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D E C I S I O N
of 20 February 2002

Case Number: T 0118/01 - 3.3.3

Application Number: 94903784.0

Publication Number: 0683795

IPC: C08F 8/20

Language of the proceedings: EN

Title of invention:
Continuous process and apparatus for the halogenation of elastomers

Patentee:
PRESSINDUSTRIA A.G.

Opponent:
Exxon Chemical Company

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 83, 123(2), 123(3)

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

Decisions cited:
G 0002/88, G 0009/91, T 0119/82, T 0068/85, T 0182/89, T 0409/91, T 0677/91, T 0923/92, T 0292/95, T 0190/99

Catchword:
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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0118/01 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 20 February 2002

Appellant: (Proprietor of the patent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 23 November 2000 revoking European patent No. 0 683 795 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: R. Young
Members: C. Idez
U. Tronser

Summary of Facts and Submissions

I. The grant of European patent No 0 683 795 in respect of European patent application No. 94 903 784.0 based on International patent application No. PCT/EP93/03552 filed on 10 December 1993, and claiming priority of the earlier IT patent application No. TO930081 of 10 February 1993, was announced on 5 February 1997 (Bulletin 1997/06) on the basis of 17 claims.

Claim 1 as granted read as follows:

"Continuous process for the halogenation of elastomers, in which a halogenating agent is introduced into a solution of an unsaturated elastomer in an organic solvent and in which the said halogenating agent is mixed in a continuous stream of the said elastomer solution, thus dissolving the said halogenating agent and causing it to react with the said elastomer in the same continuous stream, characterized in that it comprises keeping the said continuous stream of elastomer solution in turbulent motion without flow inversion phenomena during the course of the reaction between the said halogenating agent and the said elastomer."

Dependent Claims 2 to 14 referred to preferred features of the process according to Claim 1.

Independent Claim 15 read as follows:

"Apparatus for performing the process according to any one of the preceding claims, in which an elastomer solution in an organic solvent is caused to flow continuously in a tubular reactor (14), such as a

column reactor, characterised in that it comprises mechanical means (15) which promote turbulence, which means may static or dynamic, for example at least one bed of Raschig rings, inserted into the said reactor (14)."

Dependent Claims 16 to 17 related to preferred elaborations of the apparatus according to Claim 15.

II. On 5 November 1997, a Notice of Opposition was lodged in which revocation of the patent in its entirety was requested on the grounds set out in Article 100(a) EPC (lack of novelty and lack of inventive step), Article 100(b) EPC (insufficency), and Article 100(c) EPC (added subject-matter). The opposition was supported inter alia by the following documents:

D1: US-A-2 964 489;

D2: US-A-3 966 692;

D8: US-A-3 099 644;

D9: "Perry's Chemical Engineers' Handbook", Sixth Edition, McGraw-Hill Book Company (1984), Sect. 6, pages 7 to 9, and Sect. 21, pages 57 to 59;

D10: US-A-5 177 233; and

D11: US-A-4 254 240;

as well as the later filed but admitted,

D21: Vauck and Müller, "Grundoperationen chemischer Verfahrenstechnik", 9th Edition, Deutscher Verlag

für Grundstoffindustrie GmbH, Leipzig (1992), page 75, and

D22: P. Magnussen et al., "Axial Mixing of Liquid in Packed Bubble Columns and Perforated Plate Columns of Large Diameter"; Chemical Reaction Engineering-Houston, ACS Symposium series, American Chemical Society, Washington D.C., 1978, pages 337 to 347.

In the course of the opposition proceedings, the Patent Proprietor relied in particular on the following documents as support for its counterstatements:

D16: N. P. Cheremisinoff, "Properties and Concepts of Single Fluid Flows", Encyclopedia of Fluid Mechanics, Volume 1, Chapter 10, (1986), pages 288 to 289, and

D20: "Perry's Chemical Engineers' Handbook", Sixth Edition, McGraw-Hill Book Company (1984), pages 4 to 24 to 4 to 31.

III. By a decision announced orally on 7 November 2000 and issued in writing on 23 November 2000, the Opposition Division revoked the patent. The decision of the Opposition Division was based on two sets of 17 Claims forming respectively a main request and an auxiliary request. The main request consisted of Claim 1 as amended at the oral proceedings of 7 November 2000, and of Claims 2 to 17 as granted.

Claim 1 of the main request differed from Claim 1 as granted by amendment of the phrase "characterized in that it comprises keeping the said continuous stream of elastomer solution in turbulent motion" to read

"characterized in that said continuous stream of elastomer solution is kept in turbulent motion".

Claims 1 to 14 of the auxiliary request exactly corresponded to Claims 1 to 14 of the main request, and Claims 15 to 17 were as filed on 1 June 1999.

Independent Claim 15 read as follows:

"Use of a tubular reactor, such as a column reactor, for performing the process according to any one of the preceding claims, the said reactor (14) comprising mechanical means (15) for promoting turbulent motion without flow inversion phenomena of the said continuous stream of elastomer solution during the course of the reaction between the said halogenating agent and the said elastomer, which means may static or dynamic, for example at least one bed of Raschig rings, inserted into the said reactor (14)."

Dependent Claims 16 and 17 related to preferred embodiments of the use of the tubular reactor according to Claim 15.

According to the decision, Claim 1 of both requests and Claims 15 to 17 of the auxiliary request met the requirements of Article 123(2) and 123(3) EPC. The decision also stated that the requirements of Article 83 EPC were fulfilled.

Concerning the main request, it held that the subject-matter of Claim 1 was novel over documents D1, D8, and D11, but that independent Claim 15, which was directed to an apparatus for performing the process according to Claims 1 to 14, lacked novelty in view of the

disclosure of document D10.

Concerning the auxiliary request, the decision stated that the subject-matter of Claim 15 was novel, since it related to the use of a known apparatus for carrying out a novel process, namely the process according to Claims 1 to 14. It held, however, that the process forming the subject-matter of Claim 1 did not involve an inventive step. More precisely, it stated, that, in view of the teachings of D1 and D11, the feature "without inversion flow phenomena during the course of the reaction" was not necessary to solve the problem of reducing the degradation of the elastomer chain. Therefore, the process of the opposed patent was considered as a simple alternative to the process of D1 and D11.

IV. On 26 January 2001, a Notice of Appeal was lodged by the Appellant (Patent Proprietor) against this decision with simultaneous payment of the prescribed fee. With the Statement of Grounds of Appeal lodged on 30 March 2001, the Appellant submitted a new main request based on a set of 17 claims consisting of Claims 1, 15 to 17 as annexed to the Statement and of Claims 2 to 14 as granted.

