BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen

D E C I S I O N
of 2 October 1996

Case Number: T 1037/93 - 3.2.5

Application Number: 86100729.2

Publication Number: 0230488

IPC: B29C45/77

Language of the proceedings: EN

Title of invention:
Method for controlling back pressure in electrically-operated injection apparatus

Patentee:
NISSEI PLASTIC INDUSTRIAL CO., LTD.

Opponent:
Battenfeld GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 54 and 56

Keyword:
"Inventive step (yes) - after amendment"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1037/93 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 2 October 1996

Appellant: (Proprietor of the patent)
NISSEI PLASTICS INDUSTRIAL CO., LTD.
2110 Ohazaminamijo
Sakakimachi
Hanishina-gun
Nagano-ken 389-06 (JP)

Representative:
Twelmeier, Ulrich, Dipl.Phys.
Patentanwälte Dr. Rudolf Bauer
Dipl. -Ing. Helmut Hubbuch, Dipl.Phys.
Ulrich Twelmeier
Westliche Karl-Friedrich-Strasse 29-31
75172 Pforzheim (DE)

Respondent: (Opponent)
Battenfeld GmbH
Scherl 10
58540 Meinerzhagen (DE)

Representative:
Müller, Gerd
Patentanwälte
HEMMERICH-MÜLLER-GROSE-POLLMEIER-MEY
Hammerstrasse 2
57072 Siegen (DE)

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 12 October 1993 revoking European patent No. 0 230 488 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: W. D. Weiß
Members: H. P. Ostertag
J. Van Moer

Summary of Facts of Submissions

I. The appellant (proprietor of the patent) lodged an appeal against the decision of the Opposition Division on the revocation of the patent No. 0 230 488.

One opposition was filed against the patent as a whole and based on Article 100(a) EPC. The Opposition Division held that the grounds for opposition mentioned in Article 100(a) EPC prejudiced the maintenance of the patent having regard to following documents

(E1) DE-T1-3 249 092, and
(E2) DE-A-3 505 880.

II. In a communication accompanying the summons of 29 April 1996 for oral proceedings the Board cited the general handbook "Plastics Engineering Handbook" 1976, pages 127 to 129, showing that pressure transducers had been generally envisaged to control, inter alia, screw back pressure which fact put into doubt that the subject-matter of Claim 1 as granted involved an inventive step.

By letter of 1 September 1996, the appellant filed new documents including two sets of amended claims as main or auxiliary requests, respectively.

III. At the end of the oral proceedings of 2 October 1996, the status of requests was the following:

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

Main request: Claims 1 and 2 filed on 5 September 1996; description page 2 as filed at the oral proceedings, pages 3 and 4 as filed on 5 September 1996; Figures 1, 2 and 3 as granted, Figure 4 as filed on 5 September 1996.

Auxiliary request: Claim 1 filed on September 1996; description and Figures as for the main request.

The respondent requested that the appeal be dismissed.

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

"1. A method for controlling back pressure in an electrically operated injection apparatus, the method comprising the steps of:

introducing a material to be molded into a tube (2) having an injection plunger (1) to move the material forward in the tube (2), the injection plunger (1) moving in a backward direction with respect to the tube (2) in response to a back pressure developing from material being moved forward in the tube (2);

coupling the injection plunger (1) to a screw shaft (11) in a manner which is effective to rotate the rotatable part in response to the backward movement of the injection plunger (1)), characterised in

sensing the instantaneous value of the back pressure by electrically measuring strain of a part which receives thrust produced in the screw shaft (11) for forwardly moving said injection plunger through a plunger movable member (6), the thrust being a reaction of the backward force of said injection plunger (1), and applying to the screw shaft (11) by means of an electric motor (22) provided on the screw shaft (11) a braking force which

is responsive to the instantaneous back pressure and which is effective to regulate the backward movement of the injection plunger (1) for causing the back pressure in the material to coincide with a preselected back pressure value."

VI. The appellant argued as follows:

Document E2 was the starting point of the invention. It disclosed a method for controlling the back pressure in an electrically-operated injection apparatus by using the power intake of a servo-motor as sensed parameter representing the back pressure. A striking drawback of this known method, which had otherwise to be rated as rather simple and elegant, resided in that the back pressure was not the only parameter influencing the power intake of the servo-motor and that there was a hysteresis originating from the rotational members transmitting the motor force.

A way to remove this drawback, which in the light of the "Plastics Engineering Handbook" cited by the Board and of document

E3 DE-A-2 030 108

could possibly rated as being obvious, led to a solution which involved the incorporation of a pressure sensor in the injection heating tube causing additional maintenance expenditures and which was technically different from the solution as now being claimed.

