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Aktenzeichen / Case Number / N^o du recours : T 265/84
Anmeldenummer / Filing No / N^o de la demande : 80 102 547.9
Veröffentlichungs-Nr. / Publication No / N^o de la publication : 20 965

Bezeichnung der Erfindung: Homogenous, ductile cobalt based brazing foils
Title of invention: and article brazed with said foils
Titre de l'invention :

Klassifikation / Classification / Classement : B23 K35/30

ENTSCHEIDUNG / DECISION
vom / of / du 17. December 1986

Anmelder / Applicant / Demandeur : Allied Corporation

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPO / EPC / CBE Articles 54 and 56 EPC

Kennwort / Keyword / Mot clé :

Inventive step
Selection inventions - Alloys
Novelty - Test for novelty in the essential sense

Leitsatz / Headnote / Sommaire

Europäisches
Patentamt
Beschwerdekammern

European Patent
Office
Boards of Appeal

Office européen
des brevets
Chambres de recours



Case Number : 265 /84

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 17 December 1986

Appellant : Allied Corporation
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U.S.A.

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Decision under appeal : Decision of Examining Division 097 of the
European Patent Office dated
27 June 1984 refusing European patent
application No. 80 102 547.9 pursuant to
Article 97(1) EPC

Composition of the Board :

Chairman : P.E.M. Delbecque
Member : G. Szabo
Member : D. Paterson

Summary of Facts and Submissions

- I. European patent application 80 102 547.9 filed on 9 May 1980 and published on 7 January 1981 with publication number 20 965, claiming priority of the prior application on 18 June 1979 (US-50006) was refused by the decision of the Examining Division 097 of the European Patent Office dated 27 June 1984. The decision was based on Claims 1 to 4 of 11 October 1983. The main claim was worded as follows:

"A brazed metal article, said article having been brazed with a filler material in the form of a homogeneous, ductile brazing foil composed of metastable material having at least 50 percent glassy structure, said foil being from 20 μm to 90 μm thick and having a composition consisting essentially of 0 to 4 atom percent iron, 0 to 26 atom percent chromium, 0 to 20 atom percent nickel, 0 to 4 atom percent tungsten, 0 to 4 atom percent molybdenum, 0 to 20 atom percent boron, 0 to 12 atom percent silicon, 0 to 2 atom percent carbon and the balance essentially cobalt and incidental impurities, wherein the composition is such that the total of iron, chromium, nickel, tungsten, molybdenum and cobalt is from 75 to 85 atom percent and the total of boron, carbon and silicon is from 15 to 25 atom percent".

- II. The stated ground for the refusal was that the subject-matter of Claims 1 to 4 did not involve an inventive step. It was known from the article of De Cristofard, N. at al, (Welding Journal 231, 1978, 57/7, 33-38) (1) that glassy alloy compositions of transitional metals (mainly Ni-based but also Fe and Co) with metalloids (P, B, Si or C) were suitable for brazing purposes. It was also mentioned that cobalt based alloys had been processed into ductile foils (p. 36). The thickness specified in the claims was within those normally used. The choice of a specific range of Co-

based amorphous filler material was within the general teaching of (1) and persons skilled in the art would have found it obvious to test such specimens. In view of the overlap of disclosures and the clear hint towards Co-based alloys, it was only a matter of appropriate tests to find the required alloys and use them in the amorphous form. It was known that the amount of glassy structure determined the values of strength and hardness combined with a good plastic deformation, and it was therefore obvious to produce sheets or foils for brazing as specified, US-A-3 856 513 (2) also disclosed inter alia Co-based alloy compositions which would have been found suitable for the purpose.

III. The Applicant filed an appeal against the decision on 26 July 1984 with the payment of the appeal fee, and submitted a Statement of Grounds on 15 October 1984. After a Communication by the Board, the Appellant reported the results of comparative tests.

IV. The Appellant argued in support of the appeal substantially as follows:

(a) The brazed metal articles according to the invention had better corrosion resistance and increased joint strength at high service temperatures. The combination of properties provided in this manner were superior to those shown by alloys prepared according to the disclosure of (2). The latter document discussed strength only before melting and not after the molten alloy was resolidified. Nowhere were the specific ranges for components disclosed or that phosphorus should not be used as a metalloïd component. In view of the broad approach of document (2) it would have taken

a very long time and a lot of selection to arrive at the particular alloys which could be used as improved alternatives to the Ni-based ones recommended in (1).

(b) The tests carried out in order to compare the shear strengths of metal articles brazed with alloys according to the invention and those in the nearest state of the art (1) showed that the former were very significantly superior. These results supported the patentability of the claimed matter.

V. The Appellant requests that the impugned decision be set aside and the patent be granted on the basis of claims amended as suggested in the letter dated 10 October 1984.

