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Datasheet for the decision of 6 February 2024

Case Number: T 0324/21 - 3.4.03

Application Number: 16905695.9

Publication Number: 3364729

IPC: H05K1/02

Language of the proceedings: EN

Title of invention:
PRINTED WIRING BOARD, AIR CONDITIONER AND A METHOD FOR MANUFACTURING PRINTED WIRING BOARD

Applicant:
MITSUBISHI ELECTRIC CORPORATION

Headword:
Intermediate generalisation in a trap-like situation

Relevant legal provisions:
EPC Art. 123(2)
RPBA 2020 Art. 13(1), 13(2)

This datasheet is not part of the Decision.
It can be changed at any time and without notice.

Keyword:
Main request - amendments - unallowable intermediate generalisation
Auxiliary requests 1 and 2 - amendment after board's communication - exceptional circumstances (yes) - suitability of amendment to resolve issues raised (no) - admitted (no)

Decisions cited:
G 0003/89, G 0011/91, G 0002/10, T 0169/83, T 0398/00, T 0989/15, T 0954/17

Catchword:
The description of a drawing may be inextricably linked to the specific disclosure of this drawing. If a feature in the description of the drawing is extracted from the very specific context of the drawing in order to be included in a claim, the specific disclosure of the drawing must be taken into account. If there is no literal support for this specific disclosure in the application as filed which could be used for supplementing the feature used for amending the claim, it may not be possible to avoid an unallowable intermediate generalisation. This may in particular occur if a feature from a specific and detailed embodiment is placed in the context of a schematic drawing. This may lead to a trap-like situation. (Reasons, 2.8.4 and 2.9)

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Beschwerdekammern

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Case Number: T 0324/21 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 6 February 2024

Appellant: MITSUBISHI ELECTRIC CORPORATION
(Applicant) 7-3, Marunouchi 2-chome
Chiyoda-ku
Tokyo 100-8310 (JP)

Representative: Pfenning, Meinig & Partner mbB
Patent- und Rechtsanwälte
Joachimsthaler Straße 10-12
10719 Berlin (DE)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted on 20 October 2020 refusing European patent application No. 16905695.9 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman T. Häusser
Members: A. Böhm-Pélissier
T. Karamanli

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division to refuse European patent application No. 16 905 695 on the grounds of lack of inventive step (Articles 52(1), 56 EPC) and lack of clarity (Article 84 EPC).

II. Reference is made to the following document:

D2: JP 2003 188565 A

III. The appellant was summoned to oral proceedings. In a communication under Article 15(1) RPBA dated 19 June 2023, the board gave its preliminary opinion.

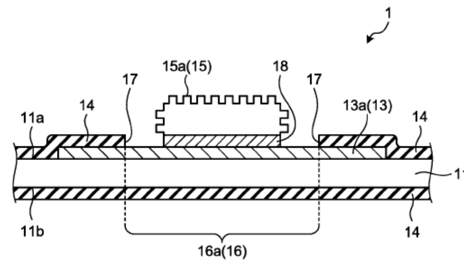
IV. Oral proceedings before the board were held on 6 February 2024.

V. 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 with the statement setting out the grounds of appeal or, alternatively, of the first or second auxiliary request, both filed by letter dated 4 September 2023.

VI. Claim 1 according to the **main request** (labelling (A), (B), ... inserted by the Board):

(A) A printed circuit board (1) comprising:
(B) an insulating substrate (11) having a plurality of wiring patterns (13a; 13b) on a main surface (11a; 11b) thereof;
(C) a plurality of pad portions (16a; 16b) on the plurality of wiring patterns;

(D) an electronic component (12; 20) mounted on the main surface and connected to the wiring patterns;
(E) a solder resist (14) and
(F) a plurality of heat-dissipating surface mount components (15a; 15b) that are surface mount components,
(G) the plurality of heat-dissipating surface mount components being joined via a solder (18) one-to-one to the plurality of pad portions (16a; 16b) to dissipate heat of the wiring pattern, wherein
(H) the electronic component is a large-current electronic component (20) having a plurality of electrodes (21) required to have insulation distances therebetween, and
(I) the plurality of the heat-dissipating surface mount components are mounted on the pad portions (16a; 16b) on the wiring patterns,
(J) the plurality of electrodes of the large-current electronic component being connected one-to-one to the plurality of pad portions (16a; 16b)
(K) wherein the pad portions (16a; 16b) are defined by the wiring patterns (13a; 13b) exposed through openings (17) provided in the solder resist (14), and wherein
(L) each of the heat-dissipating surface mount components (15a) has a bottom surface entirely joined to a corresponding one of the pad portions (16a) via a solder (18),
(M) the pad portion (16a) being larger than the bottom surface of the heat dissipating surface mount component (15a),
(N) such that the pad portion (16a) includes a part having the heat-dissipating surface mount component (15a) not mounted thereon.



