Deckblatt Übersetzung

Daten der Übersetzung:

Court/Gericht:	Bundesgerichtshof
Date of Decision / Datum der Entscheidung:	2015-06-09
Docket Number / Aktenzeichen:	X ZR 101/13
Name of Decision / Name der Entscheidung:	Polymerschaum II

FEDERAL COURT OF JUSTICE

IN THE NAME OF THE PEOPLE

JUDGMENT

X ZR 101/13

Pronounced on:
9 June 2015
Wermes
Judicial Secretary as
Clerk of the court
registry

in the patent nullity proceedings

Polymerschaum II/
Polymere foam II

Patent Act Sec. 38, Sec. 14; EPC Art. 69(1)

a) The examination of an inadmissible broadening must be preceded by an interpretation of the patent claim to be examined in this respect, in which its meaning and, in particular, the contribution which a disputed feature makes to the result of the invention must be determined.

b) The subject matter of the invention cannot be disregarded on the grounds that a feature is indeterminate and (therefore) unsuitable for distinguishing it from the state of the art (following Federal Court of Justice, judgment of 31 March 2009 X ZR 95/05, BGHZ 180, 215 Straßenbaumaschine).

Federal Court of Justice, judgment of 9 June 2015 - X ZR 101/13 –
Federal Patent Court

The X. Civil Senate of the Federal Court of Justice, following the oral hearing on 28 April 2015, attended by the presiding judge Prof. Dr. Meier-Beck, the judges Gröning, Hoffmann and Dr. Deichfuß as well as the judge Dr. Kober-Dehm

Ruled that:

The appeal against the judgment of the 3rd Senate (Nullity Senate) of the Federal Patent Court of 26 February 2013 is dismissed at the expense of the defendant.

By operation of law

Facts of the case:

1 The defendant is the owner of European patent 1 102 809 (patent in suit), which was granted with effect for the Federal Republic of Germany, was filed internationally on 30 July 1999, claiming a U.S. priority of 31 July 1998, and relates to articles containing polymer foam and a process for their production. The patent in suit comprises 38 claims, of which claims 1 and 15 read, in the language of the proceeding, as follows:

"1. A method for preparing a polymer foam, said method comprising:

(a) providing a plurality of expandable polymeric microspheres and a molten polymer composition containing less than 20 wt.% solvent, each expandable polymeric microsphere including a polymer shell and a core material in the form of a gas, liquid, or combination thereof, that expands upon heating, with the expansion of the core material, in turn, causing the shell to expand;

(b) melt mixing the molten polymer composition and the plurality of expandable polymeric microspheres, under process conditions, including temperature and shear rate, selected to form an expandable extrudable composition;

(c) extruding the expandable extrudable composition through a die to form the polymer foam; and

(d) at least partially expanding a plurality of the expandable polymeric microspheres before the expandable extrudable composition exits the die.

15. An article comprising the polymer foam obtainable according to the method of claim 1."

2 The plaintiff has argued that the subject matter of the patent in suit goes beyond the content of the documents originally filed and that the invention is not so clearly disclosed as to be capable of being carried out by a skilled person. Furthermore, the plaintiff pleaded lack of patentability.

3 The Patent Court declared the patent in suit null with effect for the territory of the Federal Republic of Germany. On appeal by the defendant, the Senate set aside the judgment of the Patent Court and referred the case back to the Patent Court for a new hearing and decision (judgment of 17 July 2012 X ZR 117/11, BGHZ 194, 107 = GRUR 2012, 1124 Polymerschaum, hereinafter: first appeal judgment).

4 The Patent Court again declared the patent in suit null. The defendant's appeal is directed against this, with which it continues to seek dismissal of the action insofar as it defends the patent in suit. According to its most recently filed main request, patent claim 1, which it defended before the Patent Court in the granted version, is to be given the following version, to which subclaims 2 to 14 are to refer back (changes to the granted version highlighted):

"A method for preparing a polymer foam, said method comprising:

(a) providing a plurality of expandable polymeric microspheres and a molten polymer composition containing less than 20 wt.% solvent **in an extruder**, each expandable polymeric microsphere including a polymer shell and a core material in the form of a gas, liquid, or combination thereof, that expands upon heating, with the expansion of the core material, in turn, causing the shell to expand;

(b) melt mixing the molten polymer composition and the plurality of expandable polymeric microspheres **in**

the extruder, under process conditions, including temperature and shear rate, selected to form an expandable extrudable composition;

(c) extruding the expandable extrudable composition through a die to form the polymer foam; and at least partially expanding a plurality of the expandable polymeric microspheres before the expandable extrudable composition exits the die."

5 According to the main request, the secondary patent claim 15 is to be given the version already defended before the Patent Court, which reads as follows (changes from the granted version highlighted):

"An article comprising the polymer foam obtainable according to the method of claim 1, **wherein said polymer foam is an adhesive, and wherein the polymer composition comprises an acrylate or methacrylate adhesive polymer or copolymer**."

