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**Datasheet for the decision
of 27 November 2014**

Case Number: T 2249/10 - 3.3.03

Application Number: 04026096.0

Publication Number: 1655335

IPC: C08L23/04, C08L23/06, C08F10/02

Language of the proceedings: EN

Title of invention:
Polymer composition for injection molding

Patent Proprietor:
Borealis Technology Oy

Opponents:
Ineos Sales (UK) Limited
THE DOW CHEMICAL COMPANY

Headword:

Relevant legal provisions:
EPÜ Art. 83
EPC Art. 123(2)

Keyword:
Combination of parameters - sufficiency of disclosure (no) -
(main and first to fifth auxiliary requests)
Amendments extend beyond the content of the application as filed (yes) (sixth and seventh auxiliary requests)

Decisions cited:

Catchword:



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Case Number: T 2249/10 - 3.3.03

**D E C I S I O N
of Technical Board of Appeal 3.3.03
of 27 November 2014**

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 29 September
2010 revoking European patent No. 1655335
pursuant to Article 101(3) (b) EPC.**

Composition of the Board:

Chairwoman	B. ter Laan
Members:	F. Rousseau
	C. Vallet

Summary of Facts and Submissions

- I. The appeal by the patent proprietor (appellant) lies from the decision of the opposition division posted on 29 September 2010 revoking European patent No. 1 655 335, based on application No. 04 026 096.0.
- II. Two notices of opposition against the patent had been filed in which revocation of the patent on the grounds of Article 100(a) EPC for lack of novelty as well as lack of an inventive step (opponents 01 and 02) and Article 100(b) EPC (opponent 02) was requested. The following documents were cited in the course of the opposition proceedings:
- D1: WO 2005/121238
D2: EP-A-1 201 713
D7: WO 02/36678 and
D15: "Mold Shrinkage", Equistar Technical Tip; Tech.Topic, 7972J/0301.
- III. The impugned decision was based on the patent as granted as main request, and four auxiliary requests.
- IV. Claim 2 of the patent as granted read as follows:
2. A polyethylene composition having a base resin, the base resin comprising
- (A) a first polyethylene fraction, and
(B) a second polyethylene fraction,
- wherein the melt flow rate $MFR_{5/190^{\circ}C}$ of the first fraction is higher than the melt flow rate $MFR_{5/190^{\circ}C}$ of the second fraction, the polyethylene composition has a

spiral flow length of 55 cm or less and a transverse middle shrinkage of 1.1 % or less.”

V. The fourth auxiliary request contained one claim reading as follows:

“1. An injection moulded pipe fitting comprising a polyethylene composition having a base resin, the base resin comprising

- (A) a first polyethylene fraction being an ethylene homopolymer, and
- (B) a second polyethylene fraction,

wherein the melt flow rate $MFR_{5/190^{\circ}C}$ of the first fraction is higher than the melt flow rate $MFR_{5/190^{\circ}C}$ of the second fraction, the flow rate ratio $FRR_{21/5}$ of the polyethylene composition, defined as the ratio of melt flow rate $MFR_{21.6/190^{\circ}C}$ to melt flow rate $MFR_{5/190^{\circ}C}$, is within the range of 15-28, the melt flow rate $MFR_{5/190^{\circ}C}$ of the polyethylene composition is within the range of 0.5-1.1 g/10 min, the composition has a shear thinning index (SHI), defined as the ratio of viscosity at a shear stress of 2.7 kPa to viscosity at a shear stress of 210 kPa, within the range of 10-60, and a viscosity η at a shear stress of 747 Pa of 300 kPa*s or less.”

VI. According to the contested decision, the subject-matter of the main request as well as that according to the first to third auxiliary requests had not been disclosed in a manner sufficiently clear and complete for it to be carried out by a skilled person, since the test method for measuring the transverse middle shrinkage was insufficiently disclosed with respect to the thickness of the samples to be tested. The opposition division was satisfied that the claims of

the fourth auxiliary request met the requirements of Articles 123(2), 84 and 83 EPC, but found that they lacked novelty over each of D1, D2 and D7. It was held in particular that the values of $FRR_{21/5}$ and $MFR_{5/190^{\circ}C}$ disclosed in those documents that were in accordance with claim 1 of the fourth auxiliary request necessarily implied values of $SHI_{2.7/210}$ and η_{747Pa} also as defined in that claim.

