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D E C I S I O N
of 4 September 2001

Case Number: T 1152/98 - 3.2.5

Application Number: 91201931.2

Publication Number: 0469673

IPC: B29C 47/06

Language of the proceedings: EN

Title of invention:
Process for the production of a continuous object of a thermosetting polymer

Patentee:
DSM N.V.

Opponent:
ROHM AND HAAS COMPANY

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1152/98 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 4 September 2001

Appellant: (Opponent)
ROHM AND HAAS COMPANY
100 Independence Mall West
Philadelphia
Pennsylvania 19106-2399 (US)

Representative:
-

Respondent: (Proprietor of the patent)
DSM N.V.
Het Overloon 1
NL-6411 TE Heerlen (NL)

Representative:
-

Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 13 October 1998 concerning maintenance of European patent No. 0 469 673 in amended form.

Composition of the Board:

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

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the interlocutory decision of the Opposition Division maintaining the patent No. 0 469 673 in amended form.

In the decision under appeal, it was held that the grounds of opposition submitted by the appellant under Article 100(a) (lack of novelty and inventive step) did not prejudice the maintenance of the patent as amended. Furthermore, it was held that the phrase "immediately beyond" in the characterising portion of the amended claim 2 had a clear meaning and was, therefore, allowable under Article 84 EPC.

The following documents were referred to in the appeal proceedings:

D2: JP-A-63-274903;

D3: US-A-4 937 029;

D7: US-A-4 876 531;

D10: Plastics Engineering Handbook, 1976, pages 197 to 201;

D12: FR-A-2 574 699.

With respect to document D2, reference is made to an English translation thereof supplied by the appellant with a letter filed on 23 February 1999. References herein to page and line numbers refer to this translation.

II. Oral Proceedings were held before the Board of Appeal on 4 September 2001.

(i) The appellant requested that the decision under appeal be set aside and that claims 2 to 10 be revoked.

(ii) The respondent (patentee) requested that the appeal be dismissed.

III. Claim 2 of the patent as maintained by the Opposition Division reads as follows:

"2. "Process for production of a continuous object comprising the extrusion of continuous thermoplastic sheath through a die and introducing a monomer of a thermosetting polymer into the sheath during extrusion of the continuous sheath, the monomer being a liquid which cannot be shaped to a self-supporting object, characterized in that the monomer is injected into the sheath immediately beyond the plane of the die."

IV. In the written and oral procedure, the appellant argued essentially as follows:

The term "immediately beyond the plane of the die" as used in claim 2 should be interpreted as including within its scope an extremely short distance beyond the plane of the die and thus cannot be used to distinguish the invention from the prior art. In claim 1 as granted, the expression "in the plane of the die or immediately beyond it" was not required in order to distinguish the subject-matter of the claim from the prior art. However, during the course of the opposition proceedings, the claim was split in two, so that the

term " immediately beyond the plane of the die" is now essential in order to distinguish the subject-matter of claim 2 from the prior art. Further, the description of the patent in suit is not consistent with claim 2 in that it refers to injection in the plane of the die in the first paragraph of page 1 and at page 4, lines 27 to 39. At page 5, line 21, reference is made to the use of a "standard extrusion head", which implies that, in the examples, injection takes place the moment the sheath leaves the extrusion die.

The subject-matter of claim 2 lacks novelty and/or inventive step in view of the disclosure of document D2. The translation of document D2 filed with the letter filed on 23 February 1999 (cf point I above) is regarded as more accurate than that previously on file. This document discloses a three step process in which the cladding material is formed as a tube by injection moulding, the core portion is pressed into the tube and the core portion is polymerised (see page 2, lines 11 and 12, lines 14 to 18 and claim 1). It is thus clear that the core material is pressed into the cladding material after it has been formed into a tube, that is, after the cladding has left the die. The subject-matter of claim 2 thus lacks novelty. If, however, the term "immediately beyond the plane of the die" as used in claim 2 is construed as referring to a point at which the sheath has cooled sufficiently for the temperature of the core material not to exceed the maximum allowable polymerisation temperature, then it is accepted that the subject-matter of claim 2 is new.

