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Datasheet for the decision of 1 March 2017

Case Number: T 0561/14 - 3.3.05

Application Number: 05730924.7

Publication Number: 1748841

IPC: B01J8/18

Language of the proceedings: EN

Title of invention:
Angular flow distribution head

Patent Proprietor:
Univation Technologies, LLC

Opponent:
Total Research & Technology Feluy

Headword:
Flow distribution/UNIVATION

Relevant legal provisions:
EPC Art. 54(1), 54(2), 56, 83

Keyword:
Novelty - Main request (yes)
Inventive step - main request (yes)
Sufficiency of disclosure - (yes)

Decisions cited:

Catchword:

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Case Number: T 0561/14 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 1 March 2017

Appellant: (Patent Proprietor)	Univation Technologies, LLC 5555 San Felipe Suite 1950 Houston, TX 77056 (US)
Representative:	Boult Wade Tennant Verulam Gardens 70 Gray's Inn Road London WC1X 8BT (GB)
Respondent: (Opponent)	Total Research & Technology Feluy Zone Industrielle C 7181 Seneffe (BE)
Representative:	Raboin, Jean-Christophe Total Research & Technology Feluy Zone Industrielle C 7181 Seneffe (BE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 28 January 2014 concerning maintenance of the European Patent No. 1748841 in amended form.**

Composition of the Board:

Chairman	E. Bendl
Members:	J.-M. Schwaller
	R. Winkelhofer

Summary of Facts and Submissions

I. The present appeal lies from the interlocutory decision of the opposition division to maintain European patent No. 1 748 841 in amended form.

II. According to the contested decision, the claims as granted (the then main request) met the requirements of Articles 123(2) and 83 EPC, but claims 1 and 2 of said request lacked novelty over D1 (US 2 665 976 A). The claims of the then pending auxiliary request were considered to meet the requirements of the EPC.

III. With its grounds of appeal, the proprietor (appellant) contested this decision and requested that the patent be maintained as granted. In the course of the appeal proceedings, he filed several auxiliary requests, which were all held by the opponent (respondent) not to be allowable.

IV. In response to a communication in which the board expressed its preliminary opinion, the appellant abandoned the requests then on file and submitted an amended (main) request, which was held by the respondent inter alia to be open to objection under Article 54 EPC. The respondent further requested that the case be remitted to the department of first instance if the board were to acknowledge the novelty of claim 1 of the main request.

V. With submission of 15 February 2017, the appellant submitted a modified main request consisting of two claims, which read as follows:

"1. *A fluidized bed polymerization reactor having a generally cylindrical vessel with a longitudinal axis, a distributor plate means positioned in said vessel,*

generally perpendicular to said longitudinal axis of said vessel, said distributor plate defining a fluidized bed region above said distributor plate means and a mixing chamber region below said distributor plate means; an inlet means opening into the bottom portion of said vessel for continuously introducing a stream of polymerizable fluids into said mixing chamber at a gas velocity sufficient to maintain particles in said fluidized bed region in suspended and fluidized condition, an outlet means for continuously removing unreacted polymerizable gases from said fluidized bed region, a catalyst injection means for introducing polymerization catalyst into said fluidized bed region, and a product removal means for removing solid particulate polymer product from said fluidized bed region; the reactor comprising, a bottom head (3) attached to said generally cylindrical vessel, wherein the bottom head (3) has an inverted cone-shaped bottom portion (5); and wherein the bottom head (3) includes an angled annular deflector (9) having an outer surface (27) with a conical shape and an inner cavity (12) along a central axis, said cavity (12) open at both ends, wherein the outer surface (27) of said flow deflector is in association with and is parallel to an inner wall (24) of the cone-shaped bottom portion (5) of the bottom head (3)."

"*2. A method for gas-phase polymerization reactions in a fluidized bed reactor comprising the step of delivering a stream of polymerizable fluid to said reactor through the fluidized bed polymerization reactor of claim 1.*"

VI. At the oral proceedings, which took place on 1 March 2017, the respondent objected to these claims under Articles 83, 54 and 56 EPC, but no longer requested

that the case be remitted to the department of first instance.

VII. After discussion the parties' requests were as follows:

The appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the claims according to the main request filed with submission of 15 February 2017.

The respondent requested that the appeal be dismissed.

VIII. The arguments of the parties which are relevant to the present decision may be summarised as follows:

The **respondent** argued that the claimed invention was insufficiently disclosed in that it could not be performed over the entire claimed range without undue burden.

Further, the reactor according to D1 was suitable for fluidised bed polymerisation, and so claim 1 was not novel.