6 The claims 16 to 23 and 25 to 35 referring back to this are to be retained in the granted version. The patent claim 36, which was secondary according to the granted version, and the subclaims 37 and 38, which refer back to it, are to be dropped according to the last main request filed. Alternatively, the defendant defends the patent in suit in eleven amended versions. The plaintiff opposes the appeal.

7 The parties have submitted a plurality of expert opinions prepared by Prof. Dr.-Ing. F. O. , College of Mechanical Engineering & Production, for the plaintiff and Prof. Dr.-Ing. M. S. M. S. , holder of the Chair of Polymer Materials, for the defendant.

Grounds of the decision:

8 The admissible appeal is unfounded.

9 A. The Patent Court held that the subject matter of the patent in suit was not patentable and essentially reasoned as follows:

10 Claim 1 contains an inadmissible extension compared to the original documents, which does not lead to a declaration of nullity, but to the fact that the examination of patentability has to be based on the subject matter of the patent in suit adjusted by this extension.

11 The subject matter of the patent in suit was manufacturing processes which, both in terms of material and process technology, could be designed with an almost unlimited breadth within the scope of the claim features. If the description lacked concrete indications for interpreting the claim, the basic knowledge of the skilled person and previously published technical literature had to be used. The term "molten polymer composition" was not characterized by a narrowly definable melting range, if only because of the material indeterminacy of the term polymer composition and the openly formulated process conditions. A melting point in the conventional sense does not generally exist for polymers, and certainly not for complex polymer compositions. The transition from the solid to the liquid state does not take place at a specific, precisely defined temperature, but rather in a softening range that varies in breadth from case to case, from the solid to the viscous, low-viscosity state to the liquefied state. The transition from the solid to the liquid or completely molten range can only be characterized by different physical parameters. The shear modulus decreases with the beginning of the softening range over the rubber-elastic range into the range of a melt beginning with the flow temperature T_f with increasing temperature towards zero. However, the parameter that particularly characterizes the flow behavior of a polymer melt is the viscosity, which decreases with increasing temperature. The polymer compositions which can be subsumed under claim 1 have, with a few exceptions, more or less pronounced broad softening or liquefaction ranges within which they are so soft that they can be mixed and processed relatively well in the extruder, but in which a molten state does not yet exist and is not absolutely necessary for processing. The question at what point in time and at what temperature a polymer composition is to be described as molten takes a back seat to these processing requirements and, due to the complexity of the composition of the polymer matrix, is in many, if not in most cases not or only with difficulty to be determined, but in the case in dispute is ultimately of no significance. Since the patent in suit also allowed up to 20% by weight of any solvent, the term "molten polymer

composition" was not only indeterminate, but rather unsuitable for designation and, in particular, for delimitation from the state of the art, and was tasked.

12 The sequence of the process steps expressed in the wording "providing a molten polymer composition" in the sense that the polymer composition must be molten before the microspheres are added is not disclosed in the original application documents (published as WO 00/06637). Neither the claims nor the description of the application contained the term "molten polymer composition" as such. Nor were there any other indications in the application documents that the polymer composition was to be provided in a molten state and that the microspheres were to be added exclusively to the already molten polymer composition. The technical term "melt mixing", also used in the original application documents, says nothing about the condition in which the components to be mixed are presented. In particular, it could not be concluded from this term that a polymer mixture was used which had already melted before the microspheres were added to the extruder. This is because in melt blending, the polymers used to produce polymer blends are usually presented in their as-is state at room temperature in the mixing vessel, which may have been preheated, and mixed in the melt produced at a selected temperature in order to obtain a melt that is as homogeneous as possible. The fact that the polymer composition must be in a molten state when the microspheres are added is also not implicitly disclosed by the description of the extrusion process in the embodiments, either in the examples relating to polymer compositions of any kind or in the examples relating to the specific hot melt compositions. Overall, the general description of the application and the examples of embodiments contained no indication that there was a connection between the softening, flowing and melting behavior of the polymer matrix composition and the addition of the microspheres.

13 Thus, claim 1 as defended by the main application, with the requirement that a molten polymer composition be provided, contained a feature not disclosed in the original application documents. Since the addition of the microspheres to a polymer composition that was already molten at the time of the addition was one of many possible process sequences that could be subsumed under the teaching disclosed in the original application documents,

the specification of this process design in the granting procedure was neither an extension nor an aliud of the subject matter of the original application, so that a declaration of nullity of the patent in suit on the grounds of inadmissible extension could not be considered.

14 The subject matter of claim 1 in the version defended by the main request was not patentable. This assessment was not contradicted by the fact that the Federal Court of Justice had considered the subject matter of patent claim 1 to be new and based on inventive step in the first appeal decision. The binding effect of the first appeal judgment is limited, even under the reformed patent nullity proceedings law, to the case that the facts to be assessed remain the same, i.e. the state of the art to be taken into account or the version of the patent in suit to be assessed do not change. In the case in dispute, the basis of assessment had changed insofar as the feature not disclosed in the original application documents had to be disregarded in the examination of patentability and the plaintiff had introduced new state of the art in the course of the new hearing after the remittal of the proceedings. New factual arguments were not excluded by the binding effect of the first appeal judgment. Accordingly, the subject matter of patent claim 1 as defended by the main request was anticipated by several citations.

