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Datasheet for the decision of 16 September 2021

Case Number: T 2083/18 - 3.3.03

Application Number: 12757850.8

Publication Number: 2687625

IPC: D01F6/70, C08G18/66, D01D5/04

Language of the proceedings: EN

Title of invention:
POLYURETHANE ELASTIC FIBERS

Patent Proprietor:
ASAHI KASEI KABUSHIKI KAISHA

Opponent:
Invista Technologies S.à r.l.

Relevant legal provisions:
EPC Art. 83, 54, 56

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

Decisions cited:
T 0004/00

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Case Number: T 2083/18 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 16 September 2021

Appellant: (Opponent)	Invista Technologies S.à r.l. Zweigniederlassung St. Gallen Flurhofstrasse 160 9000 St. Gallen (CH)
Representative:	Carpmaels & Ransford LLP One Southampton Row London WC1B 5HA (GB)
Respondent: (Patent Proprietor)	ASAHI KASEI KABUSHIKI KAISHA 1-105 Kanda Jinbocho Chiyoda-ku Tokyo 101-8101 (JP)
Representative:	dompatent von Kreisler Selting Werner - Partnerschaft von Patent- und Rechtsanwälten mbB Deichmannhaus am Dom Bahnhofsvorplatz 1 50667 Köln (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 5 June 2018 concerning maintenance of the European Patent No. 2687625 in amended form.**

Composition of the Board:

Chairman	D. Semino
Members:	M. Barrère
	A. Bacchin

Summary of Facts and Submissions

I. The appeal of the opponent lies against the interlocutory decision of the opposition division posted on 5 June 2018 concerning maintenance of European Patent number 2 687 625 in amended form on the basis of the claims of the main request filed with letter of 29 March 2018 and an amended description.

II. Claims 1 and 7 of the main request on which the decision was based read as follows:

"*1. An elastic polyurethane fiber consisting of a polyurethaneurea which is prepared from a copolyalkylene ether diol consisting of C_{2-10} different alkylene ethers, a diisocyanate, and a diamine selected from the group consisting of linear aliphatic diamine compounds, branched aliphatic diamine compounds, alicyclic diamine compounds, aromatic diamine compounds, and cyclic diamine compounds,*

wherein the polyurethaneurea has a hard segment content of from 14.0% to 25.0% inclusive, as defined by Equation (1) below:

Hard Segment Content(%) = (Number Average Molecular Weight of Urea Moieties) / {(Number Average Molecular Weight of Urethane Moieties) + (Number Average Molecular Weight of Urea Moieties)} x 100
Equation (1),

and wherein the urethane moieties have a number average molecular weight of 3000-4500, and the urea moieties have a number average molecular weight of 700-1000."

"*7. The elastic polyurethane fiber according to any of claims 1-6,*

wherein the fiber has a specific recovery stress at 200% elongation in the third cycle in a repeated 300% stretch and recovery test of a value being equal to or more than a critical specific recovery stress defined by Equation (6) below:

Critical Specific Recovery Stress (cN/dtex) = 0.0320 - 6.43 x 10^{-6} x D
Equation (6)

wherein D is the linear density (dtex) of the polyurethane elastic fiber."

III. The following document was *inter alia* cited in the opposition division's decision:

D1: EP 0872581 A1

IV. In the contested decision the opposition division held, among others, that:

- The objection of lack of sufficiency of disclosure based on alleged difficulties in reproducing the invention over the whole scope of claim 7 failed because it had not been convincingly shown that obtaining a specific recovery stress at 200% elongation (SRS200) according to claim 7 would represent an undue burden for a person skilled in the art.

- The main request was novel over Dl. In particular, it was considered that region "C" in figure 1 of D1

could not directly and unambiguously anticipate the subject-matter of claim 1.

- The main request involved an inventive step over D1 as the closest prior. Specifically the comparative examples of D1 were not suitable starting points for assessing inventive step. Furthermore, as evidenced by the experimental part of the patent in suit, the problem solved was the provision of polyurethaneurea fibers having a good balance of properties. Since there was no indication in the prior art towards the solution claimed, an inventive step was acknowledged.

