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D E C I S I O N
of 7 May 2003

Case Number: T 0991/00 - 3.2.5

Application Number: 93901277.9

Publication Number: 0625089

IPC: B29/C 45/03

Language of the proceedings: EN

Title of invention:
Injection molding of plastic article having hollow rib

Patentee:
Melea Limited

Opponent:
Cinpres Gas Injection Limited

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 83, 84, 113, 123
EPC R. 67

Keyword:
"Substantial procedural violation (no)"
"Extension (no)"
"Sufficiency of disclosure (yes)"
"Novelty, inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0991/00 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 7 May 2003

Appellant: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 10 August 2000 concerning maintenance of European patent No. 0 625 089 in amended form.**

Composition of the Board:

Chairman: W. Moser
Members: W. R. Zellhuber
P. E. Michel

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the Opposition Division maintaining the European patent No. 0 625 089 in amended form.

II. The Opposition Division held that the grounds for opposition cited in Article 100(a) EPC (lack of novelty, Article 54 EPC, and lack of inventive step, Article 56 EPC) and Article 100(b) and (c) EPC did not prejudice the maintenance of the patent as amended.

III. Oral proceedings were held before the Board of Appeal on 7 May 2003.

IV. The appellant requested that the decision under appeal be set aside and that the European patent No. 0 625 089 be revoked. The appellant further requested reimbursement of the appeal fee.

The respondent (patent proprietor) requested as a main request that the appeal be dismissed; or that the decision under appeal be set aside and that the patent be maintained on the basis of the following documents:

(a) claims 1 and 8, filed as first auxiliary request on 22 June 2001, and claims 2 to 7 and 9 to 12 as granted; or

(b) claims 1 and 8, filed as second auxiliary request on 22 June 2001, and claims 2 to 7 and 9 to 12 as granted; or

(c) claims 1 and 8, filed as third auxiliary request on 22 June 2001, and claims 3 to 7 and 10 to 12 as granted; or

(d) fourth to seventh auxiliary requests: either one of claim 1 of the main request or of the first or second auxiliary request and claims 2 to 7 as granted or of claim 1 of the third auxiliary request and claims 3 to 7 as granted; or

(e) eighth to eleventh auxiliary requests: either one of claim 8 of the main request or of the first or second auxiliary request and claims 9 to 12 as granted or of claim 8 of the third auxiliary request and claims 10 to 12 as granted.

V. Claims 1 and 8 of the main request read as follows:

"1. A process for injection molding a hollow plastic article (82, 84) comprising the steps of:

- injecting a quantity of fluent plastic into a mold cavity (68) including a channel (66) having a shape defining a rib portion (72, 86, 88) of the article (82, 84);

- displacing a portion of the plastic from the channel (66) of the mold cavity (68) into a spill cavity (73) flow coupled to the channel (66) by introduction of a charge of pressurized gas into the channel (66) of the mold cavity (68) to thereby form a gas passage (70) in the rib portion (72, 86, 88),

- permitting the injected plastic to solidify;

- venting the gas from the mold cavity (68); and

- removing the plastic article (82, 84) from the mold **characterized by** the channel (66) being tapered outwardly toward the spill cavity (73) at an angle sufficient to permit the charge of pressurized gas to travel the entire length of the channel (66) to form the gas passage (70) so that the gas passage (70) is substantially uniform in cross section along the entire length of the channel (66)."

"8. Apparatus for injection molding a hollow plastic article (82, 84), the apparatus comprising:

- a mold having a mold cavity (68) including a channel (66) having a shape defining a rib portion (72, 86, 88) of the article (82, 84) and a spill cavity (73) coupled to the channel (66);

- means (26) for injecting a quantity of fluent plastic into the mold cavity (68); and

- means (32) for introducing a charge of pressurized gas into the channel (66) of the mold cavity (68) to displace a portion of the plastic from the channel (66) of the mold cavity (68) into the spill cavity (73) to thereby form a gas passage (70) in the rib portion (72, 86, 88) **characterized by** the channel (66) being tapered outwardly toward the spill cavity (73) at an angle sufficient to permit the charge of pressurized gas to travel the entire length of the channel (66) to form the gas

passage (71) so that the gas passage (70) is substantially uniform in cross section along the entire length of the channel (66)."

