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D E C I S I O N
of 26 June 2002

Case Number: T 0072/99 - 3.4.3

Application Number: 92909877.0

Publication Number: 0577731

IPC: H01L 23/02

Language of the proceedings: EN

Title of invention:
Surface mount device with high thermal conductivity

Applicant:
OLIN CORPORATION

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56, 122

Keyword:
"Re-establishement of rights (yes) - isolated mistake"
"Inventive step (no) independent measures considered separately in the assessment of inventive step"

Decisions cited:
T 0223/88

Catchword:
-

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Case Number: T 0072/99 - 3.4.3

D E C I S I O N
of the Technical Board of Appeal 3.4.3
of 26 June 2002

Appellant: OLIN CORPORATION
91 Shelton Avenue
New Haven, CT 06511-1837 (US)

Representative: Klunker . Schmitt-Nilson . Hirsch
Winzererstrasse 106
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 10 July 1998 refusing European patent application No. 92 909 877.0 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: R. K. Shukla
Members: G. L. Eliasson
W. Moser

Summary of Facts and Submissions

I. European patent No. 92 909 877.0 was refused in a decision of the Examining Division dated 10 July 1998. The ground for the refusal was that the application did not meet the requirements of inventive step having regard to the prior art documents

D1: Patent Abstracts of Japan, vol. 9, no. 165 (E-327) [1888] 10 July 1985 & JP-A-60-041244;

D2: US-A-4 680 618;

D3: US-A-3 685 134; and

D5: US-A-4 604 495.

II. Claim 1 according to the main request under consideration in the decision under appeal reads as follows:

"1. A package (30;50) for use in encapsulating an electronic device (52), comprising:

(a) a ceramic frame (32) having a first side (33), a second side (35) and an aperture (34);

(b) and a metallic component (36; 38) bonded to said first side (33) of said ceramic frame (32) and extending across said aperture (34; 34'),

characterized by

(c) said metallic component (36; 38) being manufactured from a compacted mixture of powders consisting essentially of molybdenum or tungsten as a first component and copper, silver or alloys thereof as a second component;

(d) and a seal ring (48) manufactured from a low expansion metal and bonded to said second side (35) of said ceramic frame (32)."

III. The reasons given in the decision of the Examining Division for the refusal can be summarized as follows:

(a) The device of claim 1 according to the main request differs from that of document D2 in that

(i) the metallic component is manufactured from a compacted mixture of powders; and

(ii) a seal ring is made of a metal having low thermal expansion.

(b) The above differences solve two different and unrelated problems, namely finding an alternative to the composite metal used in the metal component in the device of document D2; and providing a seal ring manufactured from a low expansion metal, so that a lid may be attached by a seam weld.

(c) The method of forming metal components from powder mixtures is known from document D3 where such components are disclosed to have better properties than those manufactured by infiltrating techniques, as known from document D2.

(d) As to feature (ii), it is known from document D5 to use a seal ring made of Kovar to solve the problem of attaching a lid of the same material to a ceramic substrate.

IV. On 17 November 1998, the appellant (applicant) filed a notice of appeal and a statement setting out the grounds of appeal, and paid the appeal fee. Also on the same day, the appellant filed an application for re-establishment of rights under Article 122 EPC with respect to the non-observance of the time limit for filing of a notice of appeal against the decision under appeal, and paid the corresponding fee.

V. At the oral proceedings held on 27 October 2000 to consider only the issue of re-establishment of rights, the Board decided that the appellant was re-established in his rights, and that the appeal proceedings are continued in writing.

VI. In response to a communication of the Board annexed to summons to a further oral proceedings scheduled on 26 June 2002, the appellant filed new sets of claims on 25 May 2002 and 21 June 2002.

