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Datasheet for the decision of 24 April 2014

Case Number: T 2177/10 - 3.2.06

Application Number: 01906258.7

Publication Number: 1189725

IPC: B23K35/26, B23K1/08

Language of the proceedings: EN

Title of invention:
A CONTROL METHOD FOR COPPER CONTENT IN A SOLDER DIPPING BATH

Patent Proprietor:
Nihon Superior Sha Co., Ltd
Panasonic Corporation

Opponents:
Stannol GmbH
Felder GmbH

Headword:

Relevant legal provisions:
EPC 1973 Art. 54
RPBA Art. 13(1), 13(3)
EPC Art. 123(2)

Keyword:

Decisions cited:
G 0007/93

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Catchword:

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Case Number: T 2177/10 - 3.2.06

D E C I S I O N
of Technical Board of Appeal 3.2.06
of 24 April 2014

Appellant: (Patent Proprietor 1)	Nihon Superior Sha Co., Ltd 16-15, Esakacho 1-chome Suita-shi, Osaka 564-0063 (JP)
Appellant: (Patent Proprietor 2)	Panasonic Corporation 1006, Oaza Kadoma Kadoma-shi Osaka 571-8501 (JP)
Representative:	Hering, Hartmut Patentanwälte Berendt, Leyh & Hering Innere Wiener Strasse 20 81667 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 30 August 2010 revoking European patent No. 1189725 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman:	M. Harrison
Members:	M. Hannam
	W. Ungler

Summary of Facts and Submissions

I. An appeal was filed by the proprietor against the decision of the opposition division revoking European Patent No. 1 189 725. In its grounds of appeal, the appellant (proprietor) requested that the opposition division's decision be set aside and the patent be maintained as granted or, auxiliarily, in an amended form according to an auxiliary request.

II. The opponents I and II each responded to the appeal, requesting that the appeal be dismissed. Both opponents argued that the subject-matter of claim 1 of the main request at least lacked novelty in view of

D6 EP-A-0 985 486

III. With letters dated 11 November 2013 and 25 November 2013 respectively, opponent I and opponent II withdrew their oppositions.

IV. The Board issued a summons to oral proceedings including a communication containing its provisional opinion, in which it indicated *inter alia* that the subject-matter of claim 1 of the main request seemingly lacked novelty in view of D6 and that compliance with the requirements of Articles 84 and 123(2) EPC might be a topic of discussion for the auxiliary request.

V. With letter of 24 March 2014 the appellant filed a replacement auxiliary request, hereafter referred to as auxiliary request 1.

VI. Oral proceedings were held before the Board on 24 April 2014, during which the appellant filed an auxiliary request 2.

The appellant requested that the decision under appeal be set aside and the patent be maintained as granted, auxiliarily that the patent be maintained in amended form on the basis of the claims of the first auxiliary request filed with letter dated 24 March 2014, or on the basis of the claims of the second auxiliary request filed during the oral proceedings.

VII. Claim 1 of the main request reads as follows:

"A control method for copper density in a solder dipping bath holding a molten solder alloy containing at least copper as an essential composition thereof during a dip soldering step of one of a printed circuit board having a copper foil attached thereon and a component part having a copper lead attached thereto, the method comprising a step of introducing a replenished solder without copper at all or a copper content having a density lower than that of the molten solder held in the bath prior to the supply of the replenished solder to the bath so that the copper density in the bath is controlled to a predetermined constant density or lower."

Claim 1 of auxiliary request 1 reads:

"A control method for copper in a solder dipping bath holding a molten solder alloy containing tin, copper and nickel as the major compositions thereof during a dip soldering step of one of a printed circuit board having a copper foil attached thereon and a component part having a copper lead attached thereto, the method comprising a step of introducing a replenished solder containing at least tin and nickel and further no copper at all or a copper content having a density lower than that of molten solder held in the bath prior

to the supply of the replenished solder to the bath so that the copper density in the bath is controlled to a predetermined constant density or lower, wherein the copper density in the molten solder bath is controlled to less than 0.85 weight % with the molten solder alloy at a temperature of approximately 255°C to 0.7 weight."