application

11 = substrate (11a/11b surfaces)
13a= wiring pattern
14 = solder resist
15a= heat-dissipating surface mount component
16a= pad portion
17 = opening
18 = solder

VII. Claim 1 of the **first auxiliary request** differs from claim 1 of the main request in that feature (M) is deleted and feature (N) is amended to feature (N1) as follows:

(N1) ~~such that~~ the pad portion (16a) including~~es~~ a part having the heat-dissipating surface mount component (15a) not mounted thereon.

VIII. Claim 1 of the **second auxiliary request** differs from claim 1 of the first auxiliary request 1 in that features (H), (L) and (N1) are amended to features (H2), (L2) and (N2) as follows:

(H2) the electronic component is a large-current electronic component (20) having a plurality of electrodes (21) each connected to a pad portion (22a) provided on a first main-surface wiring pattern (13a) of the wiring patterns, the

electrodes being required to have insulation distances therebetween, and

(L2) each of the heat-dissipating surface mount components (15a) has a bottom surface entirely joined via a solder (18) to a corresponding one of the pad portions (16a) ~~via a solder (18)~~ on such a wide-area portion of the first main-surface wiring pattern (13a) as to increase an area where the first main-surface wiring pattern (13a) and the heat-dissipating surface mount component (15a) are joined to each other via the solder (18),

(N2) and wherein the pad portion (16a) includes~~ing~~ a part having the heat-dissipating surface mount component (15a) not mounted thereon.

IX. The arguments of the appellant can be summarised as follows:

(a) Claim 1 of all requests complies with the requirements of Article 123(2) EPC without any intermediate generalisation.
(b) Feature (H) is based on paragraph [0040] of the application as filed and feature (L) is based on claim 3 and paragraph [0039] of the application as filed.
(c) Features (M) and (N) have an equivalent meaning and are based on paragraphs [0035] and [0036] of the application as filed relating to the specific and detailed embodiments of Figures 2 to 6.
(d) In view of the schematic drawings of Figures 7 and 8 and the corresponding description having a broad meaning and substantially corresponding to the subject-matter of claim 1, features (M) and (N) can be generalised to the broad meaning of claim 1.

(e) The person skilled in the art will know how the pad portion not covered by the bottom surface of the heat dissipating component must be designed in order to achieve the effect of heat dissipation via said pad portion and to ensure correct positioning of the heat dissipating component on the pad portion.

(f) Claim 1 of auxiliary request 2 contains almost all the features from the description of Figures 7 and 8 and thus contains the exact context of features (H2), (L2) and (N2), so that these features are not isolated from their immediate context.

(g) Auxiliary requests 1 and 2 are filed in response to the objections under Article 123(2) EPC first raised in the board's communication under Article 15(1) RPBA and should therefore be admitted into the proceedings. Furthermore, respective claim 1 of these requests does not contain added subject-matter.

Reasons for the Decision

1. **The invention as claimed**

1.1 The invention relates to the improvement of heat dissipation on a printed circuit board (PCB).

1.2 This is achieved by wiring on the PCB protected with solder resist, whereby the heat dissipating surface mount components (here "HDSMC") are mounted directly on the wiring in an opening in the solder resist.

2. **Main Request - Article 123(2) EPC**

2.1 The European patent application may not be amended in such a way that it contains subject-matter which

extends beyond the content of the application as filed (Article 123(2) EPC). The concept of "content of the application as filed" relates to the parts of the European patent application which determine the disclosure of the invention, namely the description, the claims and the drawings (G 3/89, OJ EPO 1993, 117, and G 11/91, OJ EPO 1993, 125). According to the "gold standard" for assessing compliance with Article 123(2) EPC, any amendment can only be made within the limits of what the person skilled in the art would derive directly and unambiguously, using common general knowledge, and seen objectively and relative to the date of filing, from the whole disclosure of the description, claims and drawings of the application as filed (G 2/10, OJ EPO 2012, 376, G 3/89 and G 11/91; see also Case Law of the Boards of Appeal of the European Patent Office, 10th edition, 2022, II.E.1.1).

