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Datasheet for the decision of 15 October 2013

Case Number: T 1304/10 - 3.3.03

Application Number: 05716636.5

Publication Number: 1603955

IPC: C08F2/01, C08F2/00

Language of the proceedings: EN

Title of invention:
INTERCONNECTED LOOP REACTORS

Patent Proprietor:
TOTAL RESEARCH & TECHNOLOGY FELUY

Opponent:
Ineos Commercial Services UK Limited

Headword:

Relevant legal provisions:
EPC Art. 54, 56, 114(2), 123(2)
RPBA Art. 12(2)

Keyword:
Novelty - (no)
(main request, first and second auxiliary requests)
Amendments - added subject-matter (yes)
(third auxiliary request)
Late-filed request - admitted (no) (fourth auxiliary request)
Inventive step - (yes) (fifth auxiliary request)

Decisions cited:

Catchword:

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Case Number: T 1304/10 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 15 October 2013

Appellant: (Patent Proprietor)	TOTAL RESEARCH & TECHNOLOGY FELUY Zone Industrielle C 7181 Seneffe (BE)
Representative:	Leyder, Francis Total Reseach & Technology Feluy Zone Industrielle C 7181 Seneffe (BE)
Respondent: (Opponent)	Ineos Commercial Services UK Limited Hawkslease Chapel Lane Lyndhurst Hampshire SO43 7FG (GB)
Representative:	Hawkins, David George Mathisen & Macara LLP Communications House South Street Staines-upon-Thames Middlesex, TW18 4PR (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 12 April 2010 concerning maintenance of the European Patent No. 1603955 in amended form.**

Composition of the Board:

Chairman: B. ter Laan
Members: M. C. Gordon
C. Vallet

Summary of Facts and Submissions

I. The appeal by the patent proprietor lies from the interlocutory decision of the opposition division announced on 24 March 2010 and posted on 12 April 2010 according to which it was held that European patent number 1 603 955 (granted on European patent application number 05 716 636.5, derived from international application number PCT/EP2005/050524, published under the number WO2005/80442) could be maintained in amended form on the basis of the third auxiliary request (claims 1-3) filed during the oral proceedings before the opposition division.

II. The patent was granted with a set of 8 claims, whereby claims 1 and 2 were independent claims and read as follows:

"1. A double loop reactor for polymerising olefins comprising:

d) two loop reactors (1) and (11);

e) connecting means (4) to transfer the growing polymer from the first loop reactor to the second loop reactor;

f) connecting means (14) to transfer the growing polymer from the second loop reactor back to the first loop reactor.

2. A process for polymerizing olefins in two interconnected loop reactors (1) and (11) wherein the growing polymer flows continuously in circuit from the first loop reactor to the second loop reactor through pipe (4) and back to the first loop reactor through pipe (14)."

Claims 3-8 were dependent on claim 2.

III. A notice of opposition against the patent was filed on 14 February 2007 in which revocation of the patent on the grounds of Art. 100(a) EPC (lack of novelty, lack of inventive step) and Art. 100(b) EPC was requested. *Inter alia* the following documents were cited in support of the opposition:

D1: US-A-6 596 823
D2: US-A-5 639 834

IV. The decision of the opposition division was based on the claims of the patent as granted (main request) and three sets of claims forming first to third auxiliary requests, of which the first auxiliary request had been filed with a letter dated 8 October 2007 and the second and third auxiliary requests were filed during the oral proceedings before the opposition division. According to the appealed decision the main request met the requirements of Article 83 EPC, but not of Article 54 EPC in view of the disclosure of D1 which described a reactor having connecting means suitable for transporting "growing" polymer particles. The first and second auxiliary requests complied with Articles 123, 84, 83 and 54 EPC but not with Article 56 EPC in view of D1 as the closest document, the only difference being in the use of settling legs, which did not contribute to the problem of achieving more homogeneous polymers and which was moreover well-known in the art (e.g. D2). The third auxiliary request fulfilled all of the requirements of Articles 123, 84, 83, 54 and 56 EPC.

V. On 14 June 2010 the patent proprietor lodged an appeal against the decision, the prescribed fee being paid on the same date.

VI. The statement of grounds of appeal was received on 23 August 2010 accompanied by two sets of claims forming a first and second auxiliary request, the main request being for maintenance of the patent in the form as granted.

VII. The opponent - now the respondent - replied with letters dated 22 September 2010 and 24 February 2011.

VIII. On 15 March 2013 the Board issued a summons to attend oral proceedings.

In a communication dated 16 April 2013 the Board set out its preliminary assessment of the case.