With respect to inventive step, D1 and D5 (EP 0 173 261 A2) could both be taken as starting point for the assessment of inventive step. When starting from D1, the claimed invention was obvious, as this document disclosed a reactor containing the same bottom head as the one claimed, although described for another use. Since D1 further disclosed that this type of bottom head could be used for any type of catalytic conversion of hydrocarbons, its use for a polymerisation reaction was a straightforward choice which could hardly be seen as inventive. Alternatively, when starting from D5, the

problem to be solved was the provision of an alternative reactor. The solution to this problem however was obvious in view of D1.

The **appellant** argued that the claimed invention could be performed over the whole claimed range, and that the points raised by the respondent in the context of sufficiency of disclosure actually related to clarity.

The reactor according to D1 could not be used to perform a polymerisation reaction, in particular because the catalyst was not fed into the fluidised bed but was supplied already before reaching it, and so the claimed subject-matter was novel over D1.

D5 was the closest prior art. The problem to be solved was as described in paragraphs [0006] and [0035] of the patent, but the solution was not obvious from D1.

Reasons for the Decision

1. Admissibility

The amendments carried out in the main request concerned the correction of typographical errors. The respondent did not object to the late filing of this request. The board does not see any reason to take a different stance.

2. Sufficiency of disclosure

2.1 It is established case law that the requirements concerning sufficiency of disclosure under Article 83 EPC are met if, at the filing/priority date of the patent, the claimed invention could be performed by a person skilled in the art over the entire range claimed

without undue burden, using common general knowledge and having regard to the information given in the patent.

2.2 In the present case, the invention - which is based on the design of the flow distribution bottom head of a fluidised bed polymerisation reactor - is disclosed in Figures 1 to 3 and the corresponding passages of the description, namely paragraphs [0019] to [0021], which describe the geometry of said bottom head in detail.

Paragraph [0027] furthermore discloses the dimensions of one specific bottom head according to the invention, so that the skilled person would have no difficulty in reproducing the invention as illustrated in the figures.

2.3 The respondent, however, asserted that the claimed invention could not be performed over the entire range claimed without undue burden.

2.3.1 In particular it argued that there was no definition of the expression "in association with", and so there was an almost infinite number of ways in which the deflector could be associated with the inner wall of the cone-shaped bottom portion of the bottom head, with the consequence that the skilled person had to perform a research programme among the many possible configurations to select those achieving the alleged effect.

For the board it is common general knowledge that two metallic surfaces can be "associated" by welding, screwing or by any other equivalent technical means. In the present case, however, the skilled person would not, as asserted by the respondent, glue the surfaces

together or use strings, because these ways of associating two metallic surfaces in a pressurised industrial reactor working at high temperature would make no technical sense for the person skilled in the art.

2.3.2 Similarly, the respondent argued that the skilled person would have had to perform a research programme to find out which inlet means ensured a sufficient gas velocity to maintain the bed particles in suspended and fluidised condition.

This argument cannot be accepted either, because the skilled person knows how to use a fluidised bed, i.e. how to maintain a bed of particles under fluidised conditions. Even if some trial and error were necessary to optimise the fluidisation conditions, this would not be tantamount to an undue burden.

2.3.3 Lastly it was argued that the four embodiments disclosed in paragraphs [0023] to [0027] could not be reworked because they concerned "an annular disk", including the embodiment of paragraph [0027], which was supposed to illustrate the invention based on a cone-shaped design. Moreover, tables 1 to 4, which disclosed the dimensions of these four embodiments, defined the "diameter of angled annular deflector at widest region", whilst three of them defined the prior art based on an annular disk.

For the board, there is no doubt that the description of these embodiments contains some errors. This was already conceded by the appellant in opposition proceedings (see the minutes of the oral proceedings before the opposition division, page 1, fourth paragraph). In particular, the feature "diameter of

angled annular deflector at widest region" is obviously erroneous and apparently superfluous (tables 1 to 3) since, as indicated in paragraphs [0023] to [0026] of the patent, they concern the prior art based on an annular disk disclosed in US patent 4 933 149. Similarly, it is evident that the feature "inner annular disk diameter" in table 4, which concerns the invention, is erroneous and should apparently read "inner cavity diameter". Since the skilled person would, nevertheless, have no difficulty in identifying these errors, they would not hinder him from reproducing the specific conical angled annular deflector according to the invention disclosed in table 4, since the dimensions needed for its reproduction can be derived from said table.

2.4 Therefore, it follows from the above considerations that the respondent - who in the present case has the burden of proof - has not made it credible that there was any information gap or lack of guidance in the patent specification for the skilled person to reproduce the invention, with the consequence that the requirements of Article 83 EPC are met.