Claim 1 of auxiliary request 2 reads:

"A control method for copper in a solder dipping bath holding a molten solder alloy containing at least copper as an essential composition thereof during a dip soldering step of one of a printed circuit board having a copper foil attached thereon and a component part having a copper lead attached thereto, the method comprising a step of introducing a replenished solder without copper at all or a copper content having a density lower than that of the molten solder held in the bath prior to the supply of the replenished solder to the bath so that the copper density in the bath is controlled to a predetermined constant density or lower, wherein the copper density in the molten solder bath is controlled to less than 0.85 weight % with the molten solder alloy at a temperature of approximately 255°C."

VIII. The appellant's arguments may be summarised as follows:

Regarding the main request, D6 did not have the control of copper density as its intention and thus failed to disclose such a control step. It was also clear that D6 disclosed a 'static' condition of the solder bath whereas the purpose of the invention according to the contested patent was to control the increase in copper density in a solder bath in a dynamic state. Furthermore, a control method for copper density

implicitly included the measurement of an instantaneous copper density in the solder bath so that a copper density reduction need could be identified. Only then would a replenishing of the solder bath with low copper density solder be identified as necessary. This measurement was missing in D6. It was also not unambiguously clear from D6 that the solder bath was replenished rather than being discarded, nor was it credible that the skilled person would select a significantly higher copper density in the solder as the claimed 'predetermined constant density' since the problems associated with high copper densities in solder were well known. Still further, D6 disclosed a lead-free solder for use with lead-rich wires (see D6, paragraph [0035]) such that the lead from the wires would leach into the solder.

Regarding auxiliary request 1, the intention was to claim a reduction in copper density in the molten solder bath to a value between about 0.7 and 0.85 weight %. The value of 0.85 weight % was disclosed in claim 8 and paragraph [0013] of the patent and the value of 0.7 weight % was disclosed in examples 1 and 2, such that the requirement of Article 123(2) EPC was met.

Regarding auxiliary request 2, claim 1 comprised claims 1 and 8 as granted and thus overcame the deficiency of auxiliary request 1 seen by the Board. Claim 1 covered essentially the same subject-matter as claim 1 of auxiliary request 3 before the opposition division. The opposition division's decision not to admit the request, however, lacked detailed reasoning such that it was flawed. The filing of the present auxiliary request 2 during oral proceedings was necessitated only

after failure of the main request and should thus be admitted.

IX. The respondents, prior to withdrawing their appeals, argued that the subject-matter of claim 1 of the main request lacked novelty in view of D6.

Reasons for the Decision

1. Main request

1.1 The subject-matter of claim 1 lacks novelty (Article 54 EPC 1973) in view of D6.

1.2 D6 discloses all features of claim 1 as follows (the wording taken from claim 1 and the reference signs referring to D6):

A control method for copper density in a solder dipping bath (e.g. page 1, lines 22-23; page 5, lines 29-30) holding a molten solder alloy containing at least copper as an essential composition thereof (see e.g. paragraphs [0005] and [0014]) during a dip soldering step of one of a printed circuit board having a copper foil attached thereon (page 3, lines 36-37) and a component part having a copper lead attached thereto (page 3, lines 35-36; page 5, lines 29 to 31 in combination with page 2, lines 22 and 23), the method comprising a step of introducing a replenished solder (page 5, lines 29-30; necessarily occurs in a continuous use of a solder bath) with a copper content having a density lower than that of the molten solder held in the bath prior to the supply of the replenished solder to the bath (this will implicitly be the case when replenishing the bath with the same solder as

originally used, since the solder in the bath requiring replenishing will be copper enriched due to leaching of copper from the printed circuit board and/or the copper lead) so that the copper density in the bath is controlled (the replenishing of solder in the bath can be described as an open loop control) to a predetermined constant density or lower (with the 'predetermined constant density' being undefined in the claim, this can be chosen as desired; in the case where the chosen - but undefined - predetermined constant copper density is slightly higher than the desired copper density, the replenishing with base solder will necessarily effect a control to a copper density lower than this chosen density.)