15 B. This withstands review in the appeal proceedings only in the result.

16 I. The patent in suit in the defended version concerns products containing polymer foam and methods for their production in an extruder.

17 1. Such articles were already known at the time of priority of the patent in suit and are used in various fields such as aviation, vehicle construction and in the medical field.

18 Polymer foam is characterized by having a lower density than the polymer matrix it contains. The reduction in density is achieved by various methods, such as by creating gas-filled cavities in the matrix (e.g., with the aid of a blowing agent) or by adding polymeric, in particular expandable microspheres or non-polymeric such as glass microspheres. In this context, the patent specification in suit refers to German published application 195 31 631

(E01), which concerns a process for producing a thermoplastic polymer foam by means of extrusion or injection molding machines (description. para. 2, 3).

19 The patent in suit does not explicitly state which technical problem the patent in suit concerns. It can be formulated in general terms as providing a method in which foaming by means of expandable microspheres is possible reliably and without destroying the microspheres.

20 To solve the problem, the patent in suit, in the version of claim 1 last defended by the main application, proposes a process with the following features:

1. A process for preparing a polymer foam by providing
1.1 a plurality of expandable polymeric microspheres; and
1.2 a molten polymer composition
1.3 in an extruder.
2. The molten polymer composition contains less than 20 weight percent solvent.
3. Each expandable polymeric microsphere comprises a polymer shell and a core material comprising
3.1 consists of a gas, liquid or combination thereof, and
3.2 expands upon heating, resulting in expansion of the polymer shell.
4. Melt mixing the molten polymer composition and the plurality of expandable polymeric microspheres in the extruder, the process conditions including temperature and shear rate being selected to form a composition which is
4.1 extrudable and
4.2 expandable.
5. The expandable extrudable composition is extruded through a die to form the polymer foam.
6. A plurality of the expandable polymeric microspheres expand at least partially before the expandable extrudable composition exits the die.

21 The subsidiary product claim 15 claimed with the main application is also designed in its defended version as a product-by-process claim and is defined in that the products are obtainable by the process according to patent claim 1, wherein the polymer foam is an adhesive and the polymer composition comprises an adhesive acrylate or methacrylate polymer or copolymer.

22 3. The term "molten polymer composition" used in both feature 1.2 and feature 4 is of central importance for the interpretation of patent claim 1.

23 a) The parties have different views on the conditions under which a polymer composition within the meaning of patent claim 1 is to be regarded as "molten". The defendant links to the crossing of the glass transition temperature range, in the middle of which lies the glass transition temperature T_g, which is characterized by the relative maximum of the tan-δ curve. It considers that a molten polymer composition already exists when the micro-Brownian motions that start as a result of the heating of the polymer composition lead to shape changes of the chain molecules in such a way that the polymer becomes elastic ("rubbery-elastic") and the relative minimum of the tan-δ curve is crossed in the middle of this rubbery-elastic region. It bases this on the fact that, as the Patent Court also pointed out, at this stage the polymer matrix continuously changes its mechanical structural and rheological flow behavior as a result of rising temperature and becomes processable. In contrast, according to the plaintiff, there can be no talk of a molten polymer composition until the Brownian molecular movements, which become stronger as a result of the increase in temperature, further reduce the cohesion of the molecular chains by loosening the entanglements of the molecular chains and forming them anew. Only then would the polymer no longer be elastic, but would enter a "molten" state.

24 b) In this respect, the Patent Court found, without objection from the parties, that there is no melting point in the conventional sense for polymers, and even more so for complex polymer compositions (in agreement with the expert opinions submitted by the parties, see only expert opinion S. [G9], pp. 3-7, and expert opinion O. [K4], pp. 7-11). It further assumed that the matrix (co)polymers subsumable under patent claim 1 had more or less broad

softening or liquefaction ranges within which they could be well mixed and processed in the extruder with other additives. In this phase, the polymers have not yet melted, but this is not absolutely necessary for processing. At what point in time and at what temperature the polymer composition is to be described as molten is ultimately not or hardly definable, which is why the feature is indefinite and "unsuitable for differentiation from the state of the art".

25 a) Thus, the Patent Court failed to determine the subject matter of the patent in suit in the light of the overall disclosure of the patent specification before turning to the question whether this subject matter was inadmissibly broadened compared to the original documents. A granted patent claim has the character of a legal norm (Federal Court of Justice, order of 8 July 2008 - X ZB 13/06, GRUR 2008, 887 marginal no. 13 Momentanpol II), and it is a question of law what results from a patent claim as protected subject matter (established case law since Federal Court of Justice, judgment of 18 May 1999 X ZR 156/97, BGHZ 142, 7 - Räumschild). The binding answer of legal questions is the task of the court called upon, from which it is not released even if the legal norm is unclear or its interpretation is difficult. Just as the infringement judge may not rely on the fact that he is unable to determine the subject matter of the invention in whole or in part (Federal Court of Justice, judgment of 31 March 2009 X ZR 95/05, BGHZ 180, 215 marginal no. 16 - Straßenbaumaschine), the Patent Court may refrain from determining the subject matter of the invention on the grounds that a feature is indeterminate and (therefore) unsuitable for "distinguishing it from the state of the art".