VII. At the second oral proceedings held on 26 June 2002, the appellant requested that the decision under appeal be set aside and a patent be granted on the basis of one of the following requests:

(a) **main request:**
claims 1 to 18 filed as main request on 29 September 1997; or

(b) **first auxiliary request:**

claim 1 filed as first auxiliary request on 25 May 2002; or

(c) **second auxiliary request:**
claim 1 filed as second auxiliary request on 25 May 2002, with the term "by a deformation process" in feature (d) being deleted; or

(d) **third auxiliary request:**
claim 1 filed as auxiliary request C on 21 June 2002, with the term "metallic component is" in feature (f) being replaced by the term "metallic components are"; or

(e) **fourth auxiliary request:**
claim 1 filed as auxiliary request D on 21 June 2002.

VIII. Claim 1 according to the main request is the same as the main request under consideration in the decision under appeal (see item II above).

Claim 1 according to the first auxiliary request differs from claim 1 according to the main request in that it additionally contains the following feature (e):

"(e) said metallic component (36; 38) and said seal ring (48) being nickel coated."

Claim 1 according to the second auxiliary request differs from claim 1 of the main request in that feature (d) in the latter is replaced by the following features (d) and (e):

"(d) said metallic component (36; 38) being shaped to include a flange (40; 44) bonded to one side (33; 35) of said ceramic frame (32) and a pedestal (42; 46) extending into said aperture (34; 34');

(e) and a seal ring (48) manufactured from a low expansion metal and bonded to said second side (35) of said ceramic frame (32)."

Claim 1 according to the third auxiliary request differs from claim 1 of the main request in that the characterizing part reads as follows:

"(c) said package (30; 50) is a surface mount package;

(d) said ceramic frame (32) comprises a plurality of apertures (34; 34');

(e) a plurality of metallic components (36; 38) is provided, each of them bonded to said first side (33) of said ceramic frame (32) and extending across one of the apertures (34; 34');

(f) said metallic components (36; 38) are manufactured from a compacted mixture of powders consisting essentially of molybdenum or tungsten as a first component and copper, silver or alloys thereof as a second component;

(g) and a seal ring (48) is provided, manufactured from a low expansion metal and bonded to said second side (35) of said ceramic frame (32)."

Claim 1 according to the fourth auxiliary request

differs from claim 1 of the main request in that it additionally contains the following features (e) and (f):

"(e) said ceramic frame (32) having a metallization layer on said first side (33) about the perimeter of said aperture (34; 34') for bonding to said metallic component (36; 38) and a metallization layer on said second side (35) for bonding to said seal ring (48);

(f) and said metallic component (36; 38) and said seal ring (48) being nickel coated."

IX. The appellant essentially presented the following arguments in support of the application for re-establishment of rights under Article 122 EPC:

(i) The appellant, Olin Corporation, is a rather small firm with approximately 200 employees, most of them workers and only a few engineers. The appellant does not have a patent department with an appropriate docketing system of his own. The time limits to be observed in relation with patent applications and patents of the appellant are entered into the docketing system of the law firm Wiggin & Dana, New Haven, Connecticut, U.S.A.

(ii) The appellant being a small firm, Mr Struck, the president of Olin Corporation's facility in New Bedford, is the only person having the authority to decide on filing or abandoning of patent applications. Mr Struck's assistant, Mr Tower, is however authorized to convey decisions made

by Mr Struck to persons who have to take steps in accordance with Mr Struck's decisions. Mr Rosenblatt is the US patent attorney in the law firm Wiggin & Dana authorized to file a patent application, or to abandon a patent application, according to instructions from Mr Struck.

(iii) Mr Tower works as the assistant of Mr Struck since 1987 and has carried out his duties without fail. Mr Rosenblatt knows that Mr Tower is authorized to convey decisions made by Mr Struck, and that, as a consequence, he can act according to the instructions conveyed by Mr Tower.

(iv) Mr Rosenblatt sends all reminders, in particular those concerning time limits to be observed in relation with patent applications, to Mr Struck. However, it would be too cumbersome to confirm in writing oral instructions received from Mr Tower. As is normal practice among patent attorneys, Mr Rosenblatt makes notes when receiving instructions by phone, and it is assumed that these notes are correct.

