BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen

D E C I S I O N
of 26 September 1996

Case Number: T 0863/94 - 3.2.1

Application Number: 86303454.2

Publication Number: 0202814

IPC: B65D 65/40, B32B 27/30, B32B 31/28

Language of the proceedings: EN

Title of invention:
Multiple layer polymeric films, process for making them and packages made from them

Patentee:
American National Can Company

Opponent:
W. R. Grace & Co.-Conn.

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - (no)"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0863/94 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 26 September 1996

Appellant: (Proprietor of the patent)
American National Can Company
8770 West Bryn Mawr Avenue
Chicago
Illinois 60631 (US)

Representative:
Mougeot, Jean-Claude
Pechiney
28, rue de Bonnel
69433 Lyon Cedex 03 (FR)

Respondent: (Opponent)
W. R. Grace & Co.-Conn.
Grace Plaza
1114 Avenue of the Americas
New York
N. Y. 10036 (US)

Representative:
Uexküll & Stolberg
Patentanwälte
Beselerstrasse 4
22607 Hamburg (DE)

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 25 August 1994 revoking European patent No. 0 202 814 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: F. Gumbel
Members: S. Crane
J. Van Moer

Summary of Facts and Submissions

I. European patent No. 0 202 814 was granted on 5 February 1992 on the basis of European patent application No. 86 303 454.2.

II. The patent was opposed by the present respondents on the basis that its subject-matter lacked novelty and/or inventive step. Among the state of the art documents relied upon were the following:

(D1) EP-B-0 051 480.

(D4) US-A-4 448 792.

(D6) Wessling: "Polyvinylidene Chloride", Chapter 9: "Degradation", pages 133 to 157 (1977).

(D7) R. F. Boyer, J. Phys. Coll. Chem., 51, pages 80 to 106 (1947).

(D9) CA-A-982 923.

III. With its decision dated 25 August 1994 the Opposition Division revoked the patent.

IV. An appeal against this decision was filed on 27 October 1994 and the fee for appeal paid at the same time.

The statement of grounds of appeal was filed on 28 December 1994. With the statement of grounds the appellants (proprietor of the patent) submitted a sworn declaration by Mr Almar Widiger, one of the designated inventors. They also submitted a new set of claims.

V. In a communication dated 2 November 1995 the Board raised a number of formal objections against these claims. In response to this the appellants submitted a further set of claims which were, however, as explained in by the Board in the annex to the summons to oral proceedings dated 12 February 1996, still defective.

On 5 August 1996 the appellants submitted new sets of claims according to a main and an auxiliary request.

Independent claims 1 and 4 of the main request read as follows:

1. "A multiple layer polymeric film, which may be molecularly oriented, comprising first and second layers (16, 18) the compositions of which comprise 10 to 100% by weight of ethylene vinyl acetate copolymer, and a third layer (14) disposed therebetween the composition of which is made from a vinylidene chloride copolymer, wherein the composition of at least one of the first and second layers is a blend of 10% by weight to 90% by weight linear low density polyethylene and 90% to 10% ethylene vinyl acetate copolymer, wherein said third layer is a vinylidenechloride-methylacrylate copolymer, and wherein each of the first, second and third layers has been cross-linked in an amount equivalent to exposure to at least 1.5 megarads of electron beam irradiation."

4. "A process of making a multiple layer film, comprising forming a multiple layer film having first and second layers the compositions of which comprise 10 to 100% by weight of ethylene vinyl acetate copolymer and a third layer of vinylidene chloride copolymer, disposed between said first and second layers, wherein the composition of at least one of the first and second layers is a

blend of 10% by weight to 90% by weight linear low polyethylene and 90% to 10% ethylene vinyl acetate copolymer, wherein said third layer is a vinylidenechloride-methylacrylate copolymer, and wherein the process comprises subjecting the multiple layer film to electron beam irradiation in an amount of at least 1.5 megarads."

Dependent claims 2 and 3, and 5 to 7 relate to preferred embodiments of the film according to claim 1 and the process according to claim 4 respectively. Claims 8 and 9 relate to packages formed from the film.

