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**Datasheet for the decision
of 18 January 2008**

Case Number: T 1245/07 - 3.4.03

Application Number: 96920032.8

Publication Number: 0840369

IPC: H01L 21/56

Language of the proceedings: EN

Title of invention:
Electronic component and method of production therof

Applicant:
KABUSHIKI KAISHA TOSHIBA

Headword:
-

Relevant legal provisions:
EPC Art. 82, 83
EPC R. 44(1), 64(1), 137(4)

Relevant legal provisions (EPC 1973):
EPC Art. 82, 83
EPC R. 30(1), 46(1), 86(4)

Keyword:
"Amended claims relating to unsearched subject-matter (yes) - main and first auxiliary request"
"Sufficiency of disclosure (no) - second and third auxiliary request"

Decisions cited:
-

Catchword:
-

Case Number: T 1245/07 - 3.4.03

D E C I S I O N
of the Technical Board of Appeal 3.4.03
of 18 January 2008

Appellant: KABUSHIKI KAISHA TOSHIBA
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 16 March 2007 refusing European application No. 96920032.8 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: V. L. P. Frank
Members: R. Q. Bekkering
J. Van Moer

Summary of Facts and Submissions

I. This is an appeal against the refusal of application 96 920 032 for the reason that the claims had been impermissibly amended to relate to unsearched subject-matter which lacked unity with respect to the originally claimed invention (Rule 86(4) EPC 1973 (Rule 137(4) EPC)).

II. At oral proceedings before the board the appellant applicant requested that the decision under appeal be set aside and a patent granted on the basis of the following:

Main request: claims 1 to 5 filed 22 January 2007;

First auxiliary request: claims 1 to 5 filed 18 December 2007;

Second auxiliary request: claims 1 to 25 filed 18 December 2007;

Third auxiliary request: claims 1 to 23 filed 18 December 2007.

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

"*1. A fabricating method for fabricating a surface acoustic wave device, comprising the steps of:*
aligning a plurality of surface acoustic wave devices to an aggregate consisting of a plurality of printed circuit boards at a predetermined position;
assembling the surface acoustic wave devices and the aggregate of the printed circuit boards through

conductive connecting members with a predetermined spacing;
disposing a hot-melt type member on the aggregate consisting of the surface acoustic wave devices and the printed circuit boards;
heating and melting the hot-melt member while preventing the hot-melt type member from spreading into a space portion between the printed circuit boards and the surface acoustic wave devices; and
separating the aggregate of a plurality of the printed circuit boards together with the hot-melt type member into individual surface acoustic wave devices."

IV. Claim 1 of the first auxiliary request differs from claim 1 of the main request by the replacement of "*hot-melt type member*" by "*preformed sheet of hot-melt type material*".

V. Claim 1 of the second auxiliary request reads as follows:

"*1. A fabricating method for fabricating an electronic device comprising the steps of:*
(a) disposing a first surface of a printed circuit board in an opposite relation with a first surface of a functional device having an electrode disposed thereon;
(b) disposing a sealing member above the first surface of the printed circuit board and/or a second surface of the functional device; and
(c) sealing a space portion formed between the printed circuit board and the functional device while preventing the sealing member spreading into at least the space portion, wherein

prior to step (a), the printed circuit board and the functional device are temporarily bonded together using an organic adhesive."

VI. Claim 1 of the third auxiliary request is identical to claim 1 of the second auxiliary request save for the replacement of "*sealing member*" by a "*hot-melt type member*" and the insertion of "*by heating/melting the hot-melt type member*" in feature (c).

VII. Reference is made to the following prior art document:

D1: US 4 864 470 A

VIII. The appellant applicant in substance submitted the following:

The search division and examining division erred in their finding that the application, in particular the first and ninth invention identified in the search report, lacked unity. The subject-matter of claim 1 as originally filed was in fact neither anticipated nor rendered obvious by the disclosure of document D1. The hot-melt type member of claim 1 as originally filed, on proper interpretation, was a solid member. This was further supported by the fact that according to claim 1 as originally filed the member was heated and melted. In document D1 a viscous substance such as epoxy, polyimide or a frit glass paste was poured on the device. These substances were neither solid nor were they heated and melted.

Accordingly, the examining division's finding in the decision under appeal that claim 1 of the main request

related to unsearched subject-matter which did not combine with the originally filed invention or group of inventions to form a single general inventive concept could not be sustained.

Concerning claim 1 of the second auxiliary request, the passages in the description relative to the added feature of temporarily bonding together the printed circuit board and the functional device using an organic adhesive, despite their brevity, provided a sufficient level of detail to allow the skilled person to put the claimed invention into effect, so that the requirement of Article 83 EPC was met.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 The search division, when carrying out the supplementary European search, found that the application did not meet the requirement of unity of invention (Article 82 EPC). It identified within the 165 claims with about 70 independent claims nine non-unitary (group of) inventions in the application and informed the applicant (now appellant) that if the search was also to cover inventions other than the invention first mentioned in the claims, a further search fee had to be paid for each of these inventions (Rule 46(1) EPC 1973).

