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Datasheet for the decision of 14 June 2022

Case Number: T 0363/19 - 3.3.10

Application Number: 08863888.7

Publication Number: 2234951

IPC: C07C37/74, C07C39/04, C07C37/68

Language of the proceedings: EN

Title of invention:
PURIFICATION OF PHENOL

Patent Proprietor:
Borealis Technology OY

Opponent:
Ineos Phenol GmbH

Headword:
PURIFICATION OF PHENOL / BOREALIS

Relevant legal provisions:
EPC Art. 54, 56

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

Decisions cited:

Catchword:

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Case Number: T 0363/19 - 3.3.10

D E C I S I O N
of Technical Board of Appeal 3.3.10
of 14 June 2022

Appellant: (Opponent)	Ineos Phenol GmbH Dechenstrasse 3 45966 Gladbeck (DE)
Representative:	f & e patent Braunsberger Feld 29 51429 Bergisch Gladbach (DE)
Respondent: (Patent Proprietor)	Borealis Technology OY P.O.Box 330 06101 Porvoo (FI)
Representative:	Dehns St. Bride's House 10 Salisbury Square London EC4Y 8JD (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 29 November 2018 rejecting the opposition filed against European patent No. 2234951 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	P. Gryczka
Members:	J.-C. Schmid
	T. Bokor

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the Opposition Division rejecting the opposition against European patent No. 2 234 951, independent claims 1 and 13 thereof reading as follows:

"1. A process for purifying a phenolic mixture, which process comprises

- as a first step, providing a phenolic feed containing phenol, water and at least one further organic or acidic component, and
- as a second step, separating the phenolic feed by distillation into a base fraction, an intermediate fraction and a first overhead stream,
- conducting the first overhead stream through at least one condenser to an condensate drum 10 in which at least one first condensate and at least one first uncondensed fraction are formed,
- recycling at least a portion of the first condensate to the distillation;
- conducting the first uncondensed fraction to a second condenser wherein a second condensed fraction and a second uncondensed fraction are formed;
- removing at least a portion of the second uncondensed fraction;
- recycling at least a portion of the second condensed fraction to the condensate drum 10,
- removing at least a portion of said first and/or second condensed fraction."

"13. An apparatus for purifying a phenolic mixture, comprising a distillation column (1) containing a feed inlet (3), a recycle inlet (4), a phenol product outlet

(5), a base product outlet (6) and a distillate outlet (7), at least one partial condenser (2) connected to the distillate outlet (7) and to condensate drum 10, a recycle inlet (4) connected to condensate drum (4) and an outlet 12 for removing condensate from drum 10, a second partial condenser (9) arranged in series with condenser (2), said condenser (9) being provided with a line (14) arranged to recycle material from second condenser (9) to drum 10, and a line 15 arranged to remove condensate from condenser 9) wherein the the phenol distillation column (1) is preferably divided into three zones, a stripping zone with a purpose to concentrate high boiling components to the base of the column (1), an intermediate zone meant for the separation of high boiling components from the phenol product, and a pasteurization zone with the purpose to separate water and possible lighter hydrocarbon components from the phenol product."

II. In the opposition the appellant requested revocation of the patent in its entirety on the grounds of lack of novelty and inventive step (Article 100(a) EPC).

Inter alia the following documents were submitted in the opposition proceedings:

(1) US-A-5 131 984,
(2) JPA-2003 88187,
(3) Henry Z. Kister ,"Distillation operation" McGraw-Hill, 1990, pages 594 to 597 and,
(4) US-A-4 132 604.

III. According to the opposition division, the subject-matter of claim 13 was novel over the documents (3) and (4). Document (1) represented the closest prior art to the invention. The problem to be solved was the

provision of a process and an apparatus for purifying a phenolic mixture. The proposed solutions, i.e. the process of claim 1 and the apparatus of claim 13, were not obvious in the light of document (1) alone or in combination with document (2).

IV. The appellant contested the findings of the opposition division on the issues of novelty over documents (3) and (4) and inventive step starting from document (1) as the closest prior art to the invention.

V. The appellant requests that the decision under appeal be set aside and the patent be revoked.

The respondent (patent proprietor) requests that the appeal be dismissed (main request), or subsidiarily, that the patent be maintained on the basis of one of auxiliary requests I to XI filed with the response to the grounds of appeal dated 1 August 2019.