Therefore, the patent was maintained in amended from on the basis of the main request.

V. With the statement setting out the grounds of appeal the opponent (appellant) requested that the decision under appeal be set aside and that the patent be revoked. The appellant contested in particular the finding of the opposition division on sufficiency of disclosure, novelty and inventive step.

VI. With the rejoinder to the statement of grounds of appeal, the patent proprietor (respondent) requested dismissal of the appeal and maintenance of the patent as amended during opposition proceedings. In the alternative maintenance of the patent in amended form on the basis of one of the 1st to 27th auxiliary requests filed therewith was requested.

VII. By letter of 25 February 2021 the appellant requested that the 8th to 27th auxiliary requests not be admitted into the proceedings.

VIII. The Board specified issues to be discussed at the oral proceedings in a communication dated 10 June 2021 containing the preliminary opinion of the Board.

IX. Oral proceedings were held before the Board on 16 September 2021 by video conference.

With regard to the objections of lack of sufficiency of disclosure and lack of novelty, the parties referred to their written submissions.

As to the inventive step attack the appellant maintained only the objection in view of document D1 alone. In this context there was no dispute between the parties that comparative example 2 of Dl could be chosen as a promising starting point for the assessment of inventive step and that the objective technical problem to be solved could be seen as to provide an alternative polyurethaneurea fiber.

X. The appellant's arguments, insofar as relevant to the decision, may be summarised as follows:

(a) Main request

(i) Sufficiency of disclosure

Claim 7 of the main request lacked sufficient disclosure because the opposed patent provided no indication as to how the skilled person could distinguish which polyurethane fibers had the specified critical recovery stress. Specifically, considering the unlimited number of different polyurethaneurea structures falling within the scope of claim 1, the application as filed did not contain any information that conveyed to the skilled person which

characteristics of the polyurethaneurea fiber were necessary to achieve the required critical recovery stress. Therefore the person skilled in the art wishing to carry out the invention over the whole scope of claim 7 had no other choice but to embark on a research program in order to identify, through trial and error, the fibers having the required property. Furthermore, the opposed patent did not indicate the temperature or elongation rate at which the test should be carried out. Depending on the processing history and measuring conditions, the same fiber could fall inside or outside the range in claim 7. The claimed invention was therefore insufficiently disclosed for it to be carry out without undue burden over the whole scope of claim 7.

(ii) Novelty

D1 disclosed polyurethaneurea elastic fibers obtained from:

a copolymerized polyalkyleneether diol composed of different alkylene ethers containing 2-10 carbon atoms,
a diisocyanate (4,4'-diphenylmethanediisocyanate), and
a diamine.

The chemical composition of the polyurethane elastic fibers described by D1 was therefore identical to the chemical composition of the polyurethane elastic fibers according to claim 1 of the main request.

The urea number average molecular weight (Mn) ranged from 650 to 950 in D1 and therefore overlapped with the range of 700-1000 in claim 1 of the main request.

However the invention described by D1 required a urethane number average molecular weight of 6000-9500 compared to the range of 3000-4500 in claim 1 of the main request.

Although the invention defined in claim 1 of D1 was outside the scope of present claim 1, comparative example 1 disclosed a polyurethaneurea characterized by a Mn of the urea portion of 716 and a Mn of the urethane portion of 5412. Furthermore, region C of figure 1, which encompassed comparative example 1, extended at least to the value of 4500 for the urethane Mn and fell within the scope of present claim 1. Region C also extended from around 680 to 750 for the Mn of the urea portion. Consequently the top left corner of this region intersected with claim 1 of the main request.

Therefore the subject-matter of claim 1 of the main request was not novel over the top left corner of said region C.

(iii) Inventive step

The closest prior art was represented by comparative Example 2 of D1, identified as point D in Figure 1 of D1. Claim 1 of the main request differed from this embodiment in that the Mn of the urethane portion was of 3000-4500 instead of about 5000.

