BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

A		B		C	X

File Number: T 0712/91 - 3.4.1

Application No.: 83 304 301.1

Publication No.: 0 100 232

Title of invention: Substrate for semiconductor apparatus

Classification: H01L 23/14

D E C I S I O N
of 24 February 1993

Proprietor of the patent: Sumitomo Electric Industries Limited

Opponent: Metallwerk Plansee GmbH

Headword:

EPC Art. 56

Keyword: "Inventive step (main and first six auxiliary requests: no; seventh auxiliary request: yes)"

Case Number : T 0712/91 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 24 February 1993

Appellant : (Opponent)
Metallwerk Plansee GmbH
A - 6600 Reutte (AT)

Representative :
Lohnert, Wolfgang, dr.
Metallwerk Plansee GmbH
A - 6600 Reutte (AT)

Respondent : (Proprietor of the patent)
Sumitomo Electric Industries Limited
No. 15, Kitahama 5-chome
Higashi-ku
Osaka-shi
JP - Osaka 541 (JP)

Representative :
Stephen C. D. Bankes
Baron & Warren
18 South End
Kensington
GB - London W8 5BU (GB)

Decision under appeal : Decision of the Opposition Division of the European Patent Office dated 16 July 1991 rejecting the opposition filed against European patent No. 0 100 232 pursuant to Article 102(2) EPC.

Composition of the Board :

Chairman : G.D. Paterson
Members : Y. van Henden
U.G.O.M. Himmler

Summary of Facts and Submissions

I. European patent No. 0 100 232 having eight claims was granted to the Respondent.

Independent Claims 1 and 7 read as follows:

1. A substrate for use as a carrier for a semiconductor chip, in which pore portions of a sintered body obtained by pressing and sintering using tungsten or molybdenum powders or a mixture thereof are filled by molten copper so as to form an alloy of tungsten and/or molybdenum with copper either

   by a method with which inner pores of the sintered body are filled with molten copper by means of infiltration of 5-30 wt.% of copper to sintered body obtained by pressing and sintering tungsten or molybdenum powders or mixed powders of tungsten and molybdenum or

   by a method with which inner pores of the sintered body are filled with molten copper obtained at the same time when 5-30 wt.% of copper powders have been mixed in advance into tungsten or molybdenum powders or mixed powders of tungsten and molybdenum and pressed and sintered.

7. An integrated circuit package comprising a substrate and semiconductor chip combination according to Claim 5 or Claim 6 mounted in an enclosure base material having a thermal expansion coefficient similar to those of the substrate and the semiconductor chip.

Claims 2 to 6 are appended to Claim 1, whereas Claim 8 is appended to Claim 7.

II. The Appellant filed an opposition against the European patent. Relying upon the state of the art disclosed, *inter alia*, in documents

D1: DE-B-1 141 725
D2: DE-B-1 143 588
D3: F. Benesovsky, "Pulvermetallurgie und Sinterwerkstoffe", Metallwerk Plansee AG & Co. KG, Reutte (Austria), 1973, pages 146-156,

he requested that said patent be revoked.

III. In a communication dispatched on 5 December 1990 as an annex to a summons to attend oral proceedings, the Opposition Division took into consideration the document

D4: DE-A-2 853 951

which had been cited in the European search report, and expressed the provisional view that, with regard to the teachings of this document and those cited by the Opponent (Appellant), Claim 1 of the patent as granted does not involve an inventive step.

IV. Oral proceedings were held on 21 June 1991, at the end of which the decision was announced that the opposition was rejected and the European patent maintained as granted.

In its written decision, the Opposition Division took the view that inventiveness cannot be contested here without taking into consideration the teachings of document (D3), which document would be in a field far removed from that of the patent in suit. As a matter of

fact, reading the initial paragraph of (D3) would be enough to deter the skilled person from further inquiring about its content.

