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D E C I S I O N
of 4 June 2004

Case Number: T 0193/01 - 3.4.2

Application Number: 97932971.1

Publication Number: 0917719

IPC: H01G 4/12

Language of the proceedings: EN

Title of invention:

Semiconductor supercapacitor system, method for making same
and articles produced therefrom

Applicant:

Energenius, Inc.

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 83, 84, 111(1)

EPC R. 29(1)

Keyword:

"Clarity and support in the description (yes)"

"Remittal for further prosecution"

Decisions cited:

T 0094/82, T 1055/92, T 0630/93, T 0860/93

Catchword:

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Case Number: T 0193/01 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 4 June 2004

Appellant:

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Representative:

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Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 28 September 2000
refusing European application No. 97932971.1
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: M. P. Stock
Members: F. J. Narganes-Quijano
M. J. Vogel

Summary of Facts and Submissions

- I. The appellant (applicant) has lodged an appeal against the decision of the examining division to refuse European patent application number 97932971.1 (based on the International application No. PCT/IB97/00985 published under International Publication No. WO 98/07167).
- II. In the decision under appeal the examining division held that the subject matter of claim 1 of the main request then on file failed to define the structural features by which the storage capacity specified in the claim could be achieved, and in particular failed to specify the increased specific area substrate surface as an essential feature of the claimed subject-matter (Article 84 EPC). The examining division also held that the relative term "thin" in the expression "thin film" of claim 1 is open to arbitrary interpretation (Article 84 EPC), and expressed doubts as to whether the storage capacity of a composite as claimed constitutes a parameter commonly used in the art and whether the parameter can be clearly and unambiguously determined (Article 84 EPC). The division further held that claim 1 according to the auxiliary requests then on file did not comply with the requirements of Article 123(2) EPC.
- III. With the statement setting out the grounds of appeal the appellant submitted an amended set of claims including a claim 1 identical to claim 1 of the main request upon which the contested decision was based and claims 2 to 39 all referring back to the subject matter of claim 1, and requested that the decision under

appeal be set aside and that a patent be granted on the basis of this set of claims. The appellant also requested oral proceedings on an auxiliary basis.

Claim 1 according to the present request of the appellant reads as follows:

"A thin film composite of a substrate and a thin film, wherein the thin film comprises barium titanate of the formula $Ba_a Ti_b O_c$ wherein a and b are independently between 0.75 and 1.25 and c is between about 2.5 and about 5.0, and further wherein the thin film composite has a storage capacity of at least 0.3 farad/cm³."

IV. With a communication pursuant to Article 12 of the Rules of Procedure of the Boards of Appeal the Board informed the appellant of its preliminary view that the arguments advanced by the examining division in the decision under appeal in support of the objections raised under Article 84 EPC with regard to claim 1 did not appear persuasive. In the communication the Board also made the following observations:

- (a) "A review of the examination file reveals that
- the examination proceedings have been essentially focused on the compliance of claim 1 with the requirements of Article 84 EPC, and the division has not yet carried out an extensive examination of the application, in particular on the requirements laid down in Article 83 EPC [...] and Article 52(1) EPC (novelty and inventive step); and

- the International Search Report has not been established for all the originally claimed subject matter (see annex to form PCT/ISA/210 of the International Search Report).

In these circumstances, the present appeal should be confined to the grounds invoked by the division in the decision under appeal, i.e. to the compliance of claim 1 with the requirements of Article 84 EPC."

- (b) "In view of the above, the Board would envisage setting aside the decision under appeal and the remittal of the case to the department of first instance for further prosecution (Article 111(1) EPC) in order not to deprive the appellant of the possibility of having the outstanding issues considered by two instances.

Since in case of remittal the examination procedure would be continued before the examination division, there appears to be no need to appoint oral proceedings before the present Board."

