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D E C I S I O N
of 24 March 1999

Case Number: T 0966/95 - 3.3.5

Application Number: 86201439.6

Publication Number: 0212758

IPC: C01B 3/38

Language of the proceedings: EN

Title of invention:
Process for the preparation of synthesis gas from a hydrocarbo-containing feed

Patentee:
SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.

Opponent:
Exxon Research and Engineering Company

Headword:
-

Relevant legal provisions:
EPC Art. 56, 111(1)

Keyword:
"Inventive step - no, aggregation of known process steps without synergistic effect"
"No automatic remittal after citation of a new document"

Decisions cited:
T 0079/89, T 0557/94, T 0097/90, T 0852/90, T 0113/96

Catchword:

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0966/95 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 24 March 1999

Appellant: (Opponent)
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Representative:
-

Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 18 october 1995 rejecting the opposition filed against European patent No. 0 212 758 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: R. K. Spangenberg
Members: G. J. Wassenaar
M. B. Günzel

Summary of Facts and Submissions

I. The appeal is from the decision of the Opposition Division to reject the opposition against European patent No. 212 758, which was granted in response to European patent application No. 86 201 439.6. Claim 1 as granted reads as follows:

"A process for the preparation of synthesis gas for the manufacture of middle distillates from a hydrocarbon-containing feed characterized by the following steps:

a) 50-99 %v of the hydrocarbons present in the feed is partially converted with steam into a product containing H_2 and CO at an elevated temperature from 400-1500 EC, a pressure from 3-50 bar, and at a space velocity from 600-1350 l(S.T.P.) hydrocarbon-containing feed/l catalyst/hour and from 3500-4500 l(S.T.P.)steam/l catalyst/hour,

b) product from step a) and any remaining part of the feed is subjected to autothermal catalytic partial oxidation with an oxygen-comprising gas at a temperature from 600-1100 EC, a pressure from 10-50 bar and a space velocity relating to the product of step b) from 5000-10000 l(S.T.P.)/l catalyst/hour, and

c) CO_2 is removed from the product obtained from step b), and wherein at least part of the CO_2 removed in step c) is led to step a) and/or b),

wherein at least a part of a light fraction is also led to step a), which light fraction is

obtained by converting at least some of the synthesis gas obtained in step c) into light and heavy hydrocarbons at a temperature of 125-350 EC and a pressure of 5-100 bar in the presence of a catalyst and separating the light fraction from a heavy fraction, and that the possible other part of the light fraction is burned in order to generate at least some of the heat needed in step a) and
wherein the said part that is led to step a) is 40 to 90 %v of the total fraction.

II. In the decision, inter alia, the following prior art document was cited:

D5: FR-A-1 410 951.

The Opposition Division considered that D5 represented the closest prior art. The technical problem underlying the invention was seen in an improvement of the flexibility of the process and the control of the hydrogen and carbon monoxide ratio. The solution of the problem given in granted claim 1 was held to involve an inventive step. They considered that the combination of features of the method disclosed in claim 1 would require skill beyond the common general knowledge without a teaching describing the recycling and utilisation as feed in the reforming step of 40 to 90% of the light fraction and the use of the rest as fuel to obtain the heat in the same reforming step.

III. In the statement of the grounds of appeal, filed on 22 February 1996, the appellant (opponent), inter alia, maintained that the process of claim 1 lacked an

inventive step and filed eight new documents. Special emphasis was put on

D15: US-A-2 347 682.

It was argued that the subject-matter of claim 1 was obvious having regard to D5 and D15.

IV. The respondent (patentee) refuted the appellant's arguments and objected to the introduction of new documents in the appeal procedure. During oral proceedings, which took place on 24 March 1999, the respondent no longer objected to the introduction of D15 into the proceedings, but requested that, if D15 would be a reason for revocation of the patent in suit, the case should be remitted to the first instance in order to safeguard a two instances decision. With respect to inventive step the respondent's arguments can be summarized as follows:

Compared with the process disclosed in D15, which aimed at using the carbon content of the feed completely for the production of liquid hydrocarbons, the process of claim 1 had the advantage of increased flexibility in the choice of the H_2/CO ratio of the synthesis gas and the operation of the reformer. The carbon in the feed was not completely converted but its use was optimized, having the advantage of reduced energy requirement. These advantages could be obtained by catalytic partial oxidation of the effluent from the reformer, separation of the carbon dioxide from the effluent of the catalytic oxidation furnace, recycling the removed carbon dioxide to the reformer and/or the partial oxidation furnace, and recycling the tail gas from the

synthesis reactor partly to the feed of the reformer and partly to the reformer furnace. D15 did not disclose or suggest the use of a catalytic partial oxidation furnace, nor the removal of carbon dioxide from the effluent of said furnace. By using the additional partial oxidation step the heat requirements in the reformer (extreme conditions) could be reduced and more tail gas could be recirculated to the reformer, resulting in reduced energy consumption. Although D5 taught the use of the catalytic partial oxidation step, its use was related to the problem of carbon deposition in the reformer and not to the problems of increasing flexibility and optimizing carbon conversion.

