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**Datasheet for the decision
of 9 June 2021**

Case Number: T 0169/18 - 3.3.03

Application Number: 05812467.8

Publication Number: 1833852

IPC: C08L53/00, C10M177/00,
C08F2/38, C08F293/00,
C10M145/14

Language of the proceedings: EN

Title of invention:
PROCESS FOR PREPARING LUBRICATING COMPOSITIONS

Patent Proprietor:
The Lubrizol Corporation

Opponent:
New Market Services Corporation

Relevant legal provisions:
EPC Art. 113(1), 111, 123(2), 56
EPC R. 103
RPBA 2020 Art. 13
RPBA Art. 12(4)

Keyword:

Substantial procedural violation - (no)

Reimbursement of appeal fee - (no)

Remittal to the department of first instance - (no)

Amendments - allowable (yes)

Inventive step - (yes)

Late-filed documents



Beschwerdekammern

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Case Number: T 0169/18 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 9 June 2021

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 15 November
2017 revoking European patent No. 1833852
pursuant to Article 101(3) (b) EPC.**

Composition of the Board:

Chairman D. Semino
Members: D. Marquis
A. Bacchin

Summary of Facts and Submissions

I. The appeal of the patent proprietor lies from the decision of the opposition division posted on 15 November 2017 to revoke the European patent EP 1 833 852 B1.

II. Claim 1 as granted read as follows:

"1. A process for preparing a lubricating composition comprising the steps of:

(1) contacting:

- (i) a free radical initiator;
- (ii) a chain transfer agent containing a thiocarbonyl thio group and a free radical leaving group; and
- (iii) a radically polymerisable monomer, to form a polymer chain;

wherein the process of step (1) is a controlled radical polymerisation process with living characteristics; and at least 50% of the polymer chains from step (1) contain a reactive end group capable of reacting with a polyvalent coupling agent;

(2) contacting the polymer prepared by step (1) with a polyvalent coupling agent to form a star-polymer; wherein said star-polymer is derived from at least two monomers comprising:

- (a) at least 50 wt % of a C12 to C15 alkyl substituted (meth) acrylate monomer; and
- (b) less than 50 wt % of an alkyl (meth) acrylate monomer containing 1 to 30 carbon atoms other than

the C12 to C15 alkyl (meth) acrylate monomer; and
(c) optionally containing less than 20 wt %
styrene; and
(d) optionally containing less than 10 wt % alkyl
methacrylamide;

(3) optionally contacting the polymer prepared by step
(1) or step (2) with a polymerisation inhibitor; and
(4) mixing the polymer prepared by step (2) or step (3)
with an oil of lubricating viscosity to form a
lubricating composition".

III. The decision of the opposition division was based on
the granted claims as the main request, on auxiliary
requests 1-5 filed by letter of 13 March 2017, on
auxiliary requests 6-11 filed by letter of 12 September
2017 and on auxiliary request 12 filed on
17 October 2017 during the oral proceedings before the
opposition division.

IV. The decision of the opposition division was based *inter
alia* on the following documents:

D4: US 6,369,162 B1

D7: WO 2004/087850 A1

D7a: US 2006/0189490 A1

D11: US 4,077,893

D14: J.M.G. Cowie et al., "Polymers: Chemistry and
Physics of Modern Materials", CRC Press, 2008, 3rd Ed.,
pages 80/81

D17: Ezio Rizzardo et al., Macromol. Symp., 143,
291-307 (1999)

V. As far as it is relevant to the present appeal, the
decision of the opposition division can be summarized

as follows:

- Claim 1 of the main request found a basis in the application as originally filed. Dependent claims 7, 8, 9 and 11 however encompassed combinations of features that involved two selections in the description for which there was no basis in the application as originally filed. The main request thus did not meet the requirements of Article 123(2) EPC. That conclusion also applied to corresponding claims of auxiliary requests 1-4 for the same reasons.
- Auxiliary request 5 met the requirements of Article 123(2) EPC.
- The process of claim 1 of auxiliary request 5 differed from the disclosure of D4 in the use of a thiocarbonyl thio group based chain transfer agent. There was no evidence on file of an effect derived from said difference. Therefore the problem solved was the provision of an alternative process for preparing a lubricating composition comprising a viscosity index (VI) improver. D17, which disclosed the use of RAFT polymerisation in general but also for the fabrication of star-polymers, rendered the claimed subject matter obvious. As D4 already disclosed the formation of star-polymers by the arms-first technique, the skilled person did not need this teaching from D17 but only the information and motivation to try out RAFT when altering example 4B of D4. Claim 1 of auxiliary request 5 lacked therefore an inventive step over D4.

- The process of claim 1 of auxiliary request 5 differed from the teaching of D7/D7a in step (2) which was characterized by contacting the living polymer chains with a coupling agent in order to obtain star-polymers. The effect of said difference was a better balance of thickening efficiency and shear stability as shown in the letter of the patent proprietor dated 10 August 2016. Thus, the technical problem was the provision of a process for preparing a lubricating composition wherein the viscosity improving agent derived therefrom had a better balance of thickening efficiency and shear stability. The solution was obvious in view of D11 representing well-established knowledge about viscosity improvers from the late 1970s. Claim 1 of auxiliary request 5 therefore also lacked an inventive step over D7/D7a.
- Claim 1 of auxiliary requests 6 to 12 as well as some dependent claims of auxiliary requests 6 to 10 did not meet the requirements of Article 123(2) EPC.
- In view of that, the patent was revoked.