Claim 1 of the main request reads as follows:

"Continuous process for the halogenation of elastomers, in which a halogenating agent is introduced into a solution of an unsaturated elastomer in an organic solvent and in which the said halogenating agent is mixed in a continuous stream of the said elastomer solution, thus dissolving the said halogenating agent and causing it to react with the said elastomer in the

same continuous stream, characterized in that said continuous stream of elastomer solution is kept in turbulent motion without flow inversion phenomena during the course of the reaction between the said halogenating agent and the said elastomer."

Independent Claim 15 reads as follows:

"Use of a tubular reactor, such as a column reactor, for performing the process according to any one of the preceding claims, the said reactor (14) comprising mechanical means (15) for promoting turbulent motion without flow inversion phenomena of the said continuous stream of elastomer solution during the course of the reaction between the said halogenating agent and the said elastomer, which means may static or dynamic, for example at least one bed of Raschig rings, inserted into the said reactor (14)."

Dependent Claims 16 and 17 relate to preferred embodiments of the use according to Claim 15.

V. In the Statement of Grounds of Appeal, the Appellant argued that the Opposition Division had been wrong in its evaluation of the inventive step, since the feature "without flow inversion phenomena during the course of the reaction", which differentiated from the disclosure of D1 enabled a product to be obtained with less degradation when correctly compared with the products obtained according to the prior art. In that respect, its arguments may be summarized as follows:

(i) All the examples of D1 dealt with a batch process. According to Examples II to IV of D1, the degradation of the Mooney viscosity varied between 7 and 16 points.

(ii) It was not disputed that D1 also referred to a continuous process but the change from a batch process to a continuous process could not be regarded as a mere alternative for obtaining halogenated elastomer while avoiding the degradation of the elastomer chain.

(iii) On the contrary, Example II of document D8 showed that a higher degradation in terms of reduction of the Mooney viscosity (expressed in points) of the elastomer occured, when a continuous process was used and the degradation was only reduced when a time tank was used.

(iv) The examples of the patent in suit clearly demonstrated that, by carrying out the halogenation reaction in a turbulent flow regime without flow inversion phenomena, a very low degradation of the elastomer was obtained. Thus, this feature contributed to solve the technical problem and could not be disregarded when judging inventive step.

(v) The decisive parameter of the process of D1 was the amount of chlorine to be added to the elastomer solution and not the flow regime during the course of the reaction. Thus, D1 itself could not suggest the solution of the technical problem proposed by the patent in suit.

(vi) D8 suggested that the mixing of the halogenating agent and the rubber solution could be effected by a centrifugal pump or by any other mixer.

(vii) A centrifugal pump would involve flow inversion phenomena. Furthermore, the preferred embodiment of the process of D8 employed a time tank in which the reaction mixture should stay. In that respect Example

II of D8 showed that a lower degradation was obtained when a time tank was used. Thus, D8 would not not teach to keep the continuous stream of elastomer solution in turbulent motion, let alone to avoid flow inversion phenomena.

(viii) D11 did not teach the flow regime according to the patent in suit. It was not totally clear whether the process disclosed in D11 was continuous or semi continuous. It taught to use a high intensity mixer for mixing the halogenating agent and the elastomer solution, which, in view of the mixers exemplified therein (ie Stratco contactor, dispersator mixer; cf. column 4, lines 34 to 41), would lead to flow inversion, and it also suggested to use a time tank. Thus, the reacting solution was not always kept in turbulent motion. Furthermore, D11 could not be used as a comparison basis since the halogenating agent was totally different from those used in the examples of the patent in suit.

(ix) Consequently, D11 could not lead to the solution proposed by the patent in suit.

(x) Thus, the subject-matter of the main request was based on an inventive step.

VI. With its letter dated 16 August 2001, the Respondent submitted two further documents:

D23: R. A. Mashelkar, "Bubble Columns", British Chemical Engineering, October 1970, Volume 15, No. 10, pages 1297 to 1304); and

D24: Vito Specchia et al., "Absorption in Packed Towers

with Concurrent Upward Flow", AICHe Journal, Volume 20, No. 4, July 1974; pages 646 to 653.

The arguments of the Respondent in this submission may be summarized as follows:

(i) Claim 1 of the main request contravened Article 123(2) EPC for the follewing reasons:

(i.1) Claim 1 of the main request was not restricted to the process steps following the term "characterized in that it consists of" in Claim 1 as originally filed.

(i.2) It included additional steps not mentioned in this claim and not disclosed in the application as originally filed.

(ii) The requirements of Article 83 EPC were not met by the patent in suit for the following reasons:

(ii.1) The term "flow inversion phenomena" was not commonly accepted in the art and not defined in the patent specification.

(ii.2) It was, thus, unclear in view of the patent specification how this phenomena could be measured and flow inversion avoided.

(ii.3) The scope of the claim was not commensurate with the technical contribution to the art. There was only one example (packed column with Raschig rings) of how to perform the alleged invention but it was not determined whether the flow inversion was indeed totally avoided. There was also no indication in the specification as to how the teaching of this example

could be generalized to other reactors and to other mechanical means for promoting turbulence. In that respect reference was made to the decisions T 409/91 (OJ EPO 1994, 653) and T 923/92 (OJ EPO, 1996, 564).

(ii.4) Claim 1 did not comprise the essential features of the reactor to be used for carrying out the claimed process and would in fact encompass the use of an empty pipe as reactor. The feature "turbulent motion without flow inversion phenomena" was therefore a functional one, which defined the process by the conditions of flow which must be achieved. The description, however, gave no indication as how to obtain this result and to verify it, and the skilled person would be involved in undue experimentation to carry out the claimed process. Reference was also made to the decision T 68/85 (OJ EPO, 1987, 228).

(ii.5) Documents D22 and D23 taught that packed columns (eg with Raschig rings) and sectionalized columns (ie with perforated plates) were considered to be equal in their backmixing behaviour. Thus, if as submitted by the Appellant, flow inversion occurred with perforated plate columns, it would also inevitably occur with packed columns. It was therefore unclear whether the examples of the patent in suit indeed fulfilled this requirement.

(ii.6) The viscosity, the temperature of the elastomer solution, the feed rate of the reactants as well as the pressure under which the addition of halogenating agent was carried out, were essential features of the process which had not been incorporated in Claim 1.

