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Datasheet for the decision of 19 September 2014

Case Number: T 1827/12 - 3.2.01

Application Number: 03744044.3

Publication Number: 1488972

IPC: B60S1/02, H01R4/02

Language of the proceedings: EN

Title of invention:
METAL FIXTURE-JOINED GLASS ARTICLE, AND JOINT STRUCTURE USING THIS

Patent Proprietor:
Nippon Sheet Glass Company, Limited

Opponent:
SAINT-GOBAIN SEKURIT Deutschland GmbH & Co. KG

Headword:

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

Keyword:
Late-filed request - admitted (yes)
Amendments - broadening of claim (no) - extension beyond the content of the application as filed (no)

Decisions cited:
T 0201/83, T 0184/05

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It can be changed at any time and without notice.

Catchword:

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Case Number: T 1827/12 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 19 September 2014

Appellant: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted on 8 August 2012 concerning maintenance of the European Patent No. 1488972 in amended form.**

Composition of the Board:

Chairman G. Pricolo
Members: W. Marx
P. Guntz

Summary of Facts and Submissions

I. The appeal from the opponent is directed against the interlocutory decision of the Opposition Division posted on 8 August 2012 to maintain European patent No. 1 488 972 in amended form on the basis of the First Auxiliary Request filed during the oral proceedings.

II. In its decision the Opposition Division held that the subject-matter of claim 1 as amended in opposition proceedings according to the First Auxiliary Request met the requirements of Articles 123(2),(3) and 56 EPC.

III. Oral proceedings took place on 19 September 2014.

The appellant (opponent) requested that the decision under appeal be set aside and that the European patent be revoked.

The respondent (patent proprietor) requested that the patent be maintained on the basis of former auxiliary request 2 of 14 August 2014 which was submitted during the oral proceedings as the sole request (claims are identical to the claims as maintained in amended form by the Opposition Division; as to the description as maintained in amended form, the sentence at the end of paragraph [0020] "the Sn-Ag alloy may contain other minor components" was deleted); all other requests were withdrawn. Clean copies of the description according to the sole request were filed during the oral proceedings.

IV. Claim 1 according to the respondent's sole request reads as follows:

A glass article with a metal member joined thereto, comprising:

(a) an electroconductive coating film formed on at least a part of a surface of the glass article by baking a silver paste that includes Ag particles and a glass frit,

(b) wherein the metal member comprises a leg part having two joining planes and bridging the two joining planes and a connection part projecting upward from the leg part, and

(c) wherein the two joining planes of the metal member are fixed onto the electroconductive coating film with a lead-free solder alloy containing Sn as a main component, and

(d) wherein by a tension test in which the metal member is pulled upward, the glass article and the metal member are ruptured due to the breakage, not of a junction portion soldered using the lead-free solder alloy, but rather an inner portion of the glass article in the vicinity of the junction portion,

(e) characterized in that the lead-free solder alloy is an Sn-Ag based alloy that contains 2 to 4 mass% Ag, and in which the rest is Sn, and

(f) wherein the Sn-Ag based alloy has a liquidus temperature of 230 °C or lower, and the difference of the liquidus temperature and a solidus temperature of the Sn-Ag based alloy is 10 °C or less, and

(g) wherein a total area of the two joining planes is in a range of 40 mm2 to 45 mm2.

V. The arguments of the appellant, insofar as they are relevant to this decision, can be summarised as follows (hereinafter, when making reference to passages of the application as filed, the A-publication is used):

The respondent's sole request, filed only late in the proceedings, should not be admitted. In particular, the respondent had already had time to file the request with its reply to the grounds of appeal, since the issues under discussion had not changed. Moreover, the objections raised under Article 123(2) and (3) EPC were not solved.

