in the light of documents D7, D8 and D10 to D12, the person skilled in the art would at most have contemplated the provision of a single relay downstream of the phase output.

11. Documents D13 to D15 concern current splitting arrangements with parallel current paths and do not address the series and modular architecture underlying the inverter topology of document D1. In particular, the Board agrees with the appellant that the teaching relied upon by the examining division from documents D13 to D15 is, in essence, the use of parallel branches to permit the use of lower-rated switching devices by dividing a single common current between them.

As rightly explained in the statement of grounds of appeal, document D13 teaches that a single, common input current is split into two parallel branches, each branch comprising a lower rated relay (31, 32), and is then recombined into a single, common output current. Document D13 thus relies on a current splitting scenario with current sharing between continuously present parallel paths, and in that context assumes that a reactor divides the (short circuit) current between the branches so that the current through each branch is reduced. The same applies, in principle, to documents D14 and D15.

Furthermore, the appellant has convincingly pointed out that, in document D1 (in particular in the topology of figure 1C), the intermediate nodes of the respective

modules are different, such that there is no common input current in the sense required by document D13, and that the current in each module is dependent on the modulation of the switches. In other words, the context of document D1 does not provide the continuously present, electrically parallel current branches that would make the teaching of document D13 applicable for the purpose asserted by the examining division, namely to justify placing separate relays in the legs O1, O2, O3 of document D1's inverter.

The Board therefore agrees with the appellant that none of the documents D13 to D15 provides a pointer towards modifying the internal structure of the modular converter of document D1 so as to introduce dedicated relays within the respective module legs as defined in claim 1.

12. In conclusion, the Board considers that the reasoning of the examining division is based on an abstraction of common general knowledge that is not confirmed by concrete evidence showing that the person skilled in the art would have modified document D1 in the claimed manner without hindsight. For this reason, the Board is not convinced that the person skilled in the art, starting from document D1 and faced with the objective technical problem of increasing the safety of a multilevel converter, would have arrived at the claimed solution in an obvious manner, either by relying on common general knowledge or by taking into account documents D7, D8 and D10 to D15.

13. Consequently, the Board arrived at the conclusion that the subject-matter of claim 1 of the main request involves an inventive step within the meaning of Article 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent on the basis of the following claims and figures and a description to be adapted thereto, where necessary:

Claims:
No. 1 to 14 filed in electronic form on 7 October 2024.

Figures:
No. 1/15 to 15/15 as originally filed.

The Registrar: The Chairman:

L. Gabor G. Flyng

Decision electronically authenticated