There was no evidence that the problem of providing an elastic polyurethane fiber having a high recovery stress, low hysteresis loss and high heat resistance was solved over the whole scope of the claims. Consequently, the objective problem to be solved was defined as providing an alternative polyurethane fiber.

Since no effect was correlated to the range of 3000-4500, it was obvious for the skilled person wishing to provide an alternative to the fiber of D1 to simply reduce the molecular weight of the polyurethane moiety.

Contrary to the preliminary opinion of the Board, the reduction of the Mn of the urethane portion did not lead to a decrease of the stability of the dope solution in D1. In fact, the comparison between example 3 and comparative example 3 showed that the increase of the urea Mn (and not the decrease of the urethane Mn) was responsible for the instability. Notwithstanding the above, the stability of the dope solution and of the spinning were measured in the examples of D1 over a period of 4 weeks which was of purely academic interest but of no relevance for an industrial process wherein dope solutions were used immediately to produce a fiber. Therefore the lack of stability identified in D1 would not be a disincentive for the skilled person. Besides, even if the dope viscosity were too high, the person skilled in the art would know how to adjust the viscosity of said dope. Thus the only relevant question for the skilled person was whether a fiber could be obtained. Since this was the case for comparative example 2, the person skilled in the art would have no concern with regard to a further reduction of the urethane Mn.

Furthermore the mechanical properties (such as the elongation at break) of the fiber of comparative example 2 of D1 were according to the preferred ranges of the opposed patent(see paragraph [0038]). Thus, even if a minimum elongation at break had to be obtain, the

person skilled in the art could still reduce the urethane Mn.

Therefore the alternative proposed in present claim 1 was obvious in view of D1 alone.

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

(a) Main request

(i) Sufficiency of disclosure

The elastic polyurethane fiber of claim 7 was defined by way of a further parameter, namely the critical specific recovery stress. It was shown in table 2 of the opposed patent that all examples falling under claim 1 of the main request fulfilled said parameter. Thus the opposed patent provided a clear teaching as to the type of polyurethaneureas which fulfilled the parameter in claim 7.

In respect of the measurement method of the contested parameter, the opposed patent disclosed the requisite measurement method in paragraphs [0054] and [0055].

Accordingly the subject-matter of claim 7 of the main request was in compliance with the requirements of sufficiency of disclosure.

(ii) Novelty

Contrary to the appellant's view, figure 1 of D1 was not a figure from which concrete, definite values could be derived. Furthermore, the dashed box C of figure 1 constituted merely a schematic representation of a

given area in said figure and the specific values of the extremes of said box were not explicitly disclosed elsewhere in D1. Thus the top left area of box C could not anticipate the subject-matter of present claim 1.

(iii) Inventive step

Comparative Example 2 of D1 could be chosen as a promising starting point for the assessment of inventive step. Claim 1 of the main request differed from this embodiment in that the Mn of the urethane portion was of 3000-4500 instead of about 5000. In agreement with the appellant, the objective problem to be solved was defined as providing an alternative polyurethane fiber.

It was shown in the examples of D1 that a decrease of the urethane Mn led to a significant degradation of the dope and spinning stability. This was confirmed by the description on page 6, lines 27-34. Furthermore, D1 clearly mentioned that the elongation degree of the fiber deteriorated when the urethane Mn was below 6000 (see page 6, lines 11-12). Thus D1 taught away of decreasing the urethane Mn below 5000 and the person skilled in the art could not expect that suitable elastic polyurethane fiber might be obtained in the Mn range of 3000 to 4500.

Contrary to the appellant's view the dope stability and the spinnability were important properties in the present technical field, as was apparent from D1 and the opposed patent. Besides the appellant did not provide any evidence showing that those properties would be irrelevant.

Therefore the alternative proposed in present claim 1 was not obvious in view of D1 alone.

XII. The appellant requested that the decision under appeal be set aside and that the opposed patent be revoked. Furthermore the appellant requested that the 8th to 27th auxiliary requests not be admitted in the proceedings.