The subject-matter of claim 2 lacks an inventive step, since the person skilled in the art would realise that it is necessary, in order to carry out the process of

document D2, to inject the monomer into the sheath beyond the plane of the die, since the cladding material must be extruded at a high temperature at which it is incapable of retaining its desired tubular shape. Consequently, the cladding material must be allowed to cool before the core material is introduced therein, in order for the cladding material to achieve sufficient structural rigidity. As an alternative to the arrangement disclosed in document D2, in which it is necessary to keep the core cool by means of cooling means in the screw, the skilled person may choose to delay the point at which the core material enters the sheath. It is not unusual to inject core materials into a sheath downstream of the plane of the die. Die heads in which this is the case are illustrated in document D10 at page 199, in document D7 in Figure 4, in document D3 in Figure 16 and in document D12.

V. In the written and oral procedure, the respondent argued essentially as follows:

The term "immediately beyond the plane of the die" as used in claim 2 is clear and refers to a point at which the sheath has cooled sufficiently for the temperature of the core material not to be caused to exceed its maximum allowable polymerisation temperature. The distance depends upon the degree of cooling of the sheath required and is exemplified at page 4, lines 31 and 32, as being 25 or 50 mm.

Document D2 does not contain any clear and unmistakable disclosure of a process in which the monomer is injected into the sheath immediately beyond the plane of the die. On the contrary, the sole figure of this document shows the core being injected before the plane

of the die. The subject-matter of claim 2 is thus new.

The subject-matter of claim 2 also involves an inventive step. There is nothing in the prior art which would encourage the person skilled in the art to depart from the teaching of document D2 and inject the core material beyond the plane of the die. The present invention solves the problem of allowing the sheath to be extruded at a higher temperature than that to which the core material may be subjected. The documents referred to by the appellant are not concerned with this problem, so that it requires hindsight to apply the teaching of these documents to that of document D2.

Reasons for the Decision

1. Clarity

1.1 The term "immediately beyond the plane of the die" as used in claim 2 should be construed in the light of the object to be solved by the invention and in the light of the description of the patent in suit at page 4, lines 27 to 39.

1.2 At page 1a, lines 15 to 20, of the description of the patent in suit, it is stated that an "aim of the invention is to provide a process wherein the maximum allowable polymerisation temperature of the monomer (that is, the core material) is significantly lower than the extrusion temperature of the sheath. This aim is achieved according to the features as set out in claim 2." It is thus clear that the point at which the monomer is injected into the sheath is such as to achieve this aim.

1.3 At page 4, lines 27 to 39, of the description of the patent in suit, reference is made to a first case, in which injection occurs in the plane of the die and a second case, in which injection occurs just beyond the plane of the die at a point at which the sheath "has already undergone a certain degree of cooling". The second case is described as being advantageous if the maximum allowable polymerisation temperature of the monomer is significantly lower than the extrusion temperature of the sheath. The first case is the subject of claim 1, and the second case is the subject of claim 2. Description relating to the first case is thus not relevant to construction of claim 2.

1.4 Whilst the description also refers to processes in which injection occurs in the plane of the die at page 1, first paragraph, and in the Examples, which utilise a "standard extrusion head", these passages also refer to the subject-matter of claim 1 and cannot be used to interpret the meaning of the second independent claim, claim 2.

1.5 The term "immediately beyond the plane of the die" thus means that the cladding material must be allowed to cool sufficiently by exposure to the environment after it has left the die before the core material is introduced therein, in order to avoid the core material being subjected to excessive temperatures. The person skilled in the art will not have any difficulty arriving at a suitable distance beyond the plane of the die, taking into account factors including the nature of the monomer, the extrusion temperature and the conditions beyond the die.