2.2 *Inter alia* features (H), (L), (M) and (N) have been amended. During the oral proceedings before the board mainly the basis for features (M) and (N) in the application as filed were discussed. Feature (N) allegedly has a basis in the respective last sentence of paragraphs [0035] and [0036] of the application as filed. Both sentences have very similar content and refer to HDSMCs 15a and 15b, respectively:

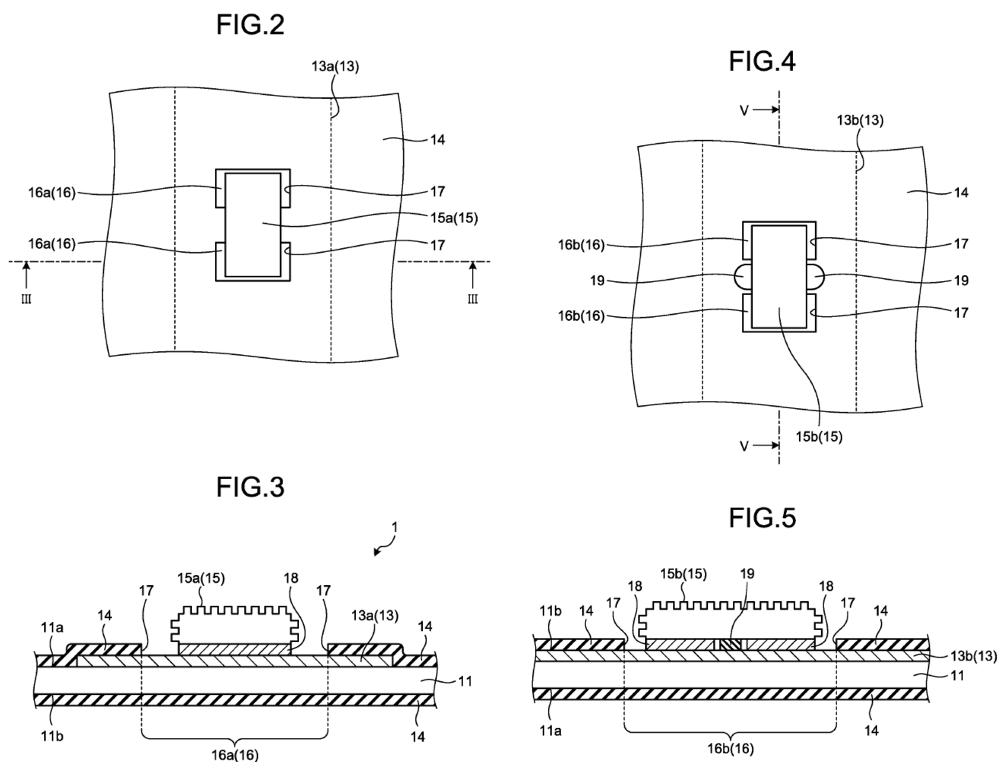
> *[0035]/[0036] ... In addition, heat conducted from the electronic component 12 to the first [second] main-surface wiring pattern 13a [13b] and heat generated from the first [second] main-surface wiring pattern 13a [13b] are partially dissipated from the first [second] main-surface wiring pattern 13a [13b] at the <u>pad portions 16 exposed through the opening 17 and having no first [second] heat-</u>*

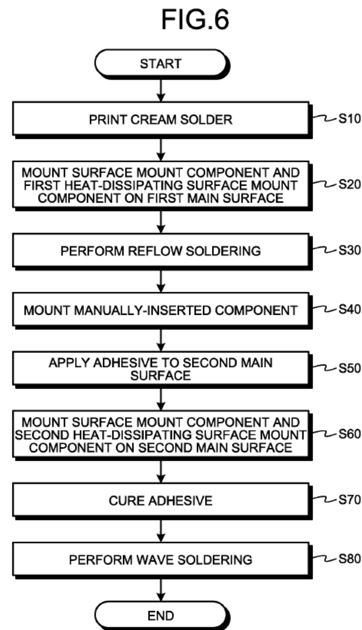
dissipating surface mount component 15a [15b] mounted thereon.