VII. On 5 November 2010 the patent proprietor (appellant) lodged an appeal against the above decision, the prescribed fee being paid on the same day. With the statement setting out the grounds for the appeal, submitted with letter of 8 February 2011, the appellant submitted inter alia document D19 (statement of Mr. Bäckman on SHI and FRR), as well as a main and seven auxiliary requests. Those requests contained in particular the following claims:

Main Request

"1. A polyethylene composition having a base resin, the base resin comprising

(A) a first polyethylene fraction, and

(B) a second polyethylene fraction,

wherein the melt flow rate $MFR_{5/190^{\circ}C}$ of the first fraction is higher than the melt flow rate $MFR_{5/190^{\circ}C}$ of the second fraction, the polyethylene composition has a spiral flow length of 55 cm or less and a transverse middle shrinkage of 1.1 % or less.

2. The polyethylene composition according to claim 1, wherein the flow rate ratio $FRR_{21/5}$ of the polyethylene

composition, defined as the ratio of melt flow rate $MFR_{21.6/190^{\circ}C}$ to melt flow rate $MFR_{5/190^{\circ}C}$ is within the range of 15-28.

3. The polyethylene composition according to claim 1 or 2, wherein the melt flow rate $MFR_{5/190^{\circ}C}$ of the polyethylene composition is within the range of 0.5-1.1 g/10 min.

4. The polyethylene composition according to any of the preceding claims, wherein the flow rate ratio $FRR_{21/5}$ is within the range of 20-26.

5. The polyethylene composition according to any of the preceding claims, wherein the melt flow rate $MFR_{5/190^{\circ}C}$ of the polyethylene composition is within the range of 0.65-0.85 g/10 min.

6. The polyethylene composition according to any of the preceding claims, wherein the composition has a shear thinning index (SHI), defined as the ratio of viscosity at a shear stress of 2.7 kPa to viscosity at a shear stress of 210 kPa, within the range of 10-60.

7. The polyethylene composition according to claim 6, wherein the shear thinning index is within the range of 15-40.

8. The polyethylene composition according to any of the preceding claims, wherein the composition has a viscosity η at a shear stress of 747 Pa of 300 kPa*s or less.

24. An injection moulded pipe fitting comprising a polyethylene composition having a base resin, the base resin comprising

(A) a first polyethylene fraction being an ethylene homopolymer, and

(B) a second polyethylene fraction,

wherein the melt flow rate $MFR_{5/190^{\circ}C}$ of the first fraction is higher than the melt flow rate $MFR_{5/190^{\circ}C}$ of the second fraction, the flow rate ratio $FRR_{21/5}$ of the polyethylene composition, defined as the ratio of melt flow rate $MFR_{21.6/190^{\circ}C}$ to melt flow rate $MFR_{5/190^{\circ}C}$, is within the range of 15-28, the melt flow rate $MFR_{5/190^{\circ}C}$ of the polyethylene composition is within the range of 0.5-1.1 g/10 min, the composition has a shear thinning index (SHI), defined as the ratio of viscosity at a shear stress of 2.7 kPa to viscosity at a shear stress of 210 kPa, within the range of 10-60, and a viscosity η at a shear stress of 747 Pa of 300 kPa*s or less."

1st Auxiliary Request

Claim 24 of the first auxiliary request corresponded to claim 24 of the main request, in which the base resin of the polyethylene composition comprised in the injection moulded pipe fitting had been further characterized as having a density within the range of 0.945 to 0.952 g/cm³.

2nd Auxiliary Request

"1. A polyethylene composition having a base resin, the base resin comprising

(A) a first polyethylene fraction, and

(B) a second polyethylene fraction,

wherein the melt flow rate $MFR_{5/190^{\circ}C}$ of the first fraction is higher than the melt flow rate $MFR_{5/190^{\circ}C}$ of the second fraction, the polyethylene composition has a spiral flow length of 42 cm or more and 55 cm or less and a transverse middle shrinkage of 1.1 % or less.

The wording of claims 2 to 8 was identical to that of claims 2 to 8 of the main request.

14. The polyethylene composition according to any of the preceding claims, wherein the first polyethylene fraction (A) is an ethylene homopolymer"

3rd Auxiliary Request

Claim 1 of the 3rd Auxiliary Request has the same wording as claim 24 of the Main Request.