VI. The patent proprietor (appellant) lodged an appeal against the decision of the opposition division and filed the following documents with the statement setting out the grounds of appeal:

D18: Declaration by Dr. Sona Slocum of 7 June 2011

D19: Experimental report and Appendices I-VIII

D20: Declaration of Dr. Renee A. Eveland dated 26 March 2018

- VII. The appellant also filed D21 (Second Declaration of Dr Renee Eveland dated 19 November 2018) and D22 (Textbook extract from Lubricants and Special Fluids, Tribology series 23, Stepina et al., Elsevier 1992, pages 357, 358 and 404) with their letter of 5 December 2018 and D23 (Third declaration of Dr Renee A. Eveland dated 31 March 2021) with letter of 29 April 2021.
- VIII. The opponent (respondent) filed D24a (Living Radical Polymerization, Abstract from Encyclopedia of Polymer Science and Technology, 15 April 2003) and D24b (Reversible Deactivation Radical Polymerization, Abstract from Encyclopedia of Polymer Science and Technology, 15 December 2015) with letter of 25 May 2021.
- IX. Oral proceedings were held on 9 June 2021, the parties being present by videoconference with the Zoom platform.
- X. The appellant's arguments, insofar as relevant to the present decision, may be summarised as follows:

Remittal and reimbursement of the appeal fee in view of an alleged substantial procedural violation

- The declaration D18 supporting a technical advantage over D7a was not admitted at the oral proceedings without having been looked at by the opposition division. Moreover, the decision of the opposition division did not contain a reasoning as to why D18 had not been admitted into the proceedings. These procedural violations were substantial and justified the requests for remittal and for reimbursement of the appeal fee.

Main request

Added matter

- The application as originally filed contained a pointer towards a process for preparing a lubricating composition which included steps (1), (2) and (4). Paragraph 79 disclosed a monomer composition that was associated to the preparation of a lubricating composition based on a star-polymer. No selections within the application as originally filed were needed therefore to arrive at the subject-matter defined in claims 1, 7, 8, 9 and 11 of the main request.

Admittance of D18-D24a/b into the proceedings

- The opposition division had used its discretion not to admit D18 into the proceedings in an unreasonable way. D18 was also re-filed in appeal as a reaction to the decision of the opposition division. D18 should therefore be admitted into the proceedings.
- D19 and D20 were filed in reaction to the attack of lack of inventive step based on the combination of D4 with D17 which had been filed late in the opposition proceedings. These experimental reports should therefore be admitted into the proceedings.
- D21 was filed in response to the opponent's criticism of D19 and D20. D21 repeats examples 4A/4B of D4 exactly and is thus highly relevant to the question of inventive step. D21 should be admitted into the proceedings.

- D22 represented the common general knowledge and was a legitimate reaction to the opposition division's reliance on D11 as the secondary document with D7/D7a as the closest prior art and the resulting decision that the claims lacked inventive step over this combination of documents. D22 should therefore be admitted into the proceedings.
- D23 was filed pre-emptively to possible criticisms of D19-D21 by the opponent.
- D24a/b should not be admitted into the proceedings as there were no exceptional circumstances that would justify the admittance of these documents.

Inventive step

Starting from D7/D7a as closest prior art

- Examples 1-4 represented the appropriate starting point within the closest prior art D7a. These examples disclosed the preparation of linear polymers via the reversible addition-fragmentation chain-transfer polymerization (RAFT polymerization).
- The additional examples provided with the letter of the appellant dated 20 December 2010 showed a comparison of a polymerization process analogous to that of examples 1-4 of D7a (comparative example 1) with a process according to operative claim 1 (example 3). In particular, the table on page 4 of the letter established that the polymer of comparative example 1 had to be present in gear oil in a higher amount (16 wt.-%) than the polymer

according to example 3 (9.4 wt.-%) in order to obtain lubricating composition with comparable viscosity index and shear stability index. Further, the thickening efficiency data (TE@100) demonstrated that a star-polymer having a similar shear stability index as a linear polymer had a higher thickening efficiency. Also, the lubricating composition of example 3 on page 4 of the letter of 20 December 2010 had an improved viscosity index (234) compared to the lubricating composition of example 5 in Table 3 of D7a (158).

- Thus, the star-polymers according to the present invention provided better viscosity modifying properties than the linear block copolymers exemplified in D7a, in particular not only a better balance of viscosity index, thickening efficiency and shear stability but also improved viscosity index and thickening efficiency. That effect was also confirmed in the examples provided in Tables 1 and 2 on page 19 of the statement setting out the grounds of appeal. The problem was thus the provision of a process for preparing a polymer for use in a lubricating composition which provided an improvement in the balance of viscosity index, thickening efficiency and shear stability index but also improved viscosity index and thickening efficiency.

- D11 would not lead the skilled person to the solution proposed in operative claim 1 because the teaching of D11 was not compatible with the process of D7a. In particular, the process of D11 related to an ionic polymerization and not a RAFT polymerization and the composition of D11 was based on styrene and isoprene monomers and not on

(meth)acrylate monomers. The teaching of D11 was specific to monomers that would not behave in the same way as the (meth)acrylates of the patent in suit. That teaching and would not have been considered relevant to D7a.

- The passage in column 6, lines 19-26 of D11 had been taken out of context by the opposition division and applied to D7a. It was however apparent from the wording of that passage that the teaching presented was only valid for the specific polymerization process of D11 which was unrelated to the polymerization process of D7a. Also, that passage compared the star-polymers with one another and as such was not relevant to the comparison of a linear polymer, as that disclosed in D7a, with a star-polymer as disclosed in the patent in suit. The teaching of D11 did also not relate to a polymerization process based on the arms-first method by the RAFT polymerization.
- D7a did also not relate to the preparation of star-polymers by RAFT polymerizations. The linear polymers of D7a were not further processed in star-polymers so that that document would not provide a proper basis for a combination with D11. Operative claim 1 was thus inventive over D7a.

Starting from D4 as closest prior art

- D4 was a more remote document with respect to the patent in suit because D4 did not concern the preparation of polymers by the RAFT polymerization process. D4 was concerned with the nitroxide mediated radical polymerization (NMP) that relied on different reagents and a different

polymerization mechanism. D4 was therefore not a valid prior art to assess the presence of an inventive step of operative claim 1.