V. The Opponent lodged an appeal against the decision of the Opposition Division. With his Statement of grounds of appeal, he submitted *inter alia* the further documents

B1: H. Schreiner "Pulvermetallurgie elektrischer Kontakte", Springer-Verlag, Berlin/Göttingen/ Heidelberg, 1964, pages III to VIII of "Vorwort" and pages 12, 13, 146 to 155, 228 and 229;

B2: Brochure headed "ELMET Kontaktwerkstoffe", Metallwerk Plansee AG & Co. KG, Reutte (Austria), 1977.

VI. The Appellant requested that the impugned decision be set aside and that the European patent be revoked. In support of this request, the Appellant submitted that the Opposition Division had infringed Article 113(1) EPC to his prejudice.

VII. The Respondent commented on the grounds of appeal in a letter dated 28 July 1992. Besides a main request having for its object the dismissal of the appeal and the maintenance of the patent as granted, he submitted three subsidiary requests based on amendments to the granted Claim 1.

The Respondent's first subsidiary request is based on Claim 1 amended so as to specify a maximum copper content of 20% by weight.

The second subsidiary request is based on Claim 1 amended to specify the combination of a substrate with a

semiconductor chip, wherein the coefficient of expansion of the substrate is similar to that of the chip.

The third subsidiary request is based on Claim 1 including the amendments of both the first and the second subsidiary requests.

VIII. In a communication pursuant to Article 11(2) RPBA, the Board expressed the provisional opinion that, having regard to the teachings of documents (D1, D3, D4, B2), none of the Respondent's requests seemed to be allowable.

IX. With telefax dated 12 February 1993, the Respondent submitted four further subsidiary requests.

The Respondent's fourth subsidiary request limits Claim 1 as granted to the first of the two methods described there.

The fifth subsidiary request has for its object

"an integrated circuit package comprising a semiconductor chip mounted on a carrier substrate, the carrier substrate being mounted in an enclosure base material having a thermal expansion coefficient similar to those of the substrate and the semiconductor chip, wherein the substrate is one in which (same continuation as in the granted Claim 1)".

With respect to the fifth subsidiary request, the sixth subsidiary request is restricted to a copper content of 5 to 20% by weight.

The seventh subsidiary request is a further restriction of the sixth one by specifying that the enclosure base material comprises alumina.

X. Oral proceedings were held on 24 February 1993. During the hearing, the Respondent filed amended pages of description, a complete draft of Claim 1 according to his seventh subsidiary request and new Claims 2 and 3 to be appended to the latter one.

XI. The Appellant maintained his request for cancellation of the decision under appeal and for revocation of the patent in suit. In support thereof, he substantially argued as follows:

The problem to be solved by the invention, i.e. achieving a good adaptation of the thermal expansion of a semiconductor element to that of its carrier, is the same as in documents (D1) and (D2). Document (D1) mentions such carriers comprising a sintered skeleton of tungsten or molybdenum filled with a metal having a good conductivity.

Starting from the teachings in (D1), the skilled person will be informed about technical literature dealing with the workability of sintered tungsten and/or molybdenum containing an infiltration of good conducting material. This leads him to read document (D3), from which he learns the advantages of sintered tungsten or molybdenum containing copper and, furthermore, the methods referred to in Claim 1. Therefore, combining the teachings of documents (D1) and (D3) leads to the patented subject-matter without the skilled person having to display inventive talent therefor.

Now, the argument that the skilled person would not take (D3) into consideration does not hold, as evidenced by document (B1), which is a reference book in the field of sintered bodies made of W/Cu, W/Ag and Mo/Cu. The Introduction of (B1) clearly shows that the author, who is mentioned as the inventor in (D1) and (D2), had

professional contact to the author of (D3) . Furthermore, the conclusion of (B1) points out the advisability of using sintered chip carriers including tungsten or molybdenum. An additional reason for taking the teachings of (D3) into consideration is that thermal expansion plays a part in the field of electrical switch contact as well as in that of chip carriers. This can also be inferred from (B2), which reveals that the percentages of tungsten and copper can be varied continuously from 0% to 100%, whereby the thermal expansion coefficient too varies continuously. Finally, as regards the use of nickel in (D1), it should be noted that the carrier disclosed there must be compatible with the thermal expansion of a housing made of copper or silver, i.e. meet a requirement which is not set in the present case.