VI. In the course of the appeal procedure, the following documents have been referred to:

D1: EP-A 0 321 117;

D2: WO-A 90/00466;

D3: EP-A 0 289 230;

D4: EP-A 0 393 315;

D5: picture of an article produced by gas assisted injection moulding filed as Figure 4 by the appellant on 11 December 2000; the article itself was presented in the course of the oral proceedings;

D6: Statement of Michael Caropreso of 7 December 2000.

VII. In the written procedure and during oral proceedings, the appellant argued essentially as follows:

Alleged substantial procedural violation

In the decision under appeal, the problem of avoiding permeation had been referred to, which, however, had not been an issue discussed before the parties in the course of the opposition procedure. The appellant thus had not had an opportunity to present his comments hereto, which represented a substantial procedural violation within the meaning of Article 113(1) EPC.

Extension (Article 123 EPC)

In the application as filed, the term "taper" had been used in the commonly known sense of "diminishing gradually", "becoming gradually smaller". In the embodiment depicted in Figure 7 of the application as filed, the channel was tapered from right to left. According to claim 1 of the main request, however, the channel was defined as "being tapered outwardly toward the spill cavity (73)", thus contrary to that what was disclosed in Figure 7 of the application as filed. Therefore, claim 1 and, for the same reasons, claim 8 of the main request did not meet the requirements of Article 123(2) EPC.

Furthermore, in claim 1 of the patent in suit as granted the channel was defined as "being tapered outwardly", whilst in claim 1 of the main request the channel was defined as "being tapered outwardly toward the spill cavity (73)". Either the meaning of the term "taper" had to be reversed in respect of its commonly known meaning, or new subject-matter had been introduced by claiming a process wherein the channel became gradually smaller towards the spill cavity, the latter contravening the requirements of Article 123(3) EPC.

Clarity (Article 84 EPC)

The above-mentioned apparently incorrect use of the term "taper" and the unclear meaning of the term "tapered outwardly" gave also rise to an objection to claims 1 and 8 with respect to the requirements of Article 84 EPC.

Insufficiency of disclosure (Article 83 EPC)

The effect of the gas opening becoming progressively smaller the greater the distance from the gas entry port, as referred to in the patent in suit as granted (cf. page 2, lines 2 to 6 and Figure 5), did not happen. Since the cooling effect was always the same along the channel, the wall thickness would be the same over the whole length. The patent in suit thus started from a fallacy.

Neither the embodiments depicted in Figures 2 and 4 of the patent in suit nor any of the documents D1 to D5 indicated such an effect. The gas channels depicted, in particular, in Figures 7, 9, and 11 of document D1 and Figure 2 of document D2 all showed uniform cross sections and a constant wall thickness. The runner section depicted in the left-hand part of Figure 2 of document D2 comprised a diverging channel and an equally diverging gas channel of constant wall thickness.

All the documents showed that a constant cross section of the channel gave rise to a constant cross section of the gas channel. In the patent in suit, there was no indication how a constant cross section of the gas channel might be achieved when starting from a channel in a mould having divergent walls.

The intention of the design referred to in document D6 was to balance mould filling with resin, i.e. to ensure the completion of the filling of all the side ribs at approximately the same time. The problem addressed in document D6 was thus a mould filling problem, rather than a gas filling problem.

Novelty (Article 54 EPC)

Document D2 disclosed a gas injection moulding process according to the preamble of claim 1 of the main request. Figure 2 of document D2 showed a rib portion comprising a channel (mould cavity 36) having tapered walls and a gas passage 44, the cross section of the latter being substantially uniform. Furthermore, document D2 referred to making a hood having a reinforcing beam. Applying the process described in document D2 for making such a hood led directly and unambiguously to a process as claimed in claim 1 of the main request.

Therefore, the subject-matter of claims 1 and 8 of the main request was not novel with regard to document D2.