XIII. The respondent requested that the appeal be dismissed, i.e. the patent be maintained according to the main request of 29 March 2018 underlying the appealed decision. In the alternative, the respondent requested that the patent be maintained in amended form on the basis of the claims of one of the 1st to 27th auxiliary requests, filed with the rejoinder to the statement of grounds of appeal.

Reasons for the Decision

1. Main request

1.1 Sufficiency of disclosure

According to the appellant the opposed patent is not disclosed in a sufficient manner for it to be carried out over the whole scope of claim 7. In particular, the opposed patent would not teach how to obtain a polyurethaneurea fiber which is characterized by a specific recovery stress at 200% elongation (SRS200) according to claim 7. Allegedly, the person skilled in the art, wishing to carry out the invention over the whole scope of claim 7, would have no other choice but to embark on a research program in order to identify,

through trial and error, whether a given polyurethaneurea fiber falls under the scope of claim 7 or not (undue burden). The appellant further criticised that the conditions (temperature, elongation rate) to measure the SRS200 are not disclosed and that, depending on the processing history of the fiber, different results could be obtained.

According to established case law, a successful objection of lack of sufficiency of disclosure presupposes that there are serious doubts, substantiated by verifiable facts. In inter partes proceedings, the burden of proof is upon the opponent to establish, on the balance of probabilities, that a skilled person reading the patent, using common general knowledge, would be unable to carry out the invention (see Case Law of the Boards of Appeal, 9th edition, 2019, II.C.9).

Dependent claim 7 of the main request covers an elastic polyurethane fiber characterised in that the SRS200 parameter is equal to or above a critical value (= critical specific recovery stress defined by Equation (6)). In order to show that the opposed patent is insufficiently disclosed in view of the limiting feature of claim 7, the Board considers that it should first be made credible that the polyurethaneurea fibers of the opposed patent (such as those falling under the scope of claim 1) are not necessary characterized by a SRS200 according to claim 7. In the present case, it is pointed out that the fibers of all inventive examples falling under the scope of present claim 1 are characterized by SRS200 values of at least 0,036 which are well above the threshold of claim 7 (see opposed patent, table 2, examples 1-7 and 9-13). Furthermore,

the appellant has not provided any evidence of the contrary.

Thus, the mere allegation that it might be difficult to obtain a fiber according to claim 7 is not sufficient to discharge the burden of proof and to raise doubts as to the ability of the skilled person to carry out the invention.

With regard to the conditions to measure the SRS200, the Board agrees with the opposition division and the respondent that the opposed patent provides sufficient details (such as a temperature of 20°C and an elongation rate of 500 mm/min) in order to measure the SRS200 (see opposed patent, paragraphs [0054]-[0055]). No proof of the contrary has been provided by the appellant, nor any evidence that a possible uncertainty in the measurement would result in lack of sufficiency.

Consequently, the Board does not see any reason to depart from the opposition division's finding with regard to sufficiency of disclosure.

1.2 Novelty

With regard to novelty, the appellant referred to the comparative examples of D1 and in particular to

