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**D E C I S I O N**  
**of 6 April 2000**

**Case Number:** T 0467/97 - 3.3.3

**Application Number:** 88303444.9

**Publication Number:** 0288227

**IPC:** C08J 5/18

**Language of the proceedings:** EN

**Title of invention:**  
Polyolefine films

**Patentee:**  
EXXON CHEMICAL PATENTS INC.

**Opponent:**  
Hercules Incorporated  
HOECHST AKTIENGESELLSCHAFT  
Imperial Chemical Industries PLC  
ACORDIS AG  
Mobil Oil Corporation Office of Patent Counsel  
Courtaulds Film & Packing (Holdings) Limited

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 54(2), 56

**Keyword:**  
"Novelty (yes) - whole contents approach - non-implicit disclosure"  
"Inventive step (yes) - non-obvious combination of known features"

**Decisions cited:**

T 0666/89; T 0246/91; T 0495/91

**Catchword:**

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Boards of Appeal

Chambres de recours

Case Number: T 0467/97 - 3.3.3

**D E C I S I O N**  
**of the Technical Board of Appeal 3.3.3**  
**of 6 April 2000**

**Appellant I:**  
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**Decision under appeal:** Interlocutory decision of the Opposition Division of the European Patent Office dated 12 March 1997, issued in writing on 2 April 1997 concerning maintenance of European patent No. 0 288 227 in amended form.

**Composition of the Board:**

**Chairman:** C. Gérardin  
**Members:** R. Young  
S. C. Perryman

## Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 288 277, in respect of European patent application 88 303 444.9, with eight claims, filed on 15 April 1988 and claiming a GB priority of 21 April 1987 (GB 8709446) was published on 6 July 1994. Claim 1 read as follows:

"A process for the production of oriented polyolefin films comprising melt blending under high shear conditions a polyolefin and a rosin or resin, preferably hydrogenated, having a number average molecular weight as measured by vapour phase osmometry below 5000, to form a concentrate containing from 10 to 90 wt% of the resin or rosin and subsequently blending the concentrate with a polyolefin and extruding the resultant blend to form a film."

Claims 2 to 8 were dependent claims directed to elaborations of the process according to Claim 1.

II. Six Notices of Opposition were filed against the patent, as follows:

(i) by Hercules Inc., (Opponent 01) on 28 March 1995, on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC);

(ii) by Hoechst AG (Opponent 02) on 6 April 1995, on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC);

(iii) by Imperial Chemical Industries PLC

- (Opponent 03), on 6 April 1995, on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC);
- (iv) by Akzo Nobel Faser (Opponent 04), on 5 April 1995, on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC);
- (v) by Mobil Oil Corporation (Opponent 05), on 12 April 1995, on the grounds of insufficiency, as well as lack of novelty and lack of inventive step (Articles 100(a) and 100(b) EPC); and
- (vi) by Courtaulds Films (Holdings) Ltd (Opponent 06), on 4 April 1995, on the grounds of insufficiency (Article 100(b) EPC), lack of industrial applicability (Article 52(1) and 57 EPC), lack of novelty and of inventive step (Article 100(a) EPC).

The oppositions were supported *inter alia* by the following documents:

- R1: GB-A-1 231 861;
- R4: GB-A-1 516 420;
- R6: US-A-3 278 646/ GB-A-993 387;
- R12: US-A-3 503 922;
- R18: GB-A-1 245 250;
- R26: "Modern Plastics Encyclopedia", 1979-1980,

pages 347, 348, 350, 352, 356, 358, 382 and 386;

R28: "Polythene" The Technology and Uses of Ethylene Polymers, Edited by A. Renfrew et al., Iliffe & Sons Limited, London 1960, pages 409 to 418;

R29: "Polyolefin Plastics", Theodore O.J. Kresser, Van Nostrand Reinhold Company, New York, 1969, pages 75 to 79; and

R30: Brochure published by Multibase SA in April 1982, relating to "MULTIBASE PPH 7012 A".

III. In a decision taken at the end of oral proceedings held on 12 March 1997 and issued in writing on 2 April 1997, the Opposition Division found that the patent in suit could be maintained in amended form, based on a set of Claims 1 to 7 and an amended description, both filed on 10 January 1997. Claim 1 of the amended version reads as follows:

"A process for the production of oriented polypropylene films comprising melt blending under high shear conditions polypropylene and a rosin or resin, preferably hydrogenated, having a number average molecular weight as measured by vapor phase osmometry below 5000, to form a concentrate containing from 10 to 90 wt% of the resin or rosin and subsequently blending the concentrate with a polypropylene and extruding the resultant blend to form a film."

Claims 2 to 7, which correspond to Claims 2 and 4 to 8, respectively, of the patent as granted, are



dependent claims directed to elaborations of the process according to Claim 1.

