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D E C I S I O N
of 12 November 2002

Case Number: T 0388/00 - 3.2.5

Application Number: 94110737.7

Publication Number: 0645226

IPC: B29C 44/28

Language of the proceedings: EN

Title of invention:
Froth process and system for continuous manufacture of polyurethane foam slab-stocks

Patentee:
FOAMING TECHNOLOGIES CARDIO B.V.

Opponents:
Hennecke GmbH
Doyle, Earl, N./Carson, Scott

Headword:
-

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

Keyword:
"Addition of subject-matter contravening Article 123(2) EPC, second auxiliary request (yes)"
"Inventive step, main request, first and third auxiliary request (no)"

Decisions cited:
T 0473/98, T 0789/89

Catchword:

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0388/00 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 12 November 2002

Appellant: (Proprietor of the patent)
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Respondents II: (Opponents 02)
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Decision under appeal: **Decision of the Oppostion Division of the European Patent Office posted 10 February 2000 revoking European patent No. 0 645 226 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: W. Moser
Members: W. Widmeier
W. R. Zellhuber

Summary of Facts and Submissions

I. The appellant (patent proprietor) lodged an appeal against the decision of the Opposition Division revoking European patent No. 0 645 226.

An appeal against this decision was also lodged by respondents II (opponents 02, Earl Doyle and Scott Carson).

Oppositions had been filed against the patent as a whole based on Article 100(a) EPC (lack of novelty and lack of inventive step), Article 100(b) EPC and Article 100(c) EPC by opponent 01, Hennecke GmbH, and by respondents II. The Opposition Division held that claims 1 and 12 as granted as well as claims 1 and 12 of the auxiliary request lacked an inventive step.

II. Oral proceedings were held before the Board of Appeal on 12 November 2002. As announced on 5 November 2002, respondents II were not represented. Opponent 01, having withdrawn the opposition on 19 April 2002, was not represented either.

III. 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) main request: claims 1 and 12, submitted as main request during oral proceedings, and claims 2 to 11 and 13 to 23 filed as main request on 19 June 2000; or

(b) first auxiliary request: claims 1 and 11, submitted as first auxiliary request during oral

proceedings, and claims 2 to 9 filed as main request on 19 June 2000, and claims 10 and 12 to 22 filed as first auxiliary request on 11 October 2002; or

(c) second auxiliary request: claims 1 and 12, submitted as second auxiliary request during oral proceedings, and claims 2 to 11 and 13 to 23 filed as main request on 19 June 2000; or

(d) third auxiliary request: claims 1 and 12, submitted as third auxiliary request during oral proceedings, and claims 2 to 11 and 13 to 23 filed as main request on 19 June 2000.

Before withdrawal of the opposition, opponent 01 had requested that the appeal of the appellant be dismissed.

Respondents II requested that the decision under appeal be set aside and that the patent be revoked on each of the grounds pursuant to Article 100(a) EPC (lack of novelty; cf. Article 54 EPC), Article 100(b) EPC and Article 100(c) EPC. As regards revocation of the patent by the Opposition Division for lack of inventive step, respondents II requested that the decision under appeal be left to stand in this respect.

IV. Claim 1 of the main request reads:

"1. A process for continuous production of polyurethane slab-stock foam (16) including the steps of:
forming a mixture of reactive chemical components;
mixing the reactive chemical components with CO_2 under sufficient pressure conditions to maintain the CO_2 in a

liquid state,
characterized by,
distributing the mixture by passing the resulting mixture along a frothing device (13) comprising an elongated pressure equalizing chamber (21), an elongated pressure drop zone (17) and a frothing cavity (19) wherein said elongated pressure drop zone (17), in the direction of flow, consists of one slot (17; 64, 66, 68) axially extending in the direction of the flow and is dimensioned to maintain back pressure on the upstream mixture to keep the CO_2 in a liquid state and to initiate frothing under pressure controlled conditions, wherein said frothing device (13) avoids turbulent evaporation of the CO_2 upon discharge of the mixture from the pressure drop zone;
and forming the discharged mixture into a progressively expanding frothing material by progressively releasing the CO_2 in the frothing material as the frothing material flows along the frothing cavity (19) and through an outlet aperture (20), thereby discharging the frothing mixture onto a substrate (2)."