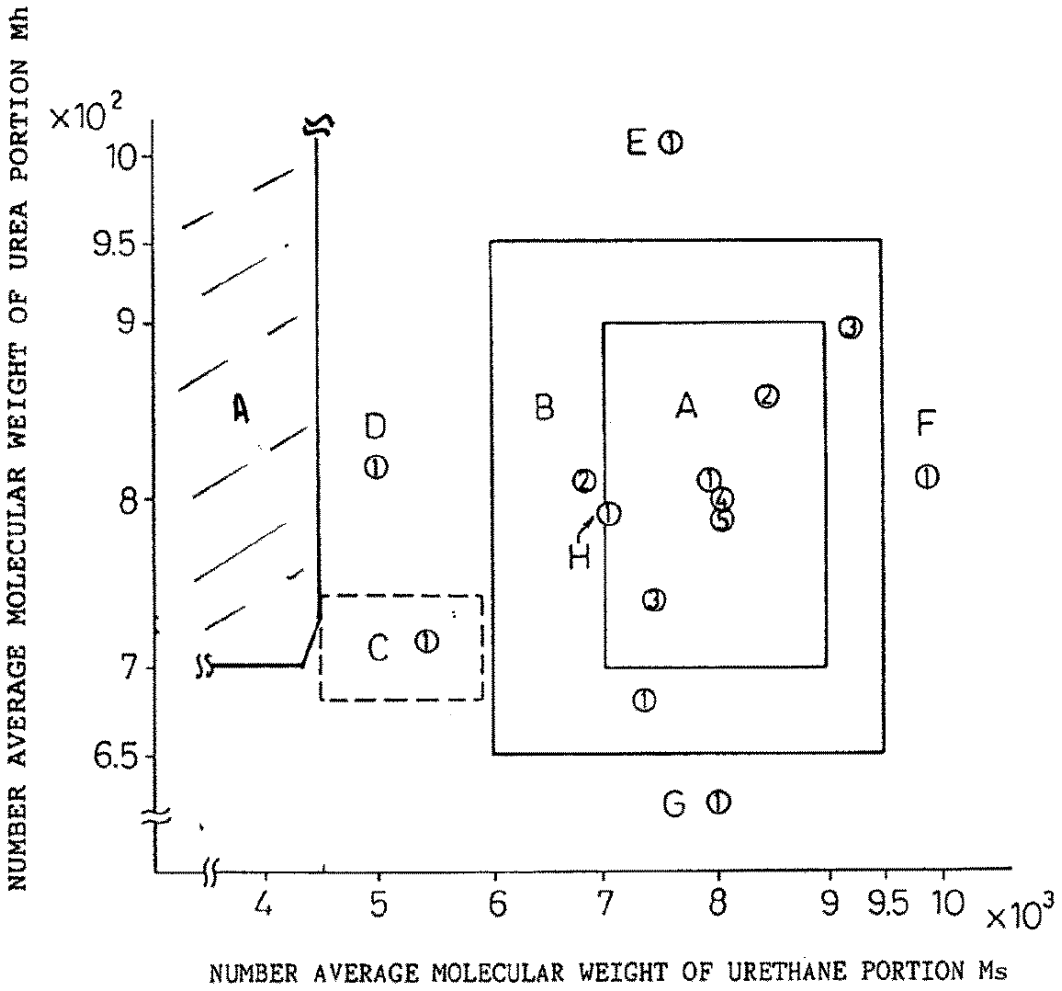
point "D" corresponding to comparative example 2 of D1 and to

region "C" which encompasses comparative example 1 of D1 (see D1, figure 1 and table 2).

Although comparative examples 1 and 2 of D1 do not anticipate the subject-matter of claim 1 of the main request (the Mn of the urethane portion being above the limit of 4500 g/mol), the appellant considers that the

top left corner of region "C" overlaps with the claimed range. Said corner would therefore be novelty destroying for the subject-matter of claim 1.

Figure 1 of D1 with an additional area representing the scope of claim 1 was provided by the appellant with the statement of grounds of appeal (page 4) as follows:



This representation is used by the Board for illustration purposes only.

The Board considers that the main questions to be answered are whether a schematic representation as the one of region "C" in figure 1 corresponds to a direct and unambiguous disclosure of all the points indicated

by the lines delimiting that region and whether region "C" clearly and unambiguously overlaps with the scope of claim 1. Indeed, according to established case law, it is a prerequisite for the acceptance of lack of novelty that the claimed subject-matter is directly and unambiguously derivable from the prior art (see Case Law of the Boards of Appeal, 9th edition 2019, I.C.4). In other words, it has to be beyond doubt – not merely probable – that the claimed subject-matter is directly and unambiguously disclosed in a prior art document.

In the present case the Board considers that the lines drawn to limit region "C" represent nothing more than the limits of a theoretical region around comparative example 1 and do not correspond to any actual fiber which has been produced or tested, or even to pairs of values of the Mn of the urea and urethane moieties which are unambiguously identified. It is therefore considered that they cannot be taken as a direct and unambiguous disclosure of each and every theoretical point on the border of the region (see a similar situation in T 4/00 of 17 January 2003, Catchword and section 3 in the reasons).