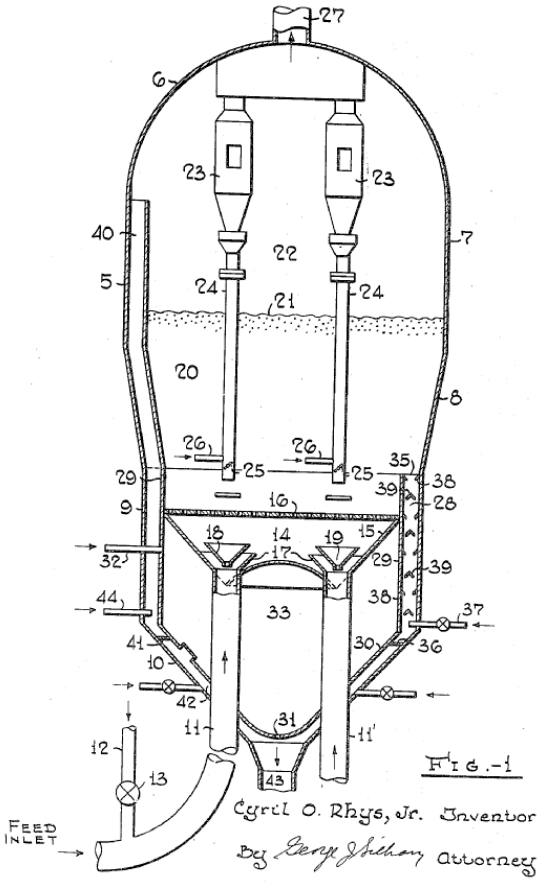
3. Novelty

The subject-matter of claim 1 at issue, which describes a fluidised bed polymerisation reactor, is novel over the disclosure of D1.

3.1 The invention according to D1 (see column 1, lines 1 to 8) pertains to reactor vessels in which gaseous or vaporous reactants are contacted with finely divided solids in dense, fluidised condition and particularly to improved inlet means for insuring even distribution of the incoming charge of finely divided solids and

reactants over the entire cross-section of the reactor vessel. In column 2, lines 34 to 37, said improved inlet means is described as being an inverted distributor cone placed over the discharge end of the inlet line for reactants below the distribution grid in the bottom portion of the vessel. Further, the invention is specifically described in connection with the catalytic cracking of hydrocarbons (Figure 1 and column 3, line 7, to column 5, line 6) and the regeneration of finely divided catalyst particles (Figure 2 and column 5, lines 7 to 54).

3.2 The board can in particular not accept the respondent's argument that the catalytic cracking reactor according to Figure 1 (reproduced below) would be suitable for fluidised bed polymerisation for the following reasons.



D1: Fig.1

3.2.1 The above reactor does not comprise a "*catalyst injection means for introducing polymerization catalyst* ***into*** *[the] fluidized bed region*" (emphasis added by the board), since the catalyst is introduced below the distribution plate 16 and so **below but not into the (dense) fluidised bed 20**.

The respondent argued that by using high velocity to introduce the gaseous reactants, the catalyst would be pushed through the distribution plate 16 and so fed into the fluidised bed region. This argument is not convincing because there is no indication of such a high velocity in D1. Furthermore, in D1 the catalyst - which is introduced through the standpipe 12 - is fed into the reactor concurrently with the gaseous or liquid feedstock (see "FEED INLET" in the figure), with the consequence that - if this were a monomer and the catalyst a polymerisation catalyst - the polymerisation reaction would inevitably start below the distribution plate 14, and so it is questionable whether the catalyst, which would already be sticky below the distribution plate due to the presence of a mixture having already (partly) started to polymerise, could even reach the fluidised bed region.

In any case, it appears to be standard in fluidised bed polymerisation that the catalyst is fed directly into the fluidised bed via an inlet located above the distribution plate (see in particular D5, figure 1, in which the catalyst is introduced via inlet 42). The respondent, having been questioned on the issue at the oral proceedings, did not contest this.

It follows from the above considerations that the catalyst injection means as defined in claim 1 at issue, i.e. "*for introducing polymerization catalyst*

into [the] fluidized bed region", cannot be directly and unambiguously derived from the catalytic cracking reactor of D1.

3.2.2 The respondent argued that the invention according to D1 was not restricted to catalytic cracking and was applicable to a wide variety of catalytic reactions, as explained in D1, column 1, lines 14 to 25.

However, nowhere in D1 is the catalyst inlet means disclosed as being disposed above the perforated distribution plate. According to column 2, lines 34 to 37, it is even required to be located below it. Similarly, in independent claims 1, 2 and 3 and in the catalyst regeneration reactor according to Figure 2, the inlet pipe for introducing the vaporous reactants and finely divided solids is located below said perforated distribution plate, and so this means too cannot be suitable "*for introducing polymerization catalyst into [the] fluidized bed region*" of a fluidised bed polymerisation reactor.