1.3 Regarding the appellant's contention that no control step of copper density is to be found in D6, the Board finds otherwise. It is to be noted that no detail of the type of control claimed is presented anywhere in the patent, such that this is not restricted to a closed-loop control arrangement in which a feedback of the actual copper density in the bath after measurement thereof at any given time would be provided. An equally applicable control method covered by the wording of claim 1 is an open-loop control method. Such an open-loop control is present when the solder bath is simply replenished after a certain period of time or simply after a certain number of printed circuit boards have been processed in the bath. Such an open loop control is thus implicitly present in D6 where, with no feed-back mentioned as to how the addition of replenishing solder is controlled, the skilled person would not envisage a closed-loop control in order to achieve continuous use of the solder bath (see paragraph [0035]), rather an open-loop control system. An open-loop control of copper density thus occurs in D6 simply

through replenishing the solder bath with 'base solder' i.e. that solder which originally filled the bath (see e.g. paragraph [0005]), which will necessarily have a lower copper density than that present in the bath after having been copper enriched through leaching of copper from the soldered components and circuit boards. Whether this open-loop control of copper density is intentional or not in D6 is irrelevant; simply through replenishing the bath with solder, the claimed control of copper density occurs. The feature of 'control', which is not further limited in claim 1, is thus anticipated by D6.

1.4 Regarding the appellant's argument that the skilled person would not select a 'high' copper density in the solder in D6 in order to anticipate the claimed 'predetermined constant density', the Board finds otherwise. The patent provides no guidance as to how the 'predetermined constant density' is to be chosen, nor does it provide any concrete values for this density, nor does it elaborate on what is meant by the term 'predetermined'. The selection of an appropriate 'predetermined constant density' is left entirely to the skilled person. Given that the teaching which the skilled person would extract from the patent is to lower the copper density in the solder bath in order to maintain high quality soldered joints (see paragraph [0002] of the patent), it is found entirely reasonable for the skilled person to select a 'predetermined constant density' of copper in D6 at such a level that addition of fresh solder will provide a resultant solder in the bath having a copper density lower than a predetermined constant density, which is all that is claimed.

1.5 The appellant's opinion that the dynamic control of copper density in the present patent differentiated itself from the static solder bath condition in D6 is not accepted. Claim 1 does not claim a dynamic or continuous control of copper density, rather solely claiming that 'the copper density in the bath is controlled to a predetermined constant density or lower'. In its most general reading, this simply indicates that a control of copper density as such takes place, yet provides no restriction to either a closed or an open loop control. Nothing in the patent as a whole indicates that the claimed control is a continual, repeated control method such that the claimed control can indeed be interpreted as a one-off control step. Just such a single control step is also disclosed in the method of D6, in which replenishing solder must be added to the copper enriched solder bath for its continuous use, thus controlling the copper density to a level lower than a predetermined constant density.

1.6 The Board also finds, contrary to the appellant's contention, that an implicit copper density measurement is not included in the claimed control method. As identified in point 1.5, the claimed method is not restricted to a continual, or closed loop, copper density control, rather it covers copper density control generally which can include open-loop control i.e. with no feed-back loop. Such an open-loop control requires no copper density measurement. It thus follows that, also on this point, claim 1 is not differentiated from the disclosure in D6.

1.7 The appellant's argument that there was no unambiguous disclosure of the solder bath being replenished in D6 is also unconvincing. Paragraph [0035] of D6

specifically states 'this means that the continuous use of a solder bath is assured ...'. Such a continuous use can only be achieved through the replenishing of solder, else the solder in the bath may be used up or may develop poor soldering performance through contamination with copper, as discussed in paragraph [0002] of the patent. It thus follows that an implicit disclosure of the solder bath being replenished is clearly provided in D6.

1.8 Regarding the appellant's further argument that D6 disclosed the use of lead-rich wires and that the lead from these wires would leach into the solder, the Board sees no reason to dispute this. It is noted, however, that a lead-rich wire, as also conceded by the appellant, still comprises copper as a base material (see also paragraph [0005]) such that this copper in the wire would still leach into the solder. The appellant did not contest this as such, nor was any evidence filed to show that this would not be the case. Thus, in D6 the solder bath would experience an increase in copper density during the soldering process in precisely the same manner as the solder bath of the patent, with the result that the replenishing solder would control the copper density to a level lower than 'a predetermined constant density'.

1.9 It thus follows that D6 deprives the subject-matter of claim 1 of novelty (Article 54 EPC 1973).

1.10 The main request is therefore not allowable.

2. Auxiliary request 1

2.1 Auxiliary request 1 was filed after the appellant had supplied its complete case with its grounds of appeal

(Article 12(2) RPBA), such that auxiliary request 1 represents a change of the appellant's case, whereby admittance of the request into proceedings requires the Board to exercise its discretion under Article 13(1) RPBA to this effect. This request was however not admitted into the proceedings by the Board when exercising its discretion, since claim 1 of this request relates to subject-matter which suffers at least *prima facie* from the defect that it extends beyond the content of the application as originally filed, contrary to the requirement of Article 123(2) EPC.