- Furthermore, the examples in D4 used a monomer composition which fell outside the scope of operative claim 1 since operative claim 1 required less than 20 wt.-% of styrene and example 4A/B of D4 employed 42 wt% styrene and example 5A/B of D4 employed 52 wt% styrene. There were thus two differences between operative claim 1 and D4, the process used to prepare the polymer arms, and the amount of styrene present in the monomer composition.
- Starting from D4, one would have to change the whole object of D4 in order to arrive at the subject-matter of the patent in suit. It was however derivable from D19 and D20 for instance that a particular feature disclosed in the context of NMP could not be immediately extrapolated to RAFT with any reasonable expectation of success.
- The data made available in D19 showed that a polymethacrylate could not be obtained with the NMP technology taught by D4 and that, in order to make a polymer by NMP, a significant amount of styrene had to be present in the process. By contrast, with the RAFT technology taught by the patent a good star-polymer was obtained with high arm-star conversion, good oil solubility, and good thickening. A similar improvement was shown in D20 which supported the improved balance of properties provided by the polymer when present in a lubricant and also showed that this was not taught or suggested in D4 or D17. Table 2 of D20 showed how

Experiment (i) (representative of D4) had a lower polymer yield and lower thickening efficiency than Experiments (ii) and (iii) (representative of the invention). Further support for the improved balance of lubricant properties was found in D21. Notably D21 compared Examples 4A/4B of D4 via NMP with Examples 4A/4B of D4 via RAFT. The results shown in Table 1 of D21 established that the RAFT arms-first process of the present invention advantageously resulted in a star-polymer with improved thickening efficiency for comparable shear stability index and oil blend viscosities at 100°C.

- The problem addressed by the present invention with respect to D4 was thus the provision of a workable process for preparing a polymethacrylate star-polymer for use in lubricating compositions with improved viscosity index and thickening efficiency without compromising the shear stability. The solution was the use of an arms-first RAFT process using the monomer composition as set out in operative claim 1.

- The solution to the problem was not obvious in view of D4. D4 provided no motivation for a skilled worker to change the process, vary the monomers and use arms-first RAFT. In more detail, there was no reason for a skilled person to modify the process of D4 to use RAFT since this is not disclosed or suggested in D4. As noted above, there are fundamental difference between RAFT and NMP meaning that their chemistry and reagents are not exchangeable. In particular, styrene was necessary for the NMP process.

- D17 did not relate to the same technical field as D4 and did not disclose the use of the RAFT process for preparing star-polymers by the arms-first method. In fact, the mention of the RAFT polymerization in D17 was limited to the preparation of linear polymers. D17 did not disclose any of the improvements resulting from operative claim 1. The only passage of D17 dealing with star-polymers (page 302) concerned core first star-polymers and not the arms first polymers according to operative claim 1. Furthermore, the monomer composition for the core first star-polymers of D17 relied on styrene and not on methacrylates as in operative claim 1. D17 therefore did not render operative claim 1 obvious and an inventive step had to be acknowledged also starting from D4 as the closest prior art.

XI. The respondent's arguments, insofar as relevant to the present decision, may be summarised as follows:

Remittal and reimbursement of the appeal fee in view of an alleged substantial procedural violation

- D18 had been filed on the day of the oral proceedings before the opposition division. The opposition division had based its decision not to admit that document into the proceedings on the correct criteria, namely its lack of *prima facie* relevance. The non-admittance of D18 did not therefore constitute a procedural violation.

Main request

Added matter

- Claim 1 of the main request extended beyond the application as originally filed in that it claimed a combination of features that has not been clearly and unambiguously disclosed originally. Claim 7 as filed did not form a proper support for claim 1 of the main request. Several selections were needed from the description to arrive at a process for preparing a star-polymer. Among these selections were the choice of the process for the formation of star-polymers. In that regard, the application as originally filed did not only disclose a process based on step (2), it also disclosed a process based on polyvalent chain transfer agents as an alternative to step (2). The monomer composition also had to be selected since paragraphs 71, 72 and 78, also disclosed alternative compositions to that present in paragraph 79. The choice of a process based on step (2) was only disclosed in combination with the monomer compositions of paragraphs 71, 72 and 78 and not with that of paragraph 79. The monomer composition of paragraph 79 was not disclosed in combination with the method of the star formation (arms first) nor with the definition of the structure of the star. Even the examples of the patent in suit did not all correspond to the process defined in claim 1 of the main request. For these reasons claim 1 as granted did not meet the requirements of Article 123(2) EPC.

- The limitations defined in claims 7, 8 and 9 of the main request each constituted one further independent selection which lacked support in the

application as originally filed. Therefore also these claims did not meet the requirements of Article 123(2) EPC.

Admittance of D18-D24a/b into the proceedings

- The rejection of D18 by the opposition division was reasonable as it was found not to be more relevant than the other documents on file. There was no reason to admit D18 into the appeal proceedings.
- The comparison allegedly demonstrated by D19 lacked any relevance for a problem-solution approach starting from examples 4A/B of D4 as closest prior art as D19 did not reproduce these examples. D20 also lacked relevance because it likewise did not represent a comparison with an example used as closest prior art. D19 and D20 could also have been filed in reply to the notice of opposition. Taking into account that neither D19 nor D20 provided said alleged effect over D4, D19 and D20 were not only late-filed without excuse, they also lacked any relevance and should not be admitted into the proceedings.
- D21 could have been filed in reply to the notice of opposition. D21 being extremely late-filed and without excuse, being furthermore irrelevant for the issues to be discussed in connection with the evaluation of inventive step, was therefore not to be admitted at this stage of the proceedings.
- There was no justification for the admittance of D22 and D23 at this stage of the appeal proceedings. These documents should not be

admitted. D24a/b should be admitted as they were filed in response to the filing of D23.

Inventive step

Starting from D7/D7a as closest prior art

- Claim 1 of the main request differed from D7a, examples 1 to 4, only in that the arms produced by RAFT in said examples were further reacted with a divalent coupling agent to a star-polymer. The problem solved over D7a could be seen as the provision of a lubricating composition with an improved balance of shear stability index, viscosity index and thickening efficiency. Even if the polymer disclosed in examples 1-4 of D7a were end products of the process disclosed in that document, these products were ready to be further reacted nonetheless.
- D11 concerned a different polymerization technique applied to a different set of monomers but it belonged to the same field and attempted to solve the same problem as in D7/D7a. D11 related to the synthesis and to the properties of lubricating oil additives having both dispersant and viscosity index-improving properties. D11 was thus known to the skilled person developing dispersant viscosity index improvers.
- D11 provided a general structure-function relationship that connected the superiority of a star-polymer (obtained by controlled living polymerization) over a linear polymer in that an optimal balance of thickening efficiency, shear

stability and viscosity index was achieved (column 6, lines 19-26).