Reasons for the Decision

1. The appeal complies with Article 106 to 108 and Rule 64 EPC and is, therefore, admissible.
2. There can be no formal objection to the amended claims since these are supported by the disclosure. The replacement of "which" in line 2 of Claims 2 and 3 with "wherein said brazing foil" eliminates the inaccuracy in the original phrasing and correctly refers to the brazing foil as being glassy and not the article itself (cf. decision, page 2, last paragraph).
3. The claimed subject-matter relates to metal articles brazed with alloys of certain structure, comprising cobalt, with optional other metals, and metalloids. The closest state of the prior art is represented by (1) which disclosed the use of specifically Ni-based brazing alloys in combination with metalloids such as B, Si, C and P, or P alone, and generally indicated the possibility of basing the ductile alloys on cobalt. The technical problem in respect of such

state of the art was to improve the shear and tensile strength of the brazed specimens, particularly at high service temperatures. The solution of the problem characteristically comprises the choice of substantially glassy Co-based foils for the purpose of brazing, which consist of at least 75 atom % Co, possibly together with other optional transitional metal components (Cr, Ni, Fe, W or Mo) in limited amounts, and of at least 15 atom % of a metalloid component which is B, C or Si but not phosphorous.

4. The test results in the specification could not be directly compared with those of the closest prior art ((1), Table 3, page 35) since the tests had not been carried out under comparable conditions. There was therefore no evidence available which could have convinced the Board that the stated technical problem was in fact solved and that an unexpected effect was at hand. The Appellant thereafter submitted evidence showing that brazing with the sample of Example 2 (Co₇₅, B₁₃, Si₁₂) had given a substantially improved shear stress for the specimen article (33% increase) when compared to the one brazed with BNi-3 of the prior art (Ni₇₇, B_{14.6}, Si_{7.9}, C_{0.3}), a substantially Ni-based similar variant. The same applied to a specimen according to the invention, i.e. Sample 4 and Example 5 of the specification (Co₃₃, Ni₂₀, Cr₂₂, Fe₃, W₄, B₁₈) and BNi-1 (Ni_{60.8}, Cr_{13.1}, Fe_{3.7}, B_{14.4}, Si_{7.8}, C_{0.2}), an increase of shear strength by as much as 65%. Although tensile strengths were compared, it appears from the various tabulated results in the specification that whenever the shear strength increases, the tensile strength increases too within the same kind of sample. Furthermore, whilst the tests could not be carried out at high service temperatures in view of the aim to achieve improved performance under such conditions, the Board accepts, in

the absence of evidence to the contrary, that the tests are indicative of the possibility of improvement at low and consequently at higher temperatures as well. The set problem has, therefore, been solved by the invention.

5. When the question of novelty is considered, it is relevant that most of the claimed brazed varieties fall within the broadest scope of the disclosure in citation (1). The latter document describes all the essential features of the claimed invention in general, without disclosing any example, however, which would be embraced by the claim. Neither does (1) mention the range of limitations in the claim, not considering, of course, those for the optional ingredients in this respect, since these cannot change the novelty situation based on the essential components. In addition, phosphorus is excluded from the subject-matter claimed, whilst the cited art includes its use as a metalloid within a range of alternatives. Such distinctions would not necessarily impart novelty to the selected ranges in the absence of any technical distinction in properties (cf. "Thiochloroformate/BASF" T 198/84, OJ 7/1986, 209, in particular paragraph 7, page 214 on "purposive selection"). This condition for novelty in an essential sense, contrasted to mere formal delimitations, is satisfied in the present case since the brazed articles manifest different, e.g. improved, properties from those in (1). The novelty of the selection is thereby confirmed. No other document cited in the proceedings discloses the selected group of articles claimed in the application either.
6. As to the inventive step, the possibility of using cobalt based alloys was mentioned in (1) without specifying the metalloid components to go with it. Whilst the advantage of a glassy, amorphous state was recognised, this was expected to be destroyed by devitrification in many instances (cf. (1), page 36). Although this is not relevant

to the placing of the metal in the joint area, it could affect the strength of the result. By adding phosphorus, the melting point of nickel can be advantageously depressed, but the invention rather uses B, C or Si instead, in conjunction with cobalt. The improvement in the strength of the brazed specimen is striking when compared to samples of equally phosphorless Ni-based foils under identical conditions.

7. It appears that Ni- and Co-based alloys with metalloid content were both generally embraced in the broad disclosure of (2). The document, however, prefers iron based variants and, if anything, replaces that component with nickel, at least partially. The only Co-based variant exemplified contains substantial amounts of phosphorus (cf. Example 23). Thus the skilled person who might have been looking for Co-alloys in document (2) for the purpose of brazing according to (1), should have found no encouragement in this direction. Whilst he could have found by mere chance or extensive research and testing phosphorus-free variants in the area of (2) or simply within the total area of (1), he had no good reason to move in such direction and to persevere in his efforts in the absence of any expectation of improvement. The assumption must therefore be that he would not have done so in the circumstances (cf. "Simethicone Tablet/RIDER" T 2/83, OJ 6/1984, 265). The selection is thus associated with an unexpected improvement and the claimed subject-matter is therefore based on an inventive step.

Order

For these reasons,

it is decided that:

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1. The decision of the Examining Division is set aside.
2. The case is remitted to the Examining Division with an order to grant a European patent on the basis of claims as submitted with the letter of 5 October 1983 (received on 11 October 1983) amended according to the letter dated 10 October 1984 (received 15 October 1984) and with an appropriately amended description.

The Registrar:

The Chairman:

Strömman

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GG 17/12/86
HT