Independent Claims 1 and 4 of the auxiliary request read as follows:

1. "A heat-shrinkable multiple layer polymeric film, molecularly oriented, comprising first and second layers (16, 18) the composition of which comprise 10 to 100% by weight of ethylene vinyl acetate copolymer, and a third layer (14) disposed therebetween the composition of which is made from a vinylidene chloride copolymer, wherein the composition of at least one of the first and second layers is a blend of 10% by weight to 90% by weight linear low density polyethylene and 90% to 10% ethylene vinyl acetate copolymer, wherein said third layer is a vinylidenechloride-methylacrylate copolymer with 3 to 20 mole per cent of the methylacrylate component, and wherein each of the first, second and third layers has been cross-linked in an amount equivalent to exposure to at least 1.5 megarads of electron beam irradiation."

4. "A process of making a heat-shrinkable multiple layer film, comprising forming a multiple layer film having first and second layers the

compositions of which comprise 10 to 100% by weight of ethylene vinyl acetate copolymer and a third layer of vinylidene chloride copolymer, disposed between said first and second layers, wherein the composition of at least one of the first and second layers is a blend of 10% by weight to 90% by weight linear low density polyethylene and 90% to 10% ethylene vinyl acetate copolymer, wherein said third layer is a vinylidenechloride-methylacrylate copolymer with 3 to 20 mole per cent of the methylacrylate component, and wherein the process comprises subjecting the multiple layer film to electron beam irradiation in an amount of a least 1.5 megarads."

Dependent claims 2 and 3, and 5 and 6 relate to preferred embodiments of the film according to claim 1 and the process according to claim 4 respectively. Claims 7 and 8 relate to packages formed from the film.

VI. Oral proceedings before the Board were held on 26 September 1996.

At the oral proceedings the appellants requested that the patent be maintained in amended form on the basis of the claims according to the main or (first) auxiliary request submitted on 5 August 1996. He also formulated orally a second auxiliary request according to which claim 1 of the main request was restricted to a "three layer film".

The respondents requested that the appeal be dismissed.

VII. The arguments of the appellants can be summarised substantially as follows:

The problem with which the invention was concerned was the provision of a heat-shrinkable packaging film which could be produced economically and which exhibited the combination of properties required by such a film, in particular high shrink, good hot strength, resistance to peeling, oil resistance, oxygen impermeability and optical clarity. This was achieved by the particular combination of layers specified in claim 1 and by the fact that these layers were cross-linked by electron beam radiation.

The only document which disclosed a film having outer layers of a blend of ethylene vinyl acetate copolymer (EVA) and linear low density polyethylene (LLDPE) and an oxygen barrier layer of a vinylidene chloride copolymer (PVDC) was document D1. Here, however, additional adhesive layers were provided between the outer layers and the PVDC layer, adding to the cost. Furthermore, the layers of the film had not been cross-linked. There was good reason for this since there was a general prejudice in the art against cross-linking PVDC by irradiation, it being known that this led to discolouration and an unacceptable product. Thus there had been recourse to expensive and less effective manufacturing processes in which individual layers of the film were cross-linked before lamination. The appellants had surprisingly found that a particular type of PVDC, a copolymer of vinylidene chloride and methyl acrylate (PVDV-MA), was significantly less susceptible to discolouration than the PVDC of choice previously used, a copolymer of vinylidene chloride and vinyl chloride (PVDC-VC), thus allowing the film as a whole to be cross-linked. This had very beneficial consequences for the hot strength and peeling resistance of the film. PVDC-MA was not a new material

but one which had been known for a long time. There was however no indication in the state of the art that it would be less liable to degradation by ionising radiation than was PVDC-VC. Documents D6 and D7, which had been relied upon by the respondents in this respect, did not suggest this. In particular, the relevant passage in document D6 which referred to document D7 was an inaccurate portrayal of the content of the latter. Only after the appellants had determined the superiority of PVDC-MA had other manufactures started to use it. This was a clear indication that its use in the given context was not obvious.