(ii.7) Although the patent in suit mentioned the use of dynamic means for promoting turbulence, it gave no information about any such means, which would be appropriate for carrying out the claimed process.

(ii.8) The term "during the course of the reaction" was not sufficiently disclosed in the opposed patent and it was not indicated to which extent the reaction should be completed. In that respect, in view of Figure 1/1 of the patent in suit unreacted halogenating agent would be still in contact with the solution of halogenated elastomer after having left the reactor.

(ii.9) Furthermore it was not clear in view of Example 2 how overconcentration of halogen and degradation of the rubber might be avoided, since the halogenated elastomer would be in contact with fresh halogenating agent. This would be technically equivalent to a flow reversal of the elastomer stream in a reactor where chlorine was only introduced from one single orifice.

(ii.10) Consequently, it was evident that the requirements of Article 83 EPC could at best and if at all be met provided Claim 1 would be restricted to the extent to cover a halogenation process performed in an apparatus (10) as depicted in the figure of the patent in suit and in the particular embodiments as used in the examples.

(iii) Claim 1 of the main request lacked novelty for the following reasons:

(iii.1) D1 related to a continuous process for halogenating elastomer. The use of a centrifugal pump

or orifice mixing zones (ie perforated plates) would result in a turbulent flow as stated in document D21. The fact that centrifugal pumps did not lead to flow inversion phenomena was apparent from figure 6.6 of document D9. Perforated plates would also avoid flow inversion as indicated in D22.

(iii.2) As indicated in D8 (cf. column 5, lines 24 to 28), the reaction time between the halogenating agent and the elastomer was very short and the reaction would proceed to substantial completion in the mixing stage (eg in the centrifugal pump).

(iii.3) Thus, the reaction would take place in a turbulent motion without flow inversion phenomena. Thus, D1 was a novelty destroying document for the subject-matter of Claim 1 of the main request.

(iii.4) Document D8 also referred to a continuous process for halogenating elastomers. It mentioned the use of centrifugal pumps for mixing the halogenating agent and the solution of the elastomer. Thus, for the same reasons as set out in paragraphs (iii.1) and (iii.2) above, D8 would be a novelty destroying document for the subject-matter of Claim 1.

(iii.5) Document D11 related to a continuous process for the halogenation of elastomer. The halogenating agent was reacted with the elastomer solution in a first high intensity mixer, and the reaction mixture was afterwards transferred to a second high intensity mixer, the mean transfer time being at least 1 minute. It was evident that the reaction in the first mixer and the second mixer took place in a turbulent flow regime due to the use of high intensity mixers. It was also

evident that the turbulent motion was maintained during the transfer, since the transfer time was short. Thus, turbulent motion was kept during the course of the reaction.

(iii.6) Even if it would be considered that flow inversion phenomena occurred during the course of the reaction in the high intensity mixer, this feature provided no technical contribution to the claimed process and could be ignored when assessing novelty. In that respect, reference was made to the decision G 2/88 (OJ EPO, 1990, 93).

(iii.7) Thus, the subject-matter of Claim 1 of the patent in suit lacked novelty in view of D11.

(iv) Claim 1 of the main request did not meet the requirements of Article 56 EPC for the following reasons:

(iv.1) D1 should be considered as the closest state of the art. It pertained to a continuous process for chlorinating an elastomer in a manner that did not degrade the molecular weight thereof.

(iv.2) The problem underlying the opposed patent was to provide a process which permitted the dispersion and the diffusion of the halogen to be improved whilst avoiding high local concentration of halogen known to result in a significant degradation of the polymer chain.

(iv.3) Although some examples (ie Examples 1, 2, and 4) performed well, the others (ie Examples 3, 5 and 6) exhibited a considerable degradation. Thus, it was

apparent that some embodiments of the alleged invention did not solve the technical problem. As a consequence, the claimed invention could not be considered as based on an inventive step over the whole range claimed in Claim 1.

(iv.4) In order to reduce the degradation of the elastomer, it was also evident to avoid backflow of already halogenated elastomer, ie to avoid contact between the halogenated elastomer and fresh halogenating agent.

(iv.5) D11 and D8 both taught that a sufficient agitation should be provided in order to avoid a local overconcentration of halogenating agent. In a continuous reactor, this would clearly imply that backflow must be avoided. Thus, the combination of D1 with either D8 or D11 would render the subject-matter of Claim 1 obvious.

(iv.6) From D22 which related to bubble columns, the skilled person would know that perforated plates or packings (Raschig rings) would reduce backmixing/axial mixing. Thus, the combination of D1 with D22 would render the subject-matter of Claim 1 obvious.

(iv.7) From D23, a person skilled in the art would know that sectionalized columns or packed columns reduced backmixing and increase the specific interfacial orifice between gas and liquid. Thus, the subject-matter of Claim 1 would be obvious in view of the combination of D1 with D23.

(iv.8) Examples II to IV of D1 showed that a reduction of the Mooney viscosity as low as 9,9% might be obtained by the process of D1 although pure chlorine was used as halogenating agent. In view of Example 3 of the patent in suit (reduction of Mooney viscosity of 11.2%) in which the concentration of chlorine was the highest, it was apparent that no improvement in terms of reduced degradation has been achieved by the claimed process in comparison to D1.

(iv.9) It was true that the process disclosed in the Examples II to IV of D1 was a batch process but the claimed process would merely represent an obvious alternative to the process exemplified in D1, since D1 also taught to carry out the process in a continuous manner.

(iv.10) Furthermore D8 showed that a similar degradation (reduction of 11% of the Mooney viscosity) might be obtained when using a continuous process.

VII. With its letter dated 3 January 2002 the Appellant filed an auxiliary request based on a set of 14 Claims consisting of Claims 1, 7 and 14 as annexed to this letter and of Claims 2 to 6, and 8 to 13 as granted. In this letter it submitted that documents D21, D22, D23 ands D24 should be excluded from the proceedings since they had been filed too late, and in response to the submissions of the Respondent in its letter dated 16 August 2001 concerning Article 123(2) EPC, sufficiency of the disclosure of the invention, EPC, novelty and the assessment of inventive step in respect of the documents D22 and D23, it argued essentially as follows:

(i) Concerning Article 123(2) EPC:

(i.1) It was clear that original Claims 2 to 14 related to original Claim 1 and contained additional process steps.

(i.2) Thus, Claim 1 of the main request had not been amended in a way that its subject-matter would extend beyond the content of the application as filed.