4th Auxiliary Request

Claim 1 of the 4th Auxiliary Request has the same wording as claim 24 of the 1st Auxiliary Request.

5th Auxiliary Request

Claim 1 of the 5th Auxiliary Request corresponds to claim 24 of the Main Request, in which the composition has been further characterized as having a spiral flow length of 52.5 cm or less and of 42 cm or more.

6th and 7th Auxiliary Requests

The 6th and 7th auxiliary requests contain the same claim 1 which reads as follows:

"1. A polyethylene composition having a base resin comprising

(A) a first polyethylene fraction,

(B) a second polyethylene fraction, and

(C) a prepolymer fraction being an ethylene homopolymer in an amount of up to 20 wt% of the total base resin,

wherein the melt flow rate $MFR_{5/190^{\circ}C}$ of the first fraction (A) is higher than the melt flow rate $MFR_{5/190^{\circ}C}$ of the second fraction (B), the flow rate ratio $FRR_{21/5}$ of the polyethylene composition, defined as the ratio of melt flow rate $MFR_{21.6/190^{\circ}C}$ to melt flow rate $MFR_{5/190^{\circ}C}$, is within the range of 20-28, the melt flow rate $MFR_{5/190^{\circ}C}$ of the polyethylene composition is within the range of 0.5-1.1 g/10 min and the weight ratio of the first polyethylene fraction (A) to the second polyethylene fraction (B) is (42-58) : (58-42)."

VIII. Rejoinders to the statement of grounds of appeal were received with letter of 4 August 2011 (respondent 1 / opponent 1) and letter of 26 August 2011 (respondent 2 / opponent 2).

IX. In a communication by the Board dated 21 October 2014 issued in preparation of the oral proceedings, it was questioned whether the patent in suit provided sufficient information to enable the skilled person to obtain a polyethylene composition having the combination of the $FRR_{21/5}$, $MFR_{5/190^{\circ}C}$, $SHI_{2.7/210}$ and η_{747Pa} as defined in claim 24 of the main request.

- X. Further submissions by respondent 2 and the appellant were made with letters of 29 October 2014 and 31 October 2014, respectively.
- XI. Oral proceedings were held before the Board on 27 November 2014, at the end of which the decision was announced.
- XII. The appellant's arguments relevant for the present decision may be summarized as follows:
- a) Even if polyethylene composition had flow rate ratio $FRR_{21/5}$ and melt flow rate $MFR_{5/190^{\circ}\text{C}}$ values falling within the ranges now being claimed, that did not mean that the $SHI_{2.7/210}$ of that composition also fell with the range of 10-60. From $FRR_{21/5}$ values no conclusion could be drawn regarding $SHI_{2.7/210}$ values, as there was no simple relationship between those two parameters. Reference was made in this respect to D19. Novelty over each of D1, D2 and D7 was therefore given.
 - b) It was clear from the description of the patent as well as from general common knowledge that for obtaining a polyethylene composition according to claim 1 of the main request a person skilled in the art had to adjust the melt flow rates, the flow rate ratio and the rheological properties such as shear thinning index and viscosity at a shear stress of 747 Pa for obtaining a composition with a certain flowability, molecular weight distribution and weight average molecular weight.
 - c) The main flow rate $MFR_{5/190^{\circ}\text{C}}$ and the viscosity η at a shear stress of 747 Pa defined in claim 24 of the main request were mainly influenced by the

molecular weight of the polyethylene composition, whereas the flow rate ratio $FRR_{21/5}$ and the shear thinning index $SHI_{2.7/210}$ (SHI) related to its molecular weight distribution. Therefore, the skilled person had merely to adjust the molecular weight and the molecular weight distribution of the polyethylene composition in order to obtain a pipe fitting according to claim 24. The adjustment of both properties belonged to the skilled person's common general knowledge and could without difficulty be done by modifying the hydrogen concentration during polymerisation and selecting an appropriate catalyst, respectively.

In that respect, the examples and comparative examples of the patent in suit showed that by increasing the hydrogen/ethylene ratio, the $MFR_{5/190^{\circ}C}$ of the resulting polyethylene composition increased while the viscosity η_{747Pa} decreased as a consequence of a lower molecular weight of the polyethylene composition.

