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D E C I S I O N
of 25 February 1998

Case Number: T 0276/93 - 3.3.3

Application Number: 86302328.9

Publication Number: 0197728

IPC: C08L 25/12

Language of the proceedings: EN

Title of invention:
Preparation of thermoformed plastics articles

Patentee:
GE Chemicals, Inc.

Opponent:
Bayer AG, Leverkusen Konzernverwaltung RP Patente Konzern

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty (yes) - no implicit disclosure"
"Inventive step (yes) - ex post facto analysis"

Decisions cited:
-

Catchword:
-



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Boards of Appeal

Chambres de recours

Case Number: T 0276/93 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 25 February 1998

Appellant:
(Opponent)

Bayer AG, Leverkusen
Konzernverwaltung RP
Patente Konzern
Bayerwerk
51368 Leverkusen (DE)

Representative:

-

Respondent:
(Proprietor of the patent)

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Parkersburg Center
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Parkersburg, West Virginia 26102 (US)

Representative:

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Decision under appeal:

Interlocutory decision of the Opposition Division
of the European Patent Office posted 1 February
1993 concerning maintenance of European patent
No. 0 197 728 in amended form.

Composition of the Board:

Chairman: C. R. J. Gérardin
Members: H. H. R. Fessel
J. A. Stephens-Ofner

Summary of Facts and Submissions

- I. European patent No. 0 197 728 in respect of European patent application No. 86 302 328.9 filed on 27 March 1986 in the name of GE CHEMICALS, INC. was granted on 31 October 1990 (cf. Bulletin 90/44) on the basis of a set of 9 claims. Claim 1, the only independent claim read as follows:

"A process for preparing shaped articles which comprises forming a moulding composition comprising a blend of, as base resin, a resin having a continuous phase of a first copolymer of a styrenic monomer and an ethylenically unsaturated nitrile, said first copolymer having a number average molecular weight of from 3×10^4 to 1×10^5 , preferably from 3.5×10^4 to 7×10^4 , more preferably from 4×10^4 to 5.5×10^4 , and, as additive resin, from 0.1 to 20, preferably 1 to 6, more preferably 2 to 4, parts by weight per 100 parts by weight of base resin of a second copolymer of a styrenic monomer and an ethylenically unsaturated nitrile, said second copolymer having a number average molecular weight of from 3×10^5 to 3×10^6 , preferably from 5×10^5 to 2×10^6 , more preferably from 8×10^5 to 1.6×10^6 , at a temperature at least 40°C , preferably at least 50°C and more preferably at least 60°C , above the glass transition temperature of the base resin and at a stress level of at most 10^6Pa ."

Dependent Claims 2 to 9 related to preferred embodiments of the subject-matter of Claim 1.

- II. A Notice of Opposition was filed by Bayer AG on 13 February 1991. The Opponent alleged lack of novelty and inventive step of the claimed subject-matter.

These objections were based essentially on:

D1: DE-A-1 964 915;

D2: US-A-3 903 023 (continuation in part of D1) and

D3: DE-B-1 965 341 (subsequently considered in the form of DE-A-1 965 341).

III. By its interlocutory decision of 15 December 1992, issued in writing on 1 February 1993, the Opposition Division held that the grounds of opposition did not prejudice the maintenance of the patent in amended form based on a set of 9 claims (cf. annexed to the written decision) filed on 6 March 1992 and amended during oral proceedings as specified in item I.5 of the decision under appeal. Independent Claim 1 reads as follows:

"A process for preparing shaped articles which comprises vacuum forming or thermo-forming an unfoamed sheet of a moulding composition comprising a blend of, as base resin, a resin having a continuous phase of a first copolymer of a styrenic monomer and an ethylenically unsaturated nitrile, said first copolymer having a number average molecular weight of from 3×10^4 to 1×10^5 and, as additive resin, from 0.1 to 20 parts by weight per 100 parts by weight of base resin of a second copolymer of a styrenic monomer and an ethylenically unsaturated nitrile, said second copolymer having a number average molecular weight of from 3×10^5 to 3×10^6 at a temperature at least 40°C above the glass transition temperature of the base resin and at a stress level of at most 10^6 Pa."