V. The appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 0 212 758 be revoked.

The respondent (patentee) requested that the appeal be dismissed and that the patent be maintained. As auxiliary request, the respondent requested that the case be referred back to the Opposition Division for consideration of the additional documents produced by the appellant in the appeal proceedings.

Reasons for the Decision

1. The appeal is admissible.

2. *New evidence and remittal*

2.1 According to Article 114(2) EPC, the EPO may disregard

facts or evidence which are not submitted in due time. From this article it follows that the Board has a discretion and thus also the power to consider late filed evidence. In the present case it is questionable whether D15, submitted in the grounds of the appeal, is to be considered as late filed at all. The filing of D15 could be seen to be a response to the Opposition Division's findings with regard to common general knowledge. The Board holds, however, that D15 is of such relevance that it should not be disregarded even if it were considered as late filed evidence within the meaning of Article 114(2) EPC. Since in the oral proceedings the respondent no longer objected to the introduction of D15 into the proceedings, there is no need for further motivation why the Board has exercised its discretion in this way. By introducing D15 into the proceedings the factual framework of the case has been changed after the delivery of the contested decision. It remains to be decided whether this change in the factual framework of the case requires or justifies a remittal of the case to the first instance.

2.2 The respondent took the position that, if the factual framework of a case was changed by the introduction of a new document there was an unconditional right of a decision by two instances. This view was, however, not supported by reference to any article or rule of the EPC. The Board is also not aware of any article or rule in the EPC from which such a right could be derived. Under Article 111(1) EPC a Board of Appeal has a discretion during appeal proceedings before it, either to "exercise any power within the competence of the department which was responsible for the decision appealed (here: the Opposition Division) or (to) remit

the case to that department for further prosecution." The attribution of a discretionary power would be meaningless if the boards were ipso facto obliged to remit the case whenever new matter was raised in appeal proceedings, irrespective of the nature of such matter. Thus, in accordance with jurisprudence of the Boards of Appeal (cf. T 557/94, not published in OJ EPO, reasons 1.3), Article 111 EPC also confers the power upon a Board of Appeal to act inter alia as the first and only instance in deciding upon a case taking into account a document, which was only filed in appeal proceedings, without the possibility of further appellate review. Remittal of a case results in a substantial delay of the procedure which keeps the public in uncertainty about the fate of the patent for several more years. It also involves additional costs for all the parties and the office. Remittal, due to the admission of a new document, should therefore rather be an exception eg if, without remittal, a party would not have had sufficient opportunity to defend itself against an attack based on the new document, or if the factual framework has changed to such an extent that the case is no longer comparable with the one decided by the first instance (see eg T 97/90, OJ EPO 1993, 719). In the present case the respondent was aware of D15 since the filing of the grounds of the appeal, ie more than 3 years before the oral proceedings took place. Furthermore D15 was only cited in support of arguments, based on common general knowledge, already present before the first instance, so that the Board does not find that the citation of this additional evidence amounts to a substantial change in the factual framework. Since the respondent had sufficient time to deal with the new evidence, the

Board holds that there was no reason to remit the case to the first instance. The request to remit the case to the first instance is therefore refused (see also T 852/90 of 2 June 1992 and T 113/96 of 19 December 1997).

3. *Inventive step*

3.1 In the contested decision D5 was regarded as closest prior art. The Board regards D15 to be not more relevant than D5 and agrees that D5 is a suitable starting point for the evaluation of inventive step.

D5 relates to the production of synthesis gas with a H_2/CO ratio of 2, suitable for the synthesis of methanol or the synthesis of liquid hydrocarbons according to the Fischer-Tropsch process (page 1, left column first paragraph; page 2, right column, fourth paragraph). Although D5 does not explicitly mention the manufacture of middle distillates, this is implicitly disclosed by the reference to the Fischer-Tropsch synthesis (synthèse genre Fischer) since the manufacture of middle distillates is the known and undisputed purpose of the Fischer-Tropsch synthesis. D5 discloses the reforming of natural gas (methane) with steam at 10 bar and a temperature of 750 to 770°C over a nickel catalyst followed by catalytic partial oxidation at the same pressure of the effluent with oxygen, mixed with recirculated CO_2 from the following decarbonisation step. The effluent from the partial oxidation reactor is cooled and decarbonized, whereby a synthesis gas is obtained which mainly comprises H_2 and CO in a ratio of about 2 (66.7 to 31.3); see page 3, example 2.