(ii) Concerning Article 83 EPC: In view of the examples of performing the invention given in the description of the patent in suit, the person skilled in the art would be able to carry out the invention.

(iii) Concerning novelty: Document D1 had been considered as the most relevant document, but as stated in the decision of the Opposition Division, in particular on page 4, last paragraph to page 5, third paragraph, it did not disclose, explicitly or implicitly, to carry out the process without flow inversion phenomena during the course of the reaction. Thus, it could not destroy the novelty of Claim 1.

(iv.) Concerning inventive step:

(iv.1) There was no indication in D22 that an orifice plate within a column reactor would eliminate flow inversion within the continuous stream of the said plate upstream and downstream. Thus, D22 would not prompt the skilled reader to change the flow regime disclosed in document D1 so as to arrive at the present invention.

(iv.2) The combination of D1 with D23 made by the Respondent was based on an ex-post facto analysis. There was no link between D1 and D23, since the latter did not relate at all to the halogenation of elastomers.

(iv.3) Even if D23 might show that a person skilled in the art knew what to do as to reduce backmixing, it did not suggest to keep an elastomer solution in turbulent flow without flow inversion phenomena during the reaction between the halogenating agent and the elastomer in order to reduce the degradation of the elastomer.

(iv.4) Thus, the subject-matter of the main request was based on an inventive step.

VIII. On 20 February 2002, oral proceedings were held before the Board.

(i) During these oral proceedings issues concerning the interpretation of the feature "without flow inversion phenomena" and the extent of Mooney viscosity degradation in Examples II to IV of D1 and Example II of D8 were considered in particular:

(i.1) The Respondent agreed with the Appellant on the interpretation of the term "without flow inversion phenomena" on the basis of the submission of the Appellant in its letter dated 6 April 1998, in the course of the opposition proceedings (cf. pages 7 and 8, paragraph 3(d) of this letter). According to this submission, the feature "turbulent motion without flow inversion phenomena" expressed that the motion was turbulent and that the component of the instantaneous

velocity in the main direction was never negative, ie that the instantaneous fluctuation of velocity in the direction of the flow was always lower, in absolute value than the time-averaged velocity. In that respect, reference was made to document D16, submitted by the Appellant with its letter dated 6 April 1998.

(i.2) There was, however, no corresponding agreement between the parties concerning the extent of loss of Mooney viscosity in Example II of D8:

(i.2.1) Concerning Example II of D8 (1,6 Minute contact time), the Appellant submitted that it was evident that the loss of Mooney viscosity was expressed in absolute terms, ie in points. Thus, this example showed a loss varying between 11 and 22 points, ie higher than that of the Examples II to IV of D1 and of Example 3 of the patent in suit (ie 6 points).

(i.2.2) According to the Respondent, the loss of Mooney viscosity indicated in Example II of D8 was expressed as a percentage of the Mooney viscosity of the starting elastomer and might be as low as 11% ie even lower than obtained in Example 3 of the patent in suit.

(i.2.3) The Respondent further submitted, that the relative loss of Mooney viscosity obtained according to Examples II to IV of D1 might be as low as 9.9%. Thus, this implied that the patent in suit provided no improvement in terms of degradation in comparison to D1.

(ii) During these oral proceedings, the Appellant referred, in substance, to its arguments submitted in

the Statement of Grounds of Appeal and in its letter dated 3 January 2002, but also made further submissions concerning the sufficiency of the disclosure of the invention, novelty, and inventive step, which may be summarized as follows:

(ii.1) Concerning Article 83 EPC:

(ii.1.1) The feature "without flow inversion phenomena" was not a functional feature of the process but, on the contrary, a technical feature characterising the regime of flow.

(ii.1.2) Claim 1 was directed to a process *per se* and not to an apparatus for carrying out the process. Thus, there was no necessity to restrict the scope of the claims by indication of technical features related to the apparatus which may be used for carrying out the claimed process.

(ii.1.3) The specification also contained examples of how to carry out the invention. On the basis of these examples and of the general concept of the specific flow regime during the reaction, the person skilled in the art was given sufficient information in order to carry out the claimed process.

(ii.1.4) Furthermore, document D23 also showed that the person skilled in the art knew how to reduce backmixing, ie flow inversion phenomena.

(ii.1.5) Thus, the patent in suit met the requirements of Article 83 EPC.

(ii.2) Concerning novelty:

(ii.2.1) Even if it would be accepted that centrifugal pumps or perforated plates might lead to a turbulent flow regime, document D1 did not disclose that a turbulent flow regime should be maintained during the course of the reaction.

(ii.2.2) Thus, D1 could not destroy the novelty of Claim 1 of the patent in suit.

(ii.2.3) D8 did not specify the flow regime during the course of the reaction and did not teach that a turbulent flow should be maintained during the course of the reaction. On the contrary, it suggested in a preferred embodiment, to use a time tank, in which a turbulent flow would not be maintained.

(ii.2.4) The use of a centrifugal pump, as disclosed in D8, would also lead to flow inversion phenomena.

(ii.2.5) Thus, D8 could not anticipate the subject-matter of Claim 1 of the patent in suit.

(ii.2.6) It was not clear whether the process disclosed in D11 was a continuous one.

(ii.2.7) D11 did not disclose that a turbulent flow regime should maintained during the course of the reaction and, like D8, also suggested the use of a time tank.

(ii.2.8) The high intensity mixers used in the process according to D11 would inevitably lead to flow inversion phenomena.

(ii.2.9) Thus, D11 could not destroy the novelty of

the subject-matter of Claim 1.

(ii.3) Concerning Inventive step:

(ii.3.1) Document D2 was the only document which explicitly referred to the conditions of flow during the halogenation reaction and would represent the closest state of the art.

(ii.3.2) According to D2 a laminar flow should be maintained during the course of the reaction. There was no hint in the cited prior art, that it would be possible to carry out the reaction in a turbulent flow and thus avoid a degradation of the elastomer. Thus, Claim 1 met the requirements of Article 56 EPC.

(iii) At this hearing, the Respondent, whilst essentially relying on the arguments put forward in its letter of 16 August 2001, further submitted a drawing illustrating the effect of insufficient mixing and a comparison table in order to show that the process of D1, D8 and D11 led to a low degradation of the elastomer by means of complete mixing. According to the Respondent, it was thus clear that the essential feature of the halogenating process would indeed be to provide sufficient mixing in order to avoid the degradation of the elastomer. Therefore, in its opinion, the feature "without flow inversion phenomena" did not contribute to the solution of the technical problem and it should be ignored when assessing inventive step.