- (c) "Incidentally, the Board draws the attention of the appellant to the following findings the pertinence of which should, upon remittal of the case, also be considered by the examining division:
 - (i) Present claims 9 and 11 refer to non-reactive, strain-inducing components in the substrate and would not appear to be supported by the description which only refers to additional components in the thin film (Article 84 EPC). In addition, these

two claims, although formally based on claim 13 of the original application, do not require an oxide including the component "M" - as was the case in claim 13 of the original application by virtue of its reference to claim 7 - and it is doubtful whether the original application supports the generalization made (Article 123(2) EPC). Similar considerations apply to claim 12 by virtue of its dependency on claim 11.

- (ii) Present claims 14 to 18 specify features (polarization reversing and inducing means, a buffer layer, etc.) that do not appear to be supported by the description (Article 84 EPC). In addition, contrary to claims 25, 33, 34 and 36 as originally filed which required particular substrate materials, present claim 14 does not appear to require any specific substrate material and the original application would not support the generalization implied by the claim (Article 123(2) EPC).
- (iii) The features of present claim 33 (unspecified "M", stoichiometric quantity defined in mol percent, etc.) are indefinite and in any case do not appear to be supported by the original application (Articles 84 and 123(2) EPC). The wording of present claim 38 (see lines 1 to 3) is also indefinite (Article 84 EPC).
- (iv) The production in claim 34, lines 2 and 3 of a titanium component from only barium and acetate components is indefinite (Article 84 EPC).

(v) Present claim 11 would appear to be superfluous by virtue of its dependency on claim 10 which also refers to claim 9 (Article 84 EPC, first sentence). The same deficiency is also noted with regard to claim 33 (see claims 7 and 28)."

V. In reply to the Board's communication the appellant expressed its agreement with the remittal of the case to the department of first instance.

VI. The arguments submitted by the appellant in support of its requests, as far as they concern issues which are relevant to the present decision, can be summarised as follows:

The thin film composite defined in claim 1 exhibits an extremely high energy density and has applicability in the production of micro-miniature capacitors.

Contrarily to the examining division's opinion, the storage capacity of a thin film composite can be given in terms of the capacitance measured in Farads per cubic centimetre. Document EP-A-0459575 cited in the International Search Report exemplifies in the passage on page 2, lines 24 and 25 the trend towards miniaturized electronic parts having a higher volume capacity. The remaining claims are directed to the different fields of application and the different methods of preparation of the thin film composite of claim 1 and are supported by the corresponding passages of the description.

Reasons for the Decision

1. The appeal is admissible.
2. *Compliance of claim 1 with the requirements of Article 84 EPC*

The application was refused by the examining division on the grounds that claim 1 did not comply with the requirements of Article 84 EPC, the reasons being as set out in point II above. Each of the issues addressed by the examining division under Article 84 EPC is considered in the following:

- 2.1 In the decision under appeal the examining division objected to the interpretation of the relative term "thin" in the expression "thin film" of the introductory passage of claim 1.

Claim 1 defines a composite constituted by a substrate and a dielectric thin-film and having a relatively high storage capacity expressed in terms of the capacitance per unit volume. The skilled person working in the technical field of microelectronic components would therefore understand that the composite defined in claim 1 operates, when electrically coupled to other components, as a capacitor of the dielectric thin-film type well known in the art. In addition, it is common knowledge in this art that the dielectric film of a thin-film capacitor should be sufficiently thin to provide a significant capacitance, but thick enough to preserve the physical characteristics of the film and in particular to withstand relatively high voltages

without dielectric breakdown. Thus, the relative term "thin" has for the skilled reader a sufficiently precise meaning in the context of the claim and in particular in the light of the use of the film in a capacitor of the dielectric thin-film type.

Consequently, the expression "thin film" has a well-recognised meaning in the context of the subject-matter of claim 1 and in the Board's view the use of the relative term "thin" does not render the claim unclear within the meaning of Article 84 EPC (see in this respect T 860/93, OJ EPO 1995, 47, point 3.1 of the reasons, and the Guidelines C-III, 4.5).

- 2.2 In the decision under appeal the examining division also objected to the definition of the subject-matter of claim 1 in terms of the storage capacity of the composite.