3.2 According to the contested decision, the problem underlying the invention was to improve the flexibility of the process and the control of the hydrogen and carbon monoxide ratio (point 6 of the reasons). In the patent in suit "flexibility" is only used in connection with a preferred embodiment of process, whereby parallel reformer and partial combustion units were used (column 3, line 49 to column 4, line 30). Such particular advantage of a special embodiment can, however, not be used for defining the problem underlying the more general process according to claim 1. During oral proceedings before the Board the respondent brought "flexibility" into relation with the H_2/CO ratio. It is evident that in the process of D5 said ratio can also be regulated but, as well as in the patent in suit, the conditions are preferably chosen so as to obtain a ratio of 2. There is no evidence of any improvement in control or "flexibility" of the H_2/CO ratio, so that this cannot be used to define the problem underlying the invention. The respondent further stressed that with the claimed process optimum use of the carbon content of the feed was obtained. "Optimum use of carbon" was said to reduce the energy requirements and to increase the flexibility of the process. The Board accepts that conversion of all the carbon present in the recirculated CO_2 reduces the degree of freedom and is energetically unfavourable. This argument must however fail since in the process of D5 not all the CO_2 is converted; just as in the patent in suit, a part is vented through the reformer furnace. Moreover, there is no indication in the patent in suit what the optimum conversion factor is. Since D5 does not disclose how the process of obtaining the synthesis gas is integrated with the Fischer-Tropsch synthesis

for the manufacturing of middle distillates, the problem underlying the invention can be seen in the provision of an integrated process for the manufacture of middle distillate from a hydrocarbon feed. It is evident and uncontested that with the process of claim 1 this problem can be solved.

3.3 It remains to be decided whether it was obvious to a person skilled in the art to solve the said problem by a process according to claim 1. The process according to claim 1 differs from the process as disclosed in D5 essentially in that a light fraction of the Fischer-Tropsch synthesis is recycled to the reformer, whereby 40 to 90 %v is led to the feed and the remaining part to the burner of the reformer. During oral proceedings the respondent agreed that, in the art of Fischer-Tropsch synthesis, it was common general knowledge to recycle at least a part of the tail gases (light fraction) from the separator behind the synthesis reactor to the reformer. The tail gas comprises hydrocarbons which can be reformed to synthesis gas or can be used as fuel. The skilled person will consider both potential uses of the tail gases in the reformer and look into the literature concerning the Fischer-Tropsch synthesis to see which use is actually recommended in the art. D15, a document relating to hydrocarbon synthesis by the Fischer-Tropsch process, teaches him to pass about 75% of the recycled tail gases, comprising hydrogen, carbon monoxide, methane, ethane and ethylene, to the reformer for the production of further quantities of make gas, and to pass the other part to the gas reformer furnace (burner) for supplying heat for the reforming step (page 6, left column, lines 29-42 and Fig. 1). Thus D15 shows that,

in a conventional plant with a Fischer-Tropsch synthesis reactor, the tail gases are recycled to the reformer in the way as required by present claim 1.

3.4 According to D15 the synthesis of liquid hydrocarbons is preferably performed at a temperature of 163 to 202°C (325-395°F); see page 2, left column, lines 60-71. D15 does not disclose the pressure in the synthesis reactor. The synthesis reactor of D15 is a rather complicated fluid bed reactor and the suitable pressure is probably not substantially higher than the atmospheric pressure. Pressures of 5 to 100 bar mentioned in present claim 1 are however common in the art for solid bed reactors. The use of such pressures belongs to the general knowledge of the skilled person dealing with Fischer-Tropsch synthesis. The other process conditions mentioned in claim 1 which are not specifically disclosed in D5 or D15, such as the space velocities and the temperature in the partial oxidation reactor, also belong to the common general knowledge or follow from routine optimisation procedures. Anyhow the patent in suit gives no motivation for the choice of said pressures and other reaction conditions, and the respondent has not argued that they are unusual in the art or that their determination requires more than routine experimentation.

3.5 The process of claim 1 is therefore a straight forward aggregation of a known process for the production of synthesis gas with a H_2/CO ratio of 2 (D5) and a known process for producing middle distillate from a synthesis gas with a H_2/CO ratio of 2 (D15) without a surprising synergistic effect. The respondent's argument that it was not obvious to combine D15 with D5

because they relate to different technical problems is not convincing. The Board accepts that the problem of reducing carbon deposition on the reformer catalyst mentioned in D5 is not directly related to the technical problems mentioned in D15. For the skilled person starting from D5, the problem of carbon deposition has already been solved and he has no reason to look for other documents treating the problem of carbon deposition. He has however good reasons to consider D15 if he wants to solve the problem how to integrate the process for the production of synthesis gas according to D5 with a process for producing middle distillates from synthesis gas. Thus the Board holds that the above mentioned technical problem has been solved in an obvious manner, so that the subject-matter of claim 1 lacks an inventive step and the patent cannot be maintained.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

S. Hue R. Spangenberg