Inventive step (Article 56 EPC)

The patent in suit made mention of three problems: bursting through, permeation and sink marks. All these problems were dealt with by providing a spill cavity as suggested in document D2. The patent in suit did not solve any technical problem, and, consequently, providing a process or an apparatus according to claims 1 and 8, respectively, did not require any inventive step within the meaning of Article 56 EPC.

In order to provide a gas passage of constant cross section, the channel had not to be tapered. According to the single preferred embodiment disclosed in the patent in suit, the angle of the tapered portion was 0.25 degrees. Such an angle was so small that the gas passage would be uniform in cross section.

The characterising feature of claims 1 and 8 of the main request amounted to nothing more than an arbitrary feature which provided no technical benefit.

VIII. In the written procedure and during oral proceedings, the respondent argued essentially as follows:

Alleged substantial procedural violation

The problem of avoiding permeation was subject-matter of the description of the patent in suit and had been addressed in the course of the opposition procedure by the respondent, cf. letter dated 9 June 2000, point 4 on page 4. The appellant had thus had the opportunity to present his comments hereto. No substantial procedural violation thus occurred.

Extension (Article 123 EPC), c*larity (Article 84 EPC)*

It was clearly derivable from the whole content of the patent in suit that the feature "being tapered outwardly toward the spill cavity" in claims 1 and 8 of the main request had to be construed as meaning that the cross section of the channel increased toward the spill cavity. That was in conformity with the disclosure of the application as filed, cf. in particular Figure 7. A person skilled in the art would not consider an interpretation of the content of claims 1 and 8 going against what was shown in Figure 7 of the patent in suit and the application as filed, respectively.

The subject-matter of claims 1 and 8 of the main request was thus clear and did not extend beyond the content of the application as filed. For the same

reasons, the scope of claim 1 of the main request had not been extended with respect to that of claim 1 of the patent in suit as granted.

Insufficiency of disclosure (Article 83 EPC)

The invention addressed the problem of making ribs wherein the specific problem of the gas opening becoming progressively smaller had been encountered. The patent in suit provided a solution to that problem (tapered channel). The definition of the angle of the taper fell within the routine experiments to be made by the skilled person.

The drawings in documents D1 to D4 as well as the drawings in the patent in suit representing the prior art (Figures 2 and 4) were schematically drafted and did not represent real life. Therefore, these documents could not be used in order to show the non-existence of a specific problem. Document D5 concerned a particular example and thus did not represent the claimed generality.

On the other hand, document D6, which was made available to the public after the priority date of the patent in suit, referred to a process of moulding an article having side ribs with an increasing cross section.

Novelty (Article 54 EPC)

The subject-matter of claims 1 and 8 of the main request was novel with regard to document D2. Document D2 did not concern a process and an apparatus for moulding an article comprising a rib portion.

Furthermore, it did not suggest a tapered channel in combination with a gas passage which was substantially uniform in cross section along the entire length of the channel.

Inventive step (Article 56 EPC)

The patent in suit provided a solution to the problem of the gas channel becoming progressively smaller as illustrated in Figure 5 of the patent in suit. That problem occurred, in particular, when making large flat thin-walled articles having ribs. The solution was to provide a tapered channel so that the gas passage was substantially uniform in cross section along the entire length of the channel.

None of the cited documents suggested that solution. The subject-matter of claims 1 and 8 thus involved an inventive step.

Reasons for the Decision

1. *Alleged substantial procedural violation*

The problem of permeation is referred to in the description of the patent in suit in column 2, lines 12 to 14, column 3, lines 4 to 11 and column 6, lines 5 to 7. In the passage in column 3, lines 4 to 11, it is explicitly mentioned that "... the tapered rib or channel design ...", which represents an essential feature of the patent in suit, "... is provided to eliminate sinkage while not producing permeation." Moreover, the problem of permeation had been addressed in the course of the opposition procedure by the

respondent, cf. letter of the respondent dated 9 June 2000, point 4 on page 4.

The decision under appeal, which referred to that problem, was thus based on grounds or evidence which were an issue of the proceedings and on which the parties concerned have had an opportunity to present their arguments, either in written form by filing submissions or orally in the course of the oral proceedings before the Opposition Division. Consequently, the requirements of Article 113(1) EPC had been met. In the Board's judgement, no substantial procedural violation thus occurred.