(v) In the present case, Mr Rosenblatt duly contacted Mr Tower on 14 September 1998 to inquire about the filing of a notice of appeal, since Mr Struck was away on holiday at that time. Before Mr Struck went on holiday, he had instructed Mr Tower to abandon the Japanese application related to the present application. Mr Tower erroneously understood that Mr Stuck's instruction was to abandon **all** foreign

applications. As a result, he saw no need to contact Mr Struck regarding the filing of a notice of appeal in respect of the European application in suit.

(vi) On his return from vacation on 21 September, Mr Struck and Mr Tower did not discuss the filing of the notice of appeal as Mr Tower was convinced that he had indeed conveyed Mr Struck's instructions to Mr Rosenblatt properly. The misunderstanding was discovered on 22 September 1998.

(vii) For the foregoing reasons, the appellant submits that in spite of all due care required by the circumstances having been taken by all the persons concerned, the time limit of 21 September 1998 was missed due to an isolated misunderstanding of the instructions.

X. In support of patentability, the appellant presented essentially the following arguments:

(a) The problem addressed by the present invention is to provide a package which can be manufactured in an efficient way, since the measures (i) and (ii) in combination contribute to facilitate the manufacture of the package (cf. item III(a) above). The realization that it is necessary to improve two different parts of the package is to be taken into account when assessing inventive step. There is no single prior art document disclosing both the measures.

(b) A skilled person would have no reason to replace

the "porous tungsten infiltrated with copper" technology with the "compacted mixture of two kinds of powders" technology, since firstly, it was not known to the skilled person how the thermal expansion match between the ceramic frame and the metal component would change. Secondly, a metal component made of compacted powder has a certain degree of porousness, and it might therefore not be suitable for sealing the electronic device in the package from air, moisture etc. Therefore, it was not predictable that a metallic component made of a mixed powder would be successful.

Although powder technology was known *per se,* the appellant was the first to employ it in the field of packages for electronic devices. Document D3 relates to an electric contact which is basically different from a metallic component for a ceramic package, and would therefore not be considered by the skilled person.

(c) Regarding feature (ii), the solder ring 14 in the device of document D2 serves to mount a cap member by soldering, whereas the claimed device features a low-expansion seal ring which facilitates mounting by allowing seam welding. Although document D5 discloses a seal ring of Kovar, there is no hint as to make the package manufactured in the most efficient way.

(d) Regarding the first auxiliary request, document D2 teaches away from coating the periphery of the metallic component.

(e) As to the second auxiliary request, the metallic component has a pedestal and a flange, in contrast to the device of document D2 where a plate-shaped metallic component is disclosed. The claimed device has the advantage over the device of document D2 in that the shape of the metallic component can easily be chosen by using a mold with suitable shape.

(f) The device according to the third auxiliary request is particularly suitable for power transistors where a small number of electrodes is required. Using a plurality of apertures which provide electrical connections, it is possible to have a package without any external leads.

Reasons for the Decision

1. *Re-establishment of rights and admissibility of the appeal*

1.1 The decision under appeal was dispatched on 10 July 1988. Hence, pursuant to Rule 78(2) EPC, the decision was deemed to have been delivered on 20 July 1998. According to Article 108 EPC, first sentence, and Rule 85(1) EPC, the time limit for filing a notice of appeal thus expired on 21 September 1998. This time limit is a time limit within the meaning of Article 122(1) EPC, because its non-observance has the direct consequence, by virtue of Rule 65(1) EPC, of causing a loss of right by rendering the appeal inadmissible.

The removal of the cause of non-compliance with the

time limit pursuant to Article 108 EPC, first sentence, occurred on 22 September 1998. Thus, in consideration of Rules 83(4) and 85(1) EPC, the time limit for filing the application for re-establishment of rights as prescribed in Article 122(2) EPC expired on 23 November 1998. The application for re-establishment of rights was filed in writing, and the corresponding fee paid, on 17 November 1998. Furthermore, the omitted act, i.e. the filing of the notice of appeal and the payment of the appeal fee, was also completed on 17 November 1998. Finally, the application contains the core facts on which it relies, and its substantiation is thus sufficient.

