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Datasheet for the decision of 20 February 2018

Case Number: T 0075/15 - 3.2.08

Application Number: 07117095.5

Publication Number: 1897649

IPC: B23K35/26, C22C13/00

Language of the proceedings: EN

Title of invention:
Lead-free solder alloy

Patent Proprietor:
SENJU METAL INDUSTRY CO., LTD.

Opponent:
Stannol GmbH

Headword:

Relevant legal provisions:
EPC Art. 123(2)

Keyword:
Amendments - added subject-matter (yes)

Decisions cited:
T 0201/83

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 0075/15 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 20 February 2018

Appellant: (Patent Proprietor)	SENJU METAL INDUSTRY CO., LTD. 23 Senju-Hashido-cho Adachi-ku Tokyo, 120-8555 (JP)
Representative:	Ter Meer Steinmeister & Partner Patentanwälte mbB Nymphenburger Straße 4 80335 München (DE)
Respondent: (Opponent)	Stannol GmbH Oskarstr. 3-7 42283 Wuppertal (DE)
Representative:	Börner, Heike Buse, Mentzel, Ludewig Patentanwälte Kleiner Werth 34 D-42275 Wuppertal (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 11 November 2014 revoking European patent No. 1897649 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairwoman	P. Acton
Members:	M. Foulger
	P. Schmitz

Summary of Facts and Submissions

I. With the decision posted on 11 November 2014, the opposition division revoked the European patent 1 897 649 because the subject-matter of the patent went beyond that of the application as originally filed.

II. The appellant (patent proprietor) filed an appeal against this decision. The appeal was filed in due form and within the given time limits.

III. Oral proceedings took place before the Board on 20 February 2018. As announced by letter dated 22 January 2018, the respondent was not represented at the oral proceedings.

IV. At the end of the oral proceedings the requests were as follows:

The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request or one of auxiliary requests 1 to 7 filed with the statement setting out the grounds of appeal, or auxiliary requests 8 or 9 submitted on 8 January 2015.

The respondent requested that the appeal be dismissed.

V. Claim 1 of the main request reads:

"A lead-free solder alloy, consisting of:
0.1 - 3 wt% of Cu,
0.3 - 2 wt% Ag,
0.001 - 0.01 wt% of P,
and a balance of Sn."

Claim 1 of the 1st auxiliary request reads:

"Use of a lead-free solder alloy for flow soldering,
the lead-free solder alloy consisting of:
0.1 - 3 wt% of Cu,
0.3 - 2 wt% Ag,
0.001 - 0.01 wt% of P,
and a balance of Sn."

Claim 1 of the 2nd auxiliary request reads:

"Use of a lead-free solder alloy for flow soldering,
the lead-free solder alloy consisting of:
0.1 - 3 wt% of Cu,
0.3 - 2 wt% Ag,
0.001 - 0.01 wt% of P,
and a balance of Sn,
wherein P is used for improving the wettability of the lead-free solder alloy."

Claim 1 of the 3rd auxiliary request reads:

"Use of a lead-free solder alloy for flow soldering,
the lead-free solder alloy consisting of:
0.1 - 3 wt% of Cu,
0.3 - 2 wt% Ag,
0.001 - 0.01 wt% of P,
and a balance of Sn,
wherein P is used for improving the wettability of the lead-free solder alloy, which is evaluated by the zero-cross time."

Claim 1 of the 4th auxiliary request reads:

"A lead-free solder alloy, consisting of:
0.1 - 3 wt% of Cu,

0.3 wt% Ag,
0.001 - 0.01 wt% of P,
and a balance of Sn."

Claim 1 of the 5th auxiliary request reads:

"Use of a lead-free solder alloy for flow soldering,
the lead-free solder alloy, consisting of:
0.1 - 3 wt% of Cu,
0.3 wt% Ag,
0.001 - 0.01 wt% of P,
and a balance of Sn."

Claim 1 of the 6th auxiliary request reads:

"Use of a lead-free solder alloy for flow soldering,
the lead-free solder alloy, consisting of:
0.1 - 3 wt% of Cu,
0.3 wt% Ag,
0.001 - 0.01 wt% of P,
and a balance of Sn,
wherein P is used for improving the wettability of the lead-free solder alloy."