Furthermore, even if these lines would represent concrete examples, the accuracy of figure 1 without sub-units between 4000 and 5000 is not sufficient to precisely determine whether the left-hand border of region "C" represents a value of 4500 (or for instance 4510, which would be outside the scope of claim 1). In the description of D1 (see page 6, lines 27-31), it is merely specified that region "C" is characterised by a number average molecular weight (Mn) of the urethane portion below 6000. No further information is available to determine with sufficient accuracy the value of Mn of the urethane moieties at the border of region "C".

The Board thus considers that D1 does not clearly and unambiguously disclose a fiber consisting of a polyurethaneurea according to claim 1 of the main request wherein the urethane moieties have a Mn of 3000-4500.

In view of the above, the appellant's novelty objection in view of D1 fails to convince and gives the board no cause to overturn the opposition division's decision in that respect. Consequently, the subject-matter of claim 1 of the main request is novel over document D1.

1.3 Inventive step over D1

1.3.1 Closest prior art

Both parties, as the opposition division, consider that D1 is suitable as the closest prior art document. The Board sees no reason to deviate from that view.

1.3.2 Most promising springboard to the invention

The Board agrees with the parties that comparative example 2 of D1 is a promising starting point for the assessment of inventive step. Even if it could in principle be questionable whether a comparative example is a suitable starting point, this has not been put into doubt in the present case and also the Board considers it as a reasonable approach for the reasons which follow.

The problem to be solved in the opposed patent has to be considered in order to select a promising springboard to the invention, in particular to establish whether - in this case - a comparative

example is an appropriate starting point. With reference to paragraph [0008], the opposed patent defines the problem to be solved as providing an elastic polyurethane fiber having:

a) high recovery stress,
b) low hysteresis loss and
c) high heat resistance.

Comparative example 2 is characterised by the best results in terms of heat resistance and modulus at 300% elongation corresponding to a measurement of the recovery stress (see D1, table 2). The person skilled in the art wishing to improve the properties a) and c) above would therefore have considered to use comparative example 2 as a promising springboard.

1.3.3 Technical differences

Comparative example 2 (see D1, page 12, line 56 - page 13, line 1 and table 1 with back reference to example 1 on page 11, line 49 - page 12, line 23) discloses a polyurethaneurea elastic fiber obtained from:

a copolymerized polyalkyleneether diol composed of tetramethylene ether and 2, 2-dimethylpropylene ether groups,
a diisocyanate (4,4'-diphenylmethanediisocyanate), and
an aliphatic diamine (ethylenediamine).

According to table 2 of D1 the Mn of the urethane portion is 5001 and the Mn of the urea portion is 811 which means that the hard segment content is about 14 %.

Thus, in agreement with the parties, the Board considers that claim 1 of the main request differs from comparative example 2 of D1 in that:

the Mn of the urethane moieties is of 3000-4500 (instead of 5001 in comparative example 2).

1.3.4 Technical problem

According to the parties the problem to be solved may be seen as providing an alternative to the fiber of comparative example 2.

The Board agrees that a direct comparison between the examples of the opposed patent and the examples of D1 does not appear to be possible (the starting monomers being different). Consequently, the Board concurs with the parties that the objective technical problem is to be formulated as the provision of an alternative polyurethaneurea fiber.

1.3.5 Obviousness of the solution

It remains to be decided whether it was obvious to reduce the Mn of the polyurethane moiety of comparative example 2 in order to provide an alternative polyurethaneurea fiber.

(a) According to the appellant, since no effect has been demonstrated for the Mn range of 3000-4500, it would be obvious for the skilled person wishing to provide an alternative to the fiber of D1 to simply reduce the molecular weight of the polyurethane moieties.

Contrary to the preliminary opinion of the Board, the reduction of the Mn of the urethane portion did not lead to a decrease of the stability of the dope solution in D1. The comparison between example 3 and comparative example 3 showed that the increase of the urea Mn (and not the decrease of the urethane Mn) was responsible for the instability.