IX. By letter dated 12 September 2013 the appellant filed two further requests, designated first and second auxiliary requests, the previously filed auxiliary requests being redesignated third and fourth auxiliary requests.

X. Oral proceedings were held before the Board on 15 October 2013.

XI. During the oral proceedings the appellant submitted a set of claims designated "fourth auxiliary request", the previously filed fourth auxiliary request (i.e. the set of claims previously submitted as second auxiliary request with the statement of grounds of appeal and redesignated fourth auxiliary request with the letter of 12 September 2013) was redesignated fifth auxiliary request.

XII. The **first auxiliary request** consisted of 7 claims, claim 1 reading as follows:

"1. A process for polymerising olefins in two interconnected loop reactors (1) and (11) wherein the growing polymer flows continuously in circuit from the first loop reactor to the second loop reactor through pipe (4) and back to the first loop reactor through pipe (14)."
Claims 2-7 were dependent process claims.

The **second auxiliary request** consisted of six claims whereby claim 1 thereof differed from claim 1 of the the first auxiliary request in that the phrase: "and wherein the catalysts system is based on a metallocene catalyst component" was introduced at the end of claim 1.

The **third auxiliary request** consisted of five claims whereby claims 1 and 2 read as follows:

"1. A double loop reactor for polymerising olefins comprising:
d) two loop reactors (1) and (11), said loop reactors comprising settling legs;
e) connecting means (4) to transfer the growing polymer from the first loop reactor to the second loop reactor;
f) connecting means (14) to transfer the growing polymer from the second loop reactor back to the first loop reactor.

2. A process for polymerising olefins in two interconnected loop reactors (1) and (11) wherein the growing polymer flows continuously in circuit from the first loop reactor to the second loop reactor through pipe (4) and back to the first loop reactor through

pipe (14) and wherein the growing polymer is transferred from the first loop reactor to the second loop reactor and from the second loop reactor to the first loop reactor by means of settling legs (3)."

Claims 3-5 were dependent process claims.

Claim 1 of the **fourth auxiliary request** differed from claim 1 of the patent as granted by the introduction at the end of the claim of the wording:
"wherein the connecting means to transfer the growing polymer from the first loop reactor to the second loop reactor and from the second loop reactor back to the first loop reactor comprise settling legs".
Amendments had also been made to claim 2 and 3 (combined) and claims 6 and 7 (deleted).

The **fifth auxiliary request** consisted of four claims corresponding to claims 2-5 of the third auxiliary request and consequently did not have any claims directed to a reactor.

XIII. The arguments of the appellant can be summarised as follows:

a) Main request/first auxiliary request.

The wording "the growing polymer" had to be interpreted, in the light of the description, as meaning that the apparatus of claim 1 of the main request was constructed so that the entirety of the polymer was transferred from the first loop to the second loop and again from the second loop back to the first loop, the consequence being that

in operation both transfer steps were effected on material of similar nature.

In contrast the apparatus of D1 was constructed to permit transfer of concentrated slurry from the first loop to the second loop but only a dilute stream of polymer particles and diluent from the second loop back to the first loop, with the consequence that in operation material of different nature was involved in each of the transfer stages.

b) Second auxiliary request.

The specification of the metallocene provided a further distinction over D1. Although D1 mentioned metallocenes there was no example thereof and hence no incentive to employ metallocenes.

c) Third auxiliary request.

Art. 123 EPC: Settling legs were connected to the reactor. Whether they were considered to form part of the loop reactor or to be part of the connecting means between the loop reactors was immaterial in terms of the technical features. With regard to an objection of the Board relating to the term "comprising" reference was made to the fourth auxiliary request.

d) Fourth auxiliary request.

The basis for the amendment was in paragraphs [0023] and [0025] and the figure of the patent in suit which showed that the settling legs formed

part of the connecting means.

e) Fifth auxiliary request

The specification of settling legs meant that the concentrated slurry was involved in both the transfer from the first to the second loop and back from the second to the first loop, and that it was possible to control the amount of growing polymer slurry reintroduced to the first reactor. The process of D1 returned only a dilute suspension of fines to the first reactor, the larger polymer particles being withdrawn from the system after the second loop. In the patent in suit there was a circuit between the two reactors allowing the growing polymer to flow continuously around the two loops, resulting in homogeneity of the polymer composition itself rather than merely of the particle size as taught in D1.

The technical problem addressed by the patent in suit was thus different to that of D1. No document taught to return the polymer from the second loop back to the first loop. Consequently the claimed process was not obvious.

XIV. The arguments of the respondent can be summarised as follows:

a) Main request/first auxiliary request.

All the features of apparatus claim 1 of the main request were disclosed in D1.