According to the decision, there was neither any insufficiency (Article 100(b) EPC), nor any lack of industrial applicability (Articles 52(1), 57 EPC). Furthermore, the process as claimed before them, which involved the steps of:

1. producing oriented polypropylene films, by
2. melt-blending under high shear
3. polypropylene and
4. a resin or rosin (Mn < 5 000)
5. to form a concentrate ("masterbatching")
6. containing 10 to 90 wt% of the resin or rosin
7. subsequently blending the concentrate with a polypropylene, and
8. extruding the resultant blend to form a film,

was novel over R4, since the reference to "masterbatching" in the latter gave no further information as to how the masterbatch was obtained. Nor was it evident how much polypropylene, if any, was present in the masterbatch. Consequently, process elements 2, 5, 6, and 7 were not explicitly or implicitly disclosed in R4.

As to inventive step, the closest state of the art was, contrary to the view of Opponent I, R1 (and not R6), in which there was, however, no mention of a combination of masterbatching and high shear, only conventional methods of mixing being used. The disclosure thus related to a film composition having certain properties, and not to a process, so that any obvious modifications would not necessarily relate to the process.

There was no suggestion or reason why the skilled person should modify the process in an obvious way such that melt blending took place under high shear, forming a masterbatch, followed by dilution with polypropylene as required by the patent in suit, an *ex post facto* approach having been used in combining of R26 and/or R29 with R1, none of the Opponents having discussed the prejudice arising from R18, and the remaining documents being less relevant.

IV. Notices of Appeal against the above decision were filed as follows:

- (i) by Appellant I (Opponent 01, Hercules) on 8 April 1997, the prescribed fee being paid on the same day, and a Statement of Grounds of Appeal being filed on 1 August 1997;
- (ii) by Appellant II (Opponent 02, Hoechst AG), on 11 June 1997, the prescribed fee being paid on the same day, and a Statement of Grounds of Appeal being filed on 5 August 1997;
- (iii) by Appellant III (Opponent 03, ICI) on 5 June

1997, the prescribed fee being paid on the same day, and a Statement of Grounds of Appeal being filed on 12 August 1997;

- (iv) by Appellant IV (Opponent 05, Mobil Oil Corp.) on 10 April 1997, the prescribed fee having been paid already on 4 April 1997, and a Statement of Grounds of Appeal being filed on 1 August 1997.

V. Letters were, however, received:

- (i) on 16 March 1999 from Appellant III (Opponent 03, ICI), informing the EPO that its opposition was withdrawn;
- (ii) on 7 January 2000 from Appellant IV (Opponent 05; Mobil Oil), informing the EPO that its appeal was withdrawn; and
- (iii) on 27 January 2000 from Opponent 06 (Courtaulds) informing the EPO that its opposition was withdrawn.

VI. In view of the numerous changes in the identity of the Appellants and their representatives, the Board issued a communication on 1 March 2000, confirming that the remaining parties to the appeal were:

1. Appellant I (Opponent (01), Hercules Inc);
2. Appellant II (Opponent (02); Hoechst AG);
3. Opponent (04); Akzo Nobel Faser AG (party as of right), renamed Acordis AG (letter of

7 September 1999); and

4. The Patentee, Exxon Chemical Patents Inc.  
(Respondent).

VII. The written submissions of the parties to substantive issues in the proceedings at this stage may be summarised as follows:

- (i) Appellant I maintained, in its Statement of Grounds of Appeal, its objection of lack of novelty in the light of R4, on the basis of a "whole contents approach", citing the decision T 666/89 (OJ EPO 1993, 495) and argued in particular that:
  - (a) the film inflating technique resulted in an oriented film in the sense of the patent in suit;
  - (b) the blending was done with a high shear device such as a Banbury mixer; high shear mixing was in any case necessary with the components under consideration;
  - (c) the low grade polyolefin corresponded, together with the tackifier component, to the resin or rosin according to the patent in suit; and
  - (d) the technique of masterbatching was standard in the art.

A new document:

R31: F. Rodriguez, "Principles of Polymer Systems", Second Edition, Hemisphere Publishing Corporation, page 307,

was cited for the first time in support of argument (b), above.

An objection was also raised for the first time that document R1 was novelty destroying for the subject-matter of the patent in suit. Although masterbatching was not mentioned in R1, it was textbook knowledge. A further document:

R32: "Polyolefin Plastics", Van Nostrand Reinhold Plastics Application Series, pages 85/86,

was cited for the first time in support of the latter argument.

