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Anmeldenummer / Filing No / N^o de la demande : 83 903 308.1

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Bezeichnung der Erfindung: Composite electromotive apparatus utilizing solar
Title of invention: energy and the like.
Titre de l'invention :

Klassifikation / Classification / Classement : H02N 11/00

ENTSCHEIDUNG / DECISION

vom / of / du 10 April 1990

Anmelder / Applicant / Demandeur : Nagai, Toki

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Art. 83

Schlagwort / Keyword / Mot clé : Non-obvious but unclear features in the claims and in the description. Questions of sufficient disclosure. Remittal to Examining Division.

Leitsatz / Headnote / Sommaire



Case Number : T 213/89 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 10 April 1990

Appellant : Nagai, Toki,
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Representative : Freed, Arthur Woolf et al.
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Decision under appeal : Decision of Examining Division 054
of the European Patent Office
dated 28 November 1988 refusing
European patent application
No. 903 308.1 pursuant to Article
97(1) EPC

Composition of the Board :

Chairman : P.K.J. van den Berg
Members : W. Riewald
P. Ford

Summary of Facts and Submissions

- I. European application No. 83 903 308.1, claiming priority of an application in Japan of 28 December 1982, filed on 26 October 1983 and published on 30 January 1985, was refused by a decision of the Examining Division 054 dated 28 November 1988.

The decision was based on Claims 1 to 4, filed with letter of 14 July 1988.

- II. The reason given for the refusal was that Claim 1 was not allowable since its subject-matter lacked an inventive step and other details of the dependent claims were routine non-inventive design features. The following prior art documents had been taken into account in the examining proceedings:

D1: US-A-4 276 441
D2: DE-A-2 412 908
D3: DE-A-2 460 075
D4: FR-A-1 296 568
D5: DE-A-2 604 175
D6: DE-A-2 713 555

The Examining Division's arguments can be summarised as follows:

The solar converter of Claim 1 dated 14 July 1988 (and also of two preceding versions of Claim 1) comprises essentially a convex lens, one or more thermocouples, a photovoltaic cell and a fan-rotated electric generator. The apparatus of Claim 1 consists merely in the juxtaposition or association of these known devices each of which acts in its normal way, so that no non-obvious

working inter-relationship between the components is produced.

- III. On 30 January 1989 the Appellant filed a Notice of Appeal against that decision, the appeal fee having been received by the Office on 19 January 1989. A Statement of Grounds of Appeal was filed on 3 April 1989.

The Appellant's arguments in support of inventive step in his grounds of appeal and in his letter dated 14 July 1988, incorporated by reference in the grounds of appeal, can be summarised as follows:

It is contended that there is an inventive step by virtue of the fact that the various components of the solar energy converter have a functional inter-relationship in the sense of a true combination because they interact with one another so as to enhance the conversion of solar energy in an efficient and effective manner.

The fan not only assists the maintenance of the high and low temperature regions, but is also involved with the production of an electromotive force by means of the electromagnetic generator.

The fan is driven by both convective heat rising from the photovoltaic cell and direct solar radiation received by its blades.

There is nowhere in the cited prior art an indication that the various solar energy converting devices can be combined so as to provide such an efficient solar energy converter.

Furthermore it is noted that none of the cited prior art references describes the possibility of incorporating one

or more vents, filters or air adjusting valves in order to aid the rotation of a fan in the convection part of the solar energy converter as specified in the dependent Claims 2 and 4 dated 14 July 1988.

- IV. The Appellant's main request is that the Examining Division's decision be set aside and a patent be granted on the basis of Claims 1 to 4 "presently on file" (i.e. the claims received on 18 July 1988 with letter of 14 July 1988).

In the alternative, the Appellant requests granting a patent on the basis of a single Set A claim based on a combination of the Claims 1 to 4 of 14 July 1988.

In a further alternative, the Appellant requested that a date be set for oral proceedings.

- V. Claim 1 of the main request reads as follows:

"A solar energy converter comprising; at least one lens (2) for receiving sunlight and focusing the sunlight at a focal point (3) of the lens, whereby the lens acts as a heat-collecting condenser; and at least one thermocouple(s) (7) of which the high-temperature side(s) (7a) is/are positioned adjacent to the focal point (3) of the lens (2) and face(s) upwardly towards the lens (2), characterised in that the space between the lens and the thermocouple (7) defines a relatively high temperature region of the apparatus, the thermocouple(s) (7) acting so as to convert the sunlight and heat generated therefrom into electrical energy; a photovoltaic cell (15) (15a) for receiving the sunlight diverging from the focal point (3) and converting the sunlight into electric power, the space between the photovoltaic cell (15) and the thermocouple(s) (7) defining a relatively low temperature region of the

apparatus; a fan means (16a) configured so as to be driven by both convective heat rising from the photovoltaic cell (15) and direct radiation received by the fan, the fan means being operative for offering resistance to convective heat reaching the thermocouple(s) (7) from the photovoltaic cell thereby assisting the maintenance of a relatively high temperature differential across the thermocouple(s); and an electromagnetic generator (17), driven by the rotation of the fan means (16a), for converting some of the convective heat energy into electric power, the lens, the thermocouple, the photovoltaic cell and the fan means thereby combining so as to enhance conversion of solar energy into electrical energy."

