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D E C I S I O N
of 8 June 1999

Case Number: T 0151/96 - 3.2.5

Application Number: 88311706.1

Publication Number: 0321160

IPC: B29C 45/17

Language of the proceedings: EN

Title of invention:
Injection molding method and nozzle for use therein

Patentee:
Melea Limited

Opponent:
Cinpres Limited

Headword:
-

Relevant legal provisions:
EPC Art. 56, 83, 123(2)

Keyword:
"Inventive step (yes)"
"Sufficiency of disclosure (yes)"
"Allowability of amendments (yes)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0151/96 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 8 June 1999

Appellant: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 18 December 1995 concerning maintenance of European patent No. 0 321 160 in amended form.**

Composition of the Board:

Chairman: H. P. Ostertag
Members: P. E. Michel
M. Lewenton

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the interlocutory decision of the Opposition Division maintaining the patent No. 0 321 160 in amended form.

Opposition was filed against the patent as a whole based on Article 100(a) EPC (lack of novelty and inventive step).

The Opposition Division held that the grounds of opposition did not prejudice the maintenance of the patent as amended.

The appeal was based on the grounds of Article 100(a), (b) and (c) EPC and refers to the document

E1: US-A-4 106 887

II. Oral Proceedings were held before the Board of Appeal on 8 June 1999.

(i) The appellant (opponent) requested that the decision under appeal be set aside and the patent be revoked.

(ii) The respondent (patentee) requested that the decision under appeal be set aside and the patent be maintained in amended form according to a main request submitted by letter dated 16 April 1999 or on the basis of a first auxiliary request submitted with the same letter or on the basis of a second auxiliary request comprising the main request, however deleting

Figures 2 and 6 and the corresponding parts of the description.

(iii) The main request includes two independent claims, claims 1 and 8, which read as follows:

"1. A method for making an article from at least one plastic resin in an injection molding system including a pressurized gas source (24), a mold (112) having an injection aperture, an injection nozzle (106) having a nozzle body (108) for establishing a flow path for molten resin through the injection aperture and valve means (132) including a piston (134) and a tip portion (150) operatively associated with the piston to move therewith, the tip portion having a closed position and an open position to communicate the flow of plastic resin from the nozzle body through the injection aperture, the method including the steps of: (a) injecting (96) an amount of molten resin sufficient for the preparation of the article by applying a first variable pressure to the piston to cause the tip portion to move to its open position to communicate the flow of plastic resin from the injection nozzle through the injection aperture in the mold; (b) communicating (98) pressurized gas from the gas source to the mold, simultaneously with or after the step of injecting the molten resin to distribute the molten resin over the interior surfaces of the mold whereby a hollow body portion is formed; (c) applying a second variable pressure to the piston to urge the tip portion towards its

closed position, the difference in the pressure between the first and second pressures causing the tip portion to move to its closed position, wherein the difference in pressure on the valve means prevents the gas from entering the flow path of the molten resin in the nozzle body; (d) cooling (100) the article to a temperature beneath the softening point of the resin; (e) relieving (102) the pressure within the hollow body portion; and (f) opening (104) the mold to remove the article, characterized by:

the tip portion is connected to the piston to move in tandem with the piston, the first pressure being provided by the resin during the resin injection step to urge the piston and, consequently the tip portion towards its open position and pressurized gas from the gas source applies at least a portion of the second pressure to urge the piston and, consequently, the tip portion towards its closed position while preventing the gas from entering the flow path of the molten resin in the nozzle body."

"8. A nozzle (106) for use in a gas-assisted injection molding system including a pressurized gas source (24), a mold (112) having an injection aperture and an injection molding machine (120), the nozzle including a nozzle body (108) having means (110, 118, 122) for establishing a flow path for molten resin, a first end of the nozzle body being adapted for resin connection with the mold and a second end thereof being adapted for resin connection with an end of the injection molding machine; valve