In substance, the Opposition Division held the claimed subject-matter to be new and took the view that the claimed process provided shaped articles by vacuum- or thermo-forming unfoamed sheets of styrene-acrylonitrile

copolymers (hereinafter referred to as SAN-resins) having a more uniform wall thickness in distinct areas such as corners. The most relevant prior art was considered to be represented by D1 and D2, but since these citations did not mention any problems related with wall thickness of vacuum- or thermoformed-articles, they did not contain any hint of the problem solved by the disputed patent and could, consequently, not render obvious the solution it claimed.

IV. On 19 March 1993 an appeal was lodged by the Appellant (Opponent) together with payment of the prescribed fee. The Statement of Grounds of Appeal was received on 12 May 1993. The arguments presented in that statement and during oral proceedings held on 25 February 1998 can be summarised as follows:

- (i) Regarding the issue of novelty, from the information in the file it was known that the average molecular weight as determined by viscosity measurements corresponded to the weight average molecular weight (M_w) and that the number average molecular weight (M_n) was obtained by dividing M_w by a factor of up to 2.5. On that basis it could be established that the high molecular weight polymers disclosed in D1 corresponded to those of the disputed patent, and that the molecular weight of the second polymer was lower than that of the first one. D1 described the use of a second or base polymer called "LORKARYL JA" (cf. Examples 15 to 17), which was an acrylonitrile-butadiene-styrene copolymer (hereinafter referred to as ABS polymer) identified in D2 as having an average molecular weight of 180,000.

The molecular weight of the second polymer was thus identical with that given in the patent in suit when applying the above mentioned correspondence of molecular weights. Although the examples in D1 described the preparation of foamed articles, the description also encompassed the corresponding process without foaming agent; since the document had to be construed as a whole the interpretation of D1 resulted in a novelty destroying teaching.

- (ii) Regarding the issue of inventive step the problem solved by D1 and by the patent in suit was the same, i.e. to increase the flowability and to provide shaped articles with a uniform wall thickness. Said problem was solved in both cases with the same means, i.e. by a mixture of a low molecular weight copolymer (engineering resin) and a product of the same kind with a high molecular weight. The absence of a foaming agent in the process as claimed could not involve an inventive step, since such a deletion would represent an obvious alternative embodiment for a skilled person.

V. In his replies of 29 November 1993 and 11 February 1998 the Respondent (Proprietor) disagreed with the arguments of the Appellant. Together with the latter statement the Respondent submitted a copy of the French Patent Application No. 182 174 of 30 December 1968, said to be the application from which priority was claimed in D1 and D2, and also filed as auxiliary request a new set of 9 claims, of which independent Claim 1 differed from Claim 1 of the main request by the insertion of "and wherein the weight ratio of styrenic monomer to ethylenically unsaturated nitrile in said additive resin is from less than 1.65 to 1.05 X the weight ratio of styrenic monomer to ethylenically

unsaturated nitrile in said base resin" after 3×10^6 . That request, however, was not maintained during oral proceedings.

During the hearing the Respondent emphasised his previous arguments, in particular that the prior art was not concerned with the preparation of shaped articles from unfoamed sheets.

VI. The Appellant requested that the decision under appeal be set aside and the patent be revoked.

The Respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.
2. *Procedural matters*

As stated above (cf. point V) the Respondent cited, for the first time, and just two weeks before the oral proceedings, the French Patent Application said to correspond to the priority document from which both D1 and D2 are derived. Although this assumption may be reasonable in the light of the content of this document, there is insufficient proof of this identity, since there is no front page unambiguously identifying the document, but only a hand written indication "FR 182174" on the first page. Although the Board did not formally exclude that document from the proceedings, because it had obviously been cited in order to clarify whether the teaching of D1 should be extended to the manufacture of non-cellular articles, the Respondent did not rely on it during the hearing, so that there will be no reference to it hereafter.

3. *Provisions of Articles 123(2) and (3) EPC*

3.1 The wording of Claim 1 differs from that originally filed (i) in that the general term "forming" is replaced by "vacuum forming or thermo-forming an unfoamed sheet of", and (ii) by the deletion of all preferred ranges of molecular weight, amount and temperature, only the basic ranges being mentioned.

Claim 2 differs in that the preferred range specified in original Claim 2 was deleted.

Claims 3 to 9, which have not been amended during opposition proceedings, correspond to Claims 4 to 10 as originally filed.