As regards the use of an enclosure base of alumina, the Appellant put forward that attempting to match thermal expansion is common practice in the art, and that the selection of alumina was a question of routine.

XII. The Respondent requested that the appeal be dismissed and that the patent be maintained as granted. Alternatively, he requested that the patent be maintained on the basis of one of the seven auxiliary requests filed on 29 July 1992 and 12 February 1993.

The Respondent's argumentation may be summarised as follows:

Document (D1) relates to silicon rectifiers and, in the introductory portion concerning background art, mentions the use of contact plates made of sintered tungsten or molybdenum filled with a metal having good conductivity. Nevertheless, the nature of the latter metal is not otherwise specified. Furthermore, to improve the

contact, document (D1) proposes to make the plates of sintered molybdenum in which the pores are filled with nickel, as well as to solder said plates to the rectifier by means of gold or a gold alloy. Likewise, document (D2) discloses contact members for semiconductor devices, which members comprise a sintered body of tungsten and/or molybdenum with nickel as filling material. Adjusting the coefficient of thermal expansion and improving the heat dissipation of a substrate is, however, not envisaged in (D2), and the inclusion of nickel will rather decrease than increase the thermal conductivity.

The sintered bodies described in (D3) are for use as electrodes or electrical contacts. The technical problems underlying their design are quite different from those arising in connection with the development of carriers for semiconductor chips. In particular, there is no mention of thermal expansion figures in the opening paragraph of (D3), where properties required for the sintered bodies are listed. As a matter of fact, an electrical contact needs a coefficient of expansion matching that of the substrate on which it is mounted, and which is obviously not that of a semiconductor material such as silicon or gallium arsenide, nor that of a ceramic material. In this respect, the lack of evidence that the Opponent ever thought of using his own "Elmet" sintered bodies for carrying semiconductor chips is noteworthy. The reason therefor is that copper-impregnated tungsten or molybdenum sinters available before the priority date of the patent in suit were too porous for them to be used as semiconductor supports. Furthermore, the table on page 151 of (D3) shows that even if the amount of copper filling the pores of a sintered body is increased to 35% by weight, i.e. to a value at which thermal expansion is unacceptable, no considerable gain in thermal conduction is provided with

respect to pure molybdenum. Finally, that there would have been professional contact between the authors of (D3) and (D1) is no evidence of such a close relationship between the respective fields dealt with in these documents that, while attempting to solve a technical problem specific to one of these fields, an expert would be led to study documents belonging to the other one.

Document (B2) does not teach more than (D3) and, moreover, shows that thermal conductivity increases much more slowly than thermal expansion when the content of copper of a sinter is augmented. Besides that, there is a doubt as regards its publication date. Document (D4) sets out the problem to which the present invention is addressed. Nevertheless, rather than going back to the materials of (D3), it proposes a porous support of copper or silver with a pore-free outer layer of metal. Furthermore, as pointed out during the hearing, this support is intended to carry semiconductor power rectifiers, and there is a huge difference of magnitude between the thermal dissipations in such devices and in chips. Therefore, an expert in the field of power rectifiers would be more interested in matching thermal expansions than in enhancing thermal conductivity, whereby he would be led away from the use of copper.

During the oral proceedings, the Respondent also referred to decisions T 165/85, T 392/86 and T 274/87 in relation to with inventiveness of the claimed subject-matter and, with respect to the admissibility of the Appellant's late submissions, to the decision T 253/85.