As no further search fees were paid by the appellant, the supplementary European search report was drawn up for the invention first mentioned in the claims only.

In particular, the invention first mentioned was considered to correspond to claims 1-7, 15-38, 46-56, 144-147, 149, 150 and to relate to a "*sealed flip-chip mounted electronic component and method of production thereof, using internal frames in order to avoid the sealing member to penetrate into the active area of the component*".

The ninth invention was considered to correspond to claims 1, 3-7, 15-32, 34-38, 46-56, 131-134, 144-147, 149, 150 and to relate to a "*sealed flip-chip mounted electronic component and method of production thereof using different cutting methods when separating devices from aggregate layers*".

2.2 Claim 1 according to the main request, refused by the examining division, corresponds to claim 131 as originally filed with the further, *per se* disclosed limitation that the electronic/functional device is a surface acoustic wave device. The claimed subject-matter is thus based on the above ninth invention.

2.3 The examining division found in the decision under appeal that as the ninth invention was not unitary with the first invention and had not been searched, amended claim 1 related to unsearched subject-matter which did not combine with the originally claimed invention or group of inventions to form a single general inventive concept, thereby contravening the requirement of Rule 86(4) EPC 1973 (Rule 137(4) EPC).

2.4 Rule 44(1) (Rule 30(1) EPC 1973) stipulates that where a group of inventions is claimed in one European patent application, the requirement of unity of invention under Article 82 EPC shall be fulfilled only when there is a technical relationship among those inventions involving one or more of the same or corresponding special technical features. The expression "*special technical features*" shall mean those features which define a contribution which each of the claimed inventions considered as a whole makes over the prior art.

2.5 Claim 1 as originally filed reads as follows:

"*1. A fabricating method for fabricating an electronic device comprising the steps of:*
(a) disposing a first surface of a printed circuit board in an opposite relation with a first surface of a functional device;
(b) disposing a hot melt type member above the first surface of the printed circuit board and/or a second surface of the functional device, and
(c) by heating/melting the hot melt type member, sealing a space portion formed between the printed circuit board and the functional device preventing the hot melt type member spreading into at least the space portion."

2.6 Prior art document D1 discloses a method for fabricating an electronic device using a flip chip mounting method in which an electronic component (24) such as a surface acoustic wave device (SAW) is placed face down on a base plate (21) with electrodes (22)

formed thereon and the electrodes (30) of the electronic component are connected to the electrodes (22) of the base plate. After that, a viscous substance such as an adhesive which is made of an epoxy resin, a polyimide resin or the like and can be set, is poured around a peripheral surface of the SAW device (24) so that the peripheral surface of the SAW device is bonded to the top surface of the base plate (21) and the space defined between the functional surface and the top surface of the base plate is sealed as the viscous substance is set. The viscous substance should however not enter the space between the SAW device and the base plate. A frit glass paste or the like may also be used as the viscous substance (column 2, lines 32 to 68; figure 1). Moreover, a viscous substance of some kind may be used to coat not only the peripheral surface of the SAW device but also the top surface thereof opposite to the functional surface to embed the SAW device in the viscous substance (column 3, lines 10 to 14).

2.7 Claim 1 as originally filed comprises, after a first step (a) which corresponds to a flip-chip mounting method as disclosed in document D1, a step (b) of disposing a "*hot melt type member*".

The appellant argued that it followed from the description that the "*hot melt type member*" as defined in claim 1 as originally filed was a solid. This was further supported by the fact that the subsequent method step of claim 1 of sealing by heating/melting of the hot melt type member also implied that the hot melt type member had to be a solid.

2.8 Conventionally, hot melt adhesives are thermoplastic adhesives which are typically applied hot in molten state.

In the application the expression "*hot melt type member*" is used in a broad sense to identify the sealing component. According to the description as originally filed, the "*hot-melt type member*" can for instance be a thermosetting resin, such as an epoxy resin, a silicone resin, a low melting (frit) glass etc. (page 14). Furthermore, "*a resin such as a thermo-plastic or a thermo-setting resin can be used*" (page 128, lines 10 to 12). Moreover, it can be a solid or a liquid. For instance, it can be "*a member being solid state in initial stage such as a resin powder which has a pellet shape*" (page 222, lines 21 to 23) or a sheet of a resin which "*can be easily obtained by cold pressing powder of raw material such as an epoxy resin into a required shape and a weight*" (page 64, lines 18 to 20). Furthermore, it can be a liquid thermo-setting member which is poured or dripped and heated/melted or heated/hardened (claim 115; page 246, line 21 to page 247, line 9; page 184, line 25 to page 185, line 18).

It follows that the appellant's allegation that the "*hot melt type member*" in claim 1 as originally filed is limited to a solid member is not supported by the original disclosure.

2.9 In document D1 the viscous substance is "*an adhesive which is made of an epoxy resin, a polyimide resin or the like and can be set*" or "*a frit glass paste or the like*".