Claim 1 of the first auxiliary request reads:

"1. A process for continuous production of polyurethane slab-stock foam (16) including the steps of:
forming a mixture of reactive chemical components;
mixing the reactive chemical components with CO_2 under sufficient pressure conditions to maintain the CO_2 in a liquid state,
characterized by,
keeping a pressure during mixing which ranges from about 5 to about 18 bar,
distributing the mixture by passing the resulting mixture along a frothing device (13) comprising an

elongated pressure equalizing chamber (21) and through an elongated pressure drop zone (17) and a frothing cavity (19) wherein said elongated pressure drop zone (17), in the direction of flow, consists of one slot (17; 64, 66, 68) axially extending in the direction of the flow and is dimensioned to maintain back pressure on the upstream mixture to keep the CO_2 in a liquid state and to initiate frothing under pressure controlled conditions, wherein said frothing device (13) avoids turbulent evaporation of the CO_2 upon discharge of the mixture from the pressure drop zone; and forming the discharged mixture into a progressively expanding frothing material by progressively releasing the CO_2 in the frothing material as the frothing material flows along the frothing cavity (19) and through an outlet aperture (20), thereby discharging the frothing mixture onto a substrate (2)."

Claim 1 of the second auxiliary request reads:

"1. A process for continuous production of polyurethane slab-stock foam (16) including the steps of:
forming a mixture of reactive chemical components;
mixing the reactive chemical components with CO_2 under sufficient pressure conditions to maintain the CO_2 in a liquid state,
characterized by,
distributing the mixture by passing the resulting mixture along a frothing device (13) comprising an elongated pressure equalizing chamber (21) and through an elongated pressure drop zone (17) and a frothing cavity (19) wherein said elongated pressure drop zone (17), in the direction of flow, consists of one slot (17; 64, 66, 68) axially extending in the direction of the flow and having a height of less than or equal

0.5 mm and is dimensioned to maintain back pressure on the upstream mixture to keep the CO_2 in a liquid state and to initiate frothing under pressure controlled conditions wherein said frothing device (13) avoids turbulent evaporation of the CO_2 upon discharge of the mixture from the pressure drop zone;
and forming the discharged mixture into a progressively expanding frothing material by progressively releasing the CO_2 in the frothing material as the frothing material flows along the frothing cavity (19) and through an outlet aperture (20), thereby discharging the frothing mixture onto a substrate (2)."

Claim 1 of the third auxiliary request reads:

"1. A process for continuous production of polyurethane slab-stock foam (16) including the steps of:
forming a mixture of reactive chemical components;
mixing the reactive chemical components with CO_2 under sufficient pressure conditions to maintain the CO_2 in a liquid state,
characterized by,
distributing the mixture by passing the resulting mixture along a frothing device (13) comprising an elongated pressure equalizing chamber (21) and through an elongated pressure drop zone (17) and a frothing cavity (19) wherein said elongated pressure drop zone (17), in the direction of flow, consists of one slot (17; 64, 66, 68) axially extending in the direction of the flow and having a height in the range of 0.3 to 0.5 mm and is dimensioned to maintain back pressure on the upstream mixture to keep the CO_2 in a liquid state and to initiate frothing under pressure controlled conditions, wherein said frothing device (13) avoids turbulent evaporation of the CO_2 upon discharge of the

mixture from the pressure drop zone;
and forming the discharged mixture into a progressively expanding frothing material by progressively releasing the CO_2 in the frothing material as the frothing material flows along the frothing cavity (19) and through an outlet aperture (20), thereby discharging the frothing mixture onto a substrate (2)."

V. The following documents are referred to in the present decision:

D1: US-A-3 181 199

D2: US-A-5 120 770

D10: "Flexible Polyurethane Foams", Ron Herrington and Kathy Hock, Dow Plastics 1991, pages 9.2 and 9.3

D21: "Bayer/Hennecke add CO_2", Urethanes Technology, August/September 1995, pages 9 and 10

VI. In the written and oral proceedings the appellant argued essentially as follows:

The expression "progressively releasing the CO_2 in the frothing material" in claim 1 of the main request does not cause an extension beyond the original disclosure. The description as originally filed supports both a gradual release and a progressive release of the blowing agent in the frothing mixture. Thus, even if the terms "gradually" and "progressively" had to be construed as having different meanings, the use of the term "progressively" in the claim was in accordance with Article 123(2) EPC.