26 The meaning of a feature must be determined with a view to what the feature is intended to achieve from the point of view of the skilled person with respect to the invention. In this context, the general as well as the usual linguistic usage in the art can provide clues for the understanding of the skilled person. In view of the fact that terms in a patent description may be used in a manner deviating from the general usage of the language, the content of the terms as derived from the overall context of the patent specification is ultimately decisive. The more the content of the patent specification indicates a deviating understanding, the less room there is for recourse to the general linguistic usage (Federal Court of Justice, judgment of 2 March 1999 X ZR 85/96, GRUR 1999,

909, 911 f. - Spannschraube). As far as the use of the description in its entirety for the interpretation of the claim is concerned, an understanding of the claim is generally indicated which is consistent with the explanations in the description as a whole. Only if and insofar as this would result in an understanding of the claim which clearly cannot correspond to what is intended to be protected, is the conclusion justified that no conclusions may be drawn from parts of the description with respect to the protected subject matter. An interpretation of the patent claim which would have the consequence that none of the embodiments described in the patent specification would be covered by the subject matter of the patent can only be considered if other possibilities of interpretation leading to the inclusion of at least part of the embodiments are necessarily ruled out or if sufficiently clear indications can be derived from the patent claim that something is actually claimed which deviates so largely from the description (Federal Court of Justice, judgment of 14 October 2014 X ZR 35/11, GRUR 2015, 159 marginal no. 26 access rights). 4.

27 4. When, within the meaning of the teaching of the patent in suit, one can speak of a "molten polymer composition" must be determined functionally. The polymer composition does not have to be molten in the strict sense when the microspheres are added, but its viscosity must merely be reduced to such an extent that it can be processed in an extruder.

28 The Senate stated in the first appeal judgment that the term "molten polymer composition" used both in feature 1.2 and in feature 4 expresses a sequence of process steps according to which the expandable microspheres are added to a polymer composition that has already "melted" before admixture. The Senate assumed that the skilled person associates an unambiguous meaning with the term "molten polymer composition" and that accordingly the temperature of the polymer composition to be extruded "must already be above the melting point of the polymer composition before the addition of the microspheres" (thus literally marginal no. 32 at the end of the first appeal judgment). Furthermore, it considered it possible, and therefore referred the matter back for further examination by the Patent Court staffed with expert technical judges, that the melting point is actually exceeded in the embodiment examples. On the basis of the findings in the second judgment of the Patent

Court and the parties' submissions on the melting point of amorphous polymers or polymer compositions of the type in question and on the understanding of the embodiments, these assumptions cannot be upheld.

29 b) The patent specification, as the Patent Court correctly points out in this respect, does not contain any express indications as to what is to be understood by a molten polymer composition according to the invention within the meaning of features 1.2 and 4, in view of the fact that there is no melting point for polymer compositions which can be determined exactly.

30 According to the general technical understanding, on which the experts of both parties also agree, amorphous polymers are distinguished between the three aggregate states glassy state, rubber-elastic state and melt, whereby the transition from one aggregate state to the next does not occur abruptly when the temperature is increased, unlike in the case of crystalline substances. Rather, the transition areas of softening and flow temperature lie between the states of aggregation (cf. Schwarzl, Polymermechanik, Springer Verlag 1990, pp. 86-91; Expert Opinion O. [K4], pp. 11-15; Expert Opinion S. [G9], pp. 2-7). The state of aggregation of a polymer depends on the relationship between the storage shear modulus G' and the loss shear modulus G''. The storage shear modulus G' refers to the ability of a material to reverse a deformation that has occurred due to a load, i.e. the reversible elastic behavior (as a solid property), while the loss shear modulus G'' describes the "irreversible" viscous behavior of a material (as a liquid property), in which the deformations that have occurred due to molecular changes are no longer reversed. The quotient of G'' and G' gives the loss factor tan δ. In the glassy state, the storage shear modulus is higher than the loss shear modulus. As the temperature increases, the loss shear modulus steadily increases while the storage shear modulus decreases. In the rubber-elastic state, the loss factor reaches a local minimum and increases with increasing temperature as the storage shear modulus decreases (cf. Schwarzl, loc. cit., p. 90). According to a generally accepted definition, a tan-δ value of 1, at which the storage shear modulus and the loss shear modulus are equal, marks the transition from the solid to the "liquid", i.e. molten, state in polymers. Also in patent applications of the defendant (US 5 593 628, Sp. 17 Z. 35-39 and WO 98/46197, p. 5 Z. 12-15) these values are assumed as the limit

for the transition to melt. Likewise, party expert S. assumes these limits when he states that the temperature above the melting temperature, at which storage and loss modulus are equal and the loss factor tan δ is thus 1, denotes a state of the polymer melt in which it is less elastic and the viscous fraction is higher than at the lower temperature, at which the loss factor tan δ is a local minimum, the material thus no longer possesses dimensional stability and runs on its own (G9 p. 5 center; cf. also G11 p. 2 above: "formal definition of a melting temperature via the criterion tan δ = 1").