IX. The Appellant requested that the decision of the Opposition Division be set aside and the patent be maintained on the basis of the main request submitted

with the Statement of Grounds of Appeal or alternatively on the basis of the auxiliary request submitted with letter dated 3 January 2002.

It also requested that late-filed documents D21, D22, D23, D24 be excluded from the proceedings.

The Respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. *Procedural matters*

2.1 The Appellant has requested that documents D21, D22, D23 and D24 be not admitted in the proceedings, since they have been filed very late (ie 2 years for D21 and D22, and 4 years for D23 and D24 after the expiration of the opposition period), and since their relevance is not such to justify their introduction.

2.2 In the Board's view, the case of documents D21 and D22 is to be distinguished from that of documents D23 and D24.

2.3 Documents D21 and D22 were submitted on 7 September 2000 by the Respondent in the course of the opposition proceedings and thus not later than the final date (ie 7 September 2000) given by the Opposition Division under Rule 71(a) EPC in the summons to oral proceedings issued on 5 November 1999.

2.4 It is established that D21 and D22 have been admitted

in the opposition proceedings by the Opposition Division as shown by the minutes of oral proceedings of 7 November 2000.

2.5 Documents D21 and D22, contrary to the submissions of the Appellant in its letter dated 3 January 2002 (cf. page 3, paragraph 2), were relied on in the decision of the Opposition Division to revoke the patent in suit (cf. page 5, lines 2 to 14 of the decision under appeal)

2.6 Thus, it follows that documents D21 and D22 belong to the factual framework of the case which is the subject of the present appeal.

2.7 In contrast to the merely administrative character of the opposition procedure, the appeal procedure is to be considered as a judicial procedure. Its purpose is mainly to give the losing party the possibility of challenging the decision of the Opposition Division on its merits (cf. G 9/91, OJ EPO 1993, 408). Consequently, the factual and legal framework of the case on appeal must remain the same or substantially the same as that of the one decided by the first instance.

2.8 Since the introduction of documents D21 and D22 in the opposition proceedings has not been alleged to be, and indeed was not the result of a procedural violation, the Board sees no reason which could justify the exclusion of such documents which belong to the factual framework of the case on appeal. Thus, D21 and D22 remain in the proceedings.

2.9 The principle that the factual framework of the case on

appeal must remain the same or substantially the same as that of the one decided by the first instance, also applies to the admissibility of late filed new facts, evidence and related arguments.

2.10 As stated in the decision T 1002/92 (OJ EPO 1995, 605), in relation to proceedings before the Boards of Appeal, new facts, evidence and related arguments should only very exceptionally be admitted to the proceedings, if such new material is *prima facie* highly relevant in the sense that it is highly likely to prejudice maintenance of the European patent in suit.

2.11 Thus, the question boils down as to whether documents D23 and D24 which have been submitted by the Respondent with its letter of 16 August 2001 in the course of the appeal procedings, meet the criteria of relevance set out in the decision T 1002/92.

2.12 Document D23 deals with bubble column reactors, ie columns in which a gas is dispersed through a liquid. It refers in particular to the problem of backmixing in the gas phase and the liquid phase and the influence thereof on the reaction selectivity and yield and to the ways of reducing backmixing in these reactors. Thus, D23, in the Board's view *prima facie meets* the requirements of relevance which justify its introduction to the proceedings.

2.13 Document D24 relates to packed towers per se. It does not specifically address the problem of backmixing in these apparatuses and therefore does add anything to the disclosure of D23.

2.14 Thus, document D23 but not document D24 is admitted to

the proceedings (Articles 114(1) and 114(2) EPC).

Main request

3. *Amendments*

3.1 Although Claim 1 as originally filed had used the expression "characterised in that it consists" in order to define the claimed process, it is evident from the documents as originally filed that the claimed process was not indeed strictly restricted to the process steps following the expression mentioned above, for the following reasons.

3.2 In view of the expression "essentially characterised in that it consists" on page 2, lines 9 to 21 of the application as originally filed, it is indeed clear that the process might also encompass process steps other than the essential ones indicated in lines 14 to 21 of original page 2 as well as in original Claim 1. This is also in line with the additional steps disclosed in the description as originally filed such as the pre-dilution of the halogenating agent (cf. page 7, lines 2 to 10), the degassing and the washing of the reacted mixture (cf. page 7, line 37 to page 8, line 2), and the removal of the solvent (cf. page 8, lines 3 to 8).

3.3 Thus, the subject-matter of Claim 1 of the main request does not extend beyond the content of the application as filed.

3.4 Dependent Claims 2 to 14 correspond to Claims 2 to 14 as originally filed.

3.4 Independent Claim 15 and dependent Claims 16 to 17 are supported by original Claims 15, 16 and 17, respectively.

3.5 Thus, Claims 1 to 17 of the main request meet the requirements of Article 123(2) EPC.

3.6 The replacement of the expression "characterized in that it **comprises** keeping the said continuous stream of elastomer solution in turbulent motion without flow inversion phenomena during the course of the reaction between the said halogenating agent and the said elastomer" used in Claim 1 as granted by the expression "characterized in that the said continuous stream of elastomer solution is kept in turbulent motion without flow inversion phenomena during the course of the reaction between the said halogenating agent and the said elastomer" in Claim 1 of the main request does not result in an extension over the protection conferred by Claim 1 as granted.

3.7 As regards the change of category of Claim 15, it is stated in the decision G 2/88 (cf. Reasons 5.) that an amendment of a European patent during opposition proceedings simply by way of change of category from a claim to a physical entity so as to include a claim involving the use of such physical entity, does not extent the protection conferred by the patent and is admissible. These conclusions apply in the present case, since Claim 15 of the main request is directed to the use of the apparatus which was the subject-matter of granted Claim 15. Similar considerations apply to Claims 16 and 17.

3.8 Thus Claims 1 to 17 of the main request meet the

requirements of Article 123(3) EPC.

4. *Clarity*

The Board is satified that no lack of clarity arises from the amendments made in the claims in the course of the appeal proceedings.

5. *Sufficiency*

5.1 The essential feature of the claimed process is that the elastomer solution is "kept in turbulent motion without flow inversion phenomena during the course of the reaction between the halogenating agent and the elastomer".