XIII. After deliberation during the oral proceedings, the Chairman announced the Board's intention to maintain the patent on the basis of the seventh auxiliary request. Accordingly, the Respondent filed a set of Claims 1 to 3

and an amended description, in further implementation of the seventh auxiliary request. At the end of the oral proceedings, the Chairman of the Board announced that the decision under appeal is set aside and that the patent is maintained in accordance with the Respondent's seventh auxiliary request.

XIV. In a letter received on 20 March 1993, the Respondent drew attention to an error in the draft of Claim 1 of the seventh auxiliary request as filed during the oral proceedings of 24 February 1993, namely the omission of the words "of copper powders" in the clause related to the alternative method of making the carrier substrate. Requesting that this error be corrected, the Respondent submitted a retyped set of Claims 1 to 3 according to the seventh auxiliary request of 12 February 1993. Claim 1 of this retyped set reads:

"An integrated circuit package comprising a semiconductor chip mounted on a carrier substrate, the carrier substrate being mounted in an enclosure base of alumina Al_2O_3, the substrate having a thermal expansion coefficient similar to those of the chip and of the alumina, characterised in that the substrate is one in which pore portions of a sintered body obtained by pressing and sintering using tungsten or molybdenum powders or a mixture thereof are filled by molten copper so as to form an alloy of tungsten and/or molybdenum with copper either

by a method in which inner pores of the sintered body are filled with molten copper by means of infiltration of 5-20 wt.%, based on the total composition, of copper to a sintered body obtained by pressing and sintering tungsten or molybdenum powders or mixed powders of tungsten and molybdenum or

by a method in which inner pores of the sintered body are filled with molten copper obtained at the same time when 5-20 wt.%, based on the total composition, of copper powders, have been mixed in advance with tungsten or molybdenum powders or mixed powders of tungsten and molybdenum and pressed and sintered."

Claims 2 and 3 were not amended.

XV. In a communication to both parties dated 30 May 1993, the Board stated that, subject to any observations from the Appellant to the contrary, it considered that the omission of the words "of copper powders" from Claim 1 as filed during the oral proceedings was in error, and that the oral decision which referred to that claim should be corrected under Rule 89 EPC. The Appellant was invited to file any observations upon the Respondent's letter dated 15 March 1993 or in reply to the Board's communication within one month. No comments were received from the Appellant in due time or at all.

Reasons for the Decision

1. The only matter at issue in the appeal is that of inventive step.

2.1 The patent in suit is concerned with an arrangement for mounting a semiconductor chip on a carrier substrate which is mounted on an enclosure base.

According to the introduction to the patent, a first technical problem to be solved in such arrangements is to provide a carrier substrate for the semiconductor chip which is capable of efficiently radiating the heat developed in the chip material, and which has thermal

expansion properties as similar as possible to those of the chip material. A further technical problem to be solved is to provide a carrier substrate which has thermal expansion properties as similar as possible to both the chip material and the enclosure base material - see page 2, lines 4 to 7 and 42 to 46.

2.2 Main requests

Claim 1 defines a chip carrier. During the oral proceedings of 24 February 1993, the Respondent drew the attention to a huge difference in magnitude between the thermal dissipation in semi-conductor power rectifiers and that in semiconductor chips. In his submission, therefore, a skilled person attempting to improve chip carriers would not take into consideration documents concerned with carriers for such power rectifiers.

The Board nevertheless observes that documents dealing with carriers for semiconductor devices with high thermal dissipation, or dealing with contacts to be bonded to the faces of a semiconductor slice in a power rectifier, relate to a field of technology in which the problems to be solved by the present invention also arise, i.e. a neighbouring field in which the skilled person involved in the design of chip carriers is expected to look for suitable parallels - cf. Decision T 176/84 (OJ EPO 1986, 50), paragraph 5.3.1 of the Reasons for the Decision. The Board furthermore observes that the higher the thermal dissipation in a semiconductor device is, the more crucial are the problems of evacuating the heat produced in the semiconductor material and of matching the respective thermal expansions of said device and its carrier. In the Board's judgment, therefore, a skilled person involved in the design of chip carriers and perceiving the necessity of further improvements with respect to

heat evacuation and to the matching of expansion coefficients would be even more interested in technical literature pertaining to carriers for semiconductor power rectifiers than in that pertaining to chip carriers.