31 However, as party expert S. rightly points out in agreement with the statements of the Patent Court, it is not the loss factor tan δ that is decisive for the processability of melting polymer materials, but the viscosity present at the desired processing temperature as a measure of the flow resistance of a fluid (G11 p. 2 above). The expert further states that for the limiting viscosity of 10^4 Pa.s given in his expert report of 24 May 2012 (G7), "melting temperatures" would result for the hot melt compositions studied, which practically coincided with those resulting from the use of the minimum of the tan-δ curve (G11 p. 5 above), although it should be noted that the actual viscosity is above zero viscosity because the polymer composition is subjected to higher shear rates in the extruder (G11 p. 10 para. 2).

32 In favor of interpreting the term "molten polymer composition" functionally in this sense is the overall content of the description of the patent in suit.

33 As far as the extrusion process is described in general, there is no indication in the description that the expandable microspheres are to be added only after the polymer composition has melted. Only the expansion of the microspheres is mentioned as a parameter for the temperature; the preferable temperature should be lower than that which leads to the expansion of the microspheres. If the temperature is chosen higher, which is possible according to the description, it must be lowered again after mixing and before adding the microspheres (p. 16 lines 14-17). In any case, temperatures should be avoided which lead to an undesired premature expansion of the microspheres during the mixing process (p. 16 Z. 29 p. 17 Z. 1). On the question of how the temperature affects or should affect the polymer mixture, namely whether it should already

have exceeded the melting point, the description of the application does not contain any statement at this point.

34 Nor does the description of the extrusion process in the embodiment examples concerning the hot melt compositions 1 to 10 disclose such a technical teaching. The skilled person cannot infer from these examples that the polymer composition is already completely melted when the microspheres are added. The Patent Court did not find anything to indicate that the skilled person takes something from the published application other than what it itself describes as skilled knowledge, namely that it is irrelevant whether a polymer composition is already completely melted at a certain point in the extrusion process, as long as the viscosity is sufficiently reduced and good mixing, in this case also with the expandable microspheres, is ensured, whereby the temperatures must in any case not be so high that the microspheres expand prematurely.

35 However, the Patent Court incorrectly assumed that the extrusion process in the examples of the patent in suit is carried out at 93.3°C over the entire extruder section. This temperature indication refers only to the process section carried out in a first extruder (Bonnot extruder), in which the hot melt composition is mixed. The mixed hot melt adhesive is then fed into a second (twin screw) extruder with three inlet ports (Pfleider extruder), in which the temperature is adjusted to the value indicated in each of the embodiment examples. Since the microspheres are only added in this second extruder via the third opening, the temperature in the second extruder in this section of the line is what matters for the question of whether the polymer composition has melted at this point. This varies from 82°C (Examples 10 and 11) to 121°C (Examples 6, 7, 8, 9, 14, 15, 50, 51 and 52).

36 Nevertheless, the examples do not show that the hot melt compositions are in a completely molten state at the time of addition of the microspheres, since their melting temperature (in terms of a loss factor of 1) is higher than the processing temperatures in the extruder, as pointed out by party expert O. (K4). Thus, it can only be inferred from the embodiment examples, as the defendant proved with expert opinion S. (G7), that the microspheres are added to the polymer composition when the loss factor tan δ has passed through its local

minimum, i.e. is below a value of 1, and the polymer matrix is thus in the rubber-elastic, processable state.

37 Finally, it cannot be inferred from the described apparatus setup that the polymer composition has already melted when the microspheres are added. The gear pump is used to control the flow rate in the first extruder, in which a temperature of 93.3°C prevails. At this temperature, the polymer composition is not molten in the strict sense (loss factor tan δ = 1).

38 c) The fact that, as also assumed by the Patent Court and as claimed by the plaintiff with reference to the explanations of its expert, it cannot be inferred from any of the examples that the temperature of the polymer mixture when the microspheres are added is above the melting temperature in the narrower, strict sense, as well as the function-oriented consideration that it is only a matter of, viscosity to such an extent that the polymer composition can be easily processed in the extruder and mixed with the microspheres, rule out an understanding according to which storage shear modulus and loss shear modulus must be equal and tan δ must therefore assume a value of 1 if it is to be possible to speak of a "molten polymer composition". 5.

39 5. If the term "molten polymer composition" in features 1.2 and 4 is to be understood as meaning that the polymer composition does not have to be molten in the strict sense when the microspheres are added, but only that its viscosity must be reduced to such an extent that it can be processed in an extruder, the subject matter of the patent in suit does not contain any impermissible extension in this respect.

40 Nevertheless, the appeal is unsuccessful. The subject matter of the patent in suit, as understood, is not patentable.

41 The re-examination of patentability is not dispensable because the Senate already affirmed it in the first appeal judgment. This assessment was based on the state of affairs at the end of the oral appeal hearing at that time and the corresponding possibilities of knowledge. However, the factual basis of the assessment has now changed, because after the first appeal judgment, actual knowledge about the processing of amorphous polymers in the extruder

has been added, which, as explained, require other conclusions for the understanding of the "molten polymer composition".