- A skilled person starting from examples 1 to 4 of D7a and aiming at an improvement of the balance of properties between thickening efficiency, viscosity index, shear stability in a lubricant, knew that within the field of interest in the art, such balance/optimization was described in D11. The skilled person would have applied the teaching contained in D11 regarding the superior properties of star-polymers prepared by the arms-first method to D7a and would have arrived at operative claim 1. Operative claim 1 thus lacked an inventive step over D7a in view of D11.

Starting from D4 as closest prior art

- D4 related to a free radical process for preparing radial polymers, i.e. star-polymers, the resulting star-polymers and lubricating oil compositions that showed improved shear stability, thickening efficiency and viscometric properties.
- In examples 4A and 4B, D4 disclosed the formation of star-polymers via NMP wherein two or more radically polymerizable monomers were polymerized to form a linear copolymer, namely 58 wt.-% of a C12 to C15 alkyl substituted methacrylate and styrene, wherein the process was a controlled radical polymerization process with living characteristics and at least 50 wt.-% of the polymer chains from step 1 containing a reactive end group capable of reacting with a polyvalent coupling agent. In example 4B said linear polymer was then coupled with divinylbenzene, i.e. a

polyvalent coupling agent and the obtained star-polymer was mixed with an oil of lubricating viscosity to form a lubricating composition. D4 unambiguously taught a process to make star-polymers following the "arms-first" method.

- The only difference between operative claim 1 and the examples of D4 was the nature of the process, RAFT in the patent in suit and NMP in D4.

- No experimental evidence had been provided during the opposition procedure showing that using RAFT polymerization resulted in any effect. The opposed patent did not associate any particular benefit with the use of RAFT over NMP. D19 was not relevant since it was based on example 5A/B and not on example 4A/B and the amount of styrene in the process was not a characterizing feature of operative claim 1, since that feature was optional. D20 did not contain a fair comparison with D4 because the monomer mixture used in the rework (86 wt.-% of methacrylate and 14 wt.-% of styrene) did not reflect example 4A/B of D4. D21 was also not a fair representation of the closest prior art D4 since the monomer used therein (lauryl methacrylate) was not the monomer used in examples 4A/4B of D4 and no hydrogenated naphthenic oil was apparently used in the rework of D21. Furthermore, the description of D21 did not mention a reaction under nitrogen gas atmosphere, a temperature of 143°C after the last addition of t-butyl peroxide, the number and weight average molecular weights of the polymer arms and the continuous mixing of the materials during the formation of the core polymer. In any case the teachings of D20 and of D21 were already provided by D17.

- The objective problem was the provision of an alternative route to make star-polymers for the use as viscosity index improver in a lubricating composition.

- A skilled person starting from D4, examples 4A and 4B, that comprised methacrylate monomers, aiming at high molecular weights and defined polydispersities would look out for developments in living radical polymerization technology taught in D17. D17 taught that NMP had less utility for the living polymerization without or with little amount of styrene as monomer. D17 thus suggested RAFT instead of NMP and it also indicated that alkyl methacrylate based monomer compositions were beneficial. The skilled person starting from D4, example 4A/B, therefore received more than an explicit pointer towards the alleged invention in that D4 suggested to change the polymerization technique. All the missing information and a clear motivation that RAFT was better than NMP was obtained from D17. Operative claim 1 therefore lacked an inventive step over D4 combined with D17.

XII. The appellant (patent proprietor) requested that the appeal fee be reimbursed and the case be remitted to the opposition division in view of an alleged substantial procedural violation. In the alternative, the appellant requested that the decision under appeal be set aside and the patent be maintained as granted, or in amended form according to one of auxiliary requests 1 to 12 filed during the opposition proceedings.

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

Reasons for the Decision

1. Remittal and reimbursement of the appeal fee in view of an alleged substantial procedural violation

1.1 The appellant requested the remittal of the case to the department of first instance and the reimbursement of the appeal fee on the grounds that a substantial procedural violation had occurred. One of the preconditions for reimbursement of the appeal fee under Rule 103(1)(a) EPC is that the reimbursement is considered equitable by reason of a substantial procedural violation. In that regard, the violation must be substantial and affect the entire proceedings, which means that the alleged procedural violation must have adversely affected the rights of the appellant to the extent that a different outcome of the proceedings would have been obtained otherwise.

1.2 In the present case, the appellant's argument was that the opposition division severely infringed their right to be heard under Article 113 EPC because the opposition division refused to see a copy of the declaration D18 before deciding not to admit it into the proceedings, D18 having been cited during oral proceedings in support of a technical advantage over D7/D7a as the closest prior art. Also, the appellant saw procedural violations in the opposition division not having asked the opponent to comment on the admissibility of D18 before deciding not to admit it into the proceedings (Sections 9-27 of the statement of grounds of appeal) and in the lack of reasoning in the contested decision as to why D18 was not admitted into

the proceedings (Sections 3 and 14 of the letter of 29 April 2021).

1.3 The question of inventive step to which D18 was potentially relevant concerned auxiliary request 5. It is apparent from the contested decision that claim 1 of auxiliary request 5 was denied an inventive step both in view of D7/D7a and in view of D4, each taken separately as the closest prior art document (section 16.2 and 16.3 of the contested decision). It is also clear from the procedure before the opposition division and from the arguments of the appellant in appeal that since D18 was submitted to support a technical advantage over D7a, its non-admittance into the proceedings could only have played a decisive role in the final conclusion reached by the opposition division regarding inventive step of claim 1 of auxiliary request 5 if D7/D7a had been the only closest prior art (section 13.1.5 and 13.1.6 of the minutes; also section 17 of the statement of grounds of appeal). However, irrespective of the admittance of D18, the decision of the opposition division on claim 1 of auxiliary request 5 was also that it lacked an inventive step also in view of D4. This conclusion could not be affected by the admittance of D18. Therefore, the non-admittance of D18 into the proceedings cannot be regarded as a substantial violation of the appellant's rights to the extent that a different outcome of the proceedings before the opposition division would have been obtained as a consequence of its admission.

