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D E C I S I O N
of 26 November 2002

Case Number: T 0047/99 - 3.2.5

Application Number: 92900994.2

Publication Number: 0556323

IPC: B29C 45/00

Language of the proceedings: EN

Title of invention:

Method for the use of gas assistance in the molding of plastic articles to enhance surface quality

Patentee:

Melea Limited

Opponents:

Battenfeld GmbH
Cinpres Gas Injection Limited

Headword:

-

Relevant legal provisions:

EPC Art. 83, 84, 123(2)
EPC R. 57a

Keyword:

"Amendments - added subject-matter (no)"
"Disclosure - sufficiency (yes)"
"Decision re appeals - remittal (yes)"

Decisions cited:

T 0789/89

Catchword:

-



Case Number: T 0047/99 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 26 November 2002

Appellant:
(Proprietor of the patent) Melea Limited
P.O. Box 239
215 Main Street
Suites 2 & 3
Gibraltar Heights
Gibraltar (GI)

Representative:
Rehders, Jochen
Velten Franz Mayer & Jakoby
Kaistrasse 20
D-40221 Düsseldorf (DE)

Respondent:
(Opponent 02) Cinpres Gas Injection Limited
Ninian Park Ninian Way
Tamworth
Staffordshire B77 5ES (GB)

Representative:
Bayliss, Geoffrey Cyril
BOULT WADE TENNANT
Verulam Gardens
70 Gray's Inn Road
London WC1X 8BT (GB)

Decision under appeal: Decision of the Opposition Division of the
European Patent Office dated 2 November 1998
revoking European patent No. 0 556 323 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: W. Moser
Members: H. M. Schram
W. R. Zellhuber

Summary of Facts and Submissions

I. The appellant (patent proprietor) and the respondent (opponent 02) each lodged an appeal against the decision of the Opposition Division revoking the European patent No. 0 556 323 on the ground that the amendments made to claim 1 during the opposition proceedings contravened the requirements of Article 123(2) EPC.

Oppositions had been filed against the patent as a whole based on Article 100(a) EPC (lack of novelty, cf. Article 54 EPC, and lack of inventive step, cf. Article 56 EPC) by two opponents, i.e. opponent 01 and the respondent.

During appeal proceedings, opponent 01 withdrew its opposition and the respondent withdrew his appeal.

II. The following documents were in particular referred to in the appeal proceedings:

E3: *Das Gasinnendruckverfahren - eine Spritzgießvariante mit besonderen Möglichkeiten*, Lecture by Renger, M., Würzburg, 18 and 19 September 1990.

E8: Extract of cross-examination of Mr Hendry in respect of W090/00466.

III. Oral Proceedings were held before the Board of Appeal on 26 November 2002.

At the end of the oral proceedings the requests of the parties were as follows:

The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the following documents:

- (a) claim 1 submitted as main request during oral proceedings; or
- (b) claim 1 filed as first auxiliary request on 22 October 2002; or
- (c) claim 1 filed as second auxiliary request on 22 October 2002; or
- (d) claims 1 to 4 filed as third auxiliary request on 1 March 1999.

The respondent requested that the appeal be dismissed.

IV. Claim 1 according to the main request reads as follows:

"1. A method for the use of gas-assistance in molding a hollow plastic article for improving surface quality of the plastic article in an injection molding system, including a mold (16) having an injection aperture (14), an article-defining cavity (26), a resin flow path extending from the injection aperture (14) to a gate (33) adjacent the cavity (26) through the gate (33) and into the cavity (26), and a gas injection device (24) communicating with the resin flow path or a gas injection pin extending into the cavity (26) at a gas injection position, the method comprising the steps of:

injecting a first amount of molten plastic resin less than a total amount of molten plastic resin sufficient for the preparation of the plastic article into the cavity (26), so that the first amount of molten plastic resin flows in the cavity (26);

injecting a charge of pressurized gas into the mold (16) after the step of injecting the first amount of plastic into the cavity (26);

continuing to inject a second amount of molten plastic resin through the injection aperture (14) along the resin flow path into the cavity (26) simultaneously with the step of injecting the charge of pressurized gas, the first and second amounts of molten plastic resin providing the total amount sufficient for the preparation of the plastic article;

continuing to inject the charge of pressurized gas into the mold (16) to distribute the total amount of molten plastic resin in the cavity (26) after completion of the step of injecting the second amount of molten plastic resin whereby imperfections on an exterior surface of the plastic article are prevented;

maintaining the gas charge under pressure within the article until the article has set up in the cavity (26) to form the article;

relieving the gas pressure within the article; and

removing the article from the mold (16);

characterized in that

for molding a thick cross-sectional extensively hollowed plastic article, like automobile handles, a ratio of the first amount of molten plastic resin injected into the cavity (26) to the total amount of molten plastic resin is in a range of 0.2 to 0.7, said first amount, sufficient for preventing blowout, being injected into the cavity (26) before injecting the charge of pressurized gas at a pressure between approximately 69 bar (1000 psi) and 345 bar (5000 psi), said gas charge being of a pressure and quantity sufficient to enter but not exit the first amount of molten plastic resin in the cavity (26) and sufficient to prevent the flow of the first amount of molten plastic in the cavity from stopping, thereby preventing formation of hesitation marks."