42 The Patent Court stated with respect to patentability:

43 German published application 195 31 631 (E01) concerns a process for producing thermoplastic foams with a syntactic foam structure. According to this, a mixture of thermoplastic polymer or a thermoplastic composition and expandable polymeric microspheres is extruded in a molten state through a die in an extruder without the addition of solvents. The embodiments of the extrusion process encompassed by the teaching of E01 had all the features of the process according to the patent in suit. Since it is not clear from the wording of claim 1 of the patent in suit as granted when exactly in the process sequence the at least partial expansion of the microspheres provided for in process step d takes place, the process according to the patent covers both embodiments in which almost the entire expansion already takes place before the polymer mass exits the extruder die and embodiments in which only a slight expansion takes place before the material exits the die and the complete expansion takes place only after the material exits the die. Since the feature that the polymer composition must first be completely melted before the expandable polymer microspheres are added is not to be taken into account, it is also irrelevant that the temperature control in the embodiments of E01, in which the temperatures in the extrusion barrel are 395 to 405 K and thus in any case above the melting or softening range of the polyethylenes used, does not differ significantly from the temperature control in the embodiments of the patent in suit.

44 The process according to claim 1 was also not new compared to the paper by Elfving, Foaming Plastics With Expancel Microspheres, seminar paper February 19, 1998, RAPRA Technology Ltd. (E02), was not new. This paper deals with the foaming of polymer compounds by means of "Expancel" microspheres. As can be seen from its title, it concerns products of a process with the criteria of feature groups 1 and 3 and also discloses the other features of patent claim 1. Thus, the microspheres already partially expand in the extruder barrel and thus before exiting the extruder nozzle, which also discloses features 5 and 6. The features of feature group 4, according to which the melt mixing of the molten polymer composition and the expandable polymer

microspheres with respect to temperature and shear rate must be carried out under such process conditions that an expandable, extrudable mass is formed, are self-evident in the extrusion of thermoplastics with microspheres, which are also apparent to the skilled person from the temperature specifications and the softening and melting ranges familiar to him of the thermoplastic elastomers used in E02. In this respect, the lack of explanations in E02 in this respect did not prevent the assumption of lack of novelty. The same applied with regard to feature 2, which was also not expressly mentioned in the E02.

45 Even if one were to assume with the defendant that the subject matter of claim 1 is novel, patentability must be denied in any case because E02 suggested to the skilled person the process according to the invention. The citation E02 did not only give the suggestion to produce extrudates from suitable thermoplastic compositions as polymer matrix and expandable and extrudable polymer microspheres, but conveyed a sufficient technical teaching, so that the skilled person, based on his technical knowledge, could have easily arrived at the processes tailored for the respective application purpose with the features of claim 1 of the patent in suit.

46 However, the subject matter of patent claim 1 was not patentable even if the feature "molten polymer composition" was taken into account with regard to the international application WO 97/47681 (E19) introduced by the plaintiff as a further citation during the renewed hearing before the Patent Court.

47 This assessment stands up to review in the appeal proceedings.

48 Contrary to the assumption of the Patent Court, the subject matter of patent claim 1 in the defended version is not anticipated by the German published application 195 31 631 (E01).

49 The prior art document E01 concerns a process for the production of thermoplastic foams with syntactic foam structure, in which commercially available bulk plastics are mixed and foamed in an extruder using thermoplastic microballoons filled with gas or liquid and expanding under the action of heat (Sp. 1 lines 1-12).

50 In the embodiment examples, the expandable microballoons consist of a polyacrylonitrile shell and about 18 weight% included isopentane; this corresponds to features 1.1 and 3. They are processed in an extruder with a polymer composition to which no solvent is added (features 1.3 and 2).

51 According to the description, the process according to E01 is characterized in that components are admixed to the matrix plastics to be processed with high softening or melting temperatures, which already form melt fractions before reaching the temperatures at which the microspheres expand. The early formed melt components are intended to allow the build-up of pressure even before the (complete) melting of the matrix polymers and to effectively prevent the expansion of the microballoons in the extruder or injection molding machine during the existence of solid, higher-melting matrix plastic components and, furthermore, to largely avoid the effect of shear forces on the microballoons (Sp. 4 lines 22-39). The expansion capacity of the microspheres should thus be preserved for the shear-free stage after leaving the extruder die and made almost completely usable for the formation of the desired syntactic foam structures (Sp. 4 lines 43-47). Thus, feature group 4 and feature 5 are also realized.