VIII. In reply the respondents argued substantially as follows:

Claim 1 according to both the main and first auxiliary request was in no way limited to a film having only three layers. This was clearly apparent from the fact that the embodiment of Figure 3 of the patent had five layers, corresponding exactly to what was taught in document D1. The only clear distinction between that state of the art and the claimed film was that the latter had been cross-linked by exposure to electron beam radiation. This had however already been proposed for a film comprising a PVDC oxygen barrier layer in document D4 and generally the benefits of cross-linking were well-known. It was said in document D4 that the degree of discolouration caused by degradation of the PVDC copolymer was acceptable. If the skilled person however nevertheless wished to improve this aspect then the choice of PVDC-MA, which was in any case one of the copolymers specifically mentioned in document D1, was obvious on the basis of the information contained in documents D6 and D7. Although PVDC-MA had been known for a long time it had only become available in a form suitable for use in a packaging film shortly before the date of the claimed invention. It also had to be noted

that the particular effect, maintaining optical clarity of the film after irradiation, now relied upon in support of patentability was nowhere mentioned in the patent specification and not clearly proved by the evidence submitted with Mr Widiger's declaration. The patent specification itself made no distinction between the properties of the film obtainable with PVDC-VC and PVDC-MA.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is therefore admissible.

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

As a result of the citation of state of the art according to Article 54(3) EPC the patent was granted with two sets of claims, the first set for the Contracting States DE, GB, IT, NL, SE and the second for the Contracting States AT, BE, CH, FR, LI and LU. The independent claims of the first set included the further limitation that at least one of the first and second layers was a blend of 10% to 90% by weight of LLDPE and 90% to 10% by weight of EVA.

The independent claims of the present main request have been derived from the first, i.e. more restricted, set of claims of the granted patent by limiting the composition of the third layer to a vinylidene chloride-methylacrylate (PVDC-MA) copolymer.

The basis for this amendment is to be found for example in claim 1 of the application as originally filed.

The independent claims according to the first auxiliary request have been further limited by the inclusion of the features that the film is heat-shrinkable and molecularly oriented and that the PVDC-MA has 3 to 20 mole per cent of the methyl acrylate component. There is ample support for the first of those features in the original application from which it is clear that the claimed invention is primarily concerned with the production of heat-shrinkable films by stretch orientation. The basis for the second feature is to be found at line 1, page 17 of the original application.

The dependent claims according to both the main and first auxiliary request correspond in essence to the equivalent claims of the granted patent and have each a counterpart in the original set of claims.

There are therefore no objections under Articles 123(2) and (3) EPC to the terms of the sets of claims corresponding to the main and first auxiliary requests.

3. *Substantive issues (main and first auxiliary request)*

3.1 Novelty

The novelty of the subject-matter of the independent claims according to both requests is no longer in dispute. Document D1 is the only state of the art on file which discloses a film having an oxygen barrier layer of a vinylidene chloride copolymer located between two other layers one of which is a blend of LLDPE and EVA and the other also such a blend or EVA alone. There is however no disclosure of cross-linking the film.

3.2 Inventive step

In general terms the claimed invention is concerned with the production of a heat-shrinkable film for use in packaging fresh food products. A film of this type has to exhibit a combination of many diverse properties including hot strength, high shrink rate, resistance to oil and water, low oxygen permeability and optical clarity. Since it would be difficult to obtain this combination of properties in one material, films of this type are traditionally made up of a plurality of layers of different materials each of which has a particular or number of functions. The films can be made by co-extrusion of the various layers followed by stretch orientation, for example by the well-known "bubble" process. This results in the molecular orientation of the material of at least some of the layers with the result that when the film is subsequently exposed to heat, e.g. in a heat water bath, the molecules return to a more random orientation and the film shrinks. Thus it is another requirement that the film have suitable properties to enable the stretch orientation to take place.

The films disclosed as the invention in document D1 have five layers. The two outer layers are of a blend of 20 to 70% by weight of LLDPE and 80 to 30% by weight of EVA. The central oxygen barrier layer is stated to be "PVDC" which is defined in general terms as being "a copolymer of 65 to 95% by weight of vinylidene chloride and 5 to 35% by weight of at least one unsaturated monomer polymerizable with vinylidene chloride. Vinyl chloride, acrylonitrile and alkyl acrylates with 1 to 18 carbon atoms in the alkyl group can be employed as the comonomer". In the examples the preferred PVDC copolymers are PVDC-VC's with a vinyl chloride comonomer contents of 20 and 15 weight% respectively.