With the amendments made, the claims of the main request are clear and in line with the description and drawings. The disclosure of the patent specification is sufficient as concerns the design of the slot and the pressure conditions. With respect to the latter, however, the common general knowledge of the person skilled in the art has to be included. It is then clear that the pressure to keep CO_2 in liquid form within the mixture is less than the pressure to keep free CO_2 in liquid form. The requirements of Articles 84 and 83 EPC are therefore fulfilled.

Independent claims 1 and 12 of the main request relate to the production of polyurethane slab-stock foam. The mixture which is released onto the substrate has a density of about 1100 to 1200 kg/m^3 whereas the finished slab-stock foam typically has a density in the range of 16 to 48 kg/m^3. Consequently, a high amount of gas is needed to expand the mixture by such a degree. This expansion also needs a certain time and thus takes place along a considerable transport distance of the substrate conveyor. The fully expanded foam reaches a height of about 1,2 m. Document D1 relates to a coating machine which produces a foam coating on a substrate, the foam thus formed having typically a density of about 350 kg/m^3 and a height of a few millimetres. Thus, significantly less gas is needed and the foaming process takes a short time and a short distance and is already finished when the mixture is released onto the substrate. Since the necessary amount of gas is small, the problem of an explosion-like evaporation of the gas and the consequent turbulences in the mixture do not occur. Moreover, document D1 is silent about the gas used as blowing agent. Finally, document D1 does not disclose a pressure drop zone which consists of one

slot axially extending in the direction of the flow and which is able to maintain a back pressure sufficient to keep CO_2 in liquid form. It discloses only a simple slit. Table 9.1 of document D10 shows some typical characteristics of slab-stock foam which differ significantly from the foam produced with the process of document D1. Document D1, therefore, will not be considered by a skilled person when designing a slab-stock foam production process and system using CO_2 as blowing agent.

In document D2 CO_2 is used as a blowing agent and, therefore, an explosion-like evaporation occurs. This instantaneous evaporation is a necessary element of the process of document D2 as can be seen from step (b) of claim 1 of this document. It is not designated as a disadvantage. For this reason a skilled person would not omit this step. Starting from document D2, a skilled person would not consider document D1 which does neither show CO_2 as blowing agent nor slab-stock foam. The combination of these two documents would not make sense; however, even if combined, this combination would not result in the process of claim 1 of the patent in suit according to the main request.

The pressure range of 5 to 18 bar as an additional feature in claim 1 according to the first auxiliary request emphasizes that the patent in suit relates to the production of slab-stock foam and implies specific features of the system according to claim 11 of the first auxiliary request. The system of document D1 lacks these specific features.

Although the description of the patent mentions only three distinct values of the slot height, a skilled

reader will recognize that these are only preferable examples and that all slot heights smaller than 0.5 mm, but at least all slot heights within the range of from 0.3 to 0.5 mm, are possible. The additional features in claim 1 according to the second auxiliary request and in claim 1 according to the third auxiliary request are therefore in accordance with Article 123(2) EPC.

The slot height is an essential feature of the invention because it is the slot which creates the necessary back pressure to keep the CO_2 in liquid form and which is instrumental in avoiding turbulent evaporation of the blowing agent. The slot height specified in claim 1 according to the second or third auxiliary request implies a certain depth of the slot which is necessary for the smooth release of the gas. With the slot as shown in document D1 it would not be possible to avoid this turbulent evaporation.

VII. As regards the subject-matter of the claims filed by the appellant on 19 June 2000 respondents II argued essentially as follows:

The claims (all requests) are not in accordance with Article 123(2) EPC. Firstly, the application as filed does not provide a basis for the feature that the slot axially extending in the direction of the flow is dimensioned to maintain back pressure on the upstream mixture to keep the CO_2 in a liquid state. Secondly, the original disclosure does not show that the discharged mixture is formed into a progressively expanding frothing material by progressively releasing the CO_2. It shows that the blowing agent is gradually released. However, progressively and gradually have different meanings.

The patent specification lacks sufficient disclosure so that a person skilled in the art is not able to carry out the claimed subject-matter. The definition of the shape and configuration of the pressure drop zone is so broad that a person skilled in the art would be required to engage an unreasonable amount of research and development to arrive at a suitable design. Furthermore, it is questionable whether the CO_2 can be kept in a liquid state. The pressure at the lower end of the range of 5 to 18 bar is not sufficient, not even at very low temperatures, to keep CO_2 liquid. For these reasons the patent specification is not in accordance with Article 83 EPC.