The patent had been amended in such a way as to extend the protection it conferred (Article 123(3) EPC). Substituting in feature (e) the term "a content of other minor components except for Sn and Ag in the Sn-Ag based alloy is 0.5 mass% or less" from claim 1 as granted for "in which the rest is Sn" extended the scope of the patent as granted. The former term limited the amount of other minor components, such as impurities, in the alloy to up to 0.5 mass%, whereas according to the new wording the amount of impurities could reach higher levels beyond 0.5 mass%. Deletion of the former term therefore broadened claim 1. The patent as granted did not specify what was to be understood by 'other minor components'. These additional minor components had to be interpreted in the patent as granted as any 'other element' within the alloy and included also impurities. It was further common practice for the skilled person that elements in the alloy composition which did not add up together to 0.5 mass% of the alloy were not specified in the composition but just generally referred to as other components. The skilled person knew that impurities had a significant effect on the properties of a metal alloy (see T 184/05), and their concentration level could not be regarded in isolation from the specific examples.

Claim 1 of the patent had been amended in such a way that it contained subject-matter which extended beyond the content of the application as filed (Article 123(2) EPC). The application as filed comprised general and specific teachings, but the features of claim 1 were functionally related (e.g. bond strength was dependent upon Ag content, volume of the solder alloy and the joining faces). Feature (d) of claim 1 had a specific meaning and was not implied by features (a) to (c). Moreover, it was not disclosed in the application as filed as a generally valid feature in the context of claim 1. In particular, paragraph [0014] as filed did not serve as a basis for its general disclosure. According to this passage, cracks in the glass in the vicinity of the soldered junction were a necessary condition for the glass article to break when performing a tension test of the metal member, due to breakage of the inner portion of the glass and not of the junction portion soldered with the lead-free alloy. These cracks could be avoided, see paragraph [0015] and table 3 as filed, so it could not be assured that the glass article according to the invention would always break inside the glass when applying a tension test to the metal member. Feature (d) provided a technical contribution to the claimed invention, containing information with regard to the character and strength of the point of contact. In this sense feature (d) was only disclosed in relation to examples 1 and 2 (see paragraphs [0033] and [0034] as filed). These examples disclosed singular values for the composition of the lead-free solder alloy, i.e. features (e) and (f), and for the total area of the two joining planes, i.e. feature (g), so that feature (d) was disclosed in the application as filed only in combination with the specific singular values of sample 2C of example 2, namely a composition of the solder alloy of 2 mass% of

Ag in which the rest was Sn and a total area for the joining planes of 42mm^2. Feature (e) specifying a range of 2 to 4 mass% of Ag therefore infringed Article 123(2) EPC. Furthermore, feature (f) which was based on paragraph [0036] of example 1, according to which just the singular compositions of the solder alloy from samples 1D to 1H with discrete values (2, 2.5, 3, 3.5, 4) of Ag content (see table 1) were disclosed, had been generalised to the whole range of 2 to 4 mass% of Ag content only mentioned in paragraph [0020]. The range of the total area of joining planes according to feature (g) was not justified by the disclosure in paragraph [0015] of the application as filed, but only disclosed in the context of the features of claim 1 for a specific sample according to table 2 (42 mm^2). As regards feature (b), the cable referred to in claim 4 and in paragraph [0021] as filed had been omitted.

VI. The respondent (patent proprietor) countered essentially as follows:

The sole request had been filed in reply to the preliminary assessment of the Board in order to address the issue raised under Article 123(3) EPC and should therefore be admitted. Moreover, this request did not raise any new objections, and the amendments involved were not complex.

The subject-matter of claim 1, read in the light of the description (any reference to minor components was deleted), complied with Article 123(3) EPC. Claim 1 limited the composition of the alloy to silver (2 to 4 mass%) and tin (rest), and, clearly for the skilled person, to an unavoidable amount of impurities, and the description (paragraph [0020]) no longer mentioned that

the alloy might contain other minor components. The granted version explicitly included a content of other minor components of 0.5 mass% or less (corresponding to a range of 0.0 to 0.5 mass%), i.e. such content was possible and not unavoidable, whereas the inherent feature of impurities was that they were unavoidable. For the skilled person, an unavoidable amount of impurities was not a content of 0.5 mass% or higher in the alloy. The subject-matter of claim 1 defining 0.0 mass% of minor components (i.e. the rest being Sn) was clearly within the scope of the subject-matter of claim 1 as initially granted.