As to inventive step, starting from R1, which disclosed a polyolefin film suitable for twist-wrapping, it was not clear what problem was solved by the patent in suit over this disclosure, particularly at the lower resin concentrations covered by Claim 1. In this connection, the only feature not disclosed was that of masterbatching. This was, however, a conventional method of mixing and blending in the plastics industry (R26, R28). Consequently, there was no inventive step over R1.

Similar considerations applied to the disclosure of R6, considered by Appellant I to represent

the closest state of the art, which related to compositions according to the patent in suit, when considered in combination with R4, which taught masterbatching.

In a further submission filed on 3 March 2000, Appellant I cited an extract from:

R33: Kirk-Othmer, "Encyclopedia of Chemical Technology", Third Edition, Volume 10 (1980), pages 216 to 246,

in support of argument (a) above.

- (ii) Appellant II, in its Statement of Grounds of Appeal, and in further submissions received on 17 December 1999 and, finally, on 14 March 2000, respectively, also maintained its objection of lack of novelty over R4 and of lack of inventive step in the light of R1 and/or R6, emphasising, in particular, that the "low grade polyolefin" in R4 was preferably a hydrogenated resin, the term "high shear" was indeterminate in scope, and the choice of closest state of the art was difficult when the definition of the technical problem was not clear, as in the case of the patent in suit.

In the submission received on 17 December 1999, it was argued that a prejudice could not be established by a single document such as R18. Additionally it was disputed that the problem of improving the clarity and seal strength of the films could be effectively solved by

masterbatching. On the contrary, the clarity, seal strength and, in part, also the modulus of elasticity could be detrimentally affected by "masterbatching".

The latter submission was accompanied by a **table of data** from earlier experiments to demonstrate such detrimental behaviour (hereinafter item (A) of experimental data).

The final submission, filed on 14 March 2000, furthermore contained additional **experimental data**, to show that no better results were obtained with masterbatching than without it (hereinafter item (B) of experimental data).

- (iii) The Respondent (Patentee, Exxon Chemical Patents Inc.) disagreed, in submissions filed on 28 May 1998, 6 March 2000 and, lastly, on 30 March 2000, with the arguments of the Appellants, and argued, in essence, that the term "masterbatch" implied nothing more than a polymeric composition comprising a high proportion of additive dispersed in the polymer, and in particular did not predicate the use of high shear. In this connection, R1 did not disclose the preparation of concentrates ("masterbatches") at all, and R4 did not provide any information on their method of preparation, the reference to the use of a Banbury mixer not being in the context of masterbatching.

Even if it were conceded that the skilled person reading R1, page 4, lines 62 to 80 would take

into consideration masterbatching, this did not mean he would know how to prepare a suitable masterbatch, since he was aware from the state of the art, in particular R18, that polypropylene useful in film production tended to degrade during dispersion operations.

Furthermore, R1 warned that, at more than 30% concentration, rosin or resin caused brittleness, and even at 20% a tendency to cause brittleness under some conditions was known, so it was surprising that no such brittleness was observed in the process according to the patent in suit. Finally, whilst the masterbatching of polyethylene had been known since 1960 (R28), almost 20 years had passed before anyone had prepared the masterbatch according to the patent in suit.

The Respondent doubted whether the newly cited documents R31 and R32 were sufficiently relevant to justify their introduction, and, in the submission received on 6 March 2000, argued that the experimental evidence of Appellant II had been filed too late.

The submission was itself accompanied by:

- (i) **an experimental report**, illustrating the tendency of rosin to form dust on shaking, compared with pure polypropylene and masterbatches containing both polypropylene and rosin (hereinafter item (C) of experimental data); and



- (ii) an amended set of Claims 1 to 7 forming a first auxiliary request.

In the last submission, received on 30 March 2000, the Respondent further contested the argument of Appellant I that, according to R4 the film was oriented, and of Appellant II that the low grade polyolefin could be regarded as a "resin". A number of further documents said to represent the general knowledge of the skilled person were referred to in this connection.

VIII. Oral proceedings were held on 6 April 2000. The proceedings were attended by Appellant I, Appellant II and the Respondent, Opponent (04), having been duly summoned, but having informed the EPO that it would not be attending the oral proceedings (letter received on 3 March 2000).

At the oral proceedings, the Respondent (Patentee) presented three further sets of Claims 1 to 7, forming a first, second and third auxiliary request, respectively, to replace the first auxiliary request filed on 6 March 2000.

Appellants I and II, who both had the same representative, informed the Board that they would neither raise issues under Article 57 or Article 100(b) EPC, nor pursue the allegation of lack of novelty in respect of the disclosure of R1.