The appellant further argued that the stability of the dope solution (i.e. viscosity stability) and of the spinning was measured in the examples of D1 over a period of 4 weeks which was of purely academic interest but of no relevance for an industrial process wherein dope solutions are used to produce a fiber shortly after preparation of the dope solution. Therefore the lack of stability identified in D1 would not be a disincentive for the skilled person. In fact, even if the dope viscosity were too high, the person skilled in the art knew how to adjust the viscosity of said dope. Thus the only relevant question for the skilled person was whether a fiber can be obtained. Since this was the case in comparative example 2, the person skilled in the art would have no concern with regard to a further reduction of the urethane Mn.

Furthermore the mechanical properties of the fiber of comparative example 2 of D1 were according to the preferred ranges of the patent in suit. Even the elongation at break fell within the preferred range of the opposed patent (see paragraph [0038]). Thus, even if a minimum elongation at break had to be obtained, the person skilled in the art could still reduce the urethane Mn.

(b) The Board cannot agree with these arguments for the following reasons:

First, although it is not disputed that the Mn of the urea portion may have an effect on the viscosity and spinning stability of the dope solution, it is also clear that the decrease of the urethane Mn leads to a significant worsening of the viscosity and spinning stability of the dope solution (see D1, table 1, examples 1-8 vs. comparative examples 1-2). In fact the viscosity appears to increase exponentially with decreasing urethane Mn. This teaching is further confirmed by the general part of the description of D1 (see D1, page 6, lines 27-34):

"*Namely, as compared with the present invention, polyurethane in region C where a number average molecular weight of urethane portion is below 6000, produces a fiber exhibiting a low elongation and high modulus, and the stability of spinning is not as good as that attained by the present invention. In region D the number average molecular weight of the urethane portion is below 6000, and that of the urea portion is greater than that in region C. Consequently, the resulting fiber exhibits a lower elongation and a higher modulus. The property of heat resistance is improved due to an increased ratio of urea portion to urethane portion, but the stability of the viscosity of the spinning dope is deteriorated resulting in a reduced spinnability whereby the stability of spinning is lowered.*" (emphasis added by the Board)

Likewise, D1 also teaches that the reduction of the urethane Mn has a negative impact on the elongation

degree (see D1, page 6, 11-12 and table 2, examples 1-8 vs comparative examples 1-2, elongation at break).

Thus D1 clearly teaches away of reducing the Mn of the urethane portion, in particular below 5000, since the viscosity and spinning stability decreases exponentially and the person skilled in the art would have no reason to expect that fibers could still be obtained.

Secondly, the argument that viscosity and spinning stability would be of purely academic interest but of no practical relevance is not supported by evidence. It furthermore contradicts the teaching of D1 and the opposed patent (see D1, page 6, lines 24-34 and opposed patent, paragraph [0053]). Thus the Board is of the opinion that the teaching of D1 in view of the spinning and viscosity stability cannot be ignored by a person skilled in the art.

Thirdly, as to the possibility to adjust the viscosity if it were too high, the Board is of the opinion that the arguments of the opponent are speculative. As shown in D1 (see table 2, comparative example 3), there are conditions in which the preparation of a fiber seems not possible according to the teaching of D1 and the appellant did not provide any evidence of the contrary.

In summary the person skilled in the art wishing to provide an alternative to the fiber of comparative example 2 of D1 would not further reduce the urethane Mn below 5000 because D1 clearly teaches that the dope viscosity and spinnability lead to instability and the elongation at break decreases.

In fact, in view of the exponential increase of the dope viscosity (in the range of 9000 to 5000), the person skilled in the art would have no reason to expect that fibers may still be obtained in a range of 3000 to 4500 for the urethane Mn.

1.3.6 In view of these considerations and of the fact that no other prior art document has been cited as relevant for the evaluation of inventive step, the subject-matter of claim 1 involves an inventive step over D1 as the closest prior art.

2. For these reasons, the arguments of the appellant provide no reason for the Board to overturn the findings of the opposition division in respect of the main request. The appeal is therefore to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

B. ter Heijden D. Semino

Decision electronically authenticated