VI. The single claim of the auxiliary request reads as follows:

"A solar energy converter comprising; at least one lens (2) for receiving sunlight and focusing the sunlight at a focal point (3) of the lens, whereby the lens acts as a heat-collecting condenser; and at least one thermocouple(s) (7) of which the high-temperature side(s) (7a) is/are positioned adjacent to the focal point (3) of the lens (2) and face(s) upwardly towards the lens (2), characterised in that the space between the lens and the thermocouple (7) defines a relatively high temperature region of the apparatus, the thermocouple(s) (7) acting so as to convert the sunlight and heat generated therefrom into electrical energy; a photovoltaic cell (15) (15a) is provided for receiving the sunlight diverging from the focal point (3) and converting the sunlight into electric power, which photovoltaic cell (15) has a concave surface, the centre of curvature of which has at the focal point (3), the space between the photovoltaic cell (15) and the thermocouple(s) (7) defining a relatively low temperature

region of the apparatus; a fan means (16a) is provided and is configured so as to be driven by both convective heat rising from the photovoltaic cell (15) and direct radiation received by the fan, the fan means being operative for offering resistance to convective heat reaching the thermocouple(s) (7) from the photovoltaic cell thereby assisting the maintenance of a relatively high temperature differential across the thermocouple(s); an electromagnetic generator (17) is provided, driven by the rotation of the fan means (16a), for converting some of the convective heat energy into electric power, the lens, the thermocouple, the photovoltaic cell and the fan means thereby combining so as to enhance conversion of solar energy into electrical energy; and a housing (20) is provided, the lens (2) being situated at the uppermost portion of the housing, the photovoltaic cell (15) being situated at the lower end of the housing remote from the solar energy source, the thermocouple(s) (7) being situated between the lens (2) and the photovoltaic cell (15), and the fan means (16a) being situated between the photovoltaic cell (15) and the thermocouple(s) (7), wherein the rotation of the fan means (16a) serves to: (a) remove convective heat from the photovoltaic cell (15) by directing warm convective air from the photovoltaic cell out of the housing (20) via a vent (28) in a neck (25) of the housing, thereby increasing the efficiency of the photovoltaic cell; and (b) enhance the temperature differential across the thermocouple(s) (7), thereby increasing the efficiency of the thermocouple(s); and wherein the housing (20) is substantially spherical and transparent, and has at least one vent (20a, 20b) having a filter for ventilation of the housing and one or more spaces with air adjusting valves (21a) and adjustable wall surfaces for promoting and aiding said rotation of the fan means (16a) caused by convection resulting from a temperature differential in the housing."

VII. In a communication dated 27 October 1989, the Rapporteur expressed the provisional opinion that some features that might be regarded as not obvious from the cited prior art were not quite clear. It was stated that these features not only required clarification but that there were also serious doubts left that a thus claimed subject-matter was disclosed in the application in a manner sufficiently clear for it to be carried out by a person skilled in the art (Article 83 EPC).

The Rapporteur drew attention to the fact that the first instance had not yet examined the application in respect of the requirements of Article 83 EPC. It was indicated that, since the Applicant was entitled to two instances in all essential questions of patentability, the Board would envisage remittal of the case to the Examining Division for further prosecution. The Appellant was asked whether he maintained his request for oral proceedings before the Board of Appeal, thus waiving his right to be heard before the first instance, or whether he agreed with the remittal of the case to the first instance.

VIII. The Japanese inventor replied directly to the EPO with two letters dated 18 February 1990, including a set of revised application documents, and accompanied by two letters to his representative (dated 25 December 1989 and 15/22 February 1990) indicating that the revised documents had also been sent to the representative.

IX. By letter of 28 February 1990 the representative confirmed that the Applicant agreed with the remittal of the case to the Examining Division for further prosecution.

Reasons for the Decision

1. The appeal is admissible.

2. No confirmation by the representative was received that any of the submissions directly received from the inventor should be regarded as an official reply to the Office action.- Since persons not having a residence or their principal place of business within the territory of one of the Contracting States must act through their representative in the proceedings, the said received direct submissions cannot be taken into account. Consequently the Board will only consider the requests according to item IV.

3. The Board agrees insofar with the decision of the Examining Division that in respect of the claimed combination of a lens, a thermocouple, a photovoltaic cell and fan means the prior art discloses already a considerable number of suggestions for use of such components.

D4 discloses a solar energy converter making use of both thermocouples and photovoltaic cells exposed to sunlight and converting it to electric power (page 1, left-hand column, lines 1 to 36; page 3, "résumé" No. 2). Biconvex lenses act as sunray collecting devices (page 3, right-hand column, lines 17 and 18).