2.2 As explained by the appellant during the oral proceedings, claim 1 was intended to be understood to mean that a copper density range of 0.7 weight % to less than 0.85 weight % was being claimed. The Board explained to the appellant that the claim was at least *prima facie* not clear (Article 84 EPC 1973) in this regard as it did not state what the appellant intended (not least because the claim made no grammatical sense) and also that no other clear meaning could be ascribed to the claim. Nevertheless, on the basis that this lack of clarity might later be corrected, the Board proceeded from the assumption that the appellant's intended meaning was contained in the formulation. However, such a range of copper density weight % is anyway not disclosed in the originally filed application. A value of less than 0.85 weight % is disclosed in paragraph [0013] of the patent (corresponding to the paragraph bridging pages 5 and 6 of the originally filed PCT application) and in claim 8 as originally filed, yet this is a disclosure with no specific lower weight % limit. A copper density of 0.7 weight % is disclosed in the examples 1, 2 and 3 on pages 7 and 8 as originally filed, although solely as a

specific value rather than as the lower limit of a range, and also solely in combination with other features, namely a specific solder chemical composition e.g. in example 1: lead free solder containing about 0.5% copper, about 0.05% nickel and the balance tin. Contrary to that argued by the appellant, these two individual disclosures, for 0.85 weight % on the one hand and for 0.7 weight % in each of the three examples on the other, are completely independent of one another lacking any suggestion of their combining into a disclosure of the limits to a range of copper density weight %. There is thus, at least *prima facie*, no direct and unambiguous disclosure of a specific copper density range of 0.7 to 0.85 weight % in the application as originally filed.

2.3 In view of the above, the Board exercised its discretion not to admit auxiliary request 1 into the proceedings with regard to Article 13(1) RPBA.

3. Auxiliary request 2

3.1 This request was not admitted into the proceedings under Article 13(3) RPBA.

3.2 This request was filed during oral proceedings before the Board, the appellant arguing that claim 1 overcame the objections raised to claim 1 of auxiliary request 1 and that the request was essentially equivalent to auxiliary request 3 filed before the opposition division.

The Board notes that claim 1 of auxiliary request 2 is in fact broader than that of auxiliary request 3 before the opposition division due to deletion of features present in claim 1 of that request detailing the

composition of the molten solder alloy. With its grounds of appeal, the appellant had not maintained that request, nor had it given arguments as to why the opposition division's conclusions had been incorrect. As a result, the Board was being presented with a new request for the very first time during oral proceedings. All the arguments in support of this request, particularly those relating to the issue of inventive step, would consequently have to have been presented for the first time on the day of the oral proceedings, requiring the Board to make investigations of its own as to inventive step objections, i.e. to deal with an entirely new case. The Board was thus presented with insufficient opportunity for considering the new case without adjournment of the oral proceedings.

The argument of the appellant that the request should be admitted because the need for this request only became apparent when the main request was found to be unallowable, is not persuasive. On filing an appeal as the patent proprietor, the appellant is expected to present its complete case (see Article 12(2) RPBA) including auxiliary requests covering possible fall-back positions in the event of the main request not being allowable. A failure to do this, and presenting an auxiliary request at the latest possible opportunity during oral proceedings, runs the risk of the request not being admitted.

Regarding the appellant's contention that the opposition division had made a flawed decision with respect to auxiliary request 3 before it, this was unconvincing. In the request before it, the opposition division had exercised its discretion not to admit the request. Notwithstanding the fact that the present

request differed from auxiliary request 3 before the opposition division, a Board of appeal should only overrule the discretion exercised by the first instance if it did not exercise its discretion in accordance with the right principles, or if it exercised its discretion in an unreasonable way (see G 7/93, Reasons 2.6). The appellant failed to indicate how the opposition division had exercised its discretion inappropriately, nor did the Board see this to have been the case.

3.3 The Board therefore did not admit auxiliary request 2 into the proceedings, since the Board could not reasonably have been expected to deal with the amended case without adjournment of the oral proceedings (Article 13(3) RPBA).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Nachtigall M. Harrison

Decision electronically authenticated