2.3 Document (D1) reveals that it is known to bond silicon rectifiers to contacting plates formed of a sintered skeleton of tungsten or molybdenum having its pores filled with a metal exhibiting good conductivity - see column 1, lines 16 to 19. Thereby, a good adaptation of thermal expansions is achieved between the semiconductor and the carrier - see column 1, lines 19 to 22.

It is true that, in relation to the use of contacting plates made of sintered tungsten or molybdenum with a filling of good conducting metal, document (D1) acknowledges a less satisfactory adaptation between the respective thermal expansions of the contacting plates and of the casing walls or support members - see column 1, lines 22 to 24. Nevertheless, this less satisfactory adaptation is mentioned in relation to the use of support members or casing walls made of copper or silver, exclusively.

2.4 It is widely known that silver and copper are among the materials exhibiting the highest electrical and thermal conductivities at normal working temperatures of electronic devices. Copper is the metal most commonly used for conducting electrical currents or heat, and is cheaper than silver. Therefore, whenever a metal with good conductivity is needed, the skilled person will first investigate whether copper meets the requirements which are set. In the Board's opinion, this should in particular be the case for the skilled person involved in the design of chip carriers and envisaging, for making such carriers, to use sintered tungsten or

molybdenum containing an impregnation of a metal with good electrical and/or thermal conductivity.

2.5 To support the view that a skilled person faced with the problem underlying the invention would be deterred from filling with copper the pores of a sintered matrix of tungsten and/or molybdenum, the Respondent drew a comparison between values of thermal conductivities figuring on page 151 of document (D3). The Board nevertheless observes that the Respondent compared the thermal conductivities of sintered tungsten matrices containing a copper impregnation with the thermal conductivity of pure sintered molybdenum. The Board furthermore observes that, according to the Table on page 151 of (D3), the latter conductivity is nearly 13% higher than that of sintered bodies of pure tungsten. The gains in thermal conductivity provided by the impregnation are thus 13% higher than the Respondent suggested. The Board does not therefore accept the Respondent's submission that a skilled person would not envisage the use of sintered bodies of tungsten and/or molybdenum with a copper impregnation for making chip carriers.

For similar compositions, the thermal conductivities reported in Table 1 of the patent in suit are at least 57% higher than those indicated in (D3). The reason for this difference may be, as the Respondent submitted, that the values of (D3) relate to sintered bodies having a higher porosity. Nevertheless, Claim 1 of the European patent does not include any teaching, for instance as regards the granulometry of the powders to be sintered or the pressure to be applied, from which it might be inferred that the claimed substrate should have a reduced porosity. Bearing in mind that the efficiency of heat evacuation through a chip carrier does not only depend on thermal conductivity, but also on the shape

and dimensions of said carrier and of the casing in which it is mounted, there is consequently no evidence that considerations based on the porosity of sintered matrices of tungsten and/or molybdenum would have dissuaded the skilled person from impregnating such matrices with copper for making chip carriers.

As a matter of fact, the advisability of choosing copper as filler material is here the more obvious as the continuous variation of the thermal expansion coefficient of a W/Cu sinter as a function of the percentage of copper by weight is known to the specialist of such sinter materials. This property, which is not dependent on a particular use of the materials and thus should be known to the specialist of chip carriers, is brought into evidence by Figure 3 of document (B2).