(differences in [0036] in brackets; underlining by the board)

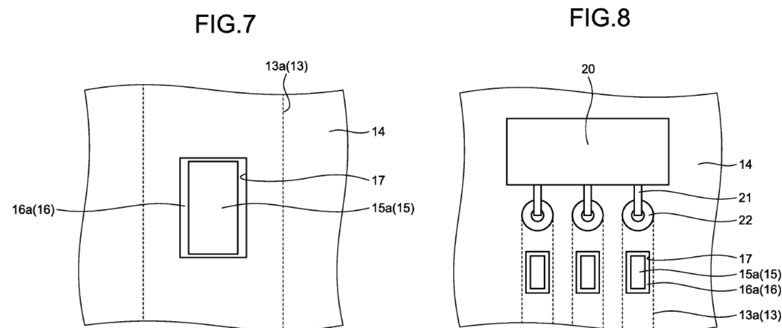
2.3 The board and the appellant agree that features (M) and (N) have equivalent meanings. Feature (M) defines that the pad portion is larger than the bottom surface of the HDSMC. Feature (N) defines the necessary and sufficient condition that a part of the pad portion does not have an HDSMC mounted thereon.

2.4 Paragraphs [0035] and [0036] refer to Figure 6 and to the two detailed embodiments shown in Figures 2 and 3 and Figures 4 and 5, respectively, i.e. the detailed manufacturing process of the claimed PCB, the result of which is shown in the two detailed embodiments of Figures 2/3 and 4/5. Figure 6 shows the individual manufacturing steps.





2.5 Figures 7 and 8 show a schematic illustration of the pad portions 16 and the wiring 13 of the PCB as well as the assembly of the high-current component 20 (Fig. 8) and one (Fig. 7) or three (Fig. 8) HDSMCs 15. The drawings are schematic in that, for example, the special pad portion shapes of Figures 2 and 4 and the special shapes of the HDSMCs 15a and 15b as well as the use of adhesive 19 and the special structure of the solder resist 14 are not shown.



2.6 Claim 1 comprises some of the features illustrated in schematic Figures 7 and 8 (and described in paragraphs [0039] and [0040]) as well as the additional features

(M) and (N) disclosed only in the description of the detailed embodiments of Figures 2 to 6 in paragraphs [0035] and [0036].

2.7 The appellant argues that the skilled person would directly and unambiguously derive features (M) and (N) in their broad meaning from Figures 7 and 8 if they knew features (M) and (N) from the description of Figures 2 to 6. Claim 1 was based on the description of Figures 7 and 8, which was very broad and thus included every shape, size and arrangement of the pads or HDSMCs. Based on this broad description, the skilled person would therefore deduce that, despite the representation of precise shapes, sizes and arrangements of the pads/HDSMCs, every shape, size and arrangement of the pads/HDSMCs was included by the inventive concept.

2.7.1 The description and drawings should be read and understood with the expertise of the skilled person. For example, the skilled person knew how large the pads had to be designed so that heat could be dissipated or so that the HDSMCs could be mounted without overlap with the solder resist. It was also recognised in the case law, such as decision T 398/00, that features could be derived from drawings.

2.7.2 The description was suitable for extracting individual features from the embodiments and including them in the independent claim. The skilled person knew that features (M) and (N) were independent of the other features, which were not essential for the invention, and that they were also not functionally related to these other features. Therefore, feature (M)/(N) could be isolated from the detailed embodiments of Figures 2 to 6 and derived directly and unambiguously in their

broad terms from the disclosure of the drawings. The skilled person would infer the general meaning of features (M) and (N) in view of the schematic drawings of Figures 7 and 8.

2.7.3 The effect of the difference in size between the bottom surface of the HDSMC to be soldered and the pad portion was both a better heat dissipation through the exposed part of the pad portion and better fitting of the HDSMC by providing a clearance for fitting the HDSMC, i.e. by minimising the risk that the HDSMC was partially mounted on solder resist. The skilled person knew how to design the pads such that these effects were achieved.

2.8 The board does not share this opinion. The embodiments of Figures 2 to 6 contain many details about the PCB and its manufacture. For example, the composition of the layers of the PCB, the adhesive 19 on the second main surface 11b, the pattering methods, curing and the various soldering methods. The feature (M)/(N) is mentioned in the context of the mode of action of the structure of the very special arrangement of Figures 2 to 5. This effect and function, namely the partial dissipation of heat by the pads 16, is only achieved for the special relative dimensions of pads 16 and HDSMCs 15 shown in Figures 2 to 5 and not for any arbitrary structure, e.g. if the pads are only infinitesimally larger than the bottom surface of the HDSMCs. The feature (M)/(N) is thus very strongly embedded in the specific embodiments of Figures 2 to 6 and cannot be transferred in its general and broad meaning to the schematic and generalised representation of Figures 7 and 8 without resulting in a generalisation, which is not disclosed in the application as filed.