means (132) for controlling the flow of resin through the nozzle body, the valve means including a piston (134) and a tip portion (150) operatively associated with the piston to move therewith, the valve means being adapted for reciprocating movement between an open position and a closed position, the tip portion communicating the flow of resin through the nozzle body in the open position, said piston having first and second surfaces (140, 142), the tip portion moving between the open and closed positions by a pressure difference on the valve means to prevent the gas from entering the flow path of the molten resin in the nozzle body and characterized by:

the tip portion is connected to the piston to move in tandem with the piston wherein the first surface (140) of the piston is adapted for communication with the resin for application of the first pressure and wherein the second surface (142) of the piston is adapted to be in communication with pressurized gas from the gas source to urge the tip portion towards its closed position while preventing the gas from entering the flow path of the molten resin in the nozzle body and to maintain the tip portion in the closed position."

(iv) The claims of the first auxiliary request include the additional feature that the tip portion is integrally connected to the piston.

(v) The claims of the second auxiliary request are identical to those of the main request, the

request differing in that Figures 2 and 6 and the corresponding parts of the description are deleted.

III. In respect of the main request, the appellant (opponent) argued essentially as follows:

The argument of the patentee, that the objection of insufficient disclosure constituted a fresh ground of appeal and should therefore not be admitted, was made too late. The issue had been raised in the oral proceedings before the Opposition Division. Moreover, the Patentee had responded substantively to this ground of appeal in his response of 29 October 1996 and hence had acquiesced in the introduction of this ground.

As regards Article 100(b) EPC, the omission of the check valve (152) as suggested in the patent in suit would result in an inoperable device. Gas pressure would be unable to drive the piston leftwards as shown in Figure 3, so that gas would mix with the plastics material and the problem stated in the patent in suit at column 1, lines 32 to 41 would occur.

As shown in Figure 3, the diameter of the passage (156) is nearly the same as that of passages (141), through which molten plastics material flows in order to exert pressure on the piston. The components of the check valve (152) will thus become contaminated with plastics material flowing through the pin (148). Gas passing through the passage (156) will not blow out any plastics present, but merely force a narrow passage through the material.

In order for the piston to be moved leftwardly as shown in Figure 3 under the influence of gas pressure acting on the piston and the force of spring (147), it is necessary for plastics material to be pushed out of the cylinder through passages (141). This is impossible, as the pin (148) is moving to its closed position.

Thus, the device described with reference to Figure 3 is inoperable, even when the check valve (152) is present.

As regards Figures 2 and 6, these do not show all the steps of the method according to the invention as defined in claim 1.

The closest state of the art is represented by E1, and in particular, the embodiment of Figure 5 thereof. This device functions in the manner described in the statement of the grounds of appeal with reference to the drawings attached to the letter of 22 April 1996 showing three stages of operation. If it was found that the spring force was insufficient to close the needle valve, so that the plastics material became contaminated with gas, it would be obvious for the skilled person to exploit gas pressure to assist the spring as shown at stage 2 of the drawings. He would therefore admit the gas through the passage (140) at an earlier point in the operating cycle whilst making sure that the pressure was not so high as to force the valve body (145) upwardly as shown in stage 3 of the drawings. The skilled person would know that gas pressure assists in closing the needle valve, since it is gas pressure that keeps the needle valve in contact with its seat during injection of gas into the mould as

shown in stage 3 of the drawings.

IV. The respondent (patentee) argued essentially as follows:

The objection of insufficient disclosure was raised by the Opponent for the first time in the appeal procedure and hence constituted a fresh ground of appeal which should not be admitted without the consent of the patentee in accordance with the decision G 10/91. The patentee does not consent to the introduction of this ground.

The omission of the check valve (152) does not result in an inoperable device. Since the gas and the resin act on surfaces (140, 142) of the piston having equal areas, the piston will close under the force of the spring (147) when the resin and gas have more or less equal pressures, If the pressure at both ends of the passage (156) is the same, there will be no tendency for flow through the passage to take place.

Even if there is some accumulation of plastics material in the passage (156), the device will continue to operate until the passage becomes blocked, at which point the device must be dismantled for cleaning. It is also noted that it is commonplace to provide a heater around the valve as shown at (406) in Figure 9 of E1. This will prevent plastics material from solidifying in the valve.

Plastics material flowing through the passages (141) as the valve closes could flow back towards the extruder.