The examples showed that by using a catalyst known to provide compositions with a narrow molecular weight distribution, the resulting compositions showed a lower $FRR_{21/5}$ and SHI than compositions prepared with a catalyst known to provide compositions with a broader molecular weight distribution.

The compositions prepared in the examples contained additives. However, those additives did not influence the parameters defined in claim 24 as was shown for example when comparing the

MFR_{5/190°C} of the base resin and that of the final composition comprising the additives.

As to the nature of the catalyst, there was a clear teaching in the contested patent which catalysts were preferably used, a more preferred one being a Ziegler-Natta catalyst. Once a catalyst was selected, it was easy to change the conditions in the reactors so as to achieve the parameters as defined in claim 24.

Therefore, the examples and the patent specification provided sufficient guidance to obtain a pipe fitting as defined in operative claim 24 or to modify the polyethylene composition of a pipe fitting falling outside claim 24 so as to make it fall inside the claim.

- d) Claim 1 and claim 24 covered different aspects of the invention described in the patent in suit. It was therefore incorrect to assume that the subject-matter of claim 1 was achieved by providing a polyethylene composition that satisfied the parameters defined in claim 24. In that respect, it was noted for instance that the MFR_{5/190°C} values mentioned in the contested patent in relation to the invention defined in claim 1 did not match the range defined in claim 24.
- e) For those reasons, the subject-matter of claim 24 of the main request was sufficiently disclosed within the meaning of Article 83 EPC.
- f) The arguments in respect of the main request for sufficiency of disclosure were also valid for the first to fifth auxiliary requests.

- g) As to the sixth auxiliary request, claim 1 corresponded to claim 1 as filed amended by limiting the $FRR_{21/5}$ of the polyethylene composition to the range of 20-28, introducing the mandatory presence of a third polymer fraction (prepolymer fraction (C)) which is an ethylene homopolymer present in the base resin in an amount of up to 20 wt%, and specifying that the weight ratio of the first polyethylene fraction (A) to the second polyethylene fraction (B) was (42-58): (58-42). Support for these amendments could be found on page 9, lines 20-21, page 6, lines 6-8, page 15, lines 5-9, and from page 11, line 22 to page 12, line 1 of in the application as filed. For those reasons, claim 1 of the sixth auxiliary request satisfied the requirements of Article 123(2) EPC. The same was valid for claim 1 of the seventh auxiliary request as its wording was identical to claim 1 of the sixth auxiliary request.

XIII. The respondents' arguments relevant for the present decision may be summarized as follows:

- a) Statement D19 confirmed that resins having a $FRR_{21/5}$ in the range of 15-28 had an SHI inside the claimed range of 10-60. Accordingly, D19 merely confirmed that claim 24 of the main request was anticipated by D1.
- b) The description and the examples were lacking any guidance as to how to achieve the combination of parameters as defined in claim 24 of the main request or to transform a material that was not covered by claim 24 into a material covered by

that claim. There was no evidence on file of any simple relationship between the different parameters characterizing the composition of the pipe fittings. The absence of a simple relationship between SHI and $FRR_{21/5}$ had been outlined by the appellant with D19. In addition, it was incorrect to assume, on the basis of the examples, that the combination of the four parameters could be easily achieved by merely selecting the catalysts and adjusting the hydrogen concentration during polymerization.

As to the influence of the catalyst, it was noted that the catalyst referred to in the comparative examples was also described as being advantageous for achieving compositions according to the invention (paragraph [0118]). This was in contradiction with the appellant's statement according to which the contested patent gave a clear guidance about the catalysts to be used in order to obtain a material according to claim 24.

For those reasons, claim 24 of the main request did not satisfy the requirements of Article 83 EPC.

- c) The broadness of claim 1 was not commensurate with the teaching provided in the contested patent. It covered all polyethylene compositions satisfying the requirements in terms of spiral flow and shrinkage as defined in claim 1, while the patent was silent on any technical concept fit for generalization enabling the skilled person to achieve the desired result without undue difficulty. As to the factors governing the polyethylene composition's shrinkage, it could not

be inferred from the contested patent that merely the molecular weight and molecular weight distribution had to be fine-tuned in that respect.