2. *Extension (Article 123 EPC)*, c*larity (Article 84 EPC)*

According to the patent in suit, cf. in particular column 2, lines 28 to 33, the mould cavity includes a channel having a tapered shape defining a rib portion of the plastic article to be moulded. Such a channel is shown in Figure 7 of the patent in suit wherein the cross section of the channel increases towards the spill cavity. The purpose of the tapering is to overcome the problems of the gas passage becoming progressively smaller and of sinkage illustrated in Figure 5 of the patent in suit and referred to in column 2, lines 1 to 9, column 3, lines 4 to 6 and column 5, lines 39 to 52.

According to claims 1 and 8 of the main request, the channel is tapered "... at an angle sufficient to permit the charge of pressurized gas to travel the entire length of the channel to form the gas passage

(70) so that the gas passage (70) is substantially uniform in cross section along the entire length of the channel (66)."

In order to avoid the gas passage running through that channel becoming progressively smaller, in the Board's judgement, a person skilled in the art would not consider providing a channel with a cross section diminishing toward the spill cavity. The effect to be achieved thus determines the direction of the tapering of the channel, which, accordingly, is to be selected such that the cross section of the channel increases in the direction from the gas entry towards the spill cavity. Any tapering of the channel in the reverse direction would make no sense technically.

Since the claims and the description of a patent address the person skilled in the art, the feature "... being tapered outwardly toward the spill cavity (73)" in claims 1 and 8 of the main request is to be construed as meaning that the channel is tapered and that its cross section increases towards the spill cavity.

The subject-matter of claims 1 and 8 of the main request is therefore based on the application as filed, which discloses a process and an apparatus wherein the mould cavity includes such a tapered channel, cf. claims 7 and 16 as well as Figure 7.

Furthermore, claim 1 of the main request differs from claim 1 of the patent in suit as granted in that the term "towards the spill cavity" is added after the term "being tapered outwardly". Since the direction of the taper is defined by the effect to be achieved as well

as by the disclosure of the description and the drawings, the scope of claim 1 of the main request has not been extended with respect to that of claim 1 of the patent in suit as granted.

Consequently, the requirements of Article 123(2) and (3) EPC have been met.

Furthermore, since the meaning of the term "being tapered outwardly toward the spill cavity" is clear, in particular in the light of the effect to be achieved, claims 1 and 8 are clear (Article 84 EPC).

3. *Sufficiency of disclosure (Articles 100(b), 83 EPC)*

3.1 The invention addresses the problem of making moulded articles having hollow ribs wherein, according to the patent in suit, cf. column 2, lines 1 to 9, the specific problem of the gas opening becoming progressively smaller the greater the distance from the gas entry has been encountered.

3.2 The appellant alleged that the problem did not exist. However, no evidence had been produced which proves that the allegation is correct.

The drawings of patent literature in general, and in particular those of documents D1 to D4, are schematic representations of the subject-matter concerned. They thus cannot be used as evidence for the existence or non-existence of any effects or details neither appearing in these drawings nor being an issue of these documents.

Document D5 concerns a specific example, which, in addition, does not concern an article manufactured according to the process of claim 1 of the main request. The article was produced without using a spill cavity, cf. appellant' s submission of 11 December 2000, Grounds of Appeal, Annex 1, paragraph A8.

In the Board's judgement, it further cannot be assumed that, in any gas injection process, the cross section of the gas passage inevitably and strictly corresponds to the cross section of the channel over the entire length of the channel, and, consequently, that the wall thickness remains constant. A lot of parameters may have an impact on the way the gas channel is actually formed (eg. type of plastic material; timing of the introduction of plastic material and gas; pressure and temperature distribution of the plastic material and of the gas; shape of the mould; shape, size and length of the channel). The assumption that the cooling effect is the same over the whole length of a channel may be an approach which might be valid under certain circumstances (eg. small sized moulds, short process duration). However, in the Board's view, it cannot be regarded as being universally valid.