In operation of the device of E1, gas is only supplied after the spring (151) has closed the needle valve. The problem of contamination of the resin by the gas is solved in E1 by this mode of operation. In response to the argument that, faced with the problem of contamination of the resin, the skilled person would immediately consider supplying the gas at an earlier point in the operating cycle, so that gas pressure assists the spring force, it was argued that the skilled person would rather consider substituting a stronger spring, even though this would involve dismantling the nozzle. It is not merely necessary to supply the gas earlier, but also to regulate the gas pressure so that, whilst the needle valve (144) was forced into the closed position, the valve body (145) was not opened until after closure of the needle valve.

Reasons for the Decision

Main Request

1. *Sufficiency of disclosure*

1.1 The Board is of the opinion that it is necessary to consider this ground of opposition, even though it was only introduced in the appeal procedure. It was decided in G 10/91 that a new ground of opposition could only be introduced into the appeal procedure with the consent of the patentee. In the present case, this ground was first mentioned in the statement of grounds of appeal filed with a letter dated 22 April 1996. In the counterstatement of the patentee filed with a letter dated 29 October 1996, the patentee responded to this objection, arguing that the embodiment of the nozzle according to the invention omitting the check valve would be capable of functioning. It was only at the oral proceedings before the Board of Appeal that the respondent introduced the argument that the new ground was not admissible, since the patentee withheld his consent to its introduction. The fact that the respondent responded substantively to the arguments of the appellant in the letter of 29 October 1996 is considered to represent a tacit consent to the introduction of the new ground.

1.2 The arguments of the Opponent that the invention is not sufficiently disclosed to enable a person skilled in the art to carry out the invention are based on allegations that the embodiments of the invention as described in the patent in suit would not function in

the intended manner. Essentially, the following three arguments were raised:

1.2.1 It is suggested at column 8, lines 6 to 9; column 9, lines 10 to 11 and column 11, lines 46 to 49 that the check valve in the piston may be omitted to permit pressure in the mould to be relieved through the nozzle. It is argued that gas pressure would be unable to drive the piston leftwards as shown in Figure 3, since the gas would merely flow through the passage (156), so that closure of the valve would not occur. This cannot, however, be accepted. Since the gas and the resin act on surfaces (140, 142) of the piston having equal areas (with or without the check valve), the piston will close under the force of the spring (147) when the resin and gas have more or less equal pressures. It is thus quite feasible for the gas to assist in urging the tip portion to its closed position, if the gas pressure is approximately the same as the resin pressure. If the pressure at both ends of the passage (156) is the same, there will be no tendency for flow through the passage to take place.

1.2.2 Even if the check valve is present, the opponent argues that, as shown in Figure 3, the diameter of the passage (156) is nearly the same as that of passages (141), through which molten plastics material flows in order to exert pressure on the piston. Molten plastics material will thus also flow into the passage (156). The components of the check valve (152) will thus become contaminated with plastics material. Gas passing through the passage (156) will not blow out any plastics present, but merely force a narrow passage through the material. This argument depends, however,

on Figure 3 being regarded as a scale drawing. Drawings of patent specifications are schematic and it is not possible to draw any conclusions from measurements carried out on the drawings which are unsupported by any disclosure in the description. In the present case, the person skilled in the art will read in the description that the passages (141) are intended to accommodate the flow of molten resin, whilst the function of the passage (156) is to supply gas to the mould. It is further noted that, if the passage (156) was to be drawn as having a small diameter, it would not be possible to illustrate clearly the check valve arrangement. The person skilled in the art will thus appreciate that the passage (156) need only have a small diameter as compared with passages (141). Even if there is some accumulation of plastics material in the passage (156), the device will continue to operate until the passage becomes blocked, at which point the device must be dismantled for cleaning. It is also noted that it is commonplace to provide a heater around the valve as shown at (406) in Figure 9 of E1. This will prevent plastics material from solidifying in the valve.