Regarding the process (main request claim 2, first auxiliary request claim 1) there was no feature in

the claim to support the interpretation of the appellant regarding the nature of what was transferred between the reactors. In D1, as in the patent, growing polymer was circulated in the system.

b) Second auxiliary request.

Metallocene was disclosed in D1 as a possible catalyst, anticipating the subject-matter of claim 1 of the second auxiliary request.

c) Third auxiliary request.

The respondent offered no comments with respect to Art. 123 EPC.

d) Fourth auxiliary request.

The situation regarding Art. 123 was similar to that of the third auxiliary request.

e) Fifth auxiliary request.

The settling legs were used for their known purpose, disclosed in D2, i.e. to transfer polymer from one reactor to another. There was no evidence of any effect resulting from the use of the settling legs nor was there any restriction in the claim as to the amount of polymer recycled back to the first reactor, or how many circuits the growing polymer made.

XV. The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained as granted. Auxiliarily he requested that

the patent be maintained in amended form according to the first or to the second auxiliary request both filed with the letter dated 12 September 2013, or according to the third auxiliary request filed with the statement of grounds of appeal as the first auxiliary request, or according to the fourth auxiliary request filed during the oral proceedings, or alternatively according to the fifth auxiliary request filed with the statement of grounds of appeal as the second auxiliary request.

The respondent (opponent 1) requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. Main request

Art. 54 EPC

2.1 Claim 1 of the main request is directed to an apparatus having two loop reactors and connecting means between these loops. The indications of the purpose of the connecting means ("to transfer growing polymer") have not been demonstrated to imply or impose any constructional restrictions. Consequently the feature "connecting means" has to be interpreted broadly.

2.2 D1 relates, according to claim 1, to a continuous process for manufacturing polyolefin resin of improved homogeneity whereby an olefin is continuously polymerised in a reactor (R) to produce a suspension (S) of diluent and polymer particles. A portion of the

suspension (S) is taken from the reactor and transferred to a hydrocyclone separator in which a flow (F) comprising diluent and polyolefin particles on the one hand and a concentrated suspension (CS) of polyolefin particles on the other hand are formed and separated. Flow (F) is recycled into the reactor (R). The concentrated suspension (CS) is passed to a subsequent reactor (R') fed with olefin to continue the polymerization and to produce a suspension (S') of diluent and polymer particles. A portion of suspension (S') is passed to a hydrocyclone separator and separated into a flow (F') containing diluent and polyolefin particles on the one hand and a concentrated suspension (CS') of polyolefin particles on the other hand. Flow (F') is recycled to the first reactor (R). Concentrated suspension (CS') is taken from the hydrocyclone separator and the polyolefin particles are separated from the suspension (CS').

According to example 1 of D1 the process is carried out in an apparatus wherein reactors (R) and (R') are loop reactors (references 1 and 8 in Figure 1), meaning that feature (d) of claim 1 is satisfied.

Example 1 of D1 further discloses that the content of the first loop reactor is transferred via a pipe (2) to a hydrocyclone separator (3), where it is separated into a concentrated suspension (CS) and a dilute flow (F). The concentrated suspension (CS) is transferred via line 6 to the second loop reactor (8). This transfer means corresponds to the connecting means, designated feature (e) of claim 1.

The second loop reactor is similarly equipped with a pipe (9) leading to a hydrocyclone separator (10) from which a flow (F') containing 14% by weight of polymer

particles was recycled back to the first reactor (1). This arrangement corresponds to the connecting means, designated feature (f) of operative claim 1.

The reactor of example 1 of D1 therefore exhibits all the features of the reactor according to operative claim 1 with the consequence that this subject-matter is not novel contrary to the requirements of Art. 54 EPC.

3. First auxiliary request

3.1 In the process carried out in the apparatus according to example 1 of D1, a concentrated suspension of polymer leaving loop (1) is transferred via pipe 2, hydrocyclone 3 and pipe 7 to the second loop reactor. In the reverse direction, a dilute flow, designated F' is transferred via pipe 9 and hydrocyclone 10 to the first reactor. Flow F' contains 14% by weight of polymer particles. According to D1 (claim 1 step (e) and column 1, lines 46 to 49, step (e)) polymerisation of the concentrated suspension (CS) transferred from the first reactor to the second reactor continues in the second loop reactor, i.e. the mass that is transferred contains "growing polymer". Similarly for flow F' according to column 5, line 58 to 61, the purpose of returning this to the first reactor is to increase the residence time in the reactor so as to continue the polymerisation reaction and increase the size of the particles, meaning that the polymer present in flow F' is also "growing polymer".