5.2 At the oral proceedings both parties agreed that the feature "without flow inversion phenomena" in relation to turbulent motion should be interpreted on the basis of the submissions of the Appellant dated 6 April 1998, pages 7 and 8, paragraph (3d) according to which "the component of instantaneous velocity in the main direction of motion is never negative, in other words the instantaneous fluctuation of the velocity in the direction of flow is always lower in absolute value than the time averaged-velocity".

5.3 According to the decision T 190/99 of 6 March 2001 (not published in OJ EPO), the skilled person when considering a claim should rule out interpretations which do not make technical sense and should arrive at an interpretation which is technically sensible and takes into account the whole disclosure of the patent. In the Board's view, this interpretation of "without flow inversion phenomena" makes technical sense and is

also in line with the term "backmixing" used in the art in connection with tubular chemical reactor (cf. D20, table 4 to 13; cf. D22, page 337, second paragraph). Therefore, the Board is satisfied that this is the true interpretation of the wording and sees no reason not to concur with the interpretation agreed by both parties.

5.4 Thus, on that basis, it remains to be decided whether or not the patent specfication provides sufficient information to the skilled person in order to carry out the halogenating reaction of elastomers under such a turbulent flow regime.

5.5 Present Claim 1 is to be construed to imply that the apparatus used and the process parameters selected should be such that the reaction is carried out in a turbulent motion without flow inversion phenomena. This implies, therefore, that this latter feature must be regarded as a functional one.

5.6 As indicated in the decision T 292/85 (OJ EPO, 1989, 275, Reasons 3.15) an invention is sufficiently disclosed if at least one way is clearly indicated enabling the person skilled in the art to carry out the invention. The decision further states that the non-availability of some particular variants of a functionally defined feature is immaterial to sufficiency as long as there are suitable variants known to the skilled person through the disclosure or common general knowledge which provide the same effect for the invention. It further stresses that the disclosure need not include specific instructions as to how all possible variants within the functional definition should be obtained.

5.7 In the present case, the patent specification contains examples (cf. Examples 1 to 6) which show as to how to carry out the invention with various halogenating agents (ie chlorine and bromine). It is true that the patent in suit indicates that mechanical means either static or dynamic may be used for promoting turbulence, but that it only exemplifies the use of Raschig rings (i.e static means). It is nevertheless evident, that there are suitable variants known to the skilled person, as evidenced by documents D20, D22 and D23 (eg packed tubular reactor using other packings than Raschig rings, or sectionalized tubular reactor) which would also provide the same effect for the invention. Even if dynamic means are not explicitly defined in the patent specification, this cannot amount to a lack of disclosure of the patent in suit, since, in the Board's view, the skilled person, would know, which dynamic means would be appropriate for such purpose, for example, in view of document D9 (cf. Figure 6.6), which shows that centrifugal pumps would be most likely able

to promote turbulent flow without flow inversion phenomena.

5.8 The argument submitted by the Respondent in respect to the decisions T 409/91 and T 923/92 is not convincing, since the facts on which these decisions were based are not comparable with those of the present case.

5.9 As indicated in T 409/91 (cf. Reasons 3.4.) the description of the application under consideration disclosed only one possibility of obtaining the desired particle size, ie the use of very specific additives, but did not contain any guidance enabling the skilled person to find other suitable additives being capable of producing the desired effect (ie obtaining small wax crystals). Furthermore, in that case, the Appellant itself admitted that it was not aware of any general knowledge which might have enabled the skilled person to find further ways to obtained the desired effect.

5.10 On the contrary, in the present case, as indicated above in paragraph 5.7, the skilled person would find further ways than the use of a reactor packed which Raschig rings to carry out the invention. Thus, the decision T 409/91 is of no relevance in the present case.

5.11 In decision T 923/92 (cf. Reasons 27.), the Board considered, in view of the broad functional meaning attributed to the quoted parameter (ie "has human tissue plasminogen activator function"), the information given in the patent was not sufficient to allow the skilled person, using general knowledge to perform the invention without undue burden in the whole area claimed.

5.12 In the present case, by contrast, the feature "turbulent motion without flow inversion phenomena" has a narrow functional meaning defining a very specific flow regime so that the person skilled in the art, using the disclosure of the patent in suit (eg Examples 1 to 7 which show the use of various halogenating agents) and its general knowledge (cf. paragraph 5.5 above) would be able to carry out the claimed process on the whole area claimed. Thus, the considerations made in the decision T 923/92 did not apply in the present case.

5.13 Although the decision T 68/85 quoted by the Respondent deals with the clarity of claims containing functional features, it indeed states that these features should provide instructions which are sufficiently clear for the expert to reduce them to practice without undue burden. This implies that the technical result to be achieved by the functional feature is one which can be verified by tests or procedures specified in the description of the description or known to the person skilled in the art and which do not require undue experimentation.

5.14 It is true, as submitted by the Respondent, that the patent in suit does not disclose how to measure the flow inversion. However, in view of documents D20 and D22 (cf. D20, page 4.31, right column, lines 1 to 33; cf. D22, page 339, lines 13 to 37), it is clear that there are several methods at the disposal of the skilled person to determine the deviation from ideal plug flow, ie the amount of backmixing. This is also confirmed by document D23 which deals with the reduction of backmixing without explicitly referring to a specific method for determining this phenomena.

5.15 Furthermore, the skilled person, as evidenced in particular by document D23 (cf. page 1301, line 1 to page 1303, line 9), is aware of the parameters which influence the presence of backmixing (eg column diameter, gas velocity, liquid velocity). As further stated in D23 (cf. page 1303, left column 1303, lines 10 to 17) on the basis of experiments made on a small scale apparatus, scale up may be done with a fair degree of confidence. Thus, in the Board's judgement, the skilled person would determine without undue burden the process parameters required to maintain the elastomer solution in a turbulent motion without flow inversion during the course of the reaction with the halogenating agent.

5.16 The Respondent has further questioned the feasibility of Example 2 of the patent in suit by arguing that it was unclear how degradation of the elastomer could be avoided, since the chlorine was introduced via two successive distributors.

5.17 In that respect, the Board observes that the halogenated elastomer obtained in Example 2 shows no substantial degradation. The issue raised by the Respondent, is an issue which would normally be decided in the light of relevant experimental evidence. No such evidence was, however, submitted by the Respondent, which has the onus of the proof of its allegation (cf. T 182/89, OJ EPO, 1991, 391).