The use of conventional blowing agents such as CFCs was outlawed for environmental reasons, and CO_2 has been established as a suitable substitute. Document D2 shows that CO_2 is the most suitable blowing agent. However, it was also known that this gas leads to a very turbulent evaporation and thus to a poor foam quality. Having this problem in mind, a person skilled in the art would inevitably consider document D1 when seeking for a solution to produce slab-stock foam without such a turbulent evaporation of the blowing agent. This document makes it clear that the apparatus which is described therein is intended for operation at high pressure and is thus suitable for use with liquid CO_2. Especially a pressure in the range from 5 to 18 bar can easily be achieved with the apparatus of document D1. In addition, this prior art apparatus has a high degree of adjustability so that the necessary adaptation can also easily be achieved. Especially the slit through which the mixture is released is fully adjustable and thus able to permit a flow at a controlled rate and to produce the necessary back pressure. Thus, when seeking

a solution to the problem of turbulent evaporation a person skilled in the art would start from document D1 and perform the necessary modifications and thus arrive at the process and system according to the patent in suit.

Reasons for the Decision

1. *Admissibility of the appeal of respondents II*

In its decision, the Opposition Division revoked the patent in suit. Thus, the patent proprietor is the only party adversely affected by the decision under appeal within the meaning of Article 107 EPC, first sentence. The appeal lodged by respondents II has therefore to be rejected as inadmissible under Rule 65(1) EPC (cf. also decision T 473/98 [OJ EPO 2001, 231], point 2 of the Reasons). However, respondents II are a party as of right to the appeal proceedings pursuant to Article 107 EPC, second sentence.

2. *Procedural status of opponent I*

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 19 April 2002 (cf. decision T 789/89 [OJ EPO 1994, 482], point 2 of the Reasons).

3. *Main request*

3.1 Respondents II raised objections under Article 123(2) EPC. They were of the opinion that the function of the pressure drop zone and the progressive release of the

CO_2 as specified in claim 1 go beyond the original disclosure.

The Board cannot follow this opinion. The application as filed (cf. page 5, lines 1 to 4 of the published version) expresses "that the purpose of the elongated pressure drop zone is to provide a back pressure ... as well as an equalization of the pressure ... to prevent turbulent evaporation of the blowing agent ...". It is self-evident that the back pressure upstream of the pressure drop zone must be sufficiently high to keep the CO_2 in a liquid state. As regards the feature "forming the discharged mixture into a progressively expanding frothing material by progressively releasing the CO_2", it follows from the passage on page 4, lines 12 and 13 of the published version of the application as filed that the blowing agent is progressively released in the reacting mass. This progressive release together with the feature "to progressively release the frothing mixture" contained in claim 23 and depicted in Figures 3 and 5 of the drawings of the application as filed imply that the frothing material expands progressively.

Also the further amendments to claim 1 are within the original disclosure. They were made in order to remove a conflict with the embodiments according to Figures 6 and 7 of the patent in suit. In addition, claim 1 does not extend the protection conferred.

The Board is therefore satisfied that the subject-matter of claim 1 meets the requirements of Articles 123(2)(3) EPC and 84 EPC.

3.2 Respondents II also raised objections under

Article 100(b) EPC. They were of the opinion that a person skilled in the art would not be able to carry out the pressure drop zone and to keep the CO_2 in liquid form because of an insufficient and wrong disclosure of the technical details in the description of the patent in suit.

The Board cannot share this opinion. The description of the patent in suit as a whole comprises sufficient details as to the function and the basic design of the pressure drop zone so that a person skilled in the art can carry out this pressure drop zone without undue burden. If, in some respect, the description of the patent in suit gives constructive freedom, a skilled person can act on the basis of its common general knowledge and by simple trial and error. The lower end of the pressure range of 5 to 18 bar to be created as back pressure does not appear to be outside of the pressure range which is necessary to keep the CO_2 in liquid form, and even if the pressure of 5 bar should be too low, this can easily be recognized and easily be corrected by a higher pressure. Thus, the patent in suit does not comprise wrong information which would hinder a skilled person to carry out the subject-matter claimed.

The Board is therefore satisfied that the requirements of Article 83 EPC are met.

3.3 None of the prior art documents shows all features of claim 1, the subject-matter of which therefore has to be considered novel. Respondents II did not raise objections as to lack of novelty.