1.4 Indeed in the present case even a causal link is missing between the alleged procedural violation(s), i.e. non-admission of D18 into the proceedings and the lack of reasoning in the contested decision as to why D18 was not admitted into the proceedings, and the

filing of the appeal since, other than argued by the appellant, it had to file the appeal irrespective of whether a procedural violation had taken place. As to the other requests (main request as well as auxiliary requests 1-4 and 6-12), the contested decision concluded that they all failed to satisfy the requirements of Article 123(2) EPC. Thus the question of whether the opposition division might have committed a procedural violation with regard to the non-admittance of document D18 is not relevant to the decision reached on these requests.

- 1.5 The Board thus finds that a substantial procedural violation did not occur and that on that ground there is no reason to remit the case to the opposition division, nor to allow a reimbursement of the appeal fee according to Rule 103 EPC.

Main request (claims as granted)

2. Added matter

- 2.1 It was not disputed that the process of claim 1 of the main request corresponds to the process of claim 1 of the application as originally filed modified in that:

- (i) it is indicated that the process is for preparing a "lubricating composition";
- (ii) step (2) defined as optional in claim 1 as originally filed is made essential; and
- (iii) the star-polymer obtained by contacting the polymer prepared in step (1) with a polyvalent coupling agent is derived from at least two monomers defined by conditions (a)-(d) found in

paragraph 79 of the application as originally filed.

2.2 The combination of (i) and (ii) is already disclosed in claim 1 as originally filed, the reference to lubricating composition (i) being mentioned at the end of the claim and (ii) being already present in claim 1 albeit as an optional step of the process. A process for preparing a lubricating composition based on step (2) defining a star-polymer as a product of the polymer of step (1) and a polyvalent coupling agent is thus explicitly disclosed in claim 1 as originally filed.

2.3 Paragraphs 77 and 79 of the description as originally filed belong to a passage of the description which explicitly concerns the preparation of lubricating compositions (page 22). These paragraphs are thus of particular relevance to the process according to claim 1 as originally filed which concerns the same application. The monomer composition comprising the conditions (a)-(d) that defines claim 1 of the main request is disclosed in paragraph 79 of the application as originally filed in the context of the preparation of star-polymers and is part of the passage relating to lubricating compositions of the invention. Even though step (2) is not explicitly mentioned in paragraph 79, the introduction in claim 1 as originally filed of the definition of the monomer compositions of paragraph 79 which are disclosed therein specifically in the context of the preparation of star polymers for lubricating compositions according to the invention is on that basis a limitation of that claim which is directly and unambiguously derivable therefrom and does not constitute therefore an extension of subject-matter in the sense of Article 123(2) EPC. That conclusion is not altered by the disclosure in paragraphs 71 and 72 of

other monomer compositions more specifically disclosed in the context of the preparation of polymers by step (2).

2.4 With regard to claims 7, 8 and 9 of the main request, the basis in the application as originally filed for the number of arms of the produced star polymers of the invention is in paragraph 78. Paragraph 78 specifies that the star polymers for which the number of arms are defined are based on (meth)acrylates. It is apparent from that formulation that there is also a link between the (meth)acrylate star polymers of paragraph 78 and the star polymers derived from at least two monomers comprising (a)-(d) defined in the following paragraph 79 since (a) and (b) are (meth)acrylate monomers. In view of that, the Board comes to the conclusion that at most a single selection is necessary to arrive at the subject-matter of claims 7-9 as granted which therefore find a basis in the application as originally filed.

2.5 Claim 11 of the main request additionally defines the polyvalent coupling agent by a general formula. That formula is disclosed in paragraph 61 and in claim 19 of the application as originally filed which is dependent on claim 1. In that regard, the application as originally filed already concerned a process for the preparation of lubricating compositions based on star-polymers wherein the polyvalent coupling agent is as defined in claim 19. The limitation of that subject-matter to the monomer compositions defined in paragraph 79 finds a support in the application as originally filed for the same reasons as claim 1 of the main request. The limitation of the parameter n from "2 or more" in claim 19 as filed to "3 or more" in claim 11 of the main request is directly and unambiguously

derivable from paragraph 61 of the application as originally filed.

2.6 On that basis the Board comes to the conclusion that the patent as granted meets the requirements of Article 123(2) EPC.

3. Admittance D18-D24a/b into the proceedings

3.1 D18 is a declaration that was referred to by the opponent during the oral proceedings before the opposition division in the context of inventive step and was intended to support a technical advantage over D7a as the closest prior art. It is apparent from the minutes of the oral proceedings that the opposition division did not admit D18 into the proceedings because it was filed late (section 13.1.6) but the non-admittance of D18 into the proceedings and the reasoning underlying that decision are not dealt with at all in the decision of the opposition division. D18 was resubmitted by the appellant with the statement of grounds of appeal. According to the consistent case law of the boards of appeal, although Article 114(2) EPC gives an opposition division discretion not to consider facts and evidence not submitted in due time, the division is obliged to give reasons for its decision. Even if submissions are late-filed, their admission remains a procedural aspect over which the opposition division can exercise discretion and as a consequence, the decision needs to show the reasoning why the discretion was exercised one way or the other (Case Law of the Boards of Appeal of the European Patent Office, 9th Edition, July 2019, IV.C.4.2). The contested decision of the opposition division is deficient in that regard so that it is not possible to understand how the division assessed the (lack of) *prima facie*

relevance and therefore this question needs to be addressed by the Board in the exercise of its discretionary power conferred by Article 12(4) RPBA 2007 (which applies in the present case in view of Article 25(2) RPBA 2020). In that regard, the declaration D18 contains data about the preparation of a RAFT star polymer with a monomer composition according to claim 1 of the main request but using a core-first approach (as taught in D7a). D18 therefore appears to be *prima facie* relevant to the question of inventive step in view of D7a as closest prior art that is pursued in appeal, justifying the admittance of D18 into the proceedings.