3.2.3 Furthermore, in the catalytic cracking reactor of D1 the means 28 (stripping zone for removing the catalyst from the dense bed 20) or 40 (vent cell for venting vapours from the annular cone 42) are likewise not suitable "*for removing solid particulate polymer product from said fluidized bed region",* because of the presence of baffles 38 or 39 and/or orifice plates 41 and 36, which would be inevitably be plugged if - as required by claim 1 at issue - these means were used for removing the solid particulate polymer product. The respondent stated that the pressure in the reactor would allow the polymer product to be removed, but did not provide any evidence for this assertion.

3.3 It follows from the above considerations that the subject-matter of claim 1 at issue is not directly and unambiguously derivable from the disclosure of D1, with the consequence that claim 1 and by the same token claim 2, which refers to a method using the reactor of claim 1, meet the requirements of Article 54(1) and (2) EPC.

4. Inventive step

Applying the problem-solution approach, the subject-matter of claim 1 involves an inventive step for the following reasons:

4.1 As the invention relates to fluidised bed polymerisation, the closest prior art is represented by document D5, which is the best starting point for assessing inventiveness since it relates to the same technical field as the present invention, namely an improvement to fluidised bed polymerisation reactors and to the distribution of fluid introduced into such reactors (D5, page 1, first paragraph).

The respondent's argument that D1 could alternatively represent the closest prior art cannot be accepted, because although this document addresses the problem of improving the distribution of the incoming charge of finely divided solids and reactants in fluidised bed systems (D1, column 1, lines 1 to 8, and column 2, lines 23 to 26), it does not in any way disclose its use in the field of polymer manufacturing. Furthermore, as explained above, the reactor according to D1 is not suitable for fluidised bed polymerisation.

4.2 As to the problem underlying the invention, this is described in paragraph [0006] of the patent as

consisting in providing an improved gas flow distribution and an improved removal of contaminants and polymer from the sides of the reaction vessel walls and the prevention of particle fall back into the gas stream inlet. According to paragraph [0034], the patent further aims at preventing pooling at higher condensing levels and higher production rates.

4.3 As a solution to this problem, the reactor according to claim 1 at issue is in particular characterised in that its bottom head has an inverted cone-shaped bottom portion and includes an angled annular deflector having a conical shape and an inner cavity along a central axis and open at both ends, the outer surface of the flow deflector being in association with and parallel to an inner wall of the cone-shaped bottom portion of the bottom head.

4.4 As to whether the problem identified in point 4.2 has indeed been solved, the board notes that, according to paragraph [0033] of the patent, the conical bottom head according to the invention, referred as "simulation 4" in example 2, shows both an improved particle escape percentage and a higher wall shear stress in comparison to those of the prior art, which are referred to as simulations 1 to 3 and can be deemed representative of the polymerisation reactor disclosed in D5, since US patent 4 933 149 which they are supposed to simulate (see paragraph [0024] of the patent) discloses exactly the same reactor as D5. The effect shown is not derivable from D5.

Paragraph [0035] of the patent furthermore states that the parallel deflector of the present invention "will prevent pooling at higher condensing levels, thus reactors can be run at higher production rates".

Since the respondent did not provide any counter-evidence to the simulations in example 2 and did not contest the statement in paragraph [0035] of the patent, there is no need to reformulate the technical problem.

4.5 As to the obviousness of the solution proposed in the claimed subject-matter, in particular in the light of document D1 which the respondent held to be particularly relevant, the board notes that D1 addresses a different problem to the one underlying the invention, as it relates to improving the distribution of the feedstock and catalyst over the entire cross-section of large fluidised bed reactor vessels and to preventing solid catalyst particles from slipping back into the feedstock inlet pipe (D1, column 2, lines 9 to 30). D1 thus neither tackles the problem identified in point 4.3 nor suggests using the improved distributor disclosed in D1 for fluidised bed polymerisation.

For sake of argument, even if the skilled person had an incentive to look at document D1, he would not arrive at the wording of claim 1 at issue because, as indicated above, the reactor according to D1 is not suitable for fluidised bed polymerisation since it does not enable the catalyst to be fed into the fluidised bed, as required by claim 1 at issue.

4.6 The other documents in the proceedings likewise do not disclose or suggest the solution as defined in claim 1 at issue to the problem defined in point 4.2 above.

4.7 It follows from the above considerations that the subject-matter of claim 1 at issue, and by the same token that of claim 2 which relates to a polymerisation

method using the reactor of claim 1, is not obvious to a person skilled in the art, and so involves an inventive step within the meaning of Article 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent on the basis of the main request as filed with submission of 15 February 2017, with the description to be adapted as necessary.

The Registrar: The Chairman:

C. Vodz E. Bendl

Decision electronically authenticated