2. *Novelty*

2.1 It was alleged on behalf of the appellant that the subject-matter of claim 2 is not new having regard to the disclosure of document D2. As stated above under point 1.5, document D2 does not, however, disclose a process in which a monomer is injected into a sheath immediately beyond the plane of a die.

2.2 The sole figure of document D2 shows a process in which the core material (1) comes into contact with the cladding material (2) as it leaves a core nozzle (4) and the cladding material containing the core enters a disgorging nozzle (3). The plane of the die is the plane defining the outlet of the disgorging nozzle (3). There is nothing in the description which is inconsistent with this interpretation of the teaching of D2. The passages referred to by the appellant refer to cooling the core whilst the cladding material is extruded, this being achieved by the cooling tube (6), shown in the figure. Polymerisation of the core material before it enters the cladding is thus prevented.

2.3 The subject-matter of claim 2 is thus novel with respect to the disclosure of document D2. The remaining cited documents do not disclose a process for production of a continuous object in which continuous thermoplastic sheath is extruded through a die and a monomer of a thermosetting polymer is introduced into the sheath.

3. *Inventive step*

3.1 Closest prior art

Document D2 represents the closest prior art and

discloses a process having all the features of the preamble of claim 2. As discussed above, document D2 does not contain any disclosure of a process in which a liquid monomer is injected into a sheath immediately beyond the plane of a die.

3.2 Object of the invention

The object of the invention is to provide a process for the production of a continuous object as defined in the preamble of claim 2 which can be utilised when the maximum allowable polymerisation temperature of the liquid core monomer is significantly lower than the extrusion temperature of the sheath.

3.3 Solution

According to claim 2, the above object is achieved by injecting the liquid monomer into the sheath immediately beyond the plane of the die.

There is nothing in the prior art which would encourage the person skilled in the art to modify the process disclosed in document D2 in this way. It is suggested on behalf of the appellant that the person skilled in the art would realise that it is necessary to inject the monomer into the sheath at a point beyond the plane of the die, since the cladding material must be extruded at a high temperature at which it is incapable of retaining its desired tubular shape. No evidence was, however, supplied to demonstrate that this is, in fact, the case. It must accordingly be assumed that the process of document D2 can be put into practice in the manner illustrated in the sole figure, the core monomer being cooled sufficiently to avoid polymerisation

before contact with the cladding.

There is, moreover, no incentive for the skilled person to experiment with such a postponement of the point at which the core material enters the cladding.

Document D10 discusses three possibilities for coextrusion, that is, upstream of the die, within the die and after leaving the die. The third possibility is used "to keep the individual layers of plastic isolated from each other until they exit from the die".

Document D7 shows in Figure 4 a coextrusion head in which the core material emerges as a cylinder through an opening (40A), surrounded by the cladding material which emerges through an opening (40B).

Document D3 shows in Figure 16 a process in which a liquid core and a liquid sheath are simultaneously extruded through nozzles (141,142). The sheath is subsequently cross-linked, for example, by means of an ultraviolet lamp (147), and then cured in a furnace (148).

Document D12 discloses a process in which core material is injected into a thermoplastic sheath beyond the plane of the die. The core material may be a thermoplastic resin also used for the cladding or a powder or fibres of a thermosetting cross-linkable polymeric material (page 4, lines 1 to 8).

There is, however, nothing in these cited documents to suggest that their disclosures could be relevant to the object of the invention as set out in paragraph 3.2 above, which concerns solving a problem associated with

core materials consisting of liquid monomers of thermosetting polymers entering a thermoplastic sheath which is extruded at a high temperature.

The subject-matter of claim 2 thus involves an inventive step. Claims 3 to 10 are directly or indirectly appendant either to claim 2 or to claim 1, claim 1 not having been opposed by the appellant. Insofar as these claims are appendant to claim 2, they involve an inventive step for the reasons given above in respect of claim 2.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Dainese W. Moser