Consequently in the process of D1 both the transfers between the reactors are of polymer that is subjected to further reaction, i.e. growing polymer.

3.2 There is no restriction in claim 1 of the first auxiliary request (or in claim 2 of the main request) of the amount of growing polymer transferred in each step, nor of the nature or form thereof, e.g. the concentration of any suspension containing it.

The use of the definite article in the claim does not impose a definition - even implicit - of the amount of polymer transferred, i.e. there is no basis for interpreting the claim as requiring that the entirety of the polymer in each reactor is to be transferred to the subsequent reactor.

Contrary to the submissions of the appellant it is neither necessary nor appropriate in the present case to consult the description in order to to interpret the claim. The claim in itself is clear and self consistent. Neither party has indicated any features in the claim that are inherently ambiguous and hence in need of interpretation.

Consequently the process of claim 1 of the first auxiliary request (and of claim 2 of the main request) lacks novelty in the light of the disclosure of D1.

3.3 The main request and first auxiliary request do not meet the requirements of Art. 54 EPC and are refused.

4. Second auxiliary request

Art. 54 EPC

Claim 1 of the second auxiliary request differs from claim 1 of the first auxiliary request by requiring that the catalyst system is based on a metallocene catalyst component.

The polymerization according to D1 is carried out in the presence of a catalyst. D1 discloses at column 2 line 48ff a list of "examples" of catalysts including *inter alia* metallocenes and chromium based catalysts. It is further stated that the catalysts may be supported. The following sentence states that "Good results" are obtained using chromium catalysts supported on a support containing silica. This does however not mean that those results are better than with other catalyst systems. Consequently D1 discloses the various catalysts as equivalent alternatives with no indication that any given catalyst is to be used in any particular situation or is preferred.

In view of that disclosure in D1 with respect to the catalysts, and in particular since chromium-based catalysts are mentioned as equivalents to metallocene catalysts, said statement in combination with the disclosure of example 1 of D1 results in D1 making available a process having all the features of operative claim 1.

The second auxiliary request does not meet the requirements of Art. 54 EPC and is refused.

5. *Third auxiliary request*

Art. 123(2) EPC

5.1 Apparatus claim 1 of the third auxiliary request specifies in section (d) "said loop reactors **comprising** settling legs" (Board's emphasis).

There is no corresponding literal disclosure of this subject-matter in the application as originally filed.

In originally filed claim 3 it is specified that the growing polymer is transferred [between the two reactors] by means of settling legs. This wording does not disclose that the settling legs are component parts of the loop reactors, but on the contrary indicates that the settling legs are features in addition to the loop reactors. In other words, the wording of originally filed claim 3 does not provide a basis for a feature that the loop reactors "comprise" settling legs.

5.2 Furthermore the disclosure of originally filed claim 3 and that of the description with regard to the settling legs is inconsistent.

Figure 1 of the application as originally filed discloses that polymer is transferred between the loops (1/11) by (means of) settling legs (3/13) and transfer lines (4/14) whereby apparently in Figure 1 the legends 4 and 14 have been transposed. Consequently according to the figure the transfer involves - is effected "by means of" - not only the settling legs but also the associated lines, which lines are not specified in originally filed claim 3.

The associated text, starting at page 6 line 9 of the application as originally filed furthermore specifies the position at which the streams from the settling legs are introduced into the reactors ("just upstream the pump (12)").

However the wording now adopted in claim 1 extends beyond the disclosures of original claim 3 and also of the indicated parts of the description, in that it does not contain any restrictions with respect to the

features of the location of the return streams on the loops, the manner of functioning or the presence of auxiliary equipment, e.g. lines on the settling legs. The subject-matter of the third auxiliary request consequently extends beyond the content of the application as originally filed, contrary to the requirements of Art. 123(2) EPC and is therefore refused.

6. *Fourth auxiliary request*

Admissibility

The fourth auxiliary request was filed during the oral proceedings.

A criterion for admissibility to the procedure of a late-filed request is that it has to be clearly allowable. In the case of any element of doubt, such requests are not to be admitted to the procedure.

Claim 1 of the fourth auxiliary request specifies that the connecting means [between the reactors] comprise settling legs.

As noted above with respect to the third auxiliary request, the application as originally filed discloses in the figure that each transfer is effected by a combination of a settling leg and a transfer line. The wording adopted in the fourth auxiliary request is however broader than this original disclosure since the term "comprises" places no restriction on features present in addition to the settling leg (see also the discussion above in point 5.2 with respect to the third auxiliary request).

In view of the above considerations and also of those in respect of the third auxiliary request, it cannot be concluded that the claim is clearly allowable with respect to Art. 123(2) EPC.

