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D E C I S I O N
of 9 September 2003

Case Number: T 0733/00 - 3.4.2

Application Number: 93114091.7

Publication Number: 0585933

IPC: G01N 27/30

Language of the proceedings: EN

Title of invention:
Planar electrode

Applicant:
MATSUSHITA ELECTRIC INDUCTRIAL CO., LTD.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 123(2)

Keyword:
"Inadmissible amendment - main request (yes); auxiliary request 1 (no), after amendment"

Decisions cited:
-

Catchword:
-

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Case Number: T 0733/00 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 9 September 2003

Appellant: MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
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Representative: VOSSIUS & PARTNER
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 2 March 2000 refusing European application No. 93114091.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: A. G. Klein
Members: M. A. Rayner
G. E. Weiss

Summary of Facts and Submissions

I. The appellant has appealed against the decision of the examining division refusing European patent application number 93 114 091.7. The patent application is in the field of neurophysiology and relates to a planar electrode.

In the examination proceedings, a text based upon which the division had proposed grant and involving an auxiliary request, was not approved by the applicant. The examining division decided the higher order requests before it contained added subject matter (Article 123(2) EPC), which led to refusal of the application. An amendment considered inadmissible by the examining division involved amending an upper limit of a range from 4×10^2 μm^2 to 4×10^4 μm^2, the division finding the documents as filed had only disclosed either the range of 3×10^2 to 4×10^2 μm^2, for example in claim 1 as filed or the specific value of 2.5×10^3 μm^2 as an example in the description. The view of the division was that existence of an error was obvious, but its correction as requested by the applicant was not. In particular, the skilled person could only determine the range as a whole was incorrect and would be unable to determine the correct range from the application as originally filed. Even if the exponent of the upper limit were proven as error source, the correction could just as easily have been 3 or 5. Although it is generally true that patent claims are drafted so that the specific values adopted in a preferred embodiment lie in the middle of the ranges specified in the claim, this need not always be the case.

II. Three sets of claims have been presented by the appellant for decision by the board, a main request, and auxiliary requests 1 and 2, these requests including independent claims worded as follows:

Main request

1. A planar electrode array comprising:
a) an insulating substrate (3) comprising one or a plurality of insulating layers;
b) one or a plurality of patterned conductive layers (1,2) on said substrate (3) which creates a plurality of nearly radially installed narrow conductive strips;
c) a patterned insulation layer (4) on said conductive layers (1,2); where a combination of said narrow conductive strips and said patterned insulation layer (4) creates one or a plurality of de-insulated conductive parts (5) in each said narrow conductive strip as terminals and one de-insulated conductive part (5) in each said narrow conductive strip as an electrode;
characterized in that said electrode has an area from 3×10^2 to 4×10^4 μm^2.

Auxiliary request 1

1. A planar electrode array comprising:
a) an insulating substrate (3) comprising one or a plurality of insulating layers;
b) one or a plurality of patterned conductive layers (1,2) on said substrate (3) which creates a

plurality of nearly radially installed narrow conductive strips;

c) a patterned insulation layer (4) on said conductive layers (1,2); where a combination of said narrow conductive strips and said patterned insulation layer (4) creates one or a plurality of de-insulated conductive parts (5) in each said narrow conductive strip as terminals and one de-insulated conductive part (5) in each said narrow conductive strip as an electrode;

d) a well for cell culture on the top of the planar electrode array;

e) each electrode having an area from 3×10^2 μm^2, including 2.5×10^3 μm^2 up to an area such that the electrode allows measuring electrical activities of cells with a sufficient signal to noise (S/N) ratio,

f) wherein each electrode has a resistance at an interface with a culture medium in said well such that electric stimulation can be applied over a long time exceeding a few days.

17. A method for capturing and/or producing a signal waveform of electrical activity in biological tissue or cell using a planar electrode array, comprising

a) an insulating substrate (3) comprising one or a plurality of insulating layers;

b) one or a plurality of patterned conductive layers (1,2) on said substrate (3) which creates a plurality of nearly radially installed narrow conductive strips;

c) a patterned insulation layer (4) on said conductive layers (1,2); where a combination of

said narrow conductive strips and said patterned insulation layer (4) creates one or a plurality of de-insulated conductive parts (5) in each said narrow conductive strip as terminals and one de-insulated conductive part (5) in each said narrow conductive strip as an electrode;
d) a well for cell culture on the top of the planar electrode array;
e) each electrode having an area from 3 x 10^2 μm^2, including 2.5 x 10^3 μm^2 up to an area such that the electrode allows measuring electrical activities of cells with a sufficient signal to noise (S/N) ratio,
f) wherein each electrode has a resistance at an interface with a culture medium in said well such that electric stimulation can be applied over a long time exceeding a few days;
wherein a stimulating current is applied over a long time exceeding a few days to biological tissue or cells at a certain electrode and wherein electrical activities of the biological tissue or cell corresponding to the stimulating current is recorded at other electrodes.