3.2 D19 and D20 were filed with the statement of grounds of appeal as a legitimate reaction to the filing of D17 with letter of 18 August 2017, two months prior to the oral proceedings before the opposition division and in response to the importance given to it in the contested decision of the opposition division (section 16.2). D17 was found there to teach the use of a RAFT polymerization instead of an NMP polymerization in the discussion of inventive step in view of D4 as closest prior art. D19 and D20 are filed to support the argument that an NMP polymerization process cannot be readily substituted for a RAFT polymerization process (section 126 of the statement of grounds of appeal). In that regard, D19 and D20 are relevant to the discussion of inventive step in appeal and the Board finds it appropriate to exercise its discretion under Article 12(4) RPBA 2007 (which applies to that situation in view of Article 25(2) RPBA 2020) in admitting D19 and D20 into the appeal proceedings.

3.3 D21 is a declaration submitted by the appellant with letter of 5 December 2018, after the reply to the

statement of grounds of appeal but before the summons to the oral proceedings before the Board. D21 contains a repeat of examples 4A/4B of D4 exactly, i.e. with NMP, and according to the process of the present invention, i.e. with arms-first RAFT. D21 was provided in reply to the criticism of D19 and D20 made by the respondent in the reply to the statement of grounds of appeal according to which D19 and D20 did not accurately repeat the example 4A/4B of D4 (sections 3.2.8.2 and 3.2.8.4 of the reply). D21 was filed at an early stage of the appeal proceedings in direct reply to an issue raised by the respondent and with the purpose of resolving that issue. The admittance of D21 into the proceedings is also not detrimental to the procedural economy of the appeal. Under these circumstances the Board finds it appropriate to exercise its discretion under Article 13(1) RPBA 2020 in admitting D21 into the appeal proceedings.

3.4 D22-D24b were also filed by the parties after the statement of grounds of appeal and the reply thereto and as such the admittance of these documents into the proceedings underlies the provisions of Article 13 RPBA 2020.

3.4.1 D22 was provided with the letter of the appellant of 5 December 2018. Even taking into account the fact that D22 is said to represent background knowledge relating to lubricants, no reason was provided that could explain why D22 could only be filed so late into the proceedings in particular in view of the fact that the question of inventive step addressed by D22 was raised by the opponent in the notice of opposition. Also, the Board does not see in the development of the case in appeal a justification for the admittance of D22 into the appeal proceedings after the statement setting out

the grounds of appeal. On this basis, the Board finds it appropriate to exercise its discretion under Article 13(1) RPBA 2020 by not admitting documents D22 into the appeal proceedings.

3.4.2 D23 is a declaration filed by the appellant with the letter of 29 April 2021, after notification of the summons to oral proceedings and as such its admittance underlies the provisions of Article 13(2) RPBA 2020. It was argued by the appellant that D23 was filed in anticipation of arguments made by the respondent in the proceedings concerning a divisional application of the present case but which had not yet been made by the respondent in the present appeal proceedings (section 22 of the letter of 29 April 2021). It is however not apparent that these arguments have been introduced into the current proceedings. The Board finds therefore that there are no exceptional circumstances referred to in Article 13(2) RPBA 2020 that would justify the admittance of D23 at such a late stage in the present case. D23 is thus not admitted into the proceedings.

3.5 Documents D24a and D24b were filed by the respondent with letter of 25 May 2021 allegedly in reply to the Board's communication (item 10.3.8) expressing doubts as to whether D17 could be seen as suggesting the replacement of an NMP polymerization with a RAFT polymerization in the process disclosed in the closest prior art D4. D24a and D24b were said to provide evidence that the skilled person knew that a RAFT polymerization was a method that still fell within the general definition of the free radical polymerization addressed in D4. However, the question of whether the teachings of D17 relating to the RAFT polymerization could be applied to D4 is not an issue first raised in the communication of the Board but it already

constituted the main point of contention between the parties in the discussion of inventive step in view of D4, as is apparent from the decision of the opposition division (section 16.2) and is also an issue that was addressed by the appellant in their statement setting out the grounds of appeal (sections 137-146) as well as in their letter of 5 December 2018 (sections 65-72). In that regard, any evidence concerning the application of the teaching in D17 relating to RAFT to D4 and in particular to the starting point in D4 disclosing an NMP polymerization could and should have been filed at the outset of the appeal proceedings at the latest. The Board does therefore not find exceptional circumstances as referred to in Article 13(2) RPBA 2020 that would justify the admittance of D24a/b at such a late stage of the appeal proceedings. Under these circumstances, D24a and D24b are not admitted into the proceedings.

4. Inventive step

4.1 The patent-in-suit concerns the production of a lubricating composition which includes the preparation of a star polymer via a reversible addition-fragmentation chain transfer (RAFT) polymerization process as can be derived from the presence of a chain transfer agent containing a thiocarbonyl thio group in the process (claim 1, paragraph 41). In the process of claim 1 of the main request, the "arms" of the star-polymer are formed first in the course of step (1) followed by contacting with the polyvalent coupling agent in a subsequent step (step (2)) to form the star polymer (paragraph 25). The star-polymer defined in operative claim 1 is derived from acrylate monomers.

4.2 D4 and D7/D7a were considered to represent valid starting points for the assessment of inventive step in

the decision of the opposition division (sections 16.1-16.3). The opposition division arrived at the conclusion that claim 1 of auxiliary request 5, which corresponds to claim 1 of the current main request, lacked an inventive step over both D4 and D7/D7a. Moreover both attacks were dealt with in detail by the parties in appeal. The Board therefore needs to address the two attacks separately in order to review the decision.

4.3 D7/D7a as closest prior art

4.3.1 The discussion in view of D7/D7a was based on D7a since it was accepted by the parties that the contents of D7 and D7a were the same. In D7a, examples 1-4 were found to be particularly relevant, these examples disclosing the polymerization of C₁₂₋₁₅ methacrylates by RAFT polymerization and the use of the polymers produced in lubricating oils. It is apparent from the description of examples 1-4 that the polymers produced and added to the lubricant oil are linear copolymers.

4.3.2 As agreed by the parties the process of claim 1 of the main request differs from the process of examples 1-4 of D7a in that claim 1 produces a star-polymer by the arms first method instead of the linear polymers prepared in D7a.

