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File Number: T 644/90 - 3.2.3
Application No.: 84 901 783.5
Publication No.: 0 172 169
Title of invention: Method of squeeze forming metal articles

Classification: B22C 9/10, B22D 15/02

D E C I S I O N
of 11 February 1992

Proprietor of the patent: GKN TECHNOLOGY LIMITED

Opponent: MAHLE GMBH

Headword:

EPC Article 56

Keyword: "Inventive step (denied)"

Headnote



Case Number : T 644/90 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 11 February 1992

Appellant :
(Opponent)

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Respondent :
(Proprietor of the patent)

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Decision under appeal :

Decision of Opposition Division of the European
Patent Office dated 12 June 1990 posted on
11 July 1990, rejecting the opposition filed
against European patent No. 0 172 169 pursuant to
Article 102(2) EPC.

Composition of the Board :

Chairman : C.T. Wilson
Members : F. Brösamle
L. Mancini

Summary of Facts and Submissions

- I. European patent application No. 84 901 783.5, filed on 18 April 1984 and published on 26 February 1986 under publication No. 0 172 169, was granted with ten claims.

Claims 1 and 3 as granted read as follows:

1. A method of manufacturing a light metal article (12, 24) by squeeze forming molten metal in a mould wherein the molten metal is introduced into the mould, the mould is closed under pressure to displace molten metal to fill a cavity in the mould and the metal is maintained under pressure whilst solidification thereof takes place, the mould subsequently being opened and the formed article removed characterised in that a required shape is formed in the squeeze formed article by locating a core (10) in the mould cavity prior to the introduction of molten metal thereto, and in that the core (10) comprises a soluble salt core produced to define said required shape solely by isostatic compaction of a fine grained salt mixture to such a density and surface finish that it retains its integrity under the conditions of sustained temperature and pressure transmitted thereto by the metal during the squeeze forming operation; the core (10) subsequently being dissolved from the squeeze formed article (12, 24)."

and

"3. A method as claimed in either one of the preceding claims wherein the salt comprising the salt core (10) is fine grained sodium chloride having a particle size of between 5 and 250 microns."

II. The patent was opposed in due time by the Appellant (Opponent) who requested revocation of the patent on the grounds of Articles 99 and 100(a) EPC inter alia in the light of the following documents:

(A1) "Light Metal Age", June 1969, pages 6 to 8;

(A3) DE-A-1 924 991, and

(A5) US-A-3 963 818.

III. The opposition was rejected pursuant to Article 102(2) EPC in the oral proceedings of 12 June 1990, whereby the reasoned decision was posted on 11 July 1990. The Opposition Division came to the conclusion that the grounds of opposition do not prejudice maintenance of the patent as granted.

IV. The Appellant (MAHLE GMBH) appealed against this decision on 6 August 1990 paying the appeal fee on the same day. The Statement of Grounds of Appeal was received on 15 November 1990 in which statement the Appellant attacked the inventive step of the subject-matter of granted Claim 1 in the light of documents (A1), (A3) and (A5) in particular.

V. In a communication of the Board pursuant to Article 11(2) RPBA dated 3 December 1991 the Board gave its provisional opinion, setting out the nearest prior art document, the problem to be solved by the invention and the assessment of the contribution of the claimed invention to the nearest prior art, thereby relying on the combination of documents (A1), (A3) and (A5), and following the problem-solution approach and the principles laid down in the decision T 176/84, published in OJ EPO, 1986, 50.

VI. Following the above-mentioned communication of the Board the Appellant gave notice that he would not be present at

the oral proceedings on 11 February 1992, but would nevertheless maintain his request that the patent be revoked, see letters of 15 November 1991 and 16 December 1991.

During the oral proceedings before the Board the Respondent pointed to the fact that, in his contention, the teachings of (A1), (A3) and (A5) would not lead a skilled person to the subject-matter of granted Claim 1, since it would be doubtful whether in (A1) a core is already envisaged, since it is clearly set out that "cores ... will be studied" i.e. in future, but not at the time when the article "Squeeze casting of Aluminium" was written. In respect of (A3) it was pointed to the combination of isostatic compaction and sintering, and, in respect of (A5), it was stressed that there pressure die casting is disclosed rather than squeeze casting as in granted Claim 1.