D2 and D3 describe the combination of air current driven fan means driving an electromagnetic generator with photovoltaic cells (D2: wind driven rotor blades 16 and electromagnetic generators 20, page 7, lines 57 to 60, photovoltaic cells 25 and thermal elements 26, page 8, lines 11 to 15; D3: wind driven rotor blades 10,

electromagnetic generators G, supporting covering 11 for solar cells 13, Claims 1, 3 and 8 to 11).

Whereas D2 and D3 make use of the natural atmospheric air currents, it is also known from D6 (in particular Figs. 3, 5, 8, 12 and 13) to provide a special arrangement for transforming convective heat generated by solar radiation in order to cause an ascending air current within the arrangement for driving an electric generator.

4. When analysing Claim 1 according to the main request, the Board came across the following features which cannot be regarded as obvious from the cited prior art, which however require further clarification and give rise to doubts whether the subject-matter thus claimed is disclosed in the description sufficiently clearly and completely:

- The fan means are configured so as to be driven not only by convective heat rising from the photovoltaic cell but also by direct radiation received by the fan.
- The fan means is operative for offering resistance to convective heat reaching the thermocouples from the photovoltaic cell thereby assisting the maintenance of a relatively high temperature differential across the thermocouple(s). This feature is not quite understood.

It might be derivable in connection with Figure 2 (original Figure 3) of the application that the air current driving the fan means also flows across the low temperature part side 7b of the thermocouple 7 in order to remove heat therefrom (see page 8, lines 3 to 6 and page 9, lines 20 to 22).

5. It appears that in respect of an understanding of the technical details necessary for the claimed invention to be carried out by a person skilled in the art, the following points are crucial:

- The direct exploitation of solar energy is absolutely limited by the so-called solar constant (1,36 kW/m²). The realistic limit of exploitation is considerably lower than that provided by the solar constant due to energy losses in the atmosphere and low efficiencies of presently available thermocouples and photovoltaic elements. Therefore, the Appellant's aim to provide a solar energy converter which requires less space than known power plant systems and which is suitable for portable use (description pages 1 and 2, in particular page 2, lines 17 to 23) appears to be unrealistic in the context of the disclosure of the application.
- Still, the aim of improving the efficiency of solar energy converters is, of course, always desirable. However, the Appellant's suggestion to transform the solar radiation into electric energy partly via thermocouples and partly via photovoltaic cells would require more details about the distribution of the different components of the solar radiation on the two receiving means, if an inventive improvement over the prior art were to be acknowledged. No such details appear to be derivable from the application documents. (A thermocouple placed at the focal point of the lens and receiving the sun rays for transforming them into heat would debar the sunlight from going on to the photovoltaic cells beyond the focal point).
- The utilisation of convective heat rising from the photovoltaic cell to drive an electric generator by the generated air current through a fan means appears also

to be unrealistic within a small single-body converter apparatus as disclosed in the figures of the present application. There is no disclosure of special features of the fan means which might allow exploitation of particularly weak air currents.

Some inconsistencies in the description make it even more difficult to derive a technically useful teaching from the documents:

The downwardly directed venting route 16b in Figure 2 (original Figure 3) appears to be in contradiction to the natural thermic heat removal ventilation which is to be expected as upwardly directed from the photovoltaic unit 15. The function and control of the air adjusting openings 21a, 21b with the valves 21c and 21d appear to be not sufficiently disclosed.

The idea that the fan assists the maintenance of a relatively high temperature differential across the thermocouple (by venting its low temperature side) appears to be in contradiction to the fact that the air rising from the voltaic cell and moving towards the said low temperature cell is convectively heated, which is contrary to the intention to keep the temperature of that side low.

6. In the result, the Board considers that the objection of obviousness cannot be upheld prima facie in view of specific features, but that, however, these features require further examination of the application in respect of clarity of the claims (Article 84 EPC) and sufficient disclosure in the description of the necessary details for carrying out the invention as claimed (Article 83 EPC).

The Examining Division had already raised objections under Article 83 and 84 EPC in view of linguistically and technically unclear, obscure, vague or repetitive words and phrases (communications dated 17 March 1987, point 1, and 19 January 1988, point 1). The decision to refuse the application was, however, based on the sole ground of lacking inventive step. There was not yet a conclusive decision in respect of the objections raised under Articles 83 and 84. In particular, the technical questions raised above in section 5 have not yet been dealt with by the first instance.

For this reason, the Board deems it appropriate to make use of the power conferred upon it by Article 111(1) EPC to remit the case to the first instance for further prosecution.

7. For avoidance of doubt, the Board points out that, if the Examining Division should come to the conclusion that the application discloses one or another technical teaching that meets the requirements of Article 83, obscurities of other technical teachings contained in the application, but not pertinent to the claimed subject-matter do not and should not debar the Examining Division from granting a patent on the basis of a claim sufficiently supported by the clear and complete part of the disclosure provided that also the other provisions of the EPC are met (in particular Article 123(2) EPC).
8. Since the Appellant has agreed with the Board's intention to remit the case to the first instance, no oral proceedings have to be held.

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 for further prosecution.

The Registrar:

The Chairman:

M. Beer

P.K.J. van den Berg