3.4 Document D1 is regarded as representing the closest

prior art. This document discloses a process for continuous production of polyurethane foam material including the steps of: forming a mixture of reactive chemical components; mixing the reactive chemical components with a blowing agent under sufficient pressure conditions, distributing the mixture by passing the resulting mixture along a frothing device 19 comprising an elongated pressure drop zone 132 and a frothing cavity 136 wherein said elongated pressure drop zone, in the direction of flow, consists of one slot 132 axially extending in the direction of the flow and is dimensioned to maintain back pressure on the upstream mixture and to initiate frothing under pressure controlled conditions, and forming the discharged mixture into an expanding frothing material by releasing the blowing agent in the frothing material as the frothing material flows along the frothing cavity and through an outlet aperture 141, thereby discharging the frothing mixture onto a substrate 111 (cf. column 1, line 48 to column 3, line 18 and Figures 1 to 3).

However, document D1 does not specify the blowing agent. Having regard to the publication date of this document, one can assume that conventional chlorofluorocarbons (CFCs) were used which were at that time the most common blowing agent for foam production. Thus, the process according to claim 1 of the patent in suit differs from the process disclosed in document D1 in that the blowing agent is CO_2, that the pressure conditions are such that the CO_2 is maintained in a liquid state, that turbulent evaporation of the CO_2 upon discharge of the mixture from the pressure drop zone is avoided and that the CO_2 is progressively released so that the mixture is formed into a progressively

expanding frothing material.

For environmental reasons CFCs can no longer be used as blowing agents in the polymeric foam production, and for this reason CFCs were replaced by other agents, e.g. CO_2. This is explained in the description of the patent in suit (cf. page 2, line 58 to page 3, line 4) where reference is made also to document D2, which teaches to replace conventional blowing agents and which describes a process for the production of slab-stock foam using CO_2 as blowing agent. Thus, the replacement of CFCs by CO_2 cannot be considered to involve an inventive step.

When it was no longer possible to run the process of document D1 with CFCs as blowing agents, it is an obvious measure for a person skilled in the art to examine whether this process and the system of document D1 are suitable for the use of CO_2 as blowing agent. When replacing CFCs by CO_2 in a system as shown in document D1, some modifications concerning temperature and/or pressure for maintaining CO_2 in liquid form, before it leaves the outlet, become necessary. The apparatus shown in document D1 allows such modifications. The back pressure on the upstream mixture depends on the height of the elongated outlet slit 132. The narrower the slit, the higher is the back pressure. The apparatus of document D1 allows to adjust the width of the elongated slit 132 by means of the adjustable plate 134 (cf. Figure 2 and column 2, lines 25 to 29) and thus to cause a back pressure high enough to maintain CO_2 in liquid form within the mixture. As is explained in the patent in suit (cf. page 5, lines 36 to 39), the height of the slit is also instrumental for the controlled pressure conditions and

thus for avoiding the turbulent evaporation of the CO_2. The argument of the appellant that not only the height of the slit, but also the depth of the slit is essential for avoiding turbulent evaporation cannot be accepted. The patent in suit is silent about a certain depth and its relevance for the pressure conditions and does therefore not form a basis for a corresponding feature which, anyway, is missing in claim 1.

Since in the process disclosed in document D1 CO_2 is not used , document D1 does not mention that the discharged mixture is formed into a progressively expanding frothing material by progressively releasing the CO_2. However, the progressive expansion and the progressive release are a consequence of the modifications which are necessary to adapt the process to CO_2. When, as a function of the slot height, frothing is initiated under pressure controlled conditions so that turbulent evaporation of the CO_2 is avoided, then the CO_2 is released progressively, rather than explosion-like as in the process of document D2, and thus the frothing material expands progressively. The appellant's argument, that the expansion of the frothing material in the process of document D1 is already finished when the material is deposited onto the substrate, whereas in the process according to claim 1 of the patent in suit the expansion is continued also after deposition of the material and along a considerable transport distance of the substrate, is not convincing, because claim 1 does not specify such a long expansion process.

The appellant argued that document D1 would not be considered because it did not relate to the production of slab-stock foams which have a high degree of expansion during production and considerable heights

when finished. However, the appellant could not convince the Board that the term "slab-stock foam" implies foam heights the device and process of document D1 are not able to produce. Document D10, which the appellant used to demonstrate the properties of slab-stock foam, lists in its introductory part (cf. page 9.2, chapter "Slabstock Foam Markets") the various applications of slab-stock foam. Among these are carpet underlayment and packaging. Foams used as carpet underlayment and in packaging normally have heights from a few millimetres to a few centimetres. This is the range of height the device and process of document D1 are intended for, as can be seen from the given dimensions (cf. column 1, lines 60 to 63 and Figure 2). Moreover, the height of the foam coating produced by the device and process of document D1 is adjustable by means of the plate 139 (cf. column 2, lines 29 to 34 and Figure 2) so that it is suitable for various applications. Apart from that, a specific foam height is not subject of claim 1.