5.18 The further argument of the Respondent that the term "in the course of the reaction" is not sufficiently disclosed is also not founded, since the patent in suit teaches that the reaction should be complete, and that in particular, among other parameters (eg temperature,

concentration of halogen and of the elastomer) the length of the reaction column should be such as to make the reaction go to completion (cf. column 5, lines 23 to 27).

5.19 Quite apart from the above, it must be borne in mind that the effect of a process manifests itself in the result, ie the product in chemical cases (cf. T 119/82, OJ EPO, 1984, 217). This is because the combination and interaction of reactants and conditions ceases to exist when the product has been generated and becomes available. In the present case, the product is a halogenated elastomer which does not exhibit significant degradation of the elastomer chain (patent in suit, column 1, lines 37 to 40). There has been no allegation, let alone proof, that the embodiment of the apparatus disclosed in the patent in suit, which utilises a bed of Raschig rings for establishing the defined flow regime, is not capable of providing the desired product, and therefore the relevant effect, whatever elastomer feedstock is used, and whatever halogenating agent is applied to it, ie over the whole range of possible products. Thus, even if the "Raschig rings" embodiment of the relevant apparatus had been the sole means made available to the skilled person by the description of the patent in suit, there would have been no lack of sufficiency in the sense of Article 83 EPC, since such embodiment would have enabled the relevant quality of product and therefore the relevant effect to be reliably obtained over the whole range claimed.

5.20 Thus, in summary it has not been shown to the satisfaction of the Board that there is a deficiency ,

in the patent in suit, in the sense of Article 100(b) or 83 EPC. Consequently, the ground of opposition under Article 100(b) EPC cannot succeed.

6. *Novelty*

6.1 The documents D1, D8 and D11 have been relied on by the Respondent in support of its objection of lack of novelty.

6.2 Document D1 relates to a process for chlorinating butyl rubber by contacting the predissolved rubbery component directly with gaseous chlorine in a manner which does not degrade the molecular weight of the rubber. The mole percent of combined chlorine should be between 0.20 to 1.0 times the mole percent of unsaturation of the polymer. The process can be carried out either batchwise or continuously. For a continuous process the preformed butyl rubber solution and the gaseous chlorine are preferably contacted in an orifice mixing zone or morepreferably in a multiple orifice mixing zone. The chlorine is bubbled into the butyl rubber solution at one or more points, preferably at the first point passed through by the butyl rubber solution. Alternatively the chlorine gas may be introduced in the rubber solution at one or a plurality of points at the suction end of a pumping means such as a centrifugal pump wherein complete mixing and substantially complete reaction takes place (cf. D1, column 2, lines 24 to 31; column 2, lines 65 to column 3, line 2; column 3, line 74 to column 4, line 26).

6.3 Even if, as submitted by the Respondent in view of D21, it would be admitted that centrifugal pumps and

perforated plates (i.e multiple orifice mixing zone) could promote turbulent flow, D1 does not contain a clear and unmistakable teaching according to which the turbulent motion **is maintained** till the completion of the reaction of the elastomer with chlorine, let alone the fact that the conditions of flow are such to promote a turbulent motion without flow inversion (cf. T 677/91 of 3 November 1992, not published in OJ EPO, Reasons 1.2).

6.4 Document D8 deals with the continuous chlorination or bromination of butyl rubber. According to D8, a solution of butyl rubber is continuously contacted with chlorine or bromine for a short period of time with or without the use of a time tank. In the case of the chlorination, a solution of butyl rubber is mixed with chlorine gas and the mixture is passed to a centrifugal pump or an other type of mixer such as a Marine impeller or commercial contactors. The mixture is sent by a pipe to a neutralization tank. The contact time between the halogen and the chlorine gas is in the order of 5 seconds to 25 minutes or more. However, if a longer residence time than that obtained in the line is desired, the chlorinated polymer is passed to a time tank, where it remains between 2 to 25 minutes, prior to being sent to the neutralization tank (cf. D8; column 1, lines 43 to 48; column 2, lines 9 to 42; Figure 1). Even if it would be assumed that the centrifugal pump (3) (cf. Figure 1 of D8) could promote a turbulent flow, it is not directly and unambiguously derivable from D8, that the reaction mixture in lines (4) and (8) **is maintained** in a turbulent motion, let alone a turbulent motion without flow inversion phenomena, till the completion of the halogenation reaction. The argument of the Respondent that the

reaction would be complete in the centrifugal pump is also not convincing, since, having regard to the high centrifugal speed reached by the reactants due the high rotation speed of the pump (e.g 1740 r.p.m as mentioned in Example I of D8), they would only remain a few tenths of a second in the pump, a time which has not been shown as sufficient to bring the reaction to completion.

6.5 Document D11 is directed to a continuous process for the preparation of bromochlorinated butyl rubber. This process comprises the steps of:

(a) providing in a first stream a solution of butyl rubber in a substantially inert solvent, said solution containing about 5 to 30 weight percent of butyl rubber,

(b) providing a second feed stream of bromine chloride in vapour form,

(c) maintaining the relative flow rates of said first and second streams such that the mole ratio of moles of bromine chloride to moles of incorporated unsaturation in said butyl rubber is about 0.6 to 1 to about 1.5 to 1 while continuously transferring the first and second streams to a high intensity mixer and contacting the streams in the mixer to provide an homogeneous reaction mixture,

(d) transferring the reaction mixture from step (c) to a second high intensity mixer, the mean transfer residence time being at least about 1 minute in order to complete the bromochlorination reaction,

(e) simultaneously adding to the second mixer an aqueous solution of a basic neutralization feed stream in a two phase, partially neutralized reaction mixture,

(f) transferring the two phase reaction mixture to polymer recovery and drying means, the residence time being at least about 1 minute in order to complete the neutralization reaction (cf. D11, Column 1, lines 7 to 15; Claim 1).

As indicated in D11, the specific type of mixer is not critical. Commercially available mixing equipment such as a Stratco contactor or a dispersator mixer are suitable. They rapidly homogenize the butyl rubber cement and bromine chloride and eliminate the risk of overhalogenation of the butyl rubber due to inadequate mixing (cf. column 4, lines 34 to 45). D11 also mentions the possibility to transfer the reaction mixture from the first high intensity mixer to a time-tank reactor, wherein the residence time is from at least about 1 to 30 minutes, as an intermediate step before its transfer to the second high intensity mixer (cf. column 4, lines 64 to 67).