It follows that the application for re-establishment of rights complies with the formal requirements of Article 122 EPC; it is, therefore, admissible.

1.2 The requirement to take all due care as stipulated in Article 122 EPC applies not only to the appellant's authorized representative, but equally to the appellant. Having regard to the facts and evidence adduced in the present case, the Board is satisfied that the appellant's European representative and the US instructing patent attorney had informed the appellant in due time regarding the filing of the notice of appeal and had correctly followed the instructions received from Mr Tower who was authorized to pass on instructions from Mr Struck. Hence, in the present case, it has to be considered whether the appellant had taken all due care pursuant to Article 122(1) EPC.

According to established jurisprudence of the Boards of Appeal, an isolated mistake in a normally satisfactory

system is excusable provided that it can be plausibly shown that a normally effective system for monitoring time limits prescribed by the EPC existed in the office in question at the relevant time. Such a system is normally satisfactory if it can be shown that it operated efficiently for many years. This generally implies the existence of a cross-check mechanism. However, in a relatively small office, normally working in an efficient and personal manner, employing normally reliable personnel, a cross-check mechanism for monitoring time limits may be dispensed with without offending against the duty of all due care as laid down in Article 122(1) EPC (cf. decision T 223/88, not published in the OJ).

This finding in decision T 223/88 applies in the case at hand. Moreover, there has existed a relationship of trust between Mr Struck and Mr Tower over a considerable period of time. Thus, in the Board's judgement, the non-compliance in the present case with the time limit pursuant to Article 108 EPC, first sentence, was the result of an isolated mistake arising due to a misunderstanding of the instructions within a normally satisfactory system. Consequently, re-establishment of rights is to be granted. All the more so because the loss of substantive rights should not result from such a mistake.

1.3 Since, on the other hand, the appeal meets the requirements of Articles 106, 107 and 108, third sentence, EPC, and of Rules 1(1) and 64 EPC, it is admissible.

2. *Prior art*

2.1 Document D2 is considered the closest prior art and discloses a package for use in encapsulating an electronic device (cf. Figure 4 with accompanying text). The package comprises a ceramic frame 32 with a metal component 30 which is bonded to a first side of the ceramic frame and extends across an aperture in the ceramic frame. The metal component 30 is made of porous Mo or W infiltrated with Cu, i.e. a porous body made of the refractory metal is impregnated with melted Cu. The proportion between porous Mo or W and Cu can be adjusted to match the thermal expansion coefficient of the ceramic, which is made of e.g. alumina (cf. column 5, lines 35 to 40; Tables 1 and 2). The ceramic frame has a first metallization layer 34 on the perimeter facing the metallic component and a second metallization layer on second side onto which a layer of solder 14 is formed.

2.2 Document D3 discloses heavy duty electrical contacts made of a mixture of powders of a refractory metal (W, Ti, Mo,...) and a highly conductive metal (Ag, Cu, Au, ...), which are repeatedly sintered and pressed (cf. column 2, lines 17 to 49). The contacts have better conductivity than those obtained by infiltration of a corresponding refractory metal with a conductive metal (cf. column 8, lines 23 to 49).

2.3 Document D5 discloses a ceramic package having a metal cap 18. The cap 18 is welded on a seal ring 20 made of Kovar which is bonded to the ceramic substrate 14 and plated with gold (cf. Figure 3; column 3, lines 28 to 29).

2.4 Document D1 discloses a ceramic package for an electronic device where the ceramic frame 11 has two

apertures. A metallic component 19 extends across each aperture and each metallic component has a flange and a pedestal. The material of the metallic components is not specified.

3. *Inventive step - main request*

3.1 The device of claim 1 according to the main request differs from that of document D2 in that:

(i) the metallic component is manufactured from a compacted mixture of powders, whereas in document D2 it is formed of porous Mo or W infiltrated with Cu; and

(ii) a seal ring made of a metal having low thermal expansion is bonded to the second side of the ceramic frame, whereas in document D2, a layer of solder 14 is formed on the second side of the ceramic frame for mounting a cap.