3.2 The feature of vacuum- or thermo-forming was disclosed on page 1, 1.3 of the original files (column 1, lines 4/5 of the patent specification) and the term "unfoamed **sheet**" is consistent with the object of the patent in suit as it appears in the light of the difficulties encountered in the prior art acknowledged on p.1, 11.21 to p.2, 1.5 of the original files (column 1, lines 26 to 50 of the patent specification). From the original files in toto, and especially from the necessity to provide articles of more uniform wall thickness in distinct areas, such as corners of formed sheets, as well as in the absence of any indication of the use of foaming agents, it is evident that the original application related to **unfoamed** sheets. Nor has this been disputed by the Appellant in its written and oral submissions, more particularly in its comparison of the features required in the patent in suit with those of the prior art teaching.

- 3.3 Since the subject-matter of Claim 1 is restricted to the vacuum- or thermo-forming of unfoamed sheets, thus being narrower in both its process and product features, it is evident that the amendments carried out during oral proceedings cannot result in an extension of the scope of protection.

The provision of Article 123(3) EPC is thus also met.

4. Novelty

- 4.1 The teaching of D1 is difficult to interpret because, although generally directed to foams (claims and examples), it contains several passages (page 3, lines 6 to 12; page 4, lines 8 to 10 and 22 to 24) which also leave open the possibility to operate without foaming agents. This raises the question of whether the disclosure of specific features in connection with one embodiment should apply to the other, e.g. which teaching has in fact been made available to the public when this citation is interpreted in the light of the document construed as a whole.
- 4.2 D1 discloses compositions comprising blends of two styrene polymers, which may be blends of an SAN-copolymer or an ABS-terpolymer (A) and a SAN-copolymer (B), the latter having an average molecular weight M_n of more than 300,000 (Claims 1 and 6). The document itself is silent as to the molecular weight of the first polymer A, and even the molecular weight of the polystyrene polymers with the Tradename LORKARIL (Examples 15 to 17) identified as being ABS polymers or those with the tradename DIKARYL (Examples 29, 30, 34 and 35) identified as being styrene-acrylonitrile copolymers is not specified. Examples 1 to 4, which describe the preparation of various styrene polymers

(A), only show that the molecular weight, whether actually indicated or given by means of intrinsic viscosity, is fairly high. However, the Appellant, who as the Opponent has the onus of proof, failed to provide evidence that these commercial products have a number average molecular weight within the terms of the patent in suit and that, thereby, the polymer compositions used in this citation would inevitably meet all the requirements of Claim 1 (Counterstatement of 29 November 1993, page 3, paragraphs 2 and 3). It follows that even if one adopts the Appellant's broad interpretation of D1, this citation does not describe clearly and unambiguously the process according to Claim 1.

The Board thus finds the claimed subject-matter to be new.

- 4.3 D2 relates to a process for improving the foamability of a thermoplastic styrene polymer. It discloses blends of a conventional styrene polymer (A), a styrene polymer (B) with an average molecular weight M_n equal to or greater than 10^6 , and a foaming agent. Commercially available products used in such blends have molecular weights from 180,000 to 380,000 (cf. D2, column 6, second table). As conceded by the Appellant both in the Statement of Grounds of Appeal (page 5, paragraph 1) and during oral proceedings, the compulsory presence of a foaming agent represents an essential difference with respect to the compositions used in the process as claimed, so that there is no need to consider the question of the molecular weight of the two polymers any further.
- 4.4 Since D3 is less relevant in this respect (see 6.3 below), the Board considers the claimed subject-matter to be new over the cited prior art.

5. *Problem and solution*

Following the amendments in Claim 1 the patent in suit concerns a process for preparing unfoamed shaped articles by vacuum- or thermo-forming a moulding composition.

- 5.1 As explained in the patent specification (column 1, lines 35 to 41), a problem encountered when forming articles by vacuum- or thermo-forming sheets of ABS resin compositions is that of uneven wall thickness, so that the thickness in areas, such as corners, subjected to high levels of deformation is less than in areas, such as long stretches of straight wall, subjected to low levels of deformation. Although no specific document supporting this technical fact was cited in the introduction of the patent specification, the Appellant agreed that it corresponded to reality.
- 5.2 In the light of this shortcoming, the technical problem underlying the patent in suit may thus be seen in the definition of a process leading to shaped articles having a more uniform wall thickness.
- 5.3 The solution given by the patent in suit consists in forming a moulding composition comprising a blend of a resin having a continuous phase of a first styrene-acrylonitrile copolymer and a second styrene-acrylonitrile copolymer, both with the characteristics and under the conditions specified in Claim 1.
- 5.4 The Board is, in light of the disclosure of the patent specification, especially its examples and figures, satisfied that the above problem has thereby been effectively solved.