6.6 Although it is most likely that turbulent flow would be promoted in high intensity mixers, D11 does not, however, contain a clear and unmistakable teaching according to which the turbulent motion **is maintained** till completion of the reaction of the elastomer with bromine chloride, let alone in the absence of flow inversion phenomena.

6.7 Thus, it follows from the above that none of the documents D1, D8 and D11 can destroy the subject-matter of Claim 1 of the patent in suit. By the same token,

dependent Claims 2 to 14 also meet the requirements of Article 54(1)(2) EPC.

Consequently, the same conclusion applies for Claims 15 to 17 which relate to the use of an apparatus for carrying out the process according to any of Claims 1 to 14.

6.8 In summary, the subject-matter claimed in the patent in suit is novel.

7. *The patent in suit, the technical problem*

7.1 The patent in suit is concerned with a continuous process for halogenating elastomers. Such process is, however, known from D1, which the Board regards as the closest state of the art.

7.2 According to D1 there is provided a process for chlorinating butyl rubber which does not degrade the molecular weight of the elastomer. Although D1 mentions that the process may be carried out either batchwise or continuously, it only exemplifies a batchwise process. According to Examples II to IV, the degradation of the elastomer amounts to a loss of 16, 15, and 7 points in terms of Mooney viscosity, ie a loss of 22,5%, 21,2%, and 9,8% of the Mooney viscosity in respect to the starting elastomer.

7.3 Thus, starting from D1, the technical problem may be seen as the provision of a more efficient process allowing the manufacture of halogenated elastomers with a degradation at least as low as that obtained with the process exemplified in D1.

7.4 The solution proposed according to Claim 1 of the patent in suit is to carry out the reaction of the elastomer with the halogenating agent in a continuous stream of the elastomer solution while keeping the elastomer solution in turbulent motion without flow inversion phenomena during the course of the reaction.

7.5 In view of Examples 1 to 4 of the patent which show a degradation of the elastomer either comparable with or much lower than that obtained in D1 using the same halogenating agent, the Board is satisfied that the technical problem is effectively solved by the claimed measures.

8. *Inventive step*

8.1 It remains to be decided whether the solution of the technical problem was obvious to a person skilled in the art having regard to the relevant prior art.

8.2 Although document D1 mentions the possibility of carrying out the process in a continuous manner, it does not rely on a specific flow regime during the course of the reaction for avoiding the degradation of the elastomer as required in Claim 1 of the patent in suit, but only stresses the importance of the amount of chlorine to be contacted with the predissolved butyl rubber (cf. D1, column 2, line 69 to column 3, line 2; column 4, lines 27 to 34). Thus, D1, itself, cannot lead to the solution of the technical problem.

8.3 Document D2 refers to a continuous process for the halogenation of elastomers (eg butyl rubber). It teaches to carry out the reaction between the elastomer and the halogenating agent, wherein the Reynold's

number of the flowing elastomer solution must not exceed 100, ie under laminar flow conditions (cf. D2, Claim 1; column 3, lines 8 to 30). Consequently, D2 leads away from the solution of the technical problem.

8.4 It is true, as submitted by the Respondent, that document D8 exemplifies a continuous process for chlorinating a butyl rubber, without the use of a time tank (cf. Example II, "1.6 minute contact time"). This example discloses a loss of Mooney viscosity of the obtained elastomer without, however, expressly referring to the units in which this loss is expressed. In the Board's view, the correct interpretation of this loss in "points Mooney" is one which follows logically from the "Mooney system".

8.4.1 The argument of the Respondent, that the values should be interpreted as percentages is not convincing, firstly since it is not supported by the disclosure, which does not mention percentages, secondly since no evidence was adduced by the Respondent, which has the onus of the proof, to show that the skilled person would have been led to understand that percentages were meant, and thirdly since the "percentage" interpretation involves a less primitive, ie more sophisticated and therefore less justified assumption than the "points" interpretation. Hence, the "Mooney loss" in Example II of D8 is regarded as expressed in "points" Mooney.

8.4.2 Since this loss, which amounts to 11 to 22 points, is, however, higher than that obtained by the batchwise process exemplified in D1, this would not prompt the skilled adressee seeking to maintain a low degradation of the obtained chlorinated elastomer to move from a

batchwise process to a continuous process.

8.4.3 Furthermore, the comparison made with a process carried out with a time tank show that a lower degradation is obtained in this latter case and would, therefore, lead the skilled person away from maintaining a turbulent motion, let alone such motion without flow inversion, during the course of the reaction in a continuous process.

8.4.4 Thus, D8 cannot suggest the solution of the technical problem.

8.5 Although D11 refers to a continuous process for the halogenation of butyl rubber, and indicates that the degradation of the elastomer, explicitly in terms of percentage loss of Mooney viscosity may be rather low, ie between 5 and 15% (column 6, lines 11 to 15), no valid conclusion can be drawn in respect of the respective degradations obtained in D11, D1, and in the Examples 1 to 4 according the patent in suit, since the halogenating agents are totally different (ie bromine chloride in D11, chlorine in D1 and in the patent in suit). Furthermore, D11 puts no emphasis on the flow regime during the reaction of the elastomer with bromine chloride, but underlines only the importance of the ratio of moles of bromine chloride to moles of incorporated unsaturation in the elastomer on the degradation of the halogenated rubber. Thus, D11, cannot suggest the solution of the technical problem.

8.6 Whilst the skilled person could derive relevant information from documents D22 and D23 concerning the reduction of backmixing in column reactors, neither D22 nor D23 refers to the halogenation of elastomers, let

alone suggests a relationship between the maintenance of a turbulent flow without flow inversion phenomena during the course of a halogenation reaction and the degradation of the elastomer obtained. Hence, neither of these documents would offer to the skilled person a hint to the solution of the technical problem.

8.7 In other words, it follows from the above that the solution of the technical problem does not arise in an obvious way from the state of the art.

8.8 Consequently, the subject-matter of Claim 1, and by the same token that of dependent Claims 2 to 14 involves an inventive step. Furthermore, the subject-matter of Claims 15 to 17, which is directed to the use of an apparatus for carrying out the process according to any of Claims 1 to 14, also involves an inventive step.

9. Since the main request of the Appellant is allowable, there is no need for the Board to consider the auxiliary request.

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 on the basis of the main request submitted with the Statement of Grounds of Appeal, ie Claims 1, and 15 to 17 submitted with the Statement of Grounds of Appeal and claims 2 to 14 as granted, after any necessary consequential amendment of the description.

The Registrar: The Chairman:

E. Görgmaier R. Young