The Respondent argued for the importance of the grain sizes, since only the combination of isostatic compacting and fine grains would allow a core suitable for the squeeze casting.

- VII. As a main request the patent is defended as granted and - in order to overcome any objection of the Board in respect of the fineness of the grains - the Respondent requested by way of an auxiliary petition to maintain the patent in amended form by combining granted Claims 1 and 3.

At the end of the oral proceedings before the Board the Chairman announced the decision of the Board to revoke the patent according to its main and auxiliary request.

Reasons for the Decision

1. The appeal is admissible.

2. Article 123 EPC

2.1 Main Request:

2.1.1 Claim 1 as granted combines the features of originally filed Claim 1, Claim 2 (isostatic compaction) and Claim 3 (fine grained salt mixture), whereby the term "to such a density ... that it retains ... sustained temperature .. during the squeeze forming operation" is a functional term and does not introduce a feature missing in the application as originally filed.

2.1.2 Claim 2 corresponds to originally filed Claim 5. Claim 3 is derived from Claim 6 as originally filed and Claims 4 to 10 correspond literally to Claims 7 to 13 as originally filed.

2.1.3 The granted set of claims is as a consequence of the foregoing not open to an objection under Article 123(2) EPC.

2.1.4 Since the patent according to the main request is defended in its granted version, it also meets the requirements of Article 123(3) EPC.

2.2 Auxiliary Request:

2.2.1 Since the main request does not contravene against the requirements of Article 123(2) EPC the auxiliary request being based on a combination of Claims 1 and 3 of the main request (granted version) also meets the requirements of Article 123(2) EPC. This is also true for the dependent claims of the auxiliary request.

2.2.2 Claim 1 of the auxiliary request is narrower than granted Claim 1, since the feature of granted Claim 3 has been incorporated into it. As a consequence the scope of protection has not been extended (Article 123(3) EPC). The dependent Claims 2 and 4 to 10 -apart from being renumbered into Claims 2 to 9 - of the auxiliary request are maintained in their granted version so that again the requirements of Article 123(3) EPC are met.

2.3 Summarising the above considerations neither the main nor the auxiliary request are open to an objection under Article 123 EPC.

3. Novelty was no longer contested by the Appellant - at least not in the proceedings before the Board - so that this issue needs no further argument. It has therefore to be decided whether or not the teaching of Claim 1 in its versions according to the main and auxiliary requests is based on an inventive step.

4. Main request

4.1 Nearest prior art document is (A1) in which document, see page 8, right column, lines 7 to 11, an insert and a core is mentioned which should be used in combination with "squeeze casting", see the words "will be studied".

It is absolutely clear that when a core should be used in combination with squeeze casting, it has to be formed into a required shape, that it has to be located in the mould cavity, and it has to be removed after carrying out the squeeze casting.

Under these circumstances it is doubtful whether Claim 1 is completely delimited over the nearest prior art

document (A1). Since Rule 29(1)(a) and (b) EPC does, however, not figure among the grounds of opposition pursuant to Article 100 EPC, a formal objection under Rule 29(1) EPC cannot be raised in respect of granted Claim 1.

Incomplete delimitation over the nearest prior art would, however, have an influence on the assessment of inventive step, since the objectively remaining technical problem to be solved by the invention depends on which features form part of the precharacterising clause of Claim 1 and which not.

4.2 Starting from (A1) the objectively remaining technical problem to be solved by the method of Claim 1 appears to be the improvement of the cores for permitting their use in combination with the squeeze casting process.

4.3 After a complete delimitation of Claim 1 over (A1) the distinguishing features of Claim 1 over (A1) are:

(a) the core is made of a soluble salt which is solely isostatically compacted,

(a2) the core has a "density ... sustained temperature and pressure conditions ... squeeze forming operation",

(b) removal of the core is carried out by dissolving it from the squeeze formed article.