- d) The subject-matter defined in claim 1 was merely achieved by providing a composition satisfying the parameters set in claim 24. Since said composition was not sufficiently disclosed, claim 1 did not meet the requirements of Article 83 EPC either.
- e) The same arguments were valid for the first to fifth auxiliary requests so that those, too, did not comply with Article 83 EPC.
- f) As regards the sixth auxiliary request, the application as filed did not disclose the combination of a prepolymer fraction that was an ethylene homopolymer in an amount up to 20%, a $FRR_{21/5}$ of 20-28, and a weight ratio of the first polyethylene fraction (A) to the second polyethylene fraction (B) of (42-58):(58-42) as defined in claim 1. Therefore, claim 1 of the sixth auxiliary request did not meet the requirements of Article 123(2) EPC.
- g) Claim 1 of the 7th auxiliary request was the same as claim 1 of the 6th auxiliary request. Therefore the same objections also applied.

XIV. The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request or alternatively on the basis of one of the first to seventh auxiliary requests all filed with the statement of grounds of appeal.

XV. The respondents requested the dismissal of the appeal.

Reasons for the Decision

1. The appeal is admissible.

Main Request

Sufficiency of disclosure

2. The question to be answered when assessing sufficiency of disclosure of the injection moulded pipe-fitting of claim 24 of the main request, is whether it is possible to prepare substantially all polyethylene compositions meeting the parametric definition required by that claim. In particular, the question arises whether a person skilled in the art has sufficient information in the patent in suit and/or based on his general knowledge to obtain polyethylene compositions meeting the combination of a flow rate ratio $FRR_{21/5}$ within the range of 15-28 and a shear thinning index ($SHI_{2.7/210}$) within the range of 10-60.
 - 2.1 According to the patent in suit, both the $FRR_{21/5}$ and the $SHI_{2.7/210}$ relate to the molecular weight distribution of the polyethylene composition. According to paragraph [0024] decreasing values for $FRR_{21/5}$ indicate a decreasing width of the molecular weight distribution. According to paragraph [0040], the shear thinning gets more pronounced the broader the molecular weight distribution is.
 - 2.2 According to the statement in D19 by one of the inventors of the patent in suit, "SHI is a rheological measurement of the molecular weight distribution by means of a plate-plate (...) Rheometer (as described in EP1655335) the measurement relation is covering a very

large part of the viscosity curve (...) and hence has a good relation to the molecular weight distribution. The reason is that the lower the shear rate the bigger the influence of the high molecular weight portion and the higher the shear rate the bigger the influence from the low molecular weight part, meaning that to get as accurate picture as possible means that as big as possible range should be chosen. Contrary to this, the $FRR_{21/5}$ is covering a much smaller portion of the viscosity curve and the lowest shear rate is considerably higher than the lower shear rate point in the plate-plate measurement. On top of this the FRR is a rheological measurement using a capillary measurement principal. That means that FRR is a less accurate rheological estimation of MWD and also added that other structural factors may come into play." In other words, the ratio $FRR_{21/5}$ covers a much narrower range on the viscosity curve than does the ratio $SHI_{2.7/210}$ and is a less accurate estimation of the molecular weight distribution than that on the basis of the complex viscosities.

- 2.3 The absence of a simple relation between $FRR_{21/5}$ and $SHI_{2.7/210}$ was argued by the appellant and is also shown by the measurements carried out on a variety of commercial resins or previously commercial resins the results of which are reported in D19. Measurements on the polyethylene resins "ME3440", "HE3494-FL" and "HE2470", indicated as bimodal, give $FRR_{21/5}$ values of 27,0, 26,0 and 26,5 respectively, whereas the corresponding $SHI_{2.7/210}$ exhibits values of 32,5, 50 and 37 respectively. The bimodal polyethylene resins "HE3490-LS" and "PE100-pilot" have $FRR_{21/5}$ values of 38,0 and 38,6, whereas their $SHI_{2.7/210}$ values are 61 and 94, respectively. The absence of a simple relationship

between $FRR_{21/5}$ and $SHI_{2.7/210}$ is also confirmed by examples 1 and 2 and comparative examples 1 and 2 of the patent in suit.