The appellant referred also to document D21 for demonstrating that the use of CO_2 was not taken into consideration in combination with the process of document D1. However, document D21, which is not prior art according to Article 54(2) or (3) EPC due to its late publication date, does not comprise a clear indication that at the priority date of the patent in suit the experts were not yet prepared to use CO_2 as blowing agent in the production of foams.

Thus, the only substantial difference between the process according to claim 1 of the main request and the process of document D1 is the use of CO_2. The use of CO_2 is known (cf. document D2) for environmental

requirements, and the necessary modification of the process of document D1 as concerns the back pressure created by the outlet slot is a self-evident measure for a person skilled in the art when changing the blowing agent. The further differences of the process of claim 1 with respect to document D1 are the consequence of this modification.

Consequently, in the absence of any further specific features, claim 1 of the main request has to be considered to lack an inventive step.

4. *First auxiliary request*

4.1 Claim 1 of the first auxiliary request is supplemented with respect to claim 1 according to the main request by the feature that the pressure is kept during mixing within a range from about 5 to 18 bar.

This additional feature is to be found in claim 10 and on page 3, line 49 of the published version of the application as filed. The subject-matter of claim 1 of the first auxiliary request fulfils the formal requirements of Articles 84, 123(2) and 123(3) EPC.

4.2 The lower limit of the pressure range indicated in claim 1 corresponds to the minimum necessary pressure for keeping CO_2 in liquid form. For this reason it is obvious to choose this lower limit. The upper limit of the pressure will be chosen by a skilled person in accordance with the given constructive and thermal conditions. A pressure of 18 bar is well within a range a skilled person will consider when modifying the process of document D1 for the use of CO_2.

Thus, the additional feature of claim 1 according to the first auxiliary request cannot establish an inventive step.

5. *Second auxiliary request*

Claim 1 according to the second auxiliary request is supplemented with respect to claim 1 according to the main request by the feature that the slot has a height of less than or equal to 0.5 mm. The application as filed does not disclose this feature. In fact, only three distinct values for the slot height, namely 0.5 mm, 0.4 mm and 0.3 mm (cf. page 7, line 6 to page 8, line 16 of the published version of the application as filed; examples 3, 4 and 5) are mentioned there. It is not derivable therefrom that the slot height may be further reduced to an unlimited small value. Thus, a value of less than 0.3 mm goes beyond the original disclosure.

Claim 1 according to the second auxiliary request therefore is not in accordance with Article 123(2) EPC.

6. *Third auxiliary request*

6.1 Claim 1 according to the third auxiliary request is supplemented with respect to claim 1 according to the main request by the feature that the slot height is in the range of 0.3 mm to 0.5 mm. Although, as mentioned above under point 5, the application as filed refers only to three distinct values of the slot height, a skilled reader would consider all values between the lower limit of 0.3 mm and the upper limit of 0.5 mm as being included by the given examples.

The Board is therefore satisfied that claim 1 according to the third auxiliary request fulfils the requirements of Article 123(2) EPC. The same applies to the other formal requirements (Articles 84 and 123(3) EPC).

6.2 As set out above (cf. point 3.4), the modification of the process of document D1 to enable the use of CO_2 concerns the height of the slot which must be adjusted so that the necessary back pressure is generated. Any slot height which creates this pressure is the result of obvious calculations or trial and error.

Consequently, a slot height within the range of 0.3 mm to 0.5 mm which, in accordance with the wording of claim 1, must be able to create the necessary back pressure, cannot be considered to involve an inventive step.

7. Since neither claim 1 according to the main request nor claim 1 according to any of the three auxiliary requests is allowable, the appeal has to be dismissed. Under the circumstances, it was not necessary to consider the second independent claim (claim 12 according to the main request and the second and third auxiliary request; claim 11 according to the first auxiliary request).

Order

For these reasons it is decided that:

1. The appeal of respondents II is rejected as inadmissible.

2. The appeal of the appellant is dismissed.

The Registrar: The Chairman:

N. Maslin W. Moser