The subject-matter of claim 1 as amended in opposition proceedings did not infringe Article 123(2) EPC. Features (a) and (c) had a basis in the application as filed, and feature (b) showed the dominant structure described in the general disclosure in paragraphs [0021] and [0025], which was not limited to other features. The passage from paragraph [0014] to [0023] of the description as filed related to the general description part of the invention, i.e. a general teaching applicable to the whole subject-matter of the description, and not to the specific embodiments referred to in examples 1 and 2. This passage generally disclosed the combination of features (a) to (e) and (g). Feature (d) which was based on paragraph [0014] referred to the thermal stress developed during soldering, as a consequence of features (a) to (c) and (e), but not to the occurrence of cracks (according to paragraphs [0011], [0015] and table 3) which was not claimed. In particular, paragraph [0014], last sentence, related to a general statement about Sn-based lead-free alloys and the phenomenon generally observed according to feature (d) of the glass article of the invention, and not to the cracks mentioned before, i.e.

cracks were not responsible for the breaking of the glass in the vicinity of the junction; rather this was due to thermal stress caused by soldering. With respect to feature (f), it was directly and unambiguously derivable for the skilled person using common general knowledge that the liquidus and solidus temperatures of the solder alloy claimed according to feature (e) were intrinsic properties to the solder alloy itself and had no further functional or structural relationship with the other features of claim 1 (such as the physical dimension of soldering joints). These properties of the alloy composition claimed were confirmed by the data in samples 1D to 1H of table 1 as filed, showing a series of discrete values of Ag content, and its generalisation to the whole continuous range claimed was implicit for the skilled person. Feature (g) was also based on a general statement in paragraph [0015], not limited to a particular embodiment, and a combination with feature (d) was clearly understood to be a preferred embodiment of the invention. The same applied to paragraph [0020] which disclosed the general teaching of a preferred range of Ag-mass% according to feature (e).

Reasons for the Decision

1. *Admissibility of request - Article 13(1) RPBA*

1.1 The respondent's sole request is admitted into the proceedings at the Board's discretion according to Article 13(1) RPBA (Rules of Procedure of the Boards of Appeal, OJ EPO 2007, 536).

1.2 The respondent filed auxiliary request 2 in reply to the Board's communication under Article 15(1) RPBA from 13 June 2014 and the provisional opinion of the Board expressed therein. This request consists of the patent as maintained in amended form by the Opposition Division with the deletion of the last sentence ("The Sn-Ag alloy may contain other minor components") of paragraph [0020] on page 3 of the amended description.

1.3 The appellant considered that the request should have been filed earlier and not admitted into the proceedings because the issues under discussion had not changed since the filing of the statement of grounds of appeal.

The Board, however, considers the amendment to be a timely reaction to the preliminary opinion expressed in its communication under Article 15(1) RPBA, which pointed out for the first time the relevance of the last two sentences in paragraph [0020] of the description as filed, the first sentence of which was still present in the patent as amended in oral proceedings, in defining the scope of protection of the amended patent. As such, the late filing of the present request constitutes a serious attempt to remedy the deficiencies under Article 123(3) EPC noted by the Board, without *prima facie* introducing new deficiencies, being complex or unjustifiably delaying the procedure.

2. Extension of scope of protection - Article 123(3) EPC

2.1 The amended European patent according to the sole request does not extend the protection conferred within the meaning of Article 123(3) EPC.

2.2 In its granted version, claim 1 determines the composition of the lead-free solder alloy as including a content of other minor components except for Sn and Ag of 0.5 mass% or less. According to the documents of the present request, the above-mentioned feature of granted claim 1 is replaced by "in which the rest is Sn", and the last two sentences from paragraph [0020] of the description of the granted patent have been deleted, namely: "The Sn-Ag alloy may contain other minor components. In this case it is preferable that the content of the minor components is 0.5 mass% or less".