Between the central barrier layer and the outer layers are thin adhesive layers of EVA. The emphasis of document D1 is on the good combination of properties, in particular oil resistance, stretchability and peel resistance obtained by the use of the blend of LLDPE and EVA.

In the opinion of the Board there can be no doubt that document D1 is the best starting point for evaluating the inventive step of the independent claims according to the main and first auxiliary requests. These claims are quite clearly not restricted to films which comprise only the three layers mentioned in them. There is nothing in the wording of the claims which could be interpreted as imposing such a restriction and to do so would be inconsistent with the patent specification itself which unambiguously embraces four or five layer films, see the embodiment of Figure 3. Thus the fact that document D1 relates to five layer films is irrelevant here. The questions which need to be addressed in this respect are firstly, whether it was obvious for the skilled person to cross-link the film known from document D1 by exposing it to at least 1.5 megarads of electron beam radiation, and secondly, whether it was obvious in this context to use PVDC-MA for the oxygen barrier layer.

As to the first question it is stated in the patent specification itself at line 12, page 2 that it is generally known that cross-linking of polymer films improves their toughness and hot strength. There are numerous examples of this teaching in the cited state of the art documents on file. More specifically, document D4 proposes exposing a six layer heat-shrinkable film, preferably after stretch orientation, to 4 to 12 megarads of electron beam radiation. The oxygen barrier layer of the film is stated to be a copolymer of vinylidene chloride with other monomers

such as vinyl chloride, acrylonitrile, methyl methacrylate, acrylates, acrylate esters, vinyl acetate etc. It is noted in column 6, lines 55 to 57, there was some degradation in optical clarity as a result of the irradiation but that this was not of practical significance. In the light of the general knowledge of the skilled person and the specific teachings of document D4 the Board is of the opinion that this first question must be answered positively and that the cross-linking by irradiation of the film of document D1 did not involve an inventive step. In particular, the Board, having regard to what is said on this subject in document D4, cannot accept the contention of the appellants that the skilled person would have been so concerned about degradation of optical clarity caused by irradiation, especially of the PVDC layer which was well-known to be susceptible to this, that he would have discarded the irradiation of the whole film disclosed in document D1 as being unworkable.

No doubt; however, the skilled person would bear the potential problem of this degradation in mind when making his choice of the particular PVDC copolymer to be used for the oxygen barrier layer. Here he can have recourse either to the manufacturers of such materials or to standard reference works about them, of which document D6 is one. Here it is stated on page 141 that

"It was quickly recognized by the early Dow workers that some of the copolymers they prepared were more stable than PVDC. Boyer[16] proposed that the greater stability of acrylate copolymers was related to the fact that long VDC sequences were broken up by comonomer units. This limited the potential length of an "unzipping" reaction. He was able to get a reasonable correlation between VDC sequence length and light stability in support of this hypothesis."

and on page 145 that

"The light stability of a number of copolymers was studied at the Dow Chemical Company. Boyer[16] used these results in formulating his ideas about the reaction mechanism. He found that acrylate copolymers had better light stability than vinyl chloride copolymers. The stability increased with acrylate content. Stability in this case was correlated with high transmission of light in the degraded films."

(The reference 16 is to document D7).

The appellants argued that the quoted passage from page 145 of document D6 represents a distortion of what is said in document D7 and should therefore be discarded. The Board cannot agree with that. On page 91 of document D7 the behaviour of copolymers of vinylidene chloride with halogenated and non-halogenated comonomers is compared with the conclusion that ideal comonomers for reducing the amount of discolouration would be ethylene, isobutylene, styrene, the acrylates and the methyl methacrylates. The particular comonomer chosen for detailed study was ethyl acrylate. Thus, document D6 does in fact give a fair summary of document D7 in this respect. Also, although the relevant passages of documents D6 and D7 are concerned with degradation by exposure to light, there could no doubt be more than a reasonable expectation that similar considerations would apply to degradation caused by ionising, e.g. electron beam, radiation. Therefore in the light of the teachings of document D6 and D7 the statement in paragraph 24 of Mr Widiger's declaration to the effect that it was a "most surprising discovery" of the appellants that PVDC-MA did not discolour when irradiated must be treated with an appropriate degree of reservation. At the oral proceedings the respondents submitted that