4.3.3 The examples of the patent in suit do not provide a comparison of properties of star-polymers with linear polymers. Such a comparison however is reported in the examples on pages 3-4 of the letter of the appellant dated 20 December 2010. In this data, polymers (examples 1 to 3) prepared according to operative claim 1 were compared to a linear polymer made using RAFT, i.e. effectively in line with the examples of D7a

(comparative example 1). The lubricating compositions of example 1-3 differ from that of comparative example 1 only by the distinguishing features between the claimed invention and D7a, namely a star-polymer instead of a linear polymer. It can be seen from the data reported in the table of page 4 that in order to achieve the same high temperature viscosity, shear stability index and viscosity index a larger quantity of the linear polymer (Treat rate of 16.0 in comparative example 1) versus star-polymer (Treat rate of 9.4 in example 3) is needed. Thus, the thickening efficiency is greater for the star-polymers prepared by the arms-first RAFT process of the present invention than for linear polymers prepared by RAFT. That effect is essentially confirmed in the examples discussed in page 19 of the statement setting out the grounds of appeal (comparison of the treat rates and low temperature brookfield viscosities of examples 3 and 4). No counter-examples were filed by the respondent or are present on file to show that this is not the case.

- 4.3.4 In addition to examples 1-4 of D7a, the appellant also cited a comparison based on example 5 of D7a at the oral proceedings before the Board. The comparison of the viscosity indexes of the lubricating compositions of example 5 of D7a (linear polymer) and of example 3 of the letter of 20 December 2010 showed, according to the appellant, that the process according to operative claim 1 would lead to lubricating composition with improved viscosity indexes. However, the compositions cited in D7a and in the supplementary examples of 20 December 2010 were produced under different conditions. Under these circumstances, it cannot be concluded from that comparison that any effect observed is attributable to the production of a star-polymer over a

linear polymer.

- 4.3.5 It follows from the above that the problem starting from D7a is the provision of lubricating compositions with an improved thickening efficiency by a comparable balance of shear stability index and viscosity index.
- 4.3.6 D7a is primarily concerned with linear copolymers, as is apparent from the examples which all relate to linear copolymers. There is in the examples of D7a no motivation to produce star-polymers from these linear polymers. The respondent found however that D11 was relevant in that regard.
- 4.3.7 D11 concerns oil-soluble additives having both dispersant and viscosity index (VI) improving properties (column 1, lines 30-56) obtained from star-polymers prepared in an arms-first fashion using a polyalkenyl coupling agent (column 2, lines 18-30). The polymer arms are living polymers obtained by polymerizing one or more conjugated dienes (column 2, lines 54-58). The process of polymerization mentioned in D11 and used in its example is the anionic polymerization (column 2, line 35-39; and illustrative embodiment I) which is a different process from the RAFT polymerization of the patent in suit.
- 4.3.8 The dispersant viscosity index improvers of D11 are said to possess excellent viscosity improving properties, oxidative stability, mechanical shear stability, and dispersancy (column 1, lines 62-65). With regard to their properties, the respondent cited the passage in column 6, lines 19-26 which teaches that the greater number of arms of the star-polymer employed in the invention of D11 significantly improved the thickening efficiency and the shear stability of the

polymer since it was then possible to prepare a viscosity index improver having a high molecular weight (resulting in increased thickening efficiency) without the necessity of excessively long arms (resulting in improved shear stability). It is however apparent that this teaching relating to the improvement of properties resulting from a greater number of arms of the star-polymer is made in the context of the invention of D11 (see "in the instant invention" in the cited paragraph), which concerns lubricants produced by anionic polymerization of conjugated dienes. It cannot be derived from D11 that the teaching in column 6, lines 19-26 would also apply to other star-polymers derived from methacrylates as disclosed in the closest prior art D7a and the patent in suit. The Board finds that the passage in column 6, lines 19-26 of D11 is to be read in the context of the polymers produced in D11 only and as such does not represent a common general knowledge applicable to the polymers of the closest prior art D7a. There would therefore be no motivation starting from D7a concerning methacrylate linear polymers to first consult D11 relating to a different type of polymers and polymer process and then to use its teaching made in the context of these polymers in the process of D7a.

- 4.3.9 Starting from the examples 1-4 of D7a as closest prior art and also taking into consideration document D11 the Board concludes that the skilled person would not have arrived at the subject-matter of operative claim 1 in order to solve the problem posed. Operative claim 1 therefore involves an inventive step starting from D7a as closest prior art.

4.4 D4 as closest prior art

4.4.1 D4 relates to a free radical process for preparing radial polymers comprising at least 3 arms (claim 1) and lubricating oil compositions including such polymers (column 1, lines 9-12). In that regard, D4 is not an unreasonable starting point for the assessment of inventive step since as in the patent in suit, that document pertains to the preparation of star-polymers for lubricating compositions, that is D4 addresses the same general application as the patent in suit and is in the same technical field.

4.4.2 The starting point chosen within D4 in the decision under appeal and in the analysis of both parties was example 4B disclosing the preparation of a radial polymer from polymer arms prepared in example 4A (Section 16.2 of the contested decision; D4, column 16, line 50 - column 17, line 9). The preparation in example 4A is based on a monomer composition comprising styrene and C₁₂₋₁₅ methacrylate mixed with TEMPO, a chain transfer agent used in nitroxide-mediated radical polymerization processes (NMP polymerization). That polymerization process is different from the RAFT polymerization performed with a chain transfer agent containing a thiocarbonyl thio group and a free radical leaving group as defined in step (1) according to operative claim 1. The type of polymerization used in the preparation of the arms of the polymer is thus a distinguishing feature of operative claim 1 over D4.

4.4.3 The appellant saw a further difference in the amount of styrene in the composition as the formulation of operative claim 1 with respect to the presence of styrene "(c) optionally containing less than 20 wt.-% styrene" would mean that operative claim 1 limited the

maximum amount of styrene. The formulation used to defined option (c) in the polymer mix of operative claim 1 and introduced by the term "optionally" is however ambiguous since taken literally, it also means that the presence of (c) in the monomer mixture including the limitation of its quantity is optional. In that regard, the Board finds that since the formulation chosen for option (c) is ambiguous in operative claim 1, it should, in accordance with the constant case law of the Boards of Appeal, be given its broadest technical meaning which is that feature (c) is simply optional in operative claim 1 and therefore not limitative. It follows from that reading of operative claim 1 that the amount of styrene in the composition is not a further distinguishing feature.