52 Contrary to the view of the defendant, the E01 also discloses feature 6. It is true that the basic idea of the E01 is to counteract an expansion of the microspheres occurring prematurely, i.e. before they leave the extruder die, due to the temperature required to melt the polymer, by building up pressure. However, as can be seen in particular from the description of Examples 2, 3 and 7, the process according to the invention allows the expansion volume of the microballoons to be used almost completely (Examples 2 and 3) or to a high degree (Example 7) to form the syntactic foam structure. According to this, it cannot be practically ruled out that microballoons already expand at least partially before exiting the extruder nozzle. This is also confirmed by the statements in E02 (p. 3 lk. sp. "Extrusion" para. 2). There it is stated that the expansion should take place for the most part behind the die when the pressure drops. However, the Expancel microspheres, which are suitable for foaming various polymers, start to expand a little already in the barrel. Thus, feature 6 is realized. For, as correctly pointed out by the Patent Court, it neither allows

quantification of the proportion of microspheres which, according to the invention, should already have expanded before leaving the die, nor quantification of the extent of the expansion.

53 Not disclosed, however, is feature 1.2. In Example 6 of E01, the polymer components are first mixed, consisting of a polyethylene powder with a melting point of about 380 K and a granulate composed in equal parts of a linear low-density polyethylene (LLD-PE) and a high-molecular-weight polyisobutylene, which is described as already having high viscosity flowability under normal conditions. Microballoons are then homogeneously mixed in and processing is carried out on the extruder as described for example 1. After this, the polymer composition already contains flowable components. However, it is not flowable as a whole in the sense in which feature 1.2 is to be understood according to the above discussion.

54 However, the subject matter of the version of patent claim 1 defended by the main request is not based on inventive step, but was suggested to the skilled person, whose definition by the Patent Court the parties do not doubt, by US patent specification 5 100 728 (E18).

55 E18 describes pressure-sensitive adhesive tapes and their production and, in particular, foamed pressure-sensitive adhesive tapes with an acrylic- or rubber-based polymer matrix (Sp. 2 lines 18-20), which is extruded (Sp. 3 lines 8-15). Mentioned in particular are polymer compositions of acrylates of different low glass transition temperatures (Sp. 5 Z. 5-19). The support layer comprises low-density microspheres (Sp. 2 lines 13-15), which may be ceramic, polymer, glass, carbon, or other suitable material and may be solid, hollow or porous, rigid or elastic, and tacky or non-tacky (Sp. 2 lines 25-31, Sp. 6 lines 31-50). Hollow microspheres are preferred, and hollow ceramic microspheres are particularly preferred because they had high fracture strength and were generally less expensive than glass, polymer, and carbon microspheres (Sp. 7 Z. 12-17). Additional fillers can be used, as in the patent in suit (cf. para. 12 of the description there), and all components can be added to the extruder in a mixed form. However, it is also possible to add one or more of the fillers first to the polymer composition already in the extrusion barrel. If the filler contains low

density fragile microspheres, it is preferred to add it at the downstream end of the extruder to reduce the risk of breakage (Sp. 10 lines 62-67).

56 Although E18 does not refer to expandable microspheres, it discloses to the skilled person a process that reduces the risk of breakage for sensitive, easily breakable microglass spheres by adding them only at the downstream end of the extruder. It also shows the skilled person that microspheres of different types, in particular hollow polymer spheres, can be used. This gave him reason to also consider expandable hollow spheres.

57 The skilled person who wants to use expandable microspheres instead of microglass spheres knew from the Technical Note No. 24 of the microspheres manufacturer Expancel (E03) that there is a relationship between the temperature and the residence time in the extruder as well as its operating speed, and that the setting of these parameters influences the behavior of the microspheres (p. 4 lk. sp. section: "Temperatures" and "Other Process Parameters - Extrusion"). Thus, the skilled person is advised in this bulletin to work at the lower end of the recommended temperatures. A lower temperature, however, extends the residence time in the extruder. This can be shortened if the extruder operates at a higher speed. However, high speed generates frictional heat and strong shear forces that could damage or destroy the microspheres. Since expandable microspheres thus react sensitively to excessively high temperatures or excessively strong shear forces in a similar way to microglass spheres, the skilled person had reason to apply the extrusion process described in E18 to the extrusion of polymer compositions with expandable microspheres as well, because it was apparent to him that he could make advantageous use of the lower viscosity of the already heated polymer composition by feeding the microspheres later. In addition, he could in this way prevent excessive heating of the microspheres, which must have been of particular concern to him in the case of expanding microspheres.

58 Claim 15 is not to be examined separately. The Patent Court states, unchallenged by the appeal, that the defendant wanted its main and auxiliary claims to be understood as closed sets of claims.

59 Finally, the patent in suit is not valid even in the version of the auxiliary requests.

60 a) With auxiliary request I, process step a is formally divided into two sections, with section a now referring exclusively to the polymer composition and section b describing the nature of the microspheres and being supplemented by the addition "and adding the unexpanded polymeric microspheres to the molten polymer composition". Thus, the sequence of process steps expressed in features 1.2 and 4 of the version defended by the main application is explicitly mentioned. A substantive change is not associated with this. Furthermore, the feature "without causing the expandable microspheres to expand or break" is to be added to the previous process step b, now c. A new process step d is to be added, which reads as follows: "transferring the expandable extrudable composition to an extrusion die". These features also do not contain any restrictions compared to the main application, but are presupposed there if an extrudable and expandable composition is to be formed according to features 4.1 and 4.2, which is extruded through a die according to feature 5. Consequently, they cannot establish patentability either.