- 2.4 Hence, the appellant's argument (brought forward in relation to novelty) that a polyethylene composition having a $FRR_{21/5}$ and a melt flow rate $MFR_{5/190^{\circ}C}$ within the presently claimed ranges does not necessarily also have the shear thinning index ($SHI_{2.7/210}$) within the claimed value, can be accepted.
- 2.5 It follows from the above that it is not sufficient to find a method for preparing a polyethylene composition having a molecular distribution that would result either in the required $FRR_{21/5}$ or the required $SHI_{2.7/210}$ values, but that it is necessary to find specific conditions to prepare the polyethylene composition meeting both parameters.
3. The patent in suit does not provide any explicit indication of the measures that have to be taken in order to achieve the combination of $FRR_{21/5}$ and $SHI_{2.7/210}$ values defined in the present claims. Apart from the combination of dependent claim 7 with either independent claim 1 or independent claim 2 of the patent in suit, examples 1 and 2, as well as comparative examples 1 and 2 are the only instances in the patent in suit concerning compositions defined by a combination of $SHI_{2.7/210}$ and $FRR_{21/5}$. Whereas the polyethylene compositions of examples 1 and 2 concern a combination of $SHI_{2.7/210}$ and a $FRR_{21/5}$ values as defined in present claim 24, the compositions of comparative examples 1 and 2 do not.

3.1 The appellant referred to the steps of the preparatory method defined in claims 16 to 19 of the patent in suit in order to explain which measures the skilled person should take to obtain the combination of $SHI_{2.7/210}$ and $FRR_{21/5}$ values defined in present claim 24. Those steps are however very generally described. In their most detailed form they consist of the polymerisation in a loop reactor of ethylene monomers and optionally one or more alpha-olefin comonomers in the presence of a Ziegler-Natta catalyst to obtain a first ethylene homo- or copolymer fraction (A), a second ethylene homo- or copolymer fraction (B) having a higher average molecular weight than fraction (A) being obtained in a gas phase reactor by polymerizing ethylene monomers and optionally one or more alpha-olefin comonomers in the presence of a Ziegler-Natta catalyst and the polymerization product of the first step, said process comprising before the polymerization step in the loop reactor a prepolymerisation step. These steps, however, are not specific for the method of the patent in suit as they have been also employed for comparative examples 1 and 2 of the patent in suit. They can therefore not serve as sufficient support for distinguishing a process for obtaining the combination of values defined in present claim 1 from a process that does not result in the claimed values.

3.2 A comparison of the process measures recommended for providing the polyethylene composition of the patent in suit with the process measures used in comparative examples 1 and 2 does not provide any indication on the measures or process steps leading to the values defined in claim 24, in particular does it not give any clue as to what should be changed in comparative examples 1 and 2 in order to arrive at the composition used in claim 24.

- 3.2.1 Concerning the type of Ziegler-Natta catalyst to be used in the process method of the invention, additional information is provided in paragraphs [0067] and [0068] of the specification. In paragraph [0068] reference is made to to EP 0 688 794 for the preparation of the catalyst that is preferably used. However, that same type of Ziegler-Natta catalyst is also used in comparative examples 1 and 2 (paragraphs [0118] and [0121]). Therefore, a difference in catalyst cannot be the reason why in comparative examples 1 and 2 the combination of $FRR_{21/5}$ and $SHI_{2.7/210}$ values defined in claim 24 of the main request is not achieved.
- 3.2.2 Furthermore, not only in the examples according to the patent in suit but also in the comparative examples the other measures recommended in the specification for the production of a polyethylene composition in accordance with claim 24 are used. Those measures concern the choice of a two step polymerisation, each with specific polymerisation conditions (temperature, pressure, content of hydrogen), the type and amount of comonomer (paragraphs [0089] and [0090]), the regulation of the molecular weight of the polymer produced in each step (paragraphs [0070], [0071] and [0088]), of the weight fraction of the first and second fraction (paragraph [0046]), as well as the choice of the density of the base resin (paragraph [0048]).
- 3.3 In the presence of only two examples and the comparatively large number of process measures and conditions indicated for those examples that may influence the molecular weight distribution and the resulting parametric values $FRR_{21/5}$ and $SHI_{2.7/210}$, it is also not possible for the skilled person, on the basis of those examples and the general description of the

process steps indicated above, to detect a more specific teaching for the above mentioned general preparatory method that would enable to achieve the specific combination of $FRR_{21/5}$ and $SHI_{2.7/210}$ defined in claim 24.