- 4.4.4 The patent in suit does not contain examples showing an effect resulting from the use of a RAFT polymerization according to operative claim 1 instead of an NMP polymerization as in example 4A of D4 to prepare the arms of a star-polymer. To that effect, the appellant submitted further experimental reports (D18-D21). Among these, D21 contains a rework of examples 4A and 4B of D4 using an NMP polymerization (experiment (i)) to prepare polymer arms from a monomer composition based on styrene and lauryl methacrylate and the polymer arms are further reacted to form a star-polymer. In experiment (ii) of D21 a RAFT polymerization of an identical monomer composition was used to prepare the polymer arms of a star polymer with a process analogous to that of operative claim 1. Table 1 of D21 shows that the star-polymers produced from the polymer arms prepared in experiment (i) (NMP polymerization) and in experiment (ii) (RAFT polymerization) differ in their thickening properties. The star-polymer issued from the RAFT polymerization (experiment (ii)) has a higher

increase in thickening efficiency relative to the linear polymers (69.30%) than the star-polymer issued from the NMP polymerization according to D4 (17.10%).

- 4.4.5 It was held by the respondent that the effect shown in D21 was not relevant since the experiments carried out in that document would not accurately correspond to the process of examples 4A/4B of D4. In particular, the experiments in D21 would not disclose all the steps disclosed in D4 (made use of lauryl methacrylate instead of C₁₂₋₁₅ methacrylate and the process did not include the addition of hydrotreated naphthenic oil (Risella G-07, 40N) followed Risella G-07 oil. Furthermore, the description of D21 did not mention a reaction under nitrogen gas atmosphere, a temperature of 143°C after the last addition of t-butyl peroxide, the number and weight average molecular weights of the polymer arms and the continuous mixing of the materials in the formation of the core polymer.
- 4.4.6 As the respondent pointed out in their letter of 7 November 2019 (point 6 on pages 4/5), the description of the rework of examples 4A/4B in D21 does not exactly correspond to the disclosure in D4. While point 4 of D21 concerning experiment (i) indicates that examples 4A/B of D4 were repeated, some details of the process of D4 are not mentioned in D21. In that regard however, the respondent listed the differences between the process described in experiment (i) of D21 and that of examples 4A/4B of D4 without showing that any of these differences would actually have a bearing on the products obtained in D21. In particular, it has not been shown that any of the alleged differences between the rework of D21 and examples 4A/4B according to D4 was such that the rework of D21 could no longer be seen as being a fair representation of the closest prior art

D4. With regard to the presence of an effect, it is paramount that that effect is demonstrated by means of truly comparable results within the experimental evidence contained in D21. Experiments (i) and (ii) of D21 differ from one another only in the use of an NMP polymerization and a RAFT polymerization, the polymer arms in experiment (ii) being made so that a similar molecular weight as that of experiment (i) is obtained. The comparison of the properties of the star-polymers resulting from experiments (i) and (ii) in D21 is thus valid to show that any measured effect actually resulted from the type of polymerization process used to make the polymer arms. Under these circumstances, the Board finds that D21 offers sufficient evidence to support a comparison with the use of an NMP polymerization according to the closest prior art D4.

- 4.4.7 D19 and D20 were also addressed by the appellant in support of an effect over D4. As the effect claimed by the appellant is already established on the basis of D21, the Board does not find it necessary to analyse this evidence in any further detail.
- 4.4.8 On the basis of the effect established in D21, the problem can be formulated as the provision of a process for preparing a lubricating composition with improved thickening efficiency properties.
- 4.4.9 D4 does not suggest the preparation of polymer arms with a RAFT polymerization performed with a chain transfer agent containing a thiocarbonyl thio group and a free radical leaving group. While the process according to claim 1 of D4 is generally directed to free radical polymerization processes for the preparation of the polymer arms, which include RAFT polymerization, D4 does not mention RAFT polymerization

specifically nor a chain transfer agent containing a thiocarbonyl thio group and a free radical leaving group according to operative claim 1. Also, the preparation of the polymer arms in all the examples of D4 involves a different chain transfer agent, TEMPO (2,2,6,6-tetramethyl-1-piperidinyloxy), which implies that an NMP polymerization was used. The skilled person therefore would have had no motivation on the basis of D4 alone to consider the use of a thiocarbonyl thio group and a free radical leaving group according to operative claim 1 in order to solve the posed problem.

4.4.10 D17 was also found to be relevant by the respondent. D17 concerns the preparation of polymers from methacrylate monomers by free radical processes and in particular by a RAFT polymerization involving a thiocarbonylthio compound as chain transfer agent (pages 293/294). The mechanism of the RAFT polymerization is described as an effective way of polymerizing methacrylates homo and copolymers (pages 295-298). While D17 suggests that the RAFT polymerization is a versatile polymerization, it does not specifically address the advantages of the RAFT polymerization over the NMP polymerization and it does not contain a teaching that would have motivated the skilled person to replace the NMP polymerization used to prepare polymer arms in D4 by a RAFT polymerization in order to solve the posed problem, all the more as D17 does not concern lubricating compositions.

4.4.11 In that regard, the mention on page 293 that NMP processes had less utility does not constitute a motivation to change the nature of the whole process used in example 4A/4B of D4, which is performed on a specific mixture of monomers, by a RAFT process which was not shown to be workable with the same monomer

mixture straight away.

- 4.4.12 Also, the indication that star polymers can be obtained by the RAFT process shown in D17 only concerns the core first method (page 302) and does not mention the arms first method followed in the patent in suit. In that regard, the Board does not find that the teaching of D17 would have rendered obvious the object of operative claim 1 when aiming at solving the posed problem. Operative claim 1 therefore involves an inventive step starting from D4 as closest prior art also when taking into consideration the teaching of D17.
5. As all the grounds for revocation in the decision under appeal and all the objections of the respondent are not found successful, the decision under appeal is to be set aside and the opposition is to be rejected.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The opposition is rejected.
3. The request for reimbursement of the appeal fee is rejected.

The Registrar:

The Chairman:



B. ter Heijden

D. Semino

Decision electronically authenticated