V. The appellant argued essentially as follows:

The amendments were introduced with a view to distinguishing the subject-matter more clearly from the prior art documents US-A 4 935 191 and GB-A 2 158 002, cited in column 2, lines 29 to 35, of the patent specification. The amendments were clear, were disclosed in the application as originally filed, and restricted the scope of protection conferred by the patent as granted, so that the requirements of Articles 84, 123(2) and 123(3) EPC were met. The amendments were occasioned by grounds for opposition (cf. Rule 57a EPC). The invention was reproducible: The claim specified the pressure range for the gas and the range for the relative amount of molten plastic resin injected into the cavity before the injection of the gas. In order to produce a desired article from a particular resin, the person skilled in the art could find, without undue experimentation, the quantity of gas that was sufficient to produce a blow-molded hollow article, whilst at the same time preventing blowout (cf. Article 83 EPC). The allegation of the respondent that gas and molten plastic could not be injected simultaneously was not based on any physical law.

VI. The respondent argued essentially as follows:

There was no need to shift the feature pertaining to preventing the flow of the first amount of molten plastic resin in the cavity from stopping to another part of the claim. It was also not necessary to introduce features into the claim that related to the injection molding system, viz. features defining an injection aperture, a resin flow path and a gas injection device, since these features were implicit in claim 1 as granted. These amendments did therefore not meet the requirements of Rule 57a EPC. Moreover, there was no basis in the application as filed that the

injection aperture and gas injection device were separate entities in the embodiment wherein gas was injected directly into the resin flow path leading to the cavity, contrary to Article 123(2) EPC. The invention could not be carried out, since gas and molten resin could not be injected simultaneously, as stated in document E3, on page 116, first full paragraph. The physical explanation why co-injection of gas and plastic was not possible, was the following: If the resin pressure was higher than the gas pressure, the gas would not enter the resin. Conversely, if the gas pressure was higher than the resin pressure, the gas would act as a valve and would stop the flow of the resin. At best, if the gas pressure and the resin pressure were about equal, the resin would break up the gas into a stream of bubbles, which would not result in a hollow article. Even the inventor no longer believed that gas and resin could be co-injected (see document E8, page 8, lines 1 to 10).

Reasons for the Decision

1. *Procedural status of opponent 01*

Opponent 01 ceased to be a party to the appeal proceedings in respect of the substantive issues after withdrawal of his opposition during appeal proceedings on 27 September 2001 (cf. decision T 789/89 [OJ EPO 1994, 482], point 2 of the Reasons).

Main request

2. *Formal allowability of the amendments*

Apart from the introduction of reference signs (cf. Rule 29(7) EPC), of the expression "characterized in that" (cf. Rule 29(1)(b) EPC), and of a few minor editorial adaptations, claim 1 has been amended as follows:

- (i) the injection molding system, which in claim 1 as granted is said to include "a mold having an article-defining cavity", is now further specified as "including a mold (16) having an injection aperture (14), an article-defining cavity (26), a resin flow path extending from the injection aperture (14) to a gate (33) adjacent the cavity (26) through the gate (33) and into the cavity (26), and a gas injection device (24) communicating with the resin flow path or a gas injection pin extending into the cavity (26) at a gas injection position";
- (ii) the feature "for molding a thick cross-sectional extensively hollowed plastic article, like automobile handles" has been added;
- (iii) the first amount is further qualified as "sufficient for preventing blowout";
- (iv) a statement of effect, viz. "thereby preventing formation of hesitation marks" has been added.

A basis in the application as filed (see WO 92/08595) for these features is the following: feature (i): see page 8, lines 5 to 15, page 10, lines 15 to 20, and claim 5; feature (ii): see page 3, lines 11 to 18, page 7, lines 9 to 16, page 13, lines 2 to 7, and

Figure 5; feature (iii): see page 11, lines 19 to 21; feature (iv): see page 12, lines 28 to 30. The features (iii) and (iv) were not objected to by the respondent under Article 123(2) EPC.