3.3 Therefore, it cannot not be excluded that, in a process of gas injection moulding of a plastic article having a hollow rib, the phenomenon of the gas channel becoming progressively smaller the greater the distance from the gas entry may be observed.

3.4 Once such a tapered gas channel is observed, the patent in suit discloses the solution in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art, namely by providing a channel which

is tapered at an angle so that a gas channel of constant cross section is formed. The patent in suit further indicates that the "angle will vary depending on the type of plastic injected, the pressure of the gas in the channel, the dimensions of the channel, etc.", cf. column 5, lines 46 to 48. In order to determine a suitable angle, the person skilled in the art will consider performing test runs as a matter of routine. There is no indication that he would not be enabled to find a satisfying solution after having carried out a reasonable amount of tests.

3.5 Consequently, in the Board's judgement, the patent in suit discloses the invention in a manner sufficiently clear and complete for it to be carried by the person skilled in the art. The ground of opposition according to Article 100(b) EPC therefore does not prejudice the maintenance of the patent in suit.

4. *Novelty (Article 54 EPC)*

The subject-matter of claims 1 and 8 of the main request is novel, since none of the cited prior art documents D1 to D4 discloses the feature of the channel being tapered so that the cross section of the gas passage is substantially uniform along the entire length of the channel.

In the process and the apparatus disclosed in document D2, a mould cavity having inclined wall sections is used. However, after having injected the plastic material and the gas, in these parts of the mould cavity, the cross section of the gas passage is not substantially uniform, cf. Figures 2 and 4. The process of document D2 thus differs from that of claim 1 of the

main request, and the mould cavity of the apparatus of document D2 is not suitable for providing a gas passage of constant cross section in a tapered channel.

Consequently, neither the process according to claim 1 nor the apparatus according to claim 8 of the main request is disclosed in document D2; neither do the other documents belonging to the state of the art.

5. *Inventive step (Article 56 EPC)*

Document D2, which is considered to represent the closest prior art, discloses an injection moulding process and apparatus wherein a portion of the injected plastic material is displaced from the mould cavity into a spill cavity.

The patent in suit also relates to such a process and apparatus. The problem of the patent in suit is related to the production of an article having a hollow rib portion and the phenomenon of the gas opening in that rib portion becoming progressively smaller the greater the distance from the gas entry port. The latter can result in sinkage at the end of that portion, cf. column 2, lines 1 to 9 of the patent in suit.

As already pointed out under point 3 above, it is not excluded that that problem, which is illustrated in Figure 5 of the patent in suit, occurs, although the cited prior art does not refer to it. The patent in suit provides a solution for that eventuality. The solution suggested in claims 1 and 8 is to provide a tapered channel having a shape defining the rib portion such that the gas passage is substantially uniform in cross section along the entire length of the channel.

Documents D1 to D4, which represent the cited prior art, neither make mention of the problem nor do they suggest the solution of the patent in suit. Furthermore, according to the solution suggested in claims 1 and 8 of the main request, the taper of the channel is linked in a specific manner to the shape of the gas channel (constant cross section). Therefore, the solution suggested in claims 1 and 8 of the main request cannot be regarded as being arbitrary, either. Although the angle of 0.25 degrees cited as single numerical example in the patent in suit, cf. claims 6 and 11, may appear very small, this is just an example which, nevertheless, may lead to the desired result, at least in specific cases, for example, when producing large, flat and thin-walled articles. The patent in suit does not specify the size, in particular, the length of the channel forming the rib portion.

The subject-matter of claims 1 and 8 is thus not rendered obvious by the cited prior art documents and, consequently, involves an inventive step within the meaning of Article 56 EPC. The subject-matter of claims 2 to 7 and 9 to 12 of the main request, which are appendant to either claim 1 or claim 8, similarly involve an inventive step.

6. Consequently, the auxiliary requests of the respondent need not be considered.

7. The request for reimbursement of the appeal fee has to be rejected, because, in the Board's view a substantial procedural violation did not occur, and, moreover, the appeal is not deemed to be allowable, cf. Rule 67 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Townend W. Moser