20. Use of a planar electrode array, comprising
a) an insulating substrate (3) comprising one or a plurality of insulating layers;
b) one or a plurality of patterned conductive layers (1,2) on said substrate (3) which creates a plurality of nearly radially installed narrow conductive strips;
c) a patterned insulation layer (4) on said conductive layers (1,2); where a combination of said narrow conductive strips and said patterned

insulation layer (4) creates one or a plurality of de-insulated conductive parts (5) in each said narrow conductive strip as terminals and one de-insulated conductive part (5) in each said narrow conductive strip as an electrode;

d) a well for cell culture on the top of the planar electrode array;

e) each electrode having an area from 3 x 10^2 μm^2, including 2.5 x 10^3 μm^2 up to an area such that the electrode allows measuring electrical activities of cells with a sufficient signal to noise (S/N) ratio,

f) wherein each electrode has a resistance at an interface with a culture medium in said well such that electric stimulation can be applied over a long time exceeding a few days;

for capturing and/or producing a signal waveform of electrical activity in biological tissue or cell using;

wherein a stimulating current is applied over a long time exceeding a few days to biological tissue or cells at a certain electrode and wherein electrical activities of the biological tissue or cell corresponding to the stimulating current is recorded at other electrodes.

Auxiliary request 2

The wording of the independent claims of auxiliary request 2 is not given as there is no need to deal with the subject matter concerned in this decision (see section 3.4 of the reasons for the present decision).

III. The case of the appellant can be summarised as follows:

Requests

Grant of a patent based on claim 1 of the main request submitted with the letter dated 1 August 2003 or alternatively that the case be remitted to the first instance for further prosecution with claims 1 to 22 of auxiliary request 1 or with claims 1 to 20 of auxiliary request 2 filed at the oral proceedings on 9 September 2003.

Arguments

The appellant argues that the skilled person would recognise the inconsistency in electrode area between the claimed range of 3×10^2 to 4×10^2 μm^2 and the value of 2.5×10^3 μm^2 in the description and thus that an error had occurred in the exponent of 10 at the upper end of the range. It is apparent to the skilled person when considering the whole application that the description is correct, it referring to a square hole of 50 µm x 50 µm and the drawings showing consistency with this and the described spacing value of 300 µm. Consequently, the skilled person recognises that it is the upper limit which is wrong. In the appellant's view, the upper exponent should be 4 (2 plus 2) in the light of discussion of the disclosed electrode spacing of 10 to 1000 µm (two orders of magnitude different), the value of which in the described embodiment is 300 µm. This is within the range, just as the area in the described embodiment is intended to be, one expecting this to be in the middle of the claimed range. This is in accordance with normal patent

drafting practice, as illustrated for example by the chemical example given in the Guide for Applicants issued by the European Patent Office (range in claim 0.1 to 30 g/l, example 4 g/l). The correction also corresponds to the appellant's intentions as disclosed in the second priority document, although on the basis of the priority document no correction contrary to decision G0003/89 is intended. From the application it is clear that the range of electrode area is selected to satisfy interface resistance, signal to noise and stimulation time requirements.

IV. In the appeal proceedings, oral proceedings were requested on an auxiliary basis by the appellant and appointed by the board. In an annex to the summons to oral proceedings, the board remarked on an inconsistency in the documents as filed between the values given in the claims and the embodiment referred to in the description and that the documents as filed seemed to teach a range for the electrode area. Delimiting this range seemed to the board to involve considerations such as resistance, S/N parameters or stimulation for a time exceeding a few days. The board had doubts about the approach of the appellant in relation to the exponent of the upper limit, since in the absence of a specific correction value, it did not seem that the reasoning offered provided a direct and unambiguous disclosure of an upper exponent limit of 4. No direct relationship between spacing and area seemed to exist and in any case the claimed exponents, i.e. 2 and 4 did not correspond to those of the spacing, i.e. 1 and 3.