It is arguable whether epoxy resins and polyimide resins are always heated and melted, as found by the examining division. In fact, thermosetting resins such as epoxy resins may cure by chemical reaction, without the need for heating and without any melting. Polyimide resins may be poured in molten state and seal the electronic device when solidifying upon cooling. There is no need for a further step for sealing the electronic device by heating/melting.

Frit glass paste, on the other hand, consists of glass powder with a binder which provides the required hermetic seal when fused after having been applied. Fusing is obtained by heating and melting the glass powder.

It follows from the above that the frit glass paste of document D1 constitutes a "hot melt type member" as per claim 1. Furthermore, document D1 implies to the person skilled in the art that sealing of the space between SAW device and base plate takes place by heating and melting the frit glass paste.

Accordingly, the subject-matter of claim 1 as originally filed is fully anticipated by document D1.

2.10 The "*special technical features*" which define a contribution over the prior art within the meaning of Rule 44(1) EPC of the first invention are provided in dependent claim 2 and relate to disposing a frame-shaped member on the surface of the printed circuit board in such a manner that it surrounds the space portion to be sealed.

As far as the ninth invention is concerned, the "*special technical features*" which define a contribution over the prior art relate to aligning a plurality of functional devices to an aggregate consisting of a plurality of printed circuit boards, assembling the functional devices and the aggregate of printed circuit boards, disposing a hot-melt type member on the aggregate, heating and melting it and separating the aggregate of a plurality of the printed circuit boards together with the hot-melt type member into individual electronic devices.

As the first and ninth inventions do not involve one or more of the same or corresponding special technical features, there is no technical relationship between them. The requirement of unity is therefore not fulfilled (Rule 44(1) EPC).

2.11 It follows that the communication under Rule 46(1) EPC 1973 (Rule 64(1) EPC), informing the appellant applicant that if the European search report was to cover the inventions other than the first, a further search fee had to be paid for each invention, was justified. As the appellant applicant failed to pay any further search fee, no search was carried out for the further inventions, in particular the above ninth invention.

Hence, claim 1 according to the main request has been amended so as to relate to unsearched subject-matter which does not combine with the originally claimed invention for which a search has been carried out, ie the first invention, to form a single general inventive

concept, thereby contravening the requirement of Rule 137(4) EPC.

3. *First auxiliary request*

Claim 1 according to the first auxiliary request is also based on the ninth invention and thus fails for the same reason as claim 1 of the main request.

4. *Second auxiliary request*

4.1 Claim 1 according to the second auxiliary request consists in substance of a broadened definition of the subject-matter of original claim 1 with the additional feature that "*prior to step (a), the printed circuit board and the functional device are temporarily bonded together using an organic adhesive*".

4.2 An organic adhesive for temporarily adhering is disclosed in the application as originally filed only on page 281, lines 11 to 15.

A fundamental requirement in the present application is that the surface of the surface acoustic wave device, or other functional device, should not be covered by resin or other material as this would degrade the performance of the device. As the electrodes should also not be covered by the adhesive in order to allow proper contacting, it is unclear where the adhesive should be applied. The application does not contain any instructions in this respect. Neither is the nature of the adhesive clearly disclosed as the mere limitation to organic adhesives leaves a myriad of adhesives only a few of which will be effectively usable.

Moreover, as the printed circuit board and the functional device are temporarily bonded together, the adhesive must be subsequently removed. However, the application does not disclose at which fabrication stage and how it should be removed.

Step (a) of claim 1 consists of disposing a first surface of a printed circuit board in an opposite relation with a first surface of a functional device having an electrode disposed thereon. It is unclear how the printed circuit board and the functional device can be temporarily bonded prior hereto. Furthermore, it is unclear how the adhesive can be removed after the device is sealed, as the adhesive would presumably be enclosed within the seal.

The appellant referred to page 70, lines 9 to 16 of the original description. This passage is however silent about how the temporary bonding should be performed. There is also no mention of any organic adhesive. It is in fact unclear whether this passage relates to the above temporary adhering with an organic adhesive or whether it relates to some other embodiment involving for instance a bonding process similar to that used for electrode bonding.

The appellant also suggested that the organic adhesive was probably not removed but remained on the device. There is however no disclosure in the application of such a process and of the effects of the heating/melting step on the organic adhesive.

The principle underlying Article 83 EPC that the skilled person should be given sufficient guidance for performing the invention without undue burden in the whole range claimed is thus not fulfilled.

4.3 It follows from the above that the concept of temporarily bonding the printed circuit board and the functional device together using an organic adhesive is not disclosed in the application in a manner sufficiently clear and complete for it to be carried out by a skilled person, contrary to Article 83 EPC.

4.4 It is moreover noted that replacing the term "bonded" in claim 1 by "adhered", as suggested by the appellant, would not alter the above finding.

5. *Third auxiliary request*

Claim 1 according to the third auxiliary request also relates to the above concept of temporarily bonding the printed circuit board and the functional device together using an organic adhesive and thus fails for the same reason as claim 1 of the second auxiliary request.

Order

For these reasons it is decided that:

The appeal is dismissed

Registrar	Chair
S. Sánchez Chiquero	V. L. P. Frank