2.3 Any reference to other minor components has thus been deleted in the description. As agreed by both parties, when explicitly claiming "other minor components" the claimed solder alloy includes any kind of voluntarily added elements as well as unavoidable ones such as impurities, in particular because this term is not further specified in the patent as granted (see paragraph [0020] of the description). Moreover, in the Board's judgment, the sentence in paragraph [0020] that the "Sn-Ag alloy <u>may</u> contain other minor components", i.e. that minor components can be added on purpose or be excluded, would be contradictory if "other minor components" were equated with "impurities", which by nature are unavoidable. By deleting the references to other minor components in paragraph [0020] of the description, which clearly indicated that they were optional components, and by the amendment to claim 1 as granted according to the sole request, the composition of the claimed solder alloy has been restricted to silver, tin and an unavoidable amount of impurities, since it is well known to the skilled person that a solder alloy will never be pure and thus contains unavoidable impurities.

Therefore, with respect to the composition of the alloy solder as granted, the scope of protection of the amended patent according to the sole request has been limited to a lead-free Sn-Ag based solder alloy that contains 2 to 4 mass% of Ag, in which the rest is Sn, further, implicitly, containing an unavoidable amount of impurities.

2.4 In accordance with the respondent's opinion, the range of "0.5 mass% or less" claimed in the granted version for the other minor components included as a lower limit "0.0 mass%" of other minor components. The present request is limited, due to the deletion of other minor components in claim 1 and the definition that "the rest is Sn", to this lower limit, i.e. in this respect the scope of protection has only been restricted compared to the patent as granted.

2.5 It remains to be discussed whether, based on claim 1 and the description of the sole request, the content of unavoidable impurities might include an amount greater than 0.5 mass% of the solder alloy, as alleged by the appellant. Starting from the undisputed understanding of the term "other minor components" in granted claim 1, comprising voluntarily added elements as well as unavoidable impurities, their total content was explicitly restricted to "0.5 mass% or less" in the granted version. In fact, this restriction was deleted in claim 1 according to the sole request. However, as a further limitation claim 1 according to the sole request now specifies a composition "in which the rest is Sn". In the absence of any evidence that a content of impurities in the solder alloy could amount to more than 0.5 mass% without being explicitly mentioned, the Board finds that, on a reasonable interpretation of the

subject-matter of claim 1 according to the present sole request, such content of unvoidable impurities higher than 0.5 mass% must be ruled out. A person skilled in the art describing the content of solder alloys would specify an element of which the content is greater than 0.5 mass% of the alloy because it will affect the properties of the alloy. In the Board's judgement, this also applies to a group of elements in the alloy, such as impurities, if their content exceeds 0.5 mass% because such impurity content would have a considerable influence on the properties of a metal alloy, as stated by the appellant himself.

In this context, the appellant cites decision T 184/05, which again refers to decision T 201/83 (OJ EPO 1984, 481) stating (point 12 of the Reasons, last sentence) that "an amendment of a concentration range in a claim for a mixture, such as an alloy, is allowable on the basis of a particular value described in a specific example, provided the skilled man could have readily recognised this value as not so closely associated with the other features of the example as to determine the effect of that embodiment of the invention as a whole in a unique manner and to a significant degree". However, the present application and the specific examples described therein are totally silent with regard to impurities and their concentration range, and only in the general part of the description, as originally filed, is it mentioned that other minor components may - optionally - be included up to a maximum content. Therefore, the the Board finds that the case law referred to by the appellant - which relates to the extraction of a particular value of a concentration range of an alloy from a given example comprising further features - is considered not to be applicable in the present case, which only excludes an

optionally mentioned solder alloy component. In particular, the Board finds that deletion of such optional alloy composition with a limited content of other minor components cannot open the door to an interpretation of the claimed subject-matter which would include an unlimited or unreasonable amount of impurities.