V. At the end of the oral proceedings, the board gave its decision.

Reasons for the Decision

1. *Admissibility of the appeal*

The appeal complies with the provisions mentioned in Rule 65(1) EPC and is therefore admissible.

2. *Pertinent Original Disclosure*

2.1 Column 3, line 55 to column 4, line 8 of the "A" publication (=first paragraph on page 7 of the documents as filed) has the following content:-

"In addition, adjusting the electrode area in the range from 3×10^2 to 4×10^2 μm^2 enables application of electric stimulation to a cell over a long time exceeding few days as well as measurement of electric activities of the cell. In particular, in the lower end of the electrode area range, the planar electrode of the invention is suited for recording subtle cell activities, while in the higher end of the electrode area range, the invention is suited for applying electric stimulation to cells over a long time. Adjusting the electrode area to the above-mentioned range enables designing a planar electrode suited for a variety of applications."

2.2 Column 7, line 52 to column 8, line 10 of the "A" publication (= paragraph bridging pages 14 and 15 of the documents as filed) has the following content:

"With respect to the electrode area, in order to avoid electrode breakage when electric stimulation is applied to the cell over a long time, it is necessary to reduce resistance at the interface with the culture medium, requiring a size exceeding a certain level. However, as the electrode area increases and the resistance at the interface with the culture medium reduces, the electric activity of the cell to be measured decreases and the signal to noise (S/N) ratio decreases. That is, if the current value I is constant, it follows from I = V/R that the potential V to be measured reduces with decreasing resistance R. That is, the electrical activities of the cell to be measured decrease and the S/N ratio lowers. Consequently, the electrode area must carefully be adjusted; it is desirable for the electrode area to be from 3 x 10^2 to 4 x 10^2 μm^2."

2.3 Column 3, line 55 to column 4, line 8 of the "A" publication pertaining to Embodiment 1 (=penultimate and paragraph bridging pages 17 and 18 of the documents as filed) has the following content:

"Then, the substrate was exposed to light through a photoresist so that the central portion of each electrode 1 was located on each intersection of 8 x 8 lattices (position 5 as shown in Fig. 2), the center-to-center distances of nearest electrodes of each electrode were equal, and lead wire 2 formed the pattern of electrode 1 and lead wire 2 in which lead wire 2 was stretched radially. It was then etched with ITO in a solution which was made up using demineralized water, hydrochloric acid, and nitric acid in a volume ratio of 50:50:1, and the photoresist was removed. The

wiring portion with electrode 1 being 60 µm in diameter, lead wire 2 being 30 µm wide, and a center-to-center distance of electrodes of 300 µm was thus formed.

Then, for insulating layer 4, negative photo-sensitive polyimide (hereinafter called "NIP") was spin-coated so that a film 1 µm thick was formed after drying, and an insulating layer pattern was exposure-formed so that a 50 µms square hole 5 was produced at the center of each electrode of the wiring section as shown in Fig. 2. Furthermore, to the exposed portion of each electrode (that is, the inside of the 50 µms square), gold 6 was evaporated in a film thickness of 50 nm.
The contact with the external circuit of the section near the end opposite to electrode 1 of lead wire 2 was coated with gold 7 and nickel 8 to improve durability."

2.4 Claim 1 as originally filed is worded as follows:

"1. A planar electrode comprising an insulating substrate, a multiplicity of electrodes on said substrate with an equal distance between adjacent electrodes, a wiring section in which lead wires are installed nearly radially from said electrodes, and an insulating layer covering said lead wires, said electrodes each having an area from 3×10^2 to 4×10^2 μm^2."

A similarly worded passage comprising two sentences is contained in lines 47 to 54 of column 2 of the "A" publication (=paragraph bridging pages 4 and 5 of the documents as filed).

3. *Article 123(2) EPC*

3.1 The disclosure referred to in section 2.1 above permits the conclusion that a "range" of electrode area is disclosed. Nevertheless, as can be seen from sections 2.3 and 2.4 above, there is an inconsistency between the values given in the claims, which refer to an area from 3 x 10^2 to 4 x 10^2 μm^2, and the specific area value of 50µm x 50µm (=2.5 x 10^3 μm^2) given for Embodiment 1, referred to in the description. Since there is no inconsistency between the lower value of 3 x 10^2 μm^2 and the value for Embodiment 1, there is no reason for the skilled person to question the value concerned.