2.6 In the Board's judgment, therefore, the lack of an explicit indication of the metals to be used for filling the pores of a sintered skeleton of tungsten or molybdenum does not represent a crucial gap in the assessment of the prior art referred to in the introductory part of (D1). In particular, no display of inventive talent was required from the skilled person at the priority date of the patent in suit to envisage, while designing a chip carrier, the use of a material of the kind mentioned there and copper as filler material.

2.7 With regard now to the methods mentioned in Claim 1, it shall be noted that the melting point of copper is 1084°C, whereas that of molybdenum is about 2600°C and that of tungsten is above 3000°C. Any possibility of filling with molten tungsten or molybdenum the pores of a pre-sintered copper skeleton is, therefore, excluded. Consequently, any person skilled in the field of sintered materials readily understands that, for making

a sintered body on the basis of tungsten or molybdenum with copper as filler material, only two possibilities are left: the first one is to press and sinter tungsten powder or molybdenum powder and afterwards to fill the pores of the sintered body through infiltration of molten copper, the second one is to press and sinter a mixture of tungsten and copper powders or a mixture of molybdenum and copper powders. As a matter of fact, the validity of this conclusion is confirmed by document (D3), which is cited here for the sole purpose of evidencing that, before the priority date of the patent in suit, the specialist of powder metallurgy already knew that the methods mentioned in Claim 1 were the main methods available for making a sintered member of tungsten and copper - see, on pages 146 to 148, the first two paragraphs of the section headed "Herstellung"; note also the implicit teaching given there as regards the reciprocal insolubility of tungsten and copper, which entails that, in Claim 1, the mention of an "alloy of tungsten and/or molybdenum with copper" does not affect the scope of granted protection.

These considerations remaining relevant when tungsten or molybdenum powder is replaced by a mixture of tungsten and molybdenum powders, no inventive step can be perceived in the reference to the methods of obtaining the claimed chip carriers.

2.8 Finally, finding the proportions of copper which are the most suitable for the use of a W/Cu, Mo/Cu or W/Mo/Cu sinter as constituent material of a chip carrier is a matter of routine experimentation. Therefore, no inventive step can be perceived in the selection of such sinter materials containing from 5% to 30% of copper by weight.

2.9 In the Board's judgment, therefore, Claim 1 of the patent in suit lacks an inventive step. Hence, the said claim is not allowable - Article 52(1) EPC in conjunction with Article 56 EPC.

3. *First auxiliary request*

The effect of a given content of copper in the claimed carrier material being derivable from routine experiments, no inventive step is required to reduce the maximum of this content to 20% by weight if higher values do not give good enough results.

Therefore, Claim 1 according to the Respondent's first auxiliary request is not allowable - Article 52(1) EPC in conjunction with Article 56 EPC.

4. *Second and third auxiliary requests*

According to the Respondent's second subsidiary request, the protection is restricted to a semiconductor chip mounted on a substrate such as defined by Claim 1 of the European patent, there being the additional statement that the coefficient of expansion of the substrate is similar to that of the chip. No inventive step, however, can be perceived in mounting a chip on a substrate especially designed to carry semiconductor chips. The similarity of the thermal expansion coefficients is the purpose to be achieved by the claimed combination. For the reasons already explained in relation to the Respondent's first auxiliary request, reducing to 20% by weight the maximum amount of copper in the substrate of an arrangement according to the second auxiliary request is not enough to render such an arrangement inventive.

Therefore, none of the Respondent's second and third auxiliary request is allowable either - Article 52(1) EPC in conjunction with Article 56 EPC.

5. *Fourth auxiliary request*

As already explained in section 2.8 of the present decision, both alternative methods mentioned in Claim 1 of the patent in suit lack an inventive step. The subject-matter for which protection was granted can thus not be rendered inventive by omitting one of said methods.

Therefore, the Respondent's fourth auxiliary request is not allowable either - Article 52(1) EPC in relation to Article 56 EPC.