3.2 It was held in the decision under appeal that measure (i) relates to the partial problem of finding an alternative method of fabricating a metal component of the device of document D2, and measure (ii) relates to the partial problem of simplifying the manner how a lid sealing the package is attached.

3.2.1 Although the Board agrees with the appellant that the above measures (i) and (ii) can be regarded as facilitating the manufacture of a package (cf. item X(a) above), these measures relate to different parts of the package (the metal component onto which the electronic device is to be mounted and the manner how the cap is mounted to seal the package, respectively), and do not cooperate or interact in any manner to

facilitate the manufacture of the package. These measures are independent of each other and are therefore to be considered separately in the assessment of inventive step.

3.3 Regarding feature (i), the Board agrees with the decision under appeal that the skilled person seeking an alternative to a metallic component fabricated through infiltration would consider the use of a metallic component produced from a mixed powder. Both the technologies of employing "porous tungsten infiltrated with copper" and "compacted mixture of copper and tungsten powders" belong to powder metallurgy techniques, since porous tungsten employed in the infiltration technique is itself produced from a raw material in powder form. Thus, the expert employed to produce the metallic component made of tungsten infiltrated with copper, would also be aware about the other techniques of powder metallurgy, such as mixing two components in powder form before sintering. Since the latter technique has the advantage that the metallic component is finished after the sintering step, it appears that the skilled person would have enough incentive to try the replacement of the infiltration technique known from document D2 with the method known from document D3.

3.3.1 Although the appellant correctly observes that document D3 cited in the decision under appeal relates to a different use of a tungsten-copper product as that of document D2 (cf. item X(b) above), the Board notes that the ordinary skilled person in the field of electronic packaging would not be expected to possess expert knowledge about porous tungsten infiltrated with copper. He would therefore have to consult an expert on

processing tungsten. Since the method of infiltrating tungsten with copper involves the use of tungsten in powder form as a raw material, such an expert would also be knowledgeable about the possibility of using a compacted mixture of copper and tungsten powders.

3.3.2 As to the alleged porousness of a metallic component produced from a mixed powder, and the doubts whether a compacted mixture of tungsten and copper would be able to have the same thermal expansion coefficient as alumina (cf, item X(b) above), the Board notes that the appellant has not been able to show any prejudice against using a compacted mixture of tungsten and copper powder based on these considerations. It also appears that porousness can be controlled by applying an appropriate pressure while compacting the powder mixture. Furthermore, the fact that a body of tungsten infiltrated with copper can be made to have the thermal expansion coefficient of alumina, as evidenced in document D2, would give the skilled person a legitimate expectation that a sintered body from a compacted mixed powder of the same metals would have about the same thermal expansion properties.

3.4 As to feature (ii), document D5 discloses that the seal ring 20 made of Kovar has the purpose of allowing the metallic cap member 18 to be seam welded (cf. Figures 1 and 3; column 1, lines 20 to 25; column 2, lines 44 to 48). Since the seam welding is carried out by bringing electrodes into contact at opposite peripheral edges of the cap member, it is apparent that the seam welding technique readily lends itself to automation, and would therefore have the potential of being more efficient than soldering. Therefore, the skilled person

seeking to simplify the manner how a lid sealing the package is attached would consider the replacement of the solder ring 14 in the device of document D2 by a low-expansion seal ring of the type known from document D5.

Thus, the argument of the appellant that document D5 contains no hint as to make the package manufactured more efficiently cannot be followed (cf. item X(c) above).

3.5 For the reasons above, therefore, the subject matter of claim 1 according to the main request does not involve an inventive step within the meaning of Article 56 EPC.

4. *Inventive step - First auxiliary request*

4.1 The device of claim 1 according to the first auxiliary request differs from that of document D2, in addition to the features (i) and (ii) referred to above, in that

(iii) the metallic component and the seal ring are nickel coated, whereas in the device of document D2, the metallic component is partially coated where the electronic device is to be attached (cf. column 3, lines 22 to 26). Furthermore, the device of document D2 does not have a seal ring.