3.4 Moreover, a comparison of the various process measures or conditions defined on the one side in examples 1 and 2 and on the other side in comparative examples 1 and 2 does not provide any information on the influence of any particular measure or condition favourable to obtain the combination of $FRR_{21/5}$ and $SHI_{2.7/210}$ values of claim 24, because several conditions were varied between any of those examples and comparative examples. It has also to be considered that the polyethylene compositions of those examples and comparative examples contain additional compounds in addition to the base resin - as shown in Table 2 by a difference in density between the various final polyethylene compositions and their respective base resins -, which was confirmed by the appellant. However, the nature of those additional compounds and their amounts are unknown, which renders a comparison between the process conditions and the parameters of the final compositions even more difficult. In this respect, the data provided in Tables 1 and 2 in particular for Example 2 regarding the base resin and the final composition comprising the additives demonstrate that additives can have an effect on $MFR_{5/190^{\circ}C}$ that may not always be neglected.

3.5 In view of the above, the skilled person is not in a position to identify, within the general instructions provided in the patent in suit, the specific conditions necessary to obtain a base resin with a molecular weight distribution resulting in a polyethylene resin composition meeting both the $FRR_{21/5}$ and $SHI_{2.7/210}$

conditions specified in claim 24 of the main request. There are also no sufficient instructions regarding the measures to be taken in case of a failure, i.e. what to change in case the $FRR_{21/5}$ or $SHI_{2.7/210}$ value of the polyethylene does not satisfy the requirements of claim 24.

- 3.6 The appellant also did not indicate any relevant general knowledge that might enable the skilled person to select appropriate conditions for preparing a base resin resulting in a polyethylene resin composition meeting both the $FRR_{21/5}$ and $SHI_{2.7/210}$ conditions specified in claim 24 of the main request.
4. Therefore the patent does not disclose a technical concept fit for generalisation that makes available to the skilled person the polyethylene compositions necessary for preparing the injection moulded pipe fitting of claim 24. Under these circumstances, it is concluded that the person skilled in the art is left on his own to find out which sets of process conditions enable him to meet the requirements set out in claim 24, which amounts to an undue burden. Thus, pursuant to Article 83 EPC , the patent cannot be maintained on the basis of the main request.

First Auxiliary Request

5. Compared to claim 24 of the main request, claim 24 of the first auxiliary request requires that the base resin has a density within the range of 0.945 to 0.952 g/cm³, in line with the general teaching of the patent in suit, which however, as shown above, is not sufficient to enable the skilled person to obtain the injection moulded pipe fitting according to claim 24 of the main request. Hence, the reasons given in

connection with the main request equally apply to the first auxiliary request so that the patent cannot be maintained in that form either.

Second Auxiliary Request

6. Claim 1 of the second auxiliary request defines a polyethylene composition having a base resin, amongst other things being characterized by a spiral flow length of 42 cm or more and 55 cm or less and a transverse middle shrinkage of 1.1 % or less. Dependent claims 2, 3, 6, 8 and 14, each referring to any of the preceding claims, define more precisely specified embodiments requiring a flow rate ratio $FRR_{21/5}$ of the polyethylene composition within the range of 15-28 (claim 2), a melt flow rate $MFR_{5/190^{\circ}C}$ of the polyethylene composition within the range of 0.5-1.1 g/10 min (claim 3), a $SHI_{2.7/210}$ of the polyethylene composition within the range of 10-60 (claim 6), a η_{747Pa} of the polyethylene composition of 300 kPa*s or less (claim 8) and the first polyethylene fraction being an ethylene homopolymer (claim 14), respectively.

6.1 With respect to claim 1 of the main request the appellant argued that for obtaining a polyethylene composition defined by a spiral flow length of 55 cm or less and a transverse middle shrinkage of 1.1% or less, a person skilled in the art had to adjust the melt flow rates, the flow rate ratio and the rheological properties such as shear thinning index and viscosity at a shear stress of 747 Pa for obtaining a composition with a certain flowability, molecular weight distribution and weight average molecular weight, these properties being defined in dependent claims 2 to 8 of the main request. In addition, the first polyethylene fraction being an ethylene homopolymer was clearly

defined to represent a feature of embodiments of the present invention as shown by paragraph [0088] of the patent in suit and its examples.

6.2 Accordingly, a polyethylene composition having the same definition as in claim 24 of the main request and in addition the further requirement that it exhibits a spiral flow length of 42 cm or more and 55 cm or less and a transverse middle shrinkage of 1.1% or less can be seen as a preferred embodiment of claim 1 of the second auxiliary request envisaged by the appellant.