1.2.3 Thirdly, the opponent argues that, in order for the piston to be moved leftwardly as shown in Figure 3 under the influence of gas pressure acting on the piston and the force of spring (147), it is necessary for plastics material to be pushed out of the cylinder through passages (141). This is impossible, as the pin (148) is moving to its closed position. Again, this argument cannot be accepted, since plastics material flowing through the passages (141) as the valve closes could flow back towards the extruder.

1.2.4 As a general point, it may be noted that Article 83 EPC does not require that the invention be disclosed in a manner such that it works for an extended period. In the present case, the Board considers that the disclosed injection moulding apparatus is capable of operation so as to make an article from at least one plastic resin.

1.3 The disclosure of the invention is thus sufficient to enable the person skilled in the art to carry out the invention.

2. *Amendments*

2.1 References to a fluid have been replaced by references to a gas throughout the description and claims. The application as filed refers to the fluid being a gas. Claim 1 of the main request is thus more restricted than claim 1 as granted and the patent does not contain any subject-matter not included in the application as filed. The claim thus complies with the requirements of Article 123(2) and (3) EPC.

2.2 It is argued on behalf of the opponent that the amendments made to the brief description of Figures 2 and 6 add subject-matter contrary to Article 123(2) EPC. This is not accepted. Although these figures do not illustrate all the steps of the method according to the invention, the person skilled in the art is not presented with any additional information by virtue of the deletion of the word "the" at column 5, lines 3 and 16.

3. *Novelty*

3.1 It is specified in claim 1 of the patent in suit that pressurized gas from the gas source applies at least a portion of the second pressure to urge the piston and, consequently, the tip portion towards its closed position while preventing the gas from entering the flow path of the molten resin in the nozzle body. In E1, the piston is urged towards the closed position of the tip portion solely by the spring (151). Gas is only supplied to the nozzle after the tip portion closes off the supply of resin from the hollow portion (132). The subject-matter of claim 1 is thus novel with respect to the disclosure of E1.

3.2 Claim 8 includes the corresponding apparatus feature and is similarly novel.

4. *Inventive step*

4.1 Closest Prior Art

4.1.1 The closest prior art is represented by document E1. This document discloses a nozzle for use in a gas-assisted injection molding system including a needle valve (144) which serves the function of the piston and tip portion of the patent in suit and a valve body (145) and tip portion (146) which together serve the function of the check valve of the patent in suit.

4.2 Problem underlying the invention

4.2.1 A problem associated with the method of E1 is contamination of the plastic in the nozzle by the gas. This is caused by the spring (151) exerting insufficient force to completely close the nozzle at

the time when the gas is introduced.

4.3 Solution

4.3.1 According to claim 1, the above problem is solved in that pressurized gas from the gas source applies at least a portion of the second pressure to urge the piston and, consequently, the tip portion towards its closed position.

4.3.2 According to claim 8, the problem is solved by the second surface of the piston being adapted to be in communication with pressurized gas from the gas source to urge the tip portion towards its closed position.

4.3.3 This solution is not suggested by the cited prior art. There is no disclosure in E1 which would suggest that gas acts on the needle valve (144) so as to assist the spring in forcing it towards its closed position.

4.3.4 It is argued on behalf of the opponent that, if it was found that the spring force was insufficient to close the needle valve, so that the plastics material became contaminated with gas, it would be obvious for the skilled person to exploit gas pressure to assist the spring. This cannot be accepted, since it would involve introducing the gas at an earlier point in the operating cycle and thus interfering with the intended mode of operation of the nozzle of E1. The more likely course of action would be simply to try a stronger spring, even though this would require the nozzle to be dismantled. The person skilled in the art is not reluctant to dismantle such a nozzle, since this is routinely necessary in order to remove deposits of

resin from the interior thereof. It may further be thought that supplying the gas at an earlier point in the operating cycle might increase rather than decrease the likelihood of contamination, since gas would be supplied to the nozzle at an earlier point in the operating cycle at which the needle valve (144) is not completely closed.

4.3.5 The subject-matter of claims 1 and 8 thus involves an inventive step. The remaining claims are directly or indirectly appendant to either claim 1 or claim 8 and similarly involve an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent according to the main request of the patentee.

The Registrar: The Chairman:

A. Townend P. Ostertag