VII. The respondent argued as follows:

The pressure sensors, which according to the documents E3 and "Plastics Engineering Handbook" were arranged within the injection heating tube were not the only known option to directly measure a pressure residing in the material inside said tube. The document

E6 "Kunststoff-Maschinen-Führer", 1984, pages 113 to 119,

which was already cited during the opposition proceedings by a letter dated 10 March 1993, mentioned strain gauges as an equivalent to piezoelectric sensors to determine the said pressure.

Consequently, the subject-matter of the amended Claim 1 did not involve an inventive step.

Reasons for the Decision

1. *Amendments*

The amended Claim 1 is based on Claim 1 as granted the scope of which has been restricted by a feature disclosed in the description of the patent as granted (column 2, lines 23 to 32, and column 3, lines 41 to 48). The subject-matter of the amended claim is disclosed in Claims 1 and 2 in the description (page 2, last paragraph, and page 5, second paragraph) as originally filed.

Consequently, Claim 1 is not to be objected on grounds of Article 123 EPC.

2. *Novelty*

Since none of the documents cited discloses the entire combination of features contained in Claim 1, novelty has not been in dispute.

3. *Inventive step*

3.1. Document E2 as well as document E1, the US version of which is acknowledged in the description of the patent in suit, disclose all the features in the preamble of Claim 1. These two documents are, therefore, equivalent in playing the role of the closest prior art.

This known method in which back pressure of the injection plunger is controlled by an electrically operated brake causes the problem that a screw shaft for forwardly moving the injection plunger, a plunger movable member threadedly engaged with the screw shaft to convert the rotational force into axial thrust of the injection plunger and the like are provided between the plunger and the back pressure control device. Therefore, a backward force from the injection plunger received by the back pressure control device is indirect and a frictional force between the members present there between is generated, thus lacking in accuracy in control of back pressure (see EP-B-0 230 488, the paragraph bridging columns 1 and 2).

This problem is solved by the combination of features in the characterising part of Claim 1.

3.2. Document E3 discloses an hydraulically operated injection moulding apparatus the injection pressure of which is controlled by a closed loop control circuit. In this known apparatus, the instantaneous value of the injection pressure during the injection phase of the injection moulding process is sensed by two pressure

transducers one of which is arranged in close proximity to the downstream end of the extrusion chamber which is identical to the heating tube during the plastifying phase of the injection moulding process.

3.3. Before the priority date of the patent in suit, transducers had been available (e.g. "Plastics Engineering Handbook" 1976, pages 127 to 129) adapted to sense the back pressure during the plastifying phase of the moulding process and apt to form part of a closed loop control circuit. Therefore, it would have been obvious to solve the problem defined above and to modify the control circuit disclosed in documents E1 or E2 by exchanging the indirect determination of back pressure via a torque measurement of the servo-motor by a measurement of its instantaneous value via a pressure transducer arranged in a similar manner as the transducer (34) disclosed in document E3. Even if the pressure transducer used in this hypothetical construction were a pressure transducer on the basis of a strain gauge like the one disclosed in document E6 (page 116, Figure 15), this solution would be different from the solution as claimed by Claim 1 of the patent in suit as now amended.

3.4. Moreover, document D6 teaches on page 118 to measure the internal pressure of the injection mould during the injection phase of the moulding process by strain gauges positioned on parts which are rigidly connected to the mould (Figure 16 b) and c)). If it would be considered obvious to abstract a general principle from this teaching specially adapted to control the internal pressure inside the mould during the injection phase and to apply it in order to control the back pressure during the plastifying phase of the injection process, a skilled person would arrive at an embodiment involving the measurement of a deformation directly produced by the back pressure in wall parts of the

heating tube itself or of constructional parts rigidly attached thereto. The patent in suit in its amended version, however, claims to measure a deformation produced by the backward force exerted by the injection plunger on the rotational part, hence a deformation produced by a force transmission containing at least two movable members.

3.5. Consequently the Board cannot see that the documents cited provide any obvious path of development leading from the closest prior art to the subject-matter of the amended Claim 1 according to the main request.

4. Since the dependent Claim 2 and the adapted description are not subject to any objection either, the Board is of the opinion that, taking into consideration the amendments made by the proprietor of the patent, the patent and the invention to which it relates meet the requirements of the EPC.

The auxiliary request, therefore, needed no consideration.

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 in amended form in the following version:

Claims 1 and 2 filed on 5 September 1996 as a main request; description page 2 filed at the oral proceedings, pages 3 and 4 filed on 5 September 1996; Figures 1, 2 and 3 as granted; Figure 4 as filed on 5 September 1996.

The Registrar:

A. Townend

The Chairman:

W. D. Weiß