The respondent has submitted that feature (i) introduced subject-matter that was not disclosed in the application as filed, since in the embodiment described on page 8, lines 5 to 9, of the application as filed, and shown in Figure 2, the injection aperture was defined by the gas injection device, i.e. it was part of the device. The Board cannot accept this assertion, since in the same paragraph cited by the respondent it is stated "*Such a device is described in detail in U.S. Patent No. 4,943,407 to Hendry, assigned to the assignee of the present application. As described in this patent, the device 24 may be positioned anywhere in the system 10 before the article-defining cavity 26(i.e. typically in the mold runner system, but may also be located on the nozzle of the system 10).*" In the Board's judgement, it is clear from this wording that the device in question is the gas injection device. From the statement that the device "*may be positioned anywhere in the system ...*" it follows that the device can be a separate device (the location of the injection aperture of the mold is per definition on a peripheral surface of the mold, and cannot be positioned "anywhere" in the system). The expressions "gas injection" (before the word pin) and "at a gas injection position" (at the end of feature (i)), have been added for the sake of clarity. These expressions were objected to by the respondent, since they are not *expressis verbis* mentioned in the application as filed. In the opinion of the Board, these expressions follow unequivocally from the context for which the pin is said to be used, namely to inject gas.

With respect to feature (ii) it is noted that in the application as filed it is stated (see page 13, lines 2 to 7) that "*the present invention works particularly well with large, thick cross-sectional moldings wherein substantial volumes of plastic are removed from the article and replaced by hollow portions and wherein injection pressures are relatively low (i.e. 1000 psi - 5000 psi).*" That pressure range is present in claim 1. The requirement that "*substantial volumes of plastic are removed from the article and replaced by hollow portions*" has been reformulated by the appellant by defining the article as being "*extensively hollowed*". Feature (ii) so amended was not objected to by the respondent under Article 123(2) EPC.

The Board is satisfied that claim 1 meets the requirements of Article 123(2) EPC. Since the scope of protection conferred by the claim is not extended with respect to claim 1 as granted, the requirements of Article 123(3) EPC are also met.

In the judgement of the Board, the subject-matter of claim 1 is also clear, and supported by the description, so that the requirements of Article 84 EPC are met as well. This was no longer contested by the respondent.

A last "amendment" in claim 1 is that the feature "*said gas charge being of a pressure and quantity sufficient to enter but not exit the first amount of molten plastic resin in the cavity (26) and sufficient to prevent the flow of the first amount of molten plastic in the cavity from stopping*" has been transferred to the final part of the claim.

Claim 1 as granted was drafted in the one-part form, whereas claim 1 according to the main request is now drafted in the two-part form. Whether the

aforementioned feature should be incorporated in the characterizing part of claim 1, or could stay in the preamble, depends on which prior art is finally considered to represent the closest prior art. This question has not yet been addressed by the Opposition Division, and, in view of the outcome of the present appeal, has not been decided by the Board.

The amendments (cf. features (i) to (iv)) are *prima facie* introduced to overcome a ground for opposition specified in Article 100 EPC, namely lack of novelty and/or lack of inventive step. The amended claim 1 basically represents a combination of claims 1 and 3 as granted, whereby the embodiment, wherein gas is injected into the cavity via a pin, is now explicitly mentioned as an alternative embodiment (cf. the term "or" in claim 1). Moreover, the claim has been restricted to a "*method for the use of gas-assistance in molding a thick cross-sectional extensively hollowed plastic article like automobile handles.*" Therefore, the amendments can be admitted under Rule 57a EPC.

3. *Sufficiency of disclosure*

The invention is based on the finding that interruptions of the flow of molten resin in the cavity of the mold may cause imperfections on an external surface of the plastic article produced. A second finding is that in molding hollow articles using gas-assistance it is imperative to inject a first amount of molten plastic resin before pressurized gas can be injected.

The invention basically proposes (cf. the wording of claim 1):

- (a) to inject a first amount of molten plastic resin into the cavity,

- (b₁) then to inject a charge of pressurized gas into the mold, and simultaneously
- (b₂) continuing to inject a second amount of molten plastic resin into the cavity.

The claim makes it absolutely clear that the second amount flows *continuously* following the first amount of plastic resin.

The following requirements for the process parameters (first and second amount, gas charge quantity and pressure) can be distinguished:

- (i) The gas charge must be of a pressure and quantity sufficient *to enter* the first amount of molten plastic resin in the cavity, and at the same time the gas charge should not interrupt the flow of the resin into the cavity (the second amount);
- (ii) The gas charge must be of a pressure and quantity such that it *does not exit* the first amount of molten plastic resin in the cavity (called blowout), and likewise, the first amount must be sufficient for preventing blowout; and
- (iii) The gas charge must be of a pressure and quantity sufficient to prevent the flow of the first amount of molten plastic in the cavity from stopping.