VI. At the end of the oral proceedings held on 14 June 2022 the decision of the Board was announced.

Reasons for the Decision

Main request (patent as granted) –

1. *Claim 13 - novelty*

1.1 *Document (3)*

According to the appellant, the subject-matter of claim 13 lacks novelty over the distillation apparatus disclosed in figure 19.9 on page 596 of document (3).

This distillation apparatus comprises a distillation column, a condenser connected to the distillation column and to a condensate drum. A second condenser is connected to the drum and comprises a line to recycle the condensate from this second condenser to the drum. This second condenser does not comprise a second line to take off the condensate from the distillation apparatus.

However, claim 13 of the patent as granted requires that the second condenser (9) is provided with a line (14) arranged to recycle material from second condenser (9) to drum (10),
and a line (15) arranged to remove condensate from condenser (9).
This feature is not disclosed in document (3). Thus the subject-matter of claim 13 is novel over document (3).

According to the appellant, claim 13 defines the line (15) as a line for removing condensate from the condenser, but does not specify that said line (15) is to be arranged to remove condensate from the system. Accordingly, the line which removes condensate from the second condenser of the distillation apparatus disclosed in document (3) and recycles it to the drum fulfils both the requirement of lines (14) and (15) required by claim 13.

The board cannot concur with the appellant's interpretation of claim 13.

Claim 13 requires that the second condenser (9) is provided with a line (14) arranged to recycle material from second condenser (9) to drum (10). Therefore, the line (14) removes condensate from the condenser to recycle it to the drum.

Claim 13, however, also requires another line (15) to remove condensate from the condenser. Thus, claim 13 requires two lines (14) and (15). These lines do not have the same function. They cannot therefore form a single line. It is clear from the context of the patent in suit (see, for example, paragraph [0031]), that line (15) required by claim 13 is a line which takes the condensate out of the distillation apparatus.

Accordingly, the appellant's claim interpretation must be rejected, with the consequence that the subject-matter of claim 13 is novel over document (3), since the apparatus disclosed in figure 19.9 does not comprise a second line which removes condensate from the second condenser out of the distillation apparatus.

1.2 *Document (4)*

According to the appellant, the subject-matter of claim 13 lacks novelty over the distillation apparatus disclosed in the figure of document (4).

The distillation apparatus disclosed in document (4) comprises a distillation column and a condenser 27 connected to the distillation column via a scrubber 22. The condenser 27 is connected to a condensate drum 29 via line 28. Drum 29 is connected to a second condenser 43 via line 33. This second condenser is connected to a separation drum 35 via line 34.

The second condenser 43, however, is not provided with a line to recycle material from said condenser to drum 29, as required by claim 13.

According to the appellant, this line to recycle material from condenser 43 to drum 29 is provided by the route condenser 43 to drum 35 via line 34; drum 35 to scrubber 22 via lines 36, 31 and 23, 24 or 25; scrubber 22 to condenser 27 via line 26 and condenser 27 to drum 29 via line 28.

However, a line is simply a pipe or tube that allows a material to be transferred. It is a conduit that may possibly be fitted with means to control the material transfer, such as pumps, valves, etc. A line therefore does not include a device that changes the composition of the material, such as a scrubber or a condenser.

The condenser 43 of the distillation apparatus disclosed in document (4) is not provided with a line arranged to recycle material from the second condenser 43 to the drum 29, with the consequence that the subject-matter of claim 13 is novel over document (4).

2. *Inventive step*

2.1 *Closest prior art*

It is agreed that document (1) represents the closest prior art to the invention.

This document discloses a process for purifying crude phenol, which process comprises introducing crude phenol as a feed to a fractional distillation column (see figure 2, inlet 2) and separating the crude phenol into a base fraction (see figure 2, outlet 4), an intermediate fraction (outlet 3) and overhead vapours (outlet 5). The overhead vapours are fed to a first condenser (6) whereby the major portion of the vapours

are condensed. The condensate is returned to the distillation column as reflux (inlet 8).

A portion of the overhead vapours withdrawn from the condenser (6) is fed via line (7) to the lower part of a distillation/stripping column (13), wherein water is injected via line 18. The overhead vapours are removed from the column and fed to a second condenser (15) via line (14). A portion of the second condensate is returned to the distillation/stripping column as reflux via line 16.
Document (1) does not disclose the presence of a condensate drum between the condenser 6 and the distillation column 1. It is not contested that the process of claim 1 differs from document (1) in that the separation of the overhead vapours into a portion of the vapours and a first condensate is effected by means of a condenser **coupled to a condensate drum**, and not only in a condenser.