Claim 1 of the 7th auxiliary request reads:

"Use of a lead-free solder alloy for flow soldering,
the lead-free solder alloy, consisting of:
0.1 - 3 wt% of Cu,
0.3 wt% Ag,
0.001 - 0.01 wt% of P,
and a balance of Sn,
wherein P is used for improving the wettability of the lead-free solder alloy. which is evaluated by the zero-cross time."

Claim 1 of the 8th and 9th auxiliary requests is identical to claim 1 of the 4th and 5th auxiliary requests respectively.

VI. In the following, unless stated otherwise, references to paragraphs, figures etc. refer to the published version of the application (EP 1 897 649 A1).

VII. The appellant argued essentially the following:

a) Main request and auxiliary requests 1-3

The application disclosed in paragraph [0025] that the total content of silver and antimony was at most 4% and preferably at most 3%. Thus, this provided a general teaching of a range of silver between 0 and 3wt%.

The functions of silver and bismuth were independent. Silver improved the strength of the solder (paragraph [0025]) whereas bismuth reduced the melting point of the solder (see paragraph [0027]). The skilled person would recognise that bismuth was not essential to solve the problem of providing improved strength.

Moreover, as shown by the experimental data illustrated in fig. 3A of the letter dated 8 March 2016, changing the silver content over the claimed range had no effect on the wettability of the solder. Thus, the silver content is independent of the phosphorus content which was provided to improve the wettability (see paragraph [0019]).

The amendments to claim 1 did not present new subject-matter, but represented a combination of features that were directly and unambiguously disclosed in the application as originally filed.

b) Auxiliary requests 4-9

The ranges of the elements in the claim of 0.1 - 3 wt% Cu and 0.001 - 0.01 wt% P were disclosed in paragraph [0015] and in claim 1 of the application as originally filed. The amount of silver was then disclosed in example 4 of the table of paragraph [0031].

Although claim 1 as originally filed required a nickel content of 0.05 - 0.5t%, paragraph [0025] listed both silver and nickel as strength improving elements. The skilled person would therefore regard these two elements as interchangeable. Thus silver was disclosed in combination with the claimed ranges of copper and phosphorus.

The experimental data illustrated in fig. 2 of the letter dated 8 March 2016 showed that the copper content did not significantly change the tensile strength. This showed that silver and copper could be regarded independently. Thus the skilled person would take it that the invention could be carried out over the whole range of copper disclosed.

Also, silver and phosphorus were functionally independent (see fig. 3 of the statement setting out the grounds of appeal). Hence, the skilled person reading the application as originally filed would understand that the value of silver in example 4 of paragraph [0031] was applicable across the full range of copper and phosphorus disclosed in paragraph [0015].

Moreover T 201/83 stated that where elements in an alloy were functionally independent from each other the amendment of a concentration range was admissible. This

applied in the current case because silver was functionally independent from phosphorus and copper.

The subject-matter of auxiliary requests 4-9 was thus disclosed in the application as originally filed.

VIII. The respondent argued essentially the following:

a) Main request and auxiliary requests 1-3

The sole disclosure of the upper value of silver of 2 wt% was in the table of paragraph [0031], this value was however in combination with 2 wt% bismuth. Paragraph [0025] disclosed that higher silver content led to an increase in the liquidus temperature. According to paragraph [0027], bismuth had the effect of reducing the melting point of the solder alloy. Thus, the value of 2 wt% silver without bismuth was not disclosed.

Consequently, the subject-matter of claim 1 of the main request and auxiliary requests 1-3 went beyond that of the application as originally filed.

b) Auxiliary requests 4-9

Example 4 from the table of paragraph [0031] disclosed a specific alloy i.e. copper 0.5 wt%, phosphorus 0.005 wt%, silver 0.5 wt% with the balance being tin. A generalisation of this teaching to cover copper ranges of 0.5 - 3 wt% could not be taken from the application as filed. The extraction of simply the value of silver from the table was not admissible because the other elements also affected the required properties of the alloy, i.e. wettability and strength. Thus silver could not been seen in isolation from the other elements

example 4.

Hence, claim 1 of auxiliary requests 4-9 contained subject-matter which went beyond that of the application as originally filed.

Reasons for the Decision

1. Main request and auxiliary requests 1-3

The alloy defined in claim 1 of the main request and auxiliary requests 1-3 is a closed composition, i.e. further non-listed components are excluded, and contains 0.3 - 2 wt% Ag.