"Feature" (a2) obviously is a functional term which sets out the requirements of the squeeze forming operation in view of the core (sustained temperature and pressure transmitted by the metal to the soluble salt core), so that it has to be decided whether or not (A3) and (A5)

give useful hints to a skilled person starting from (A1) and being confronted with the objectively remaining technical problem to be solved by the invention to realise features (a1) and (b) in combination with the features which should constitute the preamble of Claim 1.

4.4 The method of Claim 1 achieves the result that the soluble core is so highly compacted that it can withstand the sustained temperature and metal pressure prevailing in the squeeze forming process, whereby the core is composed from salt which can easily be removed by dissolving it from the squeeze formed article.

4.5 According to the decision T 176/84, published in OJ EPO 1986, 50, it can be expected that the technology (i.e. production of salt-cores in pressure die casting or for casting in general) in a neighbouring or in a more general technical field is observed, so that a skilled person starting from (A1) as the nearest prior art document being confronted with the problem of how the core can be improved, would clearly consider (A5) originating from the technical field of pressure die casting and also (A3) originating from the more general technical field of (metal-) casting.

Following the principles laid down in the decision T 176/84 there can be no doubt for the Board that the skilled person would - not only could - consider the documents (A5) and (A3), so that the argument of the Respondent presented in the oral proceedings that only an ex post facto analysis would lead a skilled person to the documents (A5) and (A3) and that the conclusion that (A5) and (A3) could be combined with (A1) would be the result of an inadmissible hindsight, is not supported by the facts, since the Board only follows settled principles

in this respect i.e. the application of the problem-solution approach.

This approach should minimise the danger that the Examining/Opposition Divisions and the Boards of Appeal rely on combinations of documents originating from completely different technical fields, that is the assessment of inventive step is carried out on an objective basis only.

Returning to the present case there can be no doubt that (A5) and (A3) would have been considered by a skilled person who is looking for help to solve the problem of how a core can be found which is suitable for squeeze forming operations.

- 4.6 From (A5) it is known to compact a salt core by the application of high pressures, see column 2, lines 18 to 22 and lines 37 to 41 (pressures in the range of $1000 + 2700 \text{ Kp/cm}^2$) or see column 3, lines 45 to 48, so that the core has sufficient strength and may be used "as a core for pressure die casting" - without a subsequent sintering process. That sintering is an optional feature in (A5) is also clear from its column 6, line 23 ("and if necessary ...").

From (A5) it is moreover clear that different methods for compacting the core can be used. In Claim 1 of it no specific method is mentioned, see also Claim 2.

In "Example I", see column 5, line 42, a "crank press" is mentioned in "Example II", however, see column 6, line 5 a "hydraulic press" is mentioned.

In attacked Claim 1 the core-material is defined as a "fine grained salt mixture". This definition of the

particle size is open to interpretation and can therefore not be seen as differentiating the teaching of Claim 1 from that of (A5), see column 2, lines 56 to 62, since there the particle size is also limited to "fine grains" i.e. by the wording "less than 1000 microns, preferably 40-100 American Foundry Standard Grain Fineness Number in grain size index". 1000 microns being the maximum particle size it follows that the grain size can lie anywhere in the range between 0 and up to 1000 microns.

- 4.7 Summarising the above observations in respect of (A5) all characterising features of granted Claim 1 are known beside the "isostatic compaction".

This method of pressing salt-cores is, however, well known in the prior art of core-production, see (A3), title and page 2, paragraph 4 (machine typed numbering!) and Claim 3 in particular.

In the row of applicable pressing methods i.e. crank press, hydraulic press, the isostatic compaction constitutes a further possibility/alternative, which has proven its advantages in combination with the core-production for metal-casting purposes, see (A3). Since in (A3) it is clearly pointed to the advantages of the isostatic compaction, i.e. no influence of friction forces and uniform density of the salt-core, it appears logical that a skilled person takes note of (A3).

- 4.8 Due to the fact that in (A1) the indication that cores should be used for squeeze casting has to be seen as a signpost the skilled person is confronted with the problem to find out a suitable core for that specific casting method, which is characterised by sustained temperatures and metal pressures. The skilled person will be taught by (A5) representing a neighbouring technical field and by

(A3) representing a more general technical field of casting.