6.3 This means that the embodiment of claim 1 of the second auxiliary request that has the same definition as in claim 24 of the main request and in addition the further requirements concerning spiral flow length and transverse middle shrinkage defined in claim 1 also lacks sufficiency of disclosure for the same reasons as given for the subject-matter of claim 24 of the main request. The second auxiliary request is therefore not allowable.

3rd and 4th Auxiliary Requests

7. The claims 1 of the 3rd and 4th auxiliary requests have the same wording as claims 24 of the main and 1st auxiliary request, respectively, the subject-matter of which was found to be insufficiently disclosed. Accordingly, the 3rd and 4th auxiliary requests are also refused.

5th Auxiliary Request

8. Compared to claim 24 of the main request, claim 1 of the fifth auxiliary request additionally requires that the polyethylene composition has a spiral flow length

of 52.5 cm or less and of 42 cm or more. Whether that additional requirement is implied by the other features of present claim 1, i.e. those of claim 24 of the main request, or restricts the definition of the claimed polyethylene compositions has no bearing on the reasoning provided with respect to the sufficiency of disclosure of claim 24 of the main request. Accordingly, claim 1 of the fifth auxiliary request is not allowable for the same reasons as given for claim 24 of the main request.

6th and 7th Auxiliary Request

9. Claim 1 of the 6th auxiliary request results from the combination of claim 1 as filed with the additional information (i) that the lower limit for the $FRR_{21/5}$ has been defined to be 20 instead of 15, (ii) that the polyethylene composition comprises an ethylene homopolymer prepolymer fraction in an amount of up to 20 wt% of the total base resin and (iii) that the weight ratio of the first polyethylene fraction (A) to the second polyethylene fraction (B) is (42-58): (58-42).
- 9.1 According to established jurisprudence (cf. Case Law of the Boards of Appeal of the EPO, 7th Edition, 2013, II.E.1.7.1), the disclosure of a quantitative range of values together with an included preferred narrower range also directly discloses the two possible part-ranges lying within the overall range on either side of the narrower range. Hence, in the present case the range of the $FRR_{21/5}$ defined in claim 1 on the basis of the original range in claim 1 as filed and the narrower range of 20-26 defined in claim 5 of the application as filed is supported by the original disclosure.

The weight ratio of the fraction having a lower average molecular weight (first fraction) to the fraction of higher average molecular weight (second fraction) is defined in the paragraph bridging pages 11 and 12 of the application as filed to be (35-65):(65-35), more preferably (40-60):(60-40), even more preferably (42-58):(58-42) and most preferably (44-56):(56-44).

As to the use of a prepolymer, on page 15, lines 5-9 of the original application it is specified that the main polymerisation stages may be optionally and advantageously preceded by a prepolymerisation, in which case up to 20 % by weight, preferably 1 to 10 % by weight, more preferably 1 to 5 % by weight, of the total base resin is produced, the prepolymer preferably being an ethylene homopolymer (HDPE).

- 9.2 It follows from the above that each of the amendments finds a basis in the original application. However, the the question is if there is a basis for the combination of features now being claimed in claim 1, in particular if there is an unambiguous and direct pointer linking the original range of the flow rate ratio $FRR_{21/5}$ of 15 to 28 of claim 1 to the choice of a higher lower limit for that range of 20 (defined in claim 5), to one of the four disclosed ranges for the weight ratio of the first and second fraction (paragraph bridging pages 11 and 12), to the use of an ethylene homopolymer prepolymer merely indicated as an optional feature, and to one of the three ranges indicating the amount of prepolymer to be used. Such a pointer, however, was not provided.
10. For the above reasons it is concluded that the subject-matter of claim 1 is a combination of several passages of the application as filed for which there is no

basis, providing the skilled person with technical information not derivable from the content of the application as filed. Consequently, the subject-matter of claim 1 extends beyond the content of the application as filed, contrary to the requirement of Article 123(2) EPC, so that the 6th auxiliary request has to be refused.

11. The same holds true for the 7th auxiliary request, claim 1 of which is identical to claim 1 of the 6th auxiliary request.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairwoman:



B. ter Heijden

B. ter Laan

Decision electronically authenticated