The Board does not share the doubts expressed by the examining division as to whether the storage capacity measured in Farads per volume unit, i.e. the volumetric capacitance, of a thin-film composite as claimed constitutes a common parameter in the field of microelectronics. The volumetric capacitance of a capacitance element depends on the structural characteristics of the element (materials, structural and geometrical arrangement, size, etc.) and constitutes a relevant parameter in the design of electronic devices, in particular when the devices require miniaturization, see in this respect page 2, lines 24 to 26 of EP-A-0459575 referred to by the appellant; see also abstract and column 1, lines 8 to 29 of US-A-4017885 and section "Introduction" and

Figure 1 of "Dielectric Characteristics of a Complex Perovskite Multilayer Ceramic Capacitor with Thin Dielectric Layers", S. Takakura et al., Japanese Journal of Applied Physics, Tokio, (JP), Vol. 34, No. 9B (1995), pages 5335 to 5337 [XP 702899], both documents being cited from the Board's own knowledge.

As regards the definition of the claimed subject-matter in terms of the storage capacity of the composite measured in Farads per unit volume, it appears that this parameter can be clearly and reliably determined by objective procedures common in the art (see the documents referred to in the former paragraph), the passage on page 24, lines 1 to 8 of the application exemplifying for the measurement of the capacitance an arrangement including a composite as claimed. In addition, claim 1 defines the composite not only in terms of the storage capacity, but also in terms of the structure of the composite (a substrate and a thin film) and of the composition of the thin film (a barium titanate as claimed), and in the Board's view this definition complies with the requirements of Article 84 and Rule 29(1) EPC, first sentence and constitutes an adequate characterisation of the claimed composite within the meaning of the established case law (see T 94/82, OJ EPO 1984, 75, points 2.1 to 2.7 of the reasons, and the consistent practice of the department of first instance set out in the Guidelines C-III, 4.7a).

Notwithstanding, the Board notes that the definition of the claimed composite in terms of its storage capacity, i.e. in terms of a parameter relating to a physical property of the composite, requires that the disclosure

of the invention enables the person skilled in the art to obtain the claimed composite in the sense of Article 83 EPC (see decision T 94/82, *supra*, point 2.5 of the reasons). This issue, however, does not appear to have been considered by the examining division so far.

Having regard to the above, the Board does not share the doubts expressed by the examining division in the contested decision as regards the clarity of the definition of the claimed composite in terms of its volumetric capacitance.

- 2.3 In its decision the examining division also held that claim 1 defines a composite in terms of its storage capacity without defining the structural features by which the storage capacity can be achieved, and in particular without specifying the increased specific area of the substrate as an essential feature of the subject-matter of the claim.

The examining division referred in this respect to the passage on page 10, lines 5 to 19 of the description of the application as published in support of its view that the structured substrate surface, i.e. the increased specific area of the substrate, is essential for achieving the claimed values of the storage capacity of at least 0.3 F/cm^3 . However, the passage states that "when produced by the methods recited herein, two-dimensional planar thin film composites have a capacitance generally up to 1.0, typically greater than 0.3, most typically between about 0.4 to about 0.5 farads/cm^3 " (page 10, lines 5 to 7), the expression "two-dimensional planar thin film

composites" being used in the context of the passage to distinguish these composites from composites having an "enhanced area (of the three-dimensional structure)" (page 10, lines 14 to 16 together with page 7, line 19 to page 10, line 4 and Figures 2 to 8). In addition, according to the same passage the latter composites have, as a consequence of the increased specific area of the substrate, a capacitance "up to 100, typically at least 1, more typically at least 50, most typically at least 100 farads per cubic centimeter" (page 10, lines 7 to 14). Therefore, according to the passage cited by the examining division a storage capacity of 0.3 F/cm^3 can be achieved according to the methods of the invention without a structured substrate surface, the latter being only essential for achieving higher values of the storage capacity according to a preferred embodiment, and consequently, contrary to the examining division's opinion, the claimed values of the storage capacity of at least 0.3 F/cm^3 are supported by the mentioned passage, on its proper interpretation, within the meaning of Article 84 EPC, second sentence.