6. It has now to be decided whether the indicated means, especially the use of the composition specified in Claim 1, is obvious having regard to the documents relied upon by the Appellant.
- 6.1 Even on the assumption that the teaching of D1 would be regarded as relevant for the definition of a process specifically directed to the production of non-foamed articles, it would not render obvious the claimed subject-matter.
- 6.1.1 D1 is basically concerned with an improved workability of styrene polymers, in particular with respect to stretching and drawing steps occurring at working procedures, such as thermoforming, to produce sheets. To ensure the desired higher stretching ratio and, thereby, to obtain articles with an improved surface (page 2, lines 34 to page 3, line 5), the composition should have an appropriate viscosity and elasticity under working conditions as well as appropriate solidification when cooled (page 3, lines 19 to 34 in conjunction with page 24, lines 1 to 7). This is achieved by adding to the basic styrene polymer, which is selected within the broad class of polymers given on page 7, lines 8 to 32, a compatible styrene polymer of a very high molecular weight (page 6, lines 10 to 23; page 7, lines 33 to page 8, lines 22).
- 6.1.2 D1 is wholly silent as to any problems related to wall thickness when forming articles by vacuum- or thermoforming of sheets. In its passage bridging pages 2/3 it teaches that polystyrene sheets produced from compositions comprising a high molecular weight styrene polymer could be stretched without giving rise to rupture, and would enable the production of formed articles with improved **surface appearance**. Contrary to the arguments provided by the Appellant, the Board cannot recognize any relationship between surface

appearance and wall thickness of unfoamed sheets. That relationship is only disclosed in connection with the production of foamed sheets (page 3, lines 9 to 11 and 23 to 28; page 24, lines 23 to 28), and illustrated accordingly in all the worked examples.

- 6.1.3 In addition, as noted above when discussing the issue of novelty, D1 also fails to disclose the molecular weight of the base polymer, which is an essential feature of the process as claimed.
- 6.1.4 For these various reasons, in spite of the fact that D1 and the patent in suit rely on the same concept, namely the good compatibility between two polymers in order to improve the properties of the base polymer, the differences in their stated objectives are such that an obviousness argument based on the similarity of their compositions can only be made by hindsight.
- 6.2 D2 on the other hand focuses on problems arising in the course of the production of styrene polymer foams, where the maximum stretching which the material can withstand without breaking and the viscosity are of importance. It has been found that the addition of a styrene polymer of a molecular weight M_n of 10^6 or higher to a conventional styrene polymer permits under foam-forming conditions to increase the maximum elongation and allows a higher output. It is furthermore said that foams are provided which have advantageous behaviour characteristics in the field of the manufacture of packaging material by thermo-forming sheets of expanded polystyrene (column 1, lines 64 to column 2, line 29).

In view of the fact that D2 is explicitly limited to the manufacture of cellular structure finished articles and that, like D1, it is not at all concerned with the problems resulting from the uneven wall thickness of

the shaped articles, it is evident that a person skilled in the art would not have any incentive whatsoever to consider such a teaching for the solution of the above defined problem.

6.3 Similar considerations apply to D3, which is directed to the production of cellular articles from compositions based on a vinyl chloride polymer and a high molecular weight styrene-acrylonitrile copolymer, and thus differs from the patent in suit by both its object and its composition.

6.4 For the reasons given above, the documents relied upon by the Appellant do not render obvious the claimed subject-matter, which thus involves an inventive step.

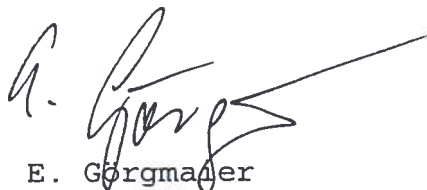
This also applies to Claims 2 to 9 which are dependent claims directed to preferred embodiments of the process according to Claim 1 and whose patentability is supported by that of the independent claim.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:



E. Görgmayer

The Chairman:



C. Gérardin