Accordingly in exercise of the discretion permitted pursuant to Art. 114(2) EPC and Art. 12(4) RPBA the fourth auxiliary request is not admitted to the proceedings.

7. *Fifth auxiliary request*

7.1 Art. 123(2) EPC

Claim 1 of the fifth auxiliary request is the result of combining the subject-matter of originally filed claims 2 and 3, whereby claim 3 was dependent on claim 2. The requirements of Art. 123(2) EPC are therefore met.

7.2 Art. 123(3) EPC

Compared to the patent as granted the scope of the claims of the fifth auxiliary request has been restricted due to the deletion of (reactor) claim 1, and by the incorporation of the features of granted claim 3 in the process according to granted claim 2. Accordingly the requirements of Art. 123(3) EPC are satisfied.

7.3 Art. 54 EPC

As explained in section 2.2 above D1 discloses a process involving two loop reactors whereby transfer of the growing polymer material between the two loops is effected by a hydrocyclone. Settling legs are not mentioned in D1.

No other document discloses a process involving loop reactors whereby the growing polymer flows continuously in circuit between two loop reactors and is transferred between the first and second reactors and returned to the first reactor, both transfers being effected by means of settling legs.

The requirements of Art. 54 EPC are therefore satisfied.

7.4 Art. 56 EPC

7.4.1 *The closest prior art*

By common consent the closest prior art is represented by the teaching of D1. As explained in section 7.3 above, the process of the patent in suit and that of D1 differ in respect of the means employed to effect the transfer of material between the reactors in the two transfer steps.

The different transfer means employed according D1 (hydrocyclone) and that according to the present claims (settling legs) has the result that the respective processes involve transfer of material of differing natures.

Thus in the process of D1 the stream to be transferred is in the case of both reactors withdrawn by means of the corresponding hydrocyclone. The hydrocyclones have two exit streams, one concentrated suspension stream (CS) and one dilute flow stream (F). According to the process of D1 the transfer between the first and second reactors is of the concentrated suspension stream (CS) derived from the first hydrocyclone. The flow from the

second reactor back to the first reactor is however taken from the dilute flow stream derived from the second hydrocyclone (flow F').

In the process of the operative claims a suspension of the polymer is recovered from the one reactor and transferred to the other by means of settling legs which have the function of concentrating the polymer suspension. Therefore, the nature of the material transferred in both of the transfer steps is similar and not different as in D1.

7.4.2 *The problem solved*

There is no evidence of any technical effect arising from the use of the settling legs to effect polymer transfer between the reactors. Although the appellant has argued that there would, as a result of the multiple passes through the two loops in the process, be an increase in homogeneity of the polymer composition rather than merely of the particle size as taught by D1, no evidence has been advanced to support this contention. Furthermore, there is no feature in the present claims that would, even theoretically, predicate such an effect since operative claim 1 does not place any restriction on the number of circuits in the system a given charge of polymer is required to make.

Consequently the problem to be solved by the subject-matter of operative claim 1 can be formulated only as to provide a further process to polymerise olefins. From the example in the patent in suit it appears that said problem has effectively been solved, which was not contested by the respondent.

7.4.3 *Obviousness*

D1 provides no suggestion to adopt process conditions and steps as now claimed, i.e. involving transferring a material of like nature in both transfer steps. Furthermore D1 does not provide any disclosure of settling legs. On the contrary, employing settling legs for the transfer would be incompatible with the process of D1 which requires the withdrawal of two streams of different nature from the loop reactors and correspondingly routing these to different parts of the reaction system (see sections 2.2 and 7.4.1, above).

D2 discloses a process for polymerising olefins involving two loop reactors in which transfer between the first and second loops is effected by means of a settling leg. However there is no recycling of the product of the second loop back to the first loop by any means and no suggestion of such a step.

7.4.4 The prior art thus does not provide any teaching that would render it obvious to solve the problem of providing a further polymerisation process by modifying the process of D1 so as to effect both transfer steps between the two reactors by means of settling legs, or by any other means to effect transfer between the two reactors, in both transfer steps, of material of like nature.

Therefore, the subject-matter of claim 1 meets the requirements of Art. 56 EPC. Since claims 2-4 are are dependent on claim 1 this assessment also applies to these claims.

Consequently it is concluded that the requirements of Art. 56 EPC are satisfied by the subject-matter of the

fifth auxiliary request.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The case is remitted to the first instance with the order to maintain the patent on the basis of the fifth auxiliary request with a description to be adapted where appropriate.

The Registrar: The Chairman:

E. Goergmaier B. ter Laan

Decision electronically authenticated