2.8.1 Despite the more generalised and simplified representation, the schematic drawings of Figures 7 and 8 still contain certain specific features, such as the shape and relative sizes of the pad portions 16 and HDSMCs 15 and also of the wiring 13 forming the pad portions 16, which in turn depend on the type and size of the large-current electric component 20. Feature (M)/(N) is very broad in that it leaves completely open the shapes of the pad portion, the HDSMC and the non-covered part of the pad portion as well as the difference in size between the bottom surface of the HDSMC to be soldered and the pad portion (between infinitesimally small and very large as no relative relationship or e.g. order(s) of magnitude are given).

2.8.2 Moreover, improved heat dissipation through the exposed part of the pad portion and improved fitting of the HDSMC can only be achieved for a certain minimum amount of clearance, as shown schematically in Figures 7 and 8. These drawings also show that an arbitrarily large spacing is not possible, due to the limited space provided by the wiring 13, the dimensions and shape of which are determined by the size and spacing of the electrodes 21 of large-current electronic component 20. However, this spacing range or any detail in this respect is not reflected in features (M) and (N) (and is not disclosed in the description of the application as filed, either).

2.8.3 Figures 7 and 8 also show both a certain (rectangular) shape of the pad portion 16 and that a distance to the solder resist 14 is maintained on all sides of the HDSMC. In features (M) and (N), however, any shape and size of both the pad portion and the bottom surface of the HDSMC is possible as long as the former is larger

than the latter. Furthermore, feature (M) also leaves it completely open whether the specified condition ("larger") applies to only one, several or all sides of the pad portion 16 and similarly for feature (N). The board is of the opinion that in order to avoid an extension of subject-matter beyond the content of the application as filed, at least these additional features of Figures 7 and 8 would have to be included in the claim wording.

2.8.4 The description of a drawing may be inextricably linked to the specific disclosure of this drawing. If a feature in the description of the drawing is extracted from the very specific context of the drawing in order to be included in a claim, the specific disclosure of the drawing must be taken into account. If there is no literal support for this specific disclosure in the application as filed which could be used for supplementing the feature used for amending the claim, it may not be possible to avoid an unallowable intermediate generalisation. This may in particular occur if a feature from a specific and detailed embodiment is placed in the context of a schematic drawing.

2.8.5 In view of the above, the board is of the opinion that an unallowable intermediate generalisation occurs by placing the text passages quoted above from paragraphs [0035] and [0036] of the detailed embodiments of Figures 2 to 6 in the context of the description of schematic Figures 7 and 8, which is in turn inseparably linked to the specific disclosure of Figures 7 and 8.

2.8.6 As an illustrative example, in the present case, the specific disclosure of Figures 7 and 8 in relation to the relative sizes and (rectangular) shapes of the pad

portions and HDSMCs and their relative arrangements may be illustrated by the following excerpts from these drawings (where the inner rectangles represent the HDSMCs and the outer rectangles the pad portions):

When incorporating feature (M)/(N) into the claim, at least this specific disclosure would have to be included in the claim as well in order to avoid an unallowable intermediate generalisation. However, in view of the schematic nature of Figures 7 and 8 and the absence of any qualitative or quantitative description in the application as filed, this may well be an impossible task.

2.8.7 Furthermore, there is no indication in the description that certain features, in particular the features mentioned in the previous section, are optional ("may", "can", "optionally", "any kind of", etc.). The application as filed does not contain a description of the invention in general terms in relation to feature (M)/(N), either.

2.8.8 In decision T 398/00 cited by the appellant, the board quoted (Reasons 3.4, second paragraph) decision T 169/83 and concluded that a feature must be clearly, unmistakably and fully derivable from the drawings in terms of structure and function by the person skilled in the art and so relatable by him to the content of the description as a whole to be manifestly part of the invention. The board in case T 398/00 held that these conditions were not met in the case underlying its decision. As discussed above, the present case is different as the board comes to the conclusion that

feature (M)/(N) is not supplemented with the additional features disclosed in Figures 7 and 8 mentioned above.

2.8.9 Consequently, the subject-matter of claim 1 of the main request extends beyond the content of the application as filed because of an unallowable intermediate generalisation, contrary to the requirements of Article 123(2) EPC.