The board therefore considers the skilled person would seek to resolve the inconsistency between the upper value given for the range and that given for Embodiment 1. So far as Embodiment 1 is concerned, a pointer to correctness is given by the recitation of an electrode spacing of 300 µm in the description. While no scale is given in Figure 2, which is a typical patent figure, it is in the view of the board nevertheless fair to say that the skilled person can see in the case of Embodiment 1 that the ratio of spacing for the electrodes to their size tally with the specific value given in the description. Moreover, in the description of Embodiment 1, there is mentioned both "a 50 µms square hole" and also "the inside of the 50 µms square", both pointing to 2.5 x 10^3 μm^2.

While it is true that the range from "3 x 10^2 to 4 x 10^2 μm^2" is mentioned in claim 1 as filed and the cited passages above except section 2.3 concerning Embodiment 1, such mentioning amounts to no more than

repeating the wording "from 3 x 10^2 to 4 x 10^2 μm^2", so that there is no further clue permitting verification of the upper value.

Therefore, the board concluded that the skilled person would resolve the inconsistency in favour of the value given for Embodiment 1, i.e. would realise on the one hand that the upper limit given for the range is simply wrong and on the other hand that the value given in Embodiment 1 is correct.

It can also be seen from he disclosure in sections 2.1 and 2.2 above that considerations involved in delimiting this range pertain to resistance, S/N parameters or stimulation for a time exceeding a few days.

3.2 Main request

The board finds itself in agreement with the examination division that the correction 10 to the power 2 to 10 to the power 4 is not an obvious correction in the sense of Rule 88. The line of argument of the appellant including its reference to the Guide for Applicants and concerning determination of ranges in drafting of patent specification as including the embodiment at the middle of the range is one quite possible description of a practical approach to patent drafting, but it is not the only possibility. Technical discussions with inventors may indicate for example that the range can be so large or so small that the example lies towards one or other extreme. In addition, technical knowledge of content of prior teachings may play a role in determining a limit of the

range. Other factors may also be involved. Therefore, it must be concluded that a possible drafting practice of a patent practitioner does not render immediately obvious that nothing other than the correction requested was intended. The fact that the value for electrode separation (300 µm) given in Embodiment 1 is in the range 10 to 1000 µm (a difference of two orders of magnitude) as recited in dependent claim 2 cannot be considered relevant to correcting the upper limit for electrode area as the parameter concerned is different, no direct and unambiguous relationship existing between the two parameters at the upper end of the respective ranges. Neither, in the light of decision G 3/99 (see point 7 of the Reasons), can the priority document be used for a correction. Therefore, the board is not satisfied that the requirements of Rule 88 are met.

As there is no disclosure of the value of 4×10^4 µm^2 in the documents as filed, the board is not satisfied as to admissibility in the sense of Article 123(2) of claim 1 according to the main request.

3.3 Auxiliary request 1

The board has no doubt that the skilled person understands from the application as filed that a range of values for the area is taught and the independent claims of this request include wording for the upper limit of the range which can be found in the documents as filed (see for example points 2.1 and 2.2 above). Replacing the incorrect upper limit with this wording accords with what the skilled person understands from the documents as filed and thus does not amount to addition of subject matter. The remaining amended

features can also be found in the documents as filed. For this reason, the appellant succeeded in convincing the board of admissibility in the sense of Article 123(2).

3.4 Auxiliary request 2

Since auxiliary request 1 provides claims against the admissibility of which the reasons for the decision under appeal pertaining to refusal of the application are not persuasive, consideration of the claims of auxiliary request 2 is not necessary in the present decision.

4. *Article 111(1)*

Since the wording of the claims of auxiliary request 1 considered admissible by the board was not included in the requests presented before the first instance, a fresh situation not considered by the first instance has arisen. Therefore, in view of the request of the appellant for remittal and to ensure the appellant is not deprived of an instance, the board considers it appropriate to remit the case to the first instance for further prosecution in respect of matters not decided by this decision. In this connection, for avoidance of doubt the board observes that amendments consistent with its *ratio decidendi* are not excluded. For example, the board has noticed that in use claim 20 of auxiliary request 1, the word "using" at the end of the penultimate clause is in error.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance for further prosecution on the basis of the auxiliary requests filed at the oral proceedings.

The Registrar:

P. Martorana

The Chairman:

A. G. Klein