although PVDC-MA as such was a material which had been known for a long time it had only become commercially available in a form which was suitable for food packaging purposes much later. The reason for this was the development of manufacturing processes which enabled the residual amount of the comonomer methyl acrylate, which had a particularly sharp and disagreeable odour, to be reduced to very low levels. These submissions went substantially unchallenged by the appellants and the Board finds them a more convincing explanation of why PVDC-MA has now become a popular material in the given context than that of a surprising discovery of new properties offered by the appellants.

The Board therefore comes to the conclusion that the choice of PVDC-MA for the oxygen barrier layer of a multiple layer film which is to be cross-linked by exposure to electron beam radiation was obvious in the circumstances and accordingly, in the light of the finding that it was obvious to cross-link the layers of a film according to document D1, that the subject-matter of claim 1 of the main request lacks inventive step (Article 56 EPC).

The same analysis applies **mutatis mutandis** to the process defined in claim 4 of the main request since this claim includes no process features of an independent character going beyond those implicit to the manufacture of a film according to claim 1 and known **per se** from for example documents D1 and D4.

As for the independent claims 1 and 4 according to the first auxiliary request it is apparent from the above discussion that the additional features concerning the fact that the film is heat-shrinkable and molecularly oriented can add nothing of significance to the

subject-matter of the claims since both of the films disclosed in documents D1 and D4 are of this type. Thus the only additional feature which requires further consideration is the requirement that the PVDC-MA contain 3 to 20 mole% of the methyl acrylate comonomer. This needs to be compared with the comonomer content of a PVDC copolymer referred to in document D1, which is 5 to 35 weight%. Converting this to a mole% for methyl acrylate gives a content of 5.6 to 37.8 mole%. It can thus be seen that the additional requirement of claims 1 and 4 according to the first auxiliary request overlaps broadly with that known in the art and is not capable of providing any inventive distinction therefrom. The subjective-matter of claims 1 and 4 according to the first auxiliary request therefore also lacks inventive step.

4. *Second auxiliary request*

It belongs to the established jurisprudence of the Boards of Appeal that the admission of amended claims into appeal proceedings, particularly when the amendments are first submitted at oral proceedings, is at the discretion of the Boards, see for example T 95/83 (OJ EPO 1985,75) and T 153/85 (OJ EPO 1988, 1). The factors which need to be taken into account when exercising this discretion include whether there is some clear justification for the late submission of the amendment and whether the amended documents are clearly allowable, firstly in the sense of conforming with the formal requirements of the EPC and secondly in the sense of having at least a reasonable prospect of removing the outstanding substantive objections against the documents previously on file."

In their submissions dated 29 December 1995 the appellants had sought to draw a distinction between a three layer film, which they saw to be the subject-

matter of their claims, and a five layer film according to document D1. Since, however, they had evidently drafted those claims to cover also the embodiments contained in the patent specification with five layers the inconsistency in this line of argument should have been apparent at least then. Furthermore, the inconsistency was pointed out to them in the respondents' letter of 16 August 1996. There was therefore no justification for offering a corresponding amendment first at the oral proceedings.

As to the substantive issues involved it is not clear to the Board how a restriction to a three layer film could make any difference to the result of the evaluation of inventive step. In particular, three layer heat-shrinkable films are well-known, one example being disclosed in document D9. This film comprises outer layers of EVA and a central barrier layer of PVDC copolymer. The same considerations with respect to cross-linking and choice of an appropriate PVDC polymer apply here as they do when document D1 is taken as the starting point. The only other factor which would need to be considered would be whether it was obvious to include upwards of 10% LLDPE in at least one of the EVA outer layers.

The Board therefore comes to the conclusion that the second auxiliary request is inadmissible and accordingly rejects it.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Fabiani F. Gumbel