Moreover, as argued by the appellant, it was common practice for the skilled person that elements in the alloy composition which do not add up together to 0.5 mass% of the alloy were not specified but just generally referred to as other components. In the absence of any citation of other minor components in claim 1, reading claim 1 with a mind willing to understand (which comprises the term "in which the rest is Sn"), the skilled reader would at the most assume an insignificant amount - far below 0.5 mass% - of unavoidable components such as unavoidable impurities.

2.6 The Board thus cannot see that the European patent has been amended in such a way as to extend the protection it conferred.

3. Amendments - Article 123(2) EPC

3.1 Claim 1 of the patent has not been amended in such a way as to contain subject-matter which extends beyond the content of the application as filed.

3.2 The combination of features (a) to (c) of claim 1 is generally disclosed in claims 1 and 4 and paragraphs [0009] and [0021] of the application as filed. With regard to feature (b), the appellant objected to the omission of the cable referred to in claim 4 and in paragraph [0021] as filed. However, in the Board's

judgement, the relevant passages identically specify that the connection part that projects upward from the leg part "is to be connected to a cable", which only means that the projecting connection part is suitable to be connected to a cable, i.e. the cable is not inextricably linked with the remaining features of claim 1. Therefore, the Board cannot see that the omission of the cable results in an illicit intermediate generalisation. Moreover, a projecting connection part of a metal terminal is always suitable to be connected to a cable, so this possibility referred to in the application as filed, even if not explicitly mentioned in present claim 1, is implicitly included.

3.3 As stated by the appellant, the application as filed comprises a general teaching starting with paragraph [0014] where the best mode for carrying out the invention is described in general terms first, and a more specific teaching when it comes to the examples as described in paragraph [0031] onwards. Based on this general teaching, a Sn-Ag based alloy that contains 2 to 4 mass% Ag is disclosed in paragraph [0020] of the description as filed as a preferable rate of Ag content. Furthermore, paragraphs [0017] and [0018] recite further advantages of having an Ag content within this range with regard to bond strength and liquidus temperature. The sentence in paragraph [0020] that the Sn-Ag alloy "may contain other minor components" implies also that a Sn-Ag alloy might comprise no further minor components, i.e. an embodiment in which apart from Ag "the rest is Sn". An example is given in paragraph [0019] for an eutectic composition of Sn-3.5Ag ("an alloy made of 3.5 mass% of Ag and Sn that accounts for the rest"), but also in example 1 according to table 1. Moreover, according to

paragraph [0015] the joining area is preferably controlled within a range of 40 mm^2 to 45 mm^2 in order to avoid a decrease in bond strength. Therefore, according to this general teaching, features (e) and (g), in combination with features (a) to (c), are disclosed in the application as filed.

3.4 Feature (f) specifies the liquidus and solidus temperatures of the Sn-Ag based alloy which are intrinsic properties of the solder alloy defined by feature (e) to be composed of 2 to 4 mass% Ag and Sn, i.e. an alloy consisting of two components only (apart from unavoidable impurities of low content, so that the properties remain unchanged as argued above).

As is known to the skilled person, and as can be derived also from table 1 in the application as filed, a Sn-Ag alloy with a composition as claimed shows a solidus temperature which is approximately constant (219 or 220°C according to table 1; paragraph [0036]). Moreover, according to table 1 the liquidus temperature has a minimum value at the eutectic composition of Sn-3.5Ag (see paragraph [0019]) and reaches a maximum value of 229°C in the claimed composition range. Although according to table 1 only discrete compositions of the alloy (samples 1D to 1H for discrete values of Ag content) are disclosed that satisfy feature (f), it is implicit for the skilled person in the field of metallurgy, based on his common general knowledge and the known shape of the binary phase diagrams of such alloys consisting of two components only, that feature (f) applies to the whole continuous range from 2 to 4 mass% of Ag.