4.2 As also confirmed by the appellant, the use of nickel coating on metal component and the seal ring has the purpose of improving wetting of solder. Thus, the technical problem associated with the feature (iii) relates to improving the soldered bonds in the package.

4.3 Since the use of nickel coating is well-known in the

art to improve wetting of solder, the skilled person would as a matter of routine consider coating the entire metallic component, as well as the seal ring with nickel whenever considered useful. Therefore, although document D2 discloses a metallic component where only the center portion is nickel coated, the skilled person would, contrary to the submissions of the appellant, not be prejudiced from providing a nickel coating over the entire metallic component whenever required or desirable (cf. item X(d) above).

Since features (i) and (ii) would be obtained without employing inventive skills for the reasons given under item 3 above, the subject matter of claim 1 according to the first auxiliary request does not involve an inventive step within the meaning of Article 56 EPC.

5. *Inventive step - Second auxiliary request*

5.1 The device of claim 1 according to the second auxiliary request differs from that of document D2, in addition to the features (i) and (ii) referred to above, in that

(iv) the metallic component is shaped to include a flange bonded to one side of the said ceramic frame and a pedestal extending into the aperture.

5.2 Since a metallic component having pedestal and a flange is known from document D1 for the same type of device, the skilled person would as a matter of routine considering such a shape, since employing this measure would only require that the mold with a corresponding shape is used for compressing the mixed powder of tungsten and copper.

Thus, the Board agrees with the submissions of the appellant that the technique of using mixed powders of tungsten and copper allows for great freedom in choosing the shape of the metallic component (cf. item X(e) above). This, however, belongs to the basic knowledge in the field of powder metallurgy and can therefore not be considered as contributing to an inventive step.

5.3 Since features (i) and (ii) would be obtained without employing inventive skills for the reasons given under item 3 above, the subject matter of claim 1 according to the second auxiliary request does not involve an inventive step.

6. *Inventive step - Third auxiliary request*

6.1 The device of claim 1 according to the second auxiliary request differs from that of document D2, in addition to the features (i) and (ii) referred to above, in that

(v) the package is a surface mount package, whereas the package of document D2 is of a pin-grid type; and

(vi) the ceramic frame comprises a plurality of apertures where a plurality of metallic components is provided, each of them bonded to the ceramic frame (32) and extending across one of the apertures, whereas in the device of document D2 only one aperture and one metallic component is present.

6.2 Features (v) and (vi) are both known from document D1 where the electronic device is mounted on one of the

metallic components, and the other metallic component acts as an electric lead. Whenever such an arrangement would be desirable, the skilled person would be able to carry out the corresponding modifications of the package known from document D2 in a routine manner.

6.3 Since a surface mount device having a plurality of metallic component is known from e.g. document D1, it is evident that all the advantages presented by the appellant were well-known in the art and could therefore not be considered inventive (cf. item X(f) above).

6.4 Since features (i) and (ii) would be obtained without employing inventive skills for the reasons given under item 3 above, the subject matter of claim 1 according to the third auxiliary request does not involve an inventive step within the meaning of Article 56 EPC.

7. *Inventive step - fourth auxiliary request*

7.1 The device of claim 1 according to the fourth auxiliary request adds to the device according to claim 1 of the main request the feature (iii) referred to above, and the following feature:

(vii) the ceramic frame has a metallization layer on the first side about the perimeter of the aperture for bonding to the metallic component and a metallization layer on the second side for bonding to the seal ring (48).

Feature (vii) is however known from document D2, since it discloses metallization layers on the first and second sides of the ceramic frame where the metallic

component and the layer of solder, respectively, are to be mounted (cf. Figure 4; column 3, lines 31 to 35).

7.2 Thus, the device of claim 1 according to the fourth auxiliary request differs from that of document D2 only in the features (i) to (iii) referred to above. Consequently, the subject matter of claim 1 according to the fourth auxiliary request does not involve an inventive step within the meaning of Article 56 EPC for the same reasons as given under items 3 and 4 above.

Order

For these reasons it is decided:

The appeal is dismissed.

The Registrar: The Chairman:

M. Beer R. K. Shukla