The skilled person will derive from (A5) the suitability of compacted, fine grained salt cores, which can be used even after compaction only, see remark 4.6 above. From (A3) he will be aware that isostatic compaction leads to highly compacted cores. Since in (A5) both possibilities in core forming are simultaneously discussed

(a) compacting the core and subsequently sintering it and

(b) compacting a core without subsequent sintering

it appears logical that a skilled person would transfer the simpler method (b) even to (A3), since in (A5), see column 1, line 66 to column 2, line 5, it is clearly pointed to the fact that by sintering "the dimensional precision of the core is greatly reduced ... beside the high production cost thereof".

This teaching of (A5) has therefore to be seen as overruling advice to the skilled person so that it is considered to be normal practice to apply a one step forming process to (A3) to obtain the advantages set out above in discussing (A5).

- 4.9 The Respondent has pointed essentially to the difference between the "pressure die casting" of (A5) and the "squeeze casting" of the attacked Claim 1. Prima facie this is a correct argument. The above-mentioned decision explains, however, the way in which a skilled person looking for the possibilities to solve a specific problem is supposed to act, so that the skilled person is not strictly bound by the teaching of a single document be it

(A1) or (A5) or (A3), but would also consider combinations of these documents. When combining the teachings of documents it is quite obvious that compromises will have to be found.

It appears therefore that a solely isostatic compaction is the result of the combined teaching of (A5) and (A3) in the light of the problem to be solved, see remark 4.2 above, even if in squeeze casting the temperatures and pressures may be higher than in other casting methods.

- 4.10 Once it is decided to use solely isostatic compaction - i.e. omitting the subsequent sintering step of (A3) - the skilled person will be aware of the influence of the grain size. By "trial and error" the optimum grain size will be found without the exercise of inventive skill.

The Respondent has argued that a technical prejudice had to be overcome, since the teachings of (A3) and (A5) would be contradictory and the skilled person would not know whether (A3) or (A5) should be followed, this argument being a clear sign for the existence of an inventive step. In this respect it was set out that (A5) teaches a relatively coarse grain, unsuitable for isostatic compaction.

The Board is of the opinion that a skilled person would even overcome this difficulty, since it is sufficient to study the behaviour of cores with different grain sizes in a squeeze casting process. By a simple variation of the grain size the optimum grain size - according to granted Claim 1 "a fine grained salt mixture" - can be obtained, so that no reason can be seen why (A3) and (A5) should not be considered in combination with (A1) as the nearest prior art document.

4.11 In the absence of convincing arguments for the existence of an inventive step the Board reached the result that the subject-matter of granted Claim 1 (main request) is not based on an inventive step in the meaning of Article 56 EPC, so that this independent claim is clearly not valid and the main request to be rejected.

5. Auxiliary request

5.1 The particle size of the salt mixture is defined by incorporating into granted Claim 1 the feature of granted Claim 3 (5 to 250 microns).

5.2 The particle size is thus no longer open to interpretation, however, the basis for the assessment of inventive step remains unchanged for the reasons set out above in remarks 4.6 and 4.10. The claimed range is again a broad range with a factor of "50" between the smallest and the largest grain. This broad range is in addition a clear support for the Board's finding that the influence of the grain size is not critical, since otherwise the claimed range could not cover a factor of "50". Though the prior art to be considered does not literally disclose a grain size range of 5 to 250 microns it is felt that by "trial and error" this range can be achieved, since the document (A5) already teaches a range (less than 1000 microns) including the claimed range.

5.3 As a result of the foregoing, Claim 1 of the auxiliary request can also not form a basis for maintaining the patent in amended form, since its subject-matter cannot be seen as inventive (Article 56 EPC).

Order

For these reasons, it is decided that:

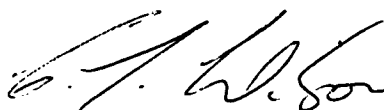
1. The impugned decision is set aside.
2. The patent is revoked.

The Registrar:



N. Maslin

The Chairman:



C.T. Wilson