The only specific disclosure of the end values of this range is in the table of paragraph [0031], examples 4 and 7. The alloy of example 4 contains 0.5 wt% Cu, 0.005 wt% P and 0.3 wt% Ag. In example 7 the alloy contains 0.5 wt% Cu, 0.005 wt% P, 2 wt% Ag and 2 wt% Bi.

Paragraph [0025] states that silver is a strength-improving element. The Board concurs with the Appellant insofar that bismuth does not contribute to the strength of the solder alloy. However this paragraph also states that, if the content of such strength improving elements is too large, they substantially elevate the liquidus temperature of the solder. Paragraph [0027] then explains that the solder may then contain melting-point lowering elements such as bismuth. Thus the skilled person would consider bismuth necessary in example 7 - not because of the solder strength - but in order to minimise thermal damage to the components to be soldered.

Hence there is no disclosure of a solder alloy with 2 wt% silver and without bismuth in the application as originally filed. Claim 1 of the main request and auxiliary requests 1-3 therefore contains subject-matter which extends beyond that of the application as originally filed.

2. Auxiliary requests 4-9

Claim 1 of all these requests includes the features that the solder alloy contains 0.1 - 3 wt% Cu and 0.001 - 0.01 wt% P in combination with 0.3 wt% Ag.

As stated bove, the only mention of 0.3 wt% Ag in the application as filed is in the table of paragraph [0031].

A basis for the claimed ranges of the elements of 0.1 - 3 wt% Cu and 0.001 - 0.01 wt% P may be found either in paragraph [0015] or in claim 1 of the application as originally filed - without however the presence of silver.

a) Originally filed claim 1 as basis:

The currently claimed solder alloy does not fall under the scope of original claim 1 because this required that nickel be present. The skilled person may well regard silver as being a suitable alternative to the originally claimed nickel (cf paragraph [0025]). However, an alternative cannot be recognised as being directly and unambiguously disclosed.

Thus the originally filed claim 1 cannot be regarded as a basis for claim 1 of auxiliary requests 4-9.

b) Paragraph [0015] as basis:

Paragraph [0015], discloses 0.1 - 3 wt% Cu with 0.001 - 0.1 wt% P. This is in principle a closed composition because the balance should be tin. However, paragraph [0016] then states that the alloy may contain further elements which improve the mechanical strength of the solder. Both copper and silver are added to the alloy to improve its strength, see paragraphs [0018] and [0025].

The appellant argued on the basis of Fig. 2 of the letter dated 8 March 2016 that the copper content did not significantly change the tensile strength. This showed that silver and copper could be regarded independently. Thus the skilled person would take it that the value of 0.3 wt% silver could be combined with the full range of 0.1 - 3 wt% Cu disclosed in paragraph [0015].

The Board does not however find this argumentation persuasive. Fig. 2 of the letter dated 8 March 2016 consists of merely three points at 0.5, 1.0 and 4.0 wt% Cu. These results do not unambiguously show that copper does not significantly change the tensile strength because no data points between 1.0 and 4.0 wt% Cu are given. Moreover, paragraph [0018] states that "[T]he presence of Cu in the solder alloy increases the mechanical strength of the solder."

Thus, the value of silver of 0.3 wt% disclosed in paragraph [0031] was not disclosed directly and unambiguously in combination with the full range of

0.1 - 3 wt% copper.

Phosphorus is added to improve the wettability, see paragraph [0024]. Fig. 3 of the statement setting out the grounds of appeal demonstrated that wetting time and phosphorus content are linked. Moreover, this demonstrates that silver content and wetting time are also related. The skilled person would therefore regard the values of silver and phosphorus in the table of paragraph [0031] as being related regarding wetting.

The jurisprudence (T 201/83, OJ EPO 1984, 481) cited by the appellant is not applicable in this particular case because the amount of silver in the examples 4 and 7 is indeed linked to the quantities of the other elements of these examples and thus cannot be regarded in isolation from these other elements.

In conclusion, claim 1 combines different aspects of the originally filed application and hence the skilled person would have had to combine several elements of the application as originally filed in order to arrive at the subject-matter of claim 1.

Hence, this subject-matter is not directly and unambiguously derivable from the application as originally filed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairwoman:

C. Moser P. Acton

Decision electronically authenticated