3.5 The Board agrees with the appellant that feature (d) is not implied by features (a) to (c), i.e. by the

structural definition of the glass article comprising a metal member having two joining planes which are fixed onto an electroconductive coating film with a lead-free solder alloy containing Sn as a main component. Moreover, feature (d) is considered to provide a technical contribution to the claimed invention, as argued by the appellant, containing information with regard to the character and strength of the point of contact. Such strength of the soldering joint between the metal member and the electroconductive coating is dependent on many parameters, and some parameters affecting the bonding strength are specified in claim 1 (e.g. the Ag content in a range of 2 to 4 mass% as mentioned above). A further parameter affecting the strength of the soldering joint is the temperature of the tip of the soldering iron as mentioned in paragraph [0019] or [0032], and it is evident for the skilled person that, if the tip temperature is too low, the soldering joint will show the characteristics of a so-called "cold" soldering joint which will easily crack under mechanical load, e.g. when applying the tension test according to feature (d). Therefore, feature (d) implies some limitation e.g. with regard to the soldering process. However, when applying a tip temperature of about 310°C - see paragraph [0032] - to a soldering joint using a Sn-Ag based alloy according to example 1 as described in the application as filed in table 1, rupture takes place inside the glass in all the samples, as stated in paragraph [0034]. Although a tension test according to feature (d) was performed only for the discrete samples according to table 1, the Board cannot see why this behaviour should not apply implicitly for the continuous range of 2 to 4 mass% of Ag and Sn as the remaining component of the solder alloy as defined by feature (e), which also implies

feature (f) as argued above, provided that the conditions of the soldering process remain unchanged.

It is acknowledged that example 1 refers to samples having a total area of 56 mm^2 of the two joining planes of the metal member, whereas feature (g) specifies a range of 40 to 45 mm^2. However, according to paragraph [0015] of the application as filed, and proven by example 2 (see table 2 and Figure 5), the specified range according to feature (g) leads to higher values of bond strength and, irrespective of a reduction of the total area of joining planes from 56 mm^2 to 40 mm^2, also to a rupture inside the glass when performing a tension test. The Board therefore concludes that a tension test which leads to rupture inside the glass for the samples according to example 1 and table 1 (see paragraph [0034]) exhibiting a lower bonding strength due to the enlarged total area of joining planes, will definitely lead to the same result when increasing the bonding strength by optimising the total area of joining planes as mentioned in paragraph [0015] and specified by feature (g).

In particular, the Board does not agree with the appellant that paragraph [0014] of the application as filed, which discloses the tension test claimed by feature (d), requires at the same time that the thermal stress due to the temperature change caused by soldering always leads to cracks at the surface of the glass. As explicitly stated in paragraph [0014], "in some cases, cracks may occur". Moreover, the tension test mentioned in paragraph [0014] immediately afterwards makes no reference at all to cracks in the glass caused by soldering, and according to paragraph [0015] cracks can even be prevented by controlling the amount of solder used. Admittedly, the

amount or volume of solder alloy is not specified in claim 1. However, leaving open this parameter is not an issue under Article 123(2) EPC but concerns the broadness of claim 1 and and the extension of protection of the claimed subject-matter, which has not changed in this respect in comparison to claim 1 as granted. So there is no issue with Article 123(3) EPC.

Therefore, the Board finds that feature (d), which is disclosed in paragraph [0014] of the general teaching of the application as filed, can be combined with further features (e) and (g) also stemming from this general teaching without infringing Article 123(2) EPC.

4. It follows that the set of documents according to the sole request of the respondent forms a suitable basis for the maintenance of the patent in amended form.

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 with the order to maintain the patent on the basis of the following documents:

   - claims 1 to 4 underlying the decision under appeal
   - description pages 2 to 6 as filed during the oral proceedings of 19 September 2014
   - figures 1 to 5 as granted.

The Registrar: The Chairman:

A. Vottner G. Pricolo

Decision electronically authenticated