The respondent has argued that if the pressure of the gas charge was high enough to enter the molten resin, the flow of resin irrefutably came to a halt, since the gas acted as a valve (cf. requirement (i)).

In the judgement of the Board, this argument is not convincing. The gas is injected into the molten resin, either when the resin is in the flow path leading to the cavity, or when the resin already flows inside the cavity. In both cases the cross-section of the gas injection supply path is much smaller than the cross-section of the resin flow path, so that the gas will only locally displace the flow of resin. In this respect it is noted that the pressure of the molten resin need not be constant in the stretch from the ram extruder, via the nozzle, into the mold and up to the gate. The gas injection point may be chosen in a location, where the pressure of the molten resin is locally a minimum and the velocity of the molten resin is locally a maximum (Venturi effect).

The respondent also relied on the testimony given by Mr Hendry before the United Kingdom Patent Office on 9 February 1996 in the matter of WO 90/00466 (cf. document E8). During the interrogation, Mr Hendry, who is also named as the inventor of the patent in suit, expressed his belief that it was not possible to simultaneously inject plastic and gas (unless the cavity is filled say 70% or 80% ..., the last amount of plastic being maybe 5%).

In the judgement of the Board, opinions of an individual, which are expressed in general terms as is the case in document E8, i.e. which do not specifically relate to the subject-matter of the patent in suit, and which are provided without any further corroborative arguments given, cannot be regarded as evidence that meets the standard of proof required to demonstrate insufficiency of disclosure of the invention as now claimed.

The respondent also referred to document E3, Chapter 3.1 (pages 115 to 117). In the first full paragraph on page 116 of this document, it is stated that the simultaneous injection of plastics and gas, as described in GB-A 2 158 002, is not possible.

However, in the preceding paragraph bridging pages 115 and 116, a method for molding articles using gas is described, wherein a substantial first amount of plastic is injected into the mold, followed by a short phase of simultaneously injecting gas and plastic. The injection of a substantial first amount of plastic is said to be absolutely necessary to prevent the gas from breaking through the leading face of the plastic. If the statement referred to above by the respondent is read in the context of the preceding paragraph, it is clear that the author of document E3 tries to distinguish between the case that (a) a substantial first amount of plastic is injected into the mold (subsequent co-injection of gas and plastic possible) and (b) co-injection of gas and plastic right from the start of the injection molding, i.e. into an empty mold (not possible).

The Board thus comes to the conclusion that document E3 (see the paragraph bridging pages 115 and 116) teaches the person skilled in the art that *simultaneous* injection of gas and a second amount of resin is possible, provided that a substantial first amount has been injected into the mold (cf. requirement (i)), and that the first amount must be chosen large enough to prevent blowout (cf. requirement (ii)).

Claim 1 specifies that the ratio of the first amount of molten plastic resin injected into the cavity to the total amount of molten plastic resin must be in a range of 0,2 to 0,7. The requirement of reproducibility applies to the whole ambit of the claim. It is clear

that the lower the first amount of molten plastic resin, the more difficult it will be to prevent blowout. The respondent submitted that the range given for the ratio would be too low to prevent blowout, thereby merely referring to the testimony of Mr Hendry, who believed that the first amount must be 95% of the total amount of molten plastic resin for co-injection of the last 5% with the gas to be possible.

The burden of proof that the invention cannot be carried out by the person skilled in the art lies with the party making the allegation. Since document E3 credibly shows that blow-molding a hollow article, whereby gas is simultaneously injected with the resin after a first amount of resin has been injected, is possible, the Board is satisfied that the person skilled in the art is able to carry out the invention within the ranges specified for the pressure and for the relative proportion of the first amount, i.e. to find, without undue experimentation, the gas charge that is sufficient to produce a blow-molded hollow article without causing blowout, and that at the same time the flow of the first amount of molten plastic in the cavity is prevented from stopping.

To sum up, in the judgement of the Board, the patent in suit discloses the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

Since the main request meets the requirements of Articles 83, 84, 123(2) and 123(3) EPC, there is no need to consider whether the auxiliary requests of the appellant meet these requirements as well.

4. *Remittal*

Claim 1 according to the main request has been amended substantially with respect to the claims presented before the Opposition Division. Therefore, in order not to deprive the parties of the opportunity to have the issue of novelty and inventive step of the subject-matter of claim 1 according to the main request examined by two instances, the Board exercises its discretion pursuant to Article 111(1) EPC to remit the case to the Opposition Division for further prosecution.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the Opposition Division for further prosecution.

The Registrar:

The Chairman:

M. Dainese

W. Moser