61 Finally, the subject matter of patent claim 1 (corresponding to patent claim 15 of the main application) is to be limited to the preparation of an adhesive polymer foam, wherein the polymer composition is to comprise an "acrylate or methacrylate adhesive polymer or copolymer" (addition at process step f).

62 However, the use of the process of claim 1 to prepare an adhesive polymer foam using a (meth)acrylate (co)polymer was suggested to the skilled person based on citation E18, which uses an acrylic-based pressure-sensitive adhesive polymer matrix. As documented by citation E02 (E02, p. 2 Table 1), the skilled person was aware that corresponding processes can also be used to produce an adhesive polymer foam.

63 b) The subject matter of patent claim 1 in the version of auxiliary request II is also not patentable. Auxiliary claim II corresponds essentially to auxiliary claim I, the subject matter of patent claim 1 being restricted to hot-melt polymer compositions and the feature "without causing the expandable

microspheres to expand or break" included in process step c with auxiliary claim I being deleted again. The use of hot-melt polymer compositions is known to the skilled person, for example, from E03. There, among other things, ethylene vinyl acetate (EVA, cf. description, para. 48), which is also considered in the patent in suit to be useful for the polymer matrix of the foam, is mentioned as a polymer compatible for extrusion with expancel microspheres. Likewise, the skilled person is familiar with the use of hot melt compositions from E18 (Sp. 5 line 31; Sp. 14 lines 23-28).

64 c) Likewise, the subject matter of patent claim 1 as amended by auxiliary claim III is not patentable. This auxiliary request builds on auxiliary request II, whereby in process step b at the end the feature "and adding the ***unexpanded*** polymeric microspheres to the molten polymer composition" is replaced by the feature "and adding the ***expandable*** polymeric microspheres to the molten polymer composition". The replacement of the terms "unexpanded" and "expandable" has no substantive meaning. Furthermore, according to auxiliary claim III, the following process step d should be included: "wherein the temperature during melt mixing is controlled to a value insufficient to cause expandable microspheres to expand". That the microspheres should preferably not expand already during melt mixing is already apparent to the skilled person from E01 (Sp. 4 lines 22-39 and lines 43-47).

65 The substitution of the term "a plurality" by "most" in the last process step ("at least partially expanding most of ...") cannot establish patentability either. Apart from the fact that this criterion already lacks the necessary clarity, it is not excluded in practice that microspheres expand for the most part already before exiting the extruder die at least partially. Thus, it is stated in E02 (p. 3 lk. Sp. "Extrusion" para. 2) that the spheres already start to expand a little in the extrusion barrel ("start to expand a little already in the barrel").

66 d) Auxiliary claim IV essentially adopts the version of claim 1 defended by the main claim with the proviso that the microspheres are added downstream into the extruder ("feeding a polymer composition comprising an acrylate or methacrylate adhesive polymer or copolymer and downstream adding a plurality of expandable polymeric microspheres"). This feature has already been dealt with under 3 b.

67 e) Auxiliary claim V corresponds to auxiliary claim IV but, unlike the latter, is restricted to hot-melt polymer compositions. The comments on auxiliary request II, which also relates to hot melt polymer compositions, and on auxiliary request IV apply accordingly.

68 f) Auxiliary application VI corresponds to auxiliary application I, with the exception that the feature "wherein the polymer composition comprises an acrylate or methacrylate adhesive polymer or copolymer" is to be moved from process step f to process step a. Since this merely involves the description of a possible composition of the polymer used, but not a change in the process sequence, auxiliary request VI is thus not different in substance from auxiliary request I. Thus, the patentability of the subject matter of patent claim 1 is not given for the reasons cited for auxiliary request I.

69 g) Auxiliary claim VII supplements auxiliary claim VI by the process step d from auxiliary claim III "wherein the temperature during melt mixing is controlled to a value insufficient to cause expandable microspheres to expand" and further modifies process step g - as already in auxiliary claim III - to the effect that not a plurality but most ("most" instead of "a plurality") of the expandable polymeric microspheres are at least partially expanded before the expandable extrudable composition leaves the die. Even in this version, patent claim 1 is not legally valid for the reasons set forth with respect to auxiliary claims VI and III.

70 h) Auxiliary claim VIII corresponds to auxiliary claim VII and additionally provides for a new process step h: "further comprising crosslinking the expandable extrudable composition or the polymer adhesive foam". The crosslinking of the polymer matrix is known to the skilled person from E18 (Sp. 5 lines 54-68) and therefore represents an obvious further development of the process.

71 Auxiliary claims IX, X and XI differ from auxiliary claims II, IV and V only by the omission of the product claims and therefore, according to the above, do not require separate discussion.

72 The decision on costs is based on Sec. 121(2) Patent Act in conjunction with Sec. 97(1) Code of Civil Procedure.

Meier-Beck Gröning Hoffmann

Deichfuß Kober-Dehm

Previous instance:
Federal Patent Court, judgment of 26 February 2013 – 3 Ni 28/09 (EU) –