2.9 The board notes that the only option to arrive at a claim which does not extend beyond the application as filed would be to delete both features (M) and (N). However, this may well lead to an objection of lack of inventive step over document D2 as indicated in the board's communication under Article 15(1) RPBA. Therefore, a trap-like situation occurs because the features may not be removed from the claim (as it would lead to lack of inventive step) while they may not be left in the claim (due to added subject-matter because of an unallowable intermediate generalisation) and apparently cannot be supplemented with features that would avoid an unallowable intermediate generalisation (due to lack of explicit disclosure).

3. **Admittance of the first and second auxiliary requests**

3.1 According to Article 13(2) RPBA (valid as from 1 January 2024 (OJ EPO 2024, A15)), any amendment to a party's appeal case made after notification of a communication under Article 15(1) RPBA will, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned.

3.2 In the case at hand, the first and second auxiliary requests were filed after the notification of the

communication under Article 15(1) RPBA and are therefore an amendment to the appellant's appeal case. In claim 1 of both auxiliary requests, feature (M) is deleted. In the second auxiliary request "pad portion" (pad portion 22 of the large-current electronic component 20) is added to feature (H) (see feature (H2)) and the definition of "*such a wide-area portion of the first main-surface wiring pattern (13a) as to increase an area where the first main-surface wiring pattern (13a) and the heat-dissipating surface mount component (15a) are joined to each other*" is added to feature (L) (see feature (L2)).

3.3 Article 13(2) RPBA implements the third level of the convergent approach applicable in appeal proceedings (see Supplementary publication 2, OJ EPO 2020, explanatory remarks on Article 13(2), first paragraph, first sentence). When exercising its discretion in accordance with Article 13(2) RPBA and deciding whether to admit an amendment made at the third level of the convergent approach, the board is free to use or not use the criteria applicable at the second level of the convergent approach, i.e. as set out in Article 13(1) RPBA (see Supplementary publication 2, OJ EPO 2020, explanatory remarks on Article 13(2), fourth paragraph; and, for example, decisions T 989/15, point 16.2 of the Reasons, and T 954/17, point 3.10 of the Reasons).

According to Article 13(1) RPBA, the board exercises its discretion in view of, *inter alia*, the current state of the proceedings and the suitability of the amendment to resolve the issues which were raised by the board, and whether the party has demonstrated that the corresponding amendment to the patent application, *prima facie*, overcomes the issues raised by the board and does not give rise to new objections.

3.4 The appellant submits that auxiliary requests 1 and 2 were filed in response to the objections under Article 123(2) EPC first raised in the board's communication under Article 15(1) RPBA. Moreover, claim 1 of auxiliary request 2 now contained almost all the features from the description of Figures 7 and 8 and thus contained the exact context of features (H), (L) and (N), so that it could no longer be objected that these features were isolated from their immediate context. Auxiliary requests 1 and 2 should therefore be admitted into the proceedings.

3.5 The board is of the opinion that exceptional circumstances within the meaning of Article 13(2) RPBA are given, since the objection of an unallowable intermediate generalisation was raised by the board for the first time in its communication according to Article 15(1) RPBA.

However, in the board's opinion the amendments made in relation to claim 1 of auxiliary requests 2 are not related to the pad portion defined in feature (N) because they refer to a further pad portion 22 of the large-current electronic component 20 and to the part of the previously defined pad portion 16 covered by the HDSMC, whereas feature (N) refers to the part of the pad portion 16 which is not covered by the HDSMC. Both auxiliary requests still contain the subject-matter of feature (N), even if the wording has been slightly modified. In the present case the description of Figures 7 and 8 is inseparably linked to the specific disclosure of Figures 7 and 8. Consequently, the above discussion on Article 123(2) EPC regarding feature (M)/(N) of claim 1 of the main request applies to respective claim 1 of both auxiliary requests which

therefore cannot overcome the objections of added matter raised against the main request. The inclusion of "pad portion 22" and the additional feature in feature (L2) are not related to the pad portion defined in feature (N) and do not change the reasoning above.

In view of the above, auxiliary requests 1 and 2 cannot overcome the objections under Article 123(2) EPC raised with respect to the main request.

Therefore, the board exercised its discretion under Article 13(2) RPBA, taking into account the criteria of Article 13(1) RPBA, and decided not to admit the first and second auxiliary requests into the appeal proceedings.

4. Conclusions

Since the main request does not fulfil the requirements of Article 123(2) EPC and the new first and second auxiliary requests were not admitted into the proceedings in view of Article 13(2) RPBA, the appeal must fail.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Sánchez Chiquero T. Häusser

Decision electronically authenticated