6. *Fifth, sixth and seventh auxiliary requests*

In contrast to the previous requests, in which the claims define the composition of the substrate either "for use as a carrier for a semiconductor chip" (main request and first auxiliary request), or in combination with a semiconductor chip (second to fourth auxiliary requests), the claims of the fifth, sixth and seventh auxiliary requests each define an "integrated circuit package" comprising a combination of three components, namely the substrate (with specified composition), the semiconductor chip, and the enclosure. Neither the fifth nor the sixth auxiliary requests specify the material of the enclosure base, however, beyond saying that such material must have "a thermal expansion coefficient similar to those of the substrate and the semiconductor chip". This is merely a statement of the problem which must be solved, which the introduction to the patent acknowledges to be known at the priority date.

Claim 1 of the seventh auxiliary request requires that the material of the enclosure base is alumina, Al_2O_3. The introduction to the patent in suit acknowledges that alumina has often been used as the enclosure material (page 2, line 19). However, in the Board's view, it was not foreseeable at the priority date of the patent, having regard to the prior art documents relied upon, that the defined substrate composition when incorporated into an integrated circuit package would have a thermal expansion coefficient which is similar not only to the chip material but also to alumina, the required enclosure base material. This similarity is clearly demonstrated in the embodiments of the invention described in the examples of the patent. Before the invention as claimed in the seventh auxiliary request was made, in the Board's view it could not have been expected by a skilled person that such a similarity of thermal expansion coefficient could be obtained by using a substrate composition as defined in the claim.

It follows that in the Board's judgment an integrated circuit package as defined in each of Claims 1,2 and 3 of the seventh auxiliary request involves an inventive step within the meaning of Article 56 EPC.

8. The filing of new Claim 1 during the oral proceedings on 24 February 1993 was to meet the lack of a complete draft of Claim 1 according to the Respondent's seventh auxiliary request. The Respondent's submission dated 12 February 1993 makes it clear that, in the latter claim, the clauses pertaining to the methods of making the carrier substrate shall be the same as in Claim 1 of the patent as granted, except that the maximum content of copper shall be 20 wt%. The omission of the words "of copper powders" was thus an error of transcription and obviously in error. Therefore, in the Board's judgment, the oral decision of 24 February 1993 shall be corrected

under Rule 89 EPC and the patent shall be maintained with the new version of Claims 1 to 3 of the seventh auxiliary request, which was filed on 20 March 1993.

9. *Alleged violation of Article 113(1) EPC*

Article 113(1) EPC states that "the decisions of the EPO may only be based on grounds or evidence on which the parties concerned have had an opportunity to present their comments". Now, in section 10 of a note filed on 25 July 1990, the Respondent submitted that the sintered bodies described in document (D3) are for use as electrodes or electrical contacts, that there is no disclosure in (D3) concerning their use in conjunction with semiconductor chips, and that, while developing said sintered bodies, the author of (D3) had in mind problems quite different from those related to the use as chip carriers. There is indeed no mention of thermal expansion in (D3), whereas six required properties for the sintered bodies are set out in the opening paragraph.

In the Board's view, the only logical conclusion which can be drawn from such assertions is that the skilled person involved in the design of chip carriers would not be incited to search among the documentation relating to switch contacts, nor to read the whole content of (D3) if, per chance, he nonetheless had found this document.

The Appellant had thus nearly one year to comment on said conclusion. In the Board's judgment, therefore, the requirements of Article 113(1) EPC were not infringed to the Appellant's prejudice.

Order

For these reasons, it is decided that:

1. The decision of the Opposition Division dated 16 July 1991 is set aside.

2. The Appellant's main and first to sixth auxiliary requests are rejected.

3. The case is remitted to the Opposition Division with the order to maintain the patent in amended form on the basis of the new pages of description 2 to 4 which were filed during oral proceedings on 24 February 1993 and of the new Claims 1 to 3 forming the seventh auxiliary request filed on 20 March 1993.

The Registrar: The Chairman:

M. Beer G. D. Paterson