As regards the test samples considered in the last sentence of the above-mentioned passage stating that "capacitances measurements as recited herein are based on 6 to 10 nF (nanofarads) per 1.3 mm diameter x 110 (nanometers) nm thick test samples" (page 10, lines 18 and 19), these test samples appear to have a storage capacity below the claimed storage capacity values and are not disclosed as constituting in themselves embodiments of the invention as defined in present claim 1.

In view of the above, the Board cannot follow the examining division's view that the feature relating to the structured substrate surface is disclosed in the description as constituting an essential feature of the composite defined in present claim 1.

In addition, apart from the features specified in claim 1, no other feature appears to have been disclosed in the description as constituting an essential feature of the composite defined in the claim. The Board is therefore satisfied that, as far as the content of the application is concerned (see in this respect T 1055/92, OJ EPO 1995, 214, points 4 and 5 of the reasons; see also T 630/93, not published in OJ EPO, points 3.1 and 3.2 of the reasons), the subject-matter of claim 1 appears to be supported by the description within the meaning of Article 84 EPC.

- 2.4 The Board observes in this context that the question of whether or not the claimed values of the storage capacity can actually be achieved following the methods disclosed in the application and referred to in the paragraph on page 10, lines 5 to 17 of the application cited by the examining division pertain, by their very nature, not to support by the description in the sense of Article 84 EPC, second sentence, but to the issue of sufficiency of disclosure within the meaning of Article 83 EPC. The same observation applies to the further question of whether the composites disclosed in the remaining parts of the description, and in particular in examples 1, 2 and 2[bis] relating to composites of an unspecified storage capacity and in the passage on page 20, line 14 to page 21, line 18 relating to devices and cells incorporating thin-film

composites, exhibit the storage capacity of the claimed composite.

- 2.5 The objections raised by the examining division under Article 123(2) EPC with regard to claim 1 of the auxiliary requests considered in the decision have no bearing on claim 1 according to the present request.
- 2.6 The Board concludes that, without prejudice to other amendments that might turn out to be appropriate or even necessary as a consequence of findings that may arise from the further examination of the application (see T 1055/92, *supra*, second paragraph of point 5 of the reasons, and T 630/93, *supra*, point 3.2 of the reasons), in particular on the issues of sufficiency of disclosure (Article 83 EPC) and substantive patentability (Article 52(1) EPC), present claim 1 meets the requirements set out in Article 84 EPC together with Rule 29(1) EPC, first sentence.

3. *Further prosecution*

Having regard to the above, the reasons given by the examining division for the refusal of the application on the only ground that claim 1 does not satisfy the requirements of Article 84 EPC do not convince the Board. The appellant's request for grant of a patent on the basis of the present application documents requires, however, further examination as to the formal and substantive requirements of the EPC, and in particular on the questions of whether the remaining claims satisfy the requirements of Articles 123(2) and 84 EPC (see in particular point IV-(c) above), whether the claimed invention is sufficiently disclosed within the

meaning of Article 83 EPC (see penultimate paragraph of point 2.2, and point 2.4 above), and whether the claims define patentable subject matter in the sense of Article 52(1) EPC with regard to the prior art (see second subparagraph of point IV-(a) above and the documents cited in the second paragraph of point 2.2 above).

Consequently, the decision under appeal must be set aside and, in view of the above considerations, the Board finds it appropriate to exercise its power under Article 111(1) EPC and to remit the case to the department of first instance for further prosecution.

4. *Request for oral proceedings*

Since the decision under appeal is to be set aside and the appellant has agreed with the course of action proposed by the Board in respect of the remittal of the case to the first-instance department for further prosecution (see points IV-(b) and V above), there is no need to appoint oral proceedings at this stage of the procedure.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance for further prosecution.

The Registrar:

The Chairman:

P. Martorana

M. P. Stock