Furthermore, the process of granted claim 1 requires that the first uncondensed fraction is conducted to **a second condenser** wherein a second condensed fraction is formed and that at least a portion of this second condensed fraction is recycled to the condensate drum.

In the process of document (1), a vapour portion (first uncondensed fraction) is conducted **to a distillation/ stripping column** 13, where water is added. The overhead of the column 13 is sent to a second condenser 15, where a second condensed fraction is recycled to the distillation unit via the distillation/stripping column.

The appellant submitted that the distillation/striping column 13 of document (1) is a condenser for the purposes of the claimed process.

For the person skilled in the art, the meaning of a condenser is clear, it is an apparatus designed to transform a material from the gaseous state to the liquid state. A distillation column is a device for separating liquids using the differences in their boiling points. These two devices do not require the same equipment, in particular a condenser requires heat removal means, whereas a distillation column requires heating means. Even if a distillation column consists of a multitude of trays where vapour and liquid are in equilibrium, thus condensation effects take place, the person skilled in the art will not consider a distillation column as a condenser. The appellant's argument that the distillation column (13) disclosed in document (1) is a condenser must therefore be rejected. The process of claim 1 thus differs from that disclosed in document (1) also in that the first uncondensed fraction is conducted to a second condenser.

2.2 *Technical problem*

The respondent has pointed out several improvements achieved by the claimed process. However, the technical problem is at least that of the provision of an alternative process for purifying a phenolic mixture. As the board has come to the conclusion that the solution to the problem of providing an alternative process for purifying phenol is not obvious in the light of the state of the art, it is not necessary to examine whether the improvements put forward by the respondent are indeed achieved by the claimed process.

2.3 *Solution*

The proposed solution is the process of claim 1 characterised by the use of a drum which receives the overhead stream from the distillation column after it has passed through a first condenser and into which at least part of the second condensed fraction is recycled and by conducting the first uncondensed fraction formed in the drum to a second condenser.

2.4 *Obviousness*

It remains to be decided whether or not the proposed solution to the problem of providing an alternative process of purifying phenol is obvious in view of the cited prior art.

According to the appellant, the proposed solution is obvious, since it is common in the art to couple a drum to a condenser for many reasons. This is highlighted in document (2) which discloses a distillation where the overhead of the distillation column is condensed in a condenser coupled to a drum.

Document 2 discloses the distillation of a pyrolysate in which phenol and alpha-methylstyrene are recovered by condensing the overhead stream (see paragraph [0005]). The condensation of the overhead fraction is achieved by coupling a condenser (6) with a drum (7) (see figure).

First, it appears questionable whether the person skilled in the art would turn to document (2) in order to provide an alternative process for purifying phenol. In the process of document (1), phenol is recovered from the purification distillation column as an

intermediate fraction (line 3). Document (2) does not disclose a process for purifying phenol, but a process for recovering a phenolic mixture comprising alpha-methylstyrene from a pyrolysate. The phenolic mixture is recovered from the overhead fraction. In the process of document (2), part of the condensed phenolic mixture is returned to the distillation column while the other part of the phenolic fraction is collected by line 12. This equivalent line 12 in the purification process of document (1) is used to take away phenolic by-products, not to recover phenol. Therefore, the skilled person would not combine the teaching of document (1) with that of document (2).

Further, even if the person skilled in the art were to combine document (2) with document (1), they would still not arrive at the claimed solution, since in the process of document (2), as in document (1), the non-condensed fraction coming from the drum 7 is fed to a second distillation column 9 via line 8, and not to a second condenser.

The Board therefore comes to the conclusion that the subject-matter of claim 1 of the main request is not obvious in the light of the cited prior art.

For the same reason, the apparatus of claim 13 which is characterized by a second partial condenser (9) arranged in series with condenser (2) and a line (14) arranged to recycle material from the second condenser (9) to drum 10 is also not rendered obvious by the combination of document (1) with document (2).

2.5 Accordingly, the subject-matter of independent claims 1 and 13, and by the same token that of dependent claims 2 to 12, 14 and 15 involves an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Rodríguez Rodríguez P. Gryczka

Decision electronically authenticated