The Chairman of the Board in his preliminary remarks indicated that:

- (i) documents R31, R32 and R33, as well as the other documents cited for the first time in the Respondent's submission of 30 March 2000, were all late-filed and, apparently, not of such crucial relevance as to justify their introduction into the proceedings; and
- (ii) none of items (A), (B) and (C) of experimental data had been filed in sufficiently good time for the other parties to have had a realistic opportunity fully to respond to them;

so that the Board was minded to exclude both documents (i) and experimental data items (A), (B), and (C) from the proceedings under Article 114(2) EPC.

The parties did not seek to rely on these disclosures/data in the proceedings, so that the substantive issues were discussed on the basis of the same documents as before the Opposition Division.

IX. Appellants I and II requested that the decision under appeal be set aside, and the patent revoked in its entirety.

The Respondent requested that the appeals be dismissed.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *Admissibility of grounds of opposition or issues not*

*originally raised by the parties represented at the oral proceedings*

No final decision on the admissibility of the grounds under Article 52(1) and 57 EPC (lack of industrial applicability) or 100(b) EPC (insufficiency) is necessary, since the Appellants indicated that they would not raise/pursue these grounds. Similar considerations apply to the issue of lack of novelty in relation to the disclosure of R1, which was also not further pursued.

3. *Admissibility of late filed documents/ experimental data*

No final decision on the admissibility of these late-filed items was necessary, since, following the preliminary, provisional remarks of the Chairman, the parties did not seek to rely on them during the oral proceedings (section VIII, above).

4. *The patent in suit; main request; novelty in view of R4*

The patent in suit relates to the production of polypropylene films suitable for twist wrapping applications and those which have improved stiffness, clarity, heat sealability and/or barrier properties, by a process characterised, according to Claim 1 of the patent in suit, by features 1 to 8 enumerated in the decision under appeal (section III, above). It was not disputed by the parties that the eight enumerated features, in combination, correctly reflected the subject-matter of Claim 1 of the patent in suit.

4.1 According to R4, there is disclosed a process for preparing a tacky polyolefin film including the steps of forming a film from a composition comprising 98.5 to 88 wt% of a polyolefin resin, 0.5 to 6 wt% of a low grade polyolefin and 1 to 6 wt% of a tackifier and then ageing the resulting film (Claim 1).

Suitable polyolefin resins which may be used include commercially available polyethylene, polypropylene, ethylene-propylene copolymer, ethylene-vinyl acetate copolymer, polybutene-1 and mixtures thereof, high pressure process polyethylene or ethylene-vinyl acetate copolymer being preferred (page 1, lines 64 to 77).

The low grade polyolefins are usually polyolefins having a molecular weight of 500 to 5000, such as a polyolefin obtained as a by-product in the preparation of polyolefin resin, especially such a by-product in the form of a grease wax (page 1, lines 78 to 89).

Suitable tackifiers include terpene resins, coumarone resins, coumarone-indene resins, rosins, xylene resins, petroleum resins and mixtures thereof (page 2, lines 5 to 9).

The composition can be prepared by blending the polyolefin resin, the low grade polyolefin, the tackifier and, if necessary, a defogging agent by an apparatus such as a Bumbury's [sic] mixer, a continuous mixer or a blending extruder, and then the blended composition is used for forming the film (page 3, lines 42 to 49).

The contents of the tackifier, the low grade polyolefin and the defogging agent need not be initially in the above-defined ranges, and can be adjusted by a masterbatch system wherein a masterbatch containing high proportions of the tackifier, the low grade polyolefin and the defogging agent is first prepared and the contents of these components are adjusted to within the stated ranges before forming the film. However, when their contents in the masterbatch are too high, the blending of them before forming the film is liable to be incomplete (page 3, lines 50 to 63).

The composition prepared by blending the above components, is used for forming the films, usually by the conventional inflating technique or the T-die technique and then the tacky film is prepared by ageing the resulting film. In the inflating technique, it is usually necessary to form the tubing at a blow-up ratio of at least 4, preferably 5 to 7 (page 3, lines 64 to 74).

The blow-up operation can be carried out in two steps. For example, the tubing may be formed at a blow-up ratio of 2 to 4 and then further expanded to a total blow-up ratio of higher than 4 (page 3, lines 94 to 99).

When the total blow-up ratio is less than 4, the tear strength of the tacky polyolefin film in the transverse direction is not improved and the resulting film is easily broken in packaging (page 3, lines 100 to 107).

The tacky film is prepared by ageing the film. In order to improve the tackiness, it is necessary to carry out the ageing when forming the film. It is preferably to carry out the ageing in an atmosphere at a relatively low temperature in order to maintain the mechanical characteristics of the film during forming. However, when the temperature is too low, it takes a long time to impart the desired tackiness, and when the temperature is too high, the film deteriorates through loss of molecular orientation, and the film is easily broken (page 3, line 118 to page 4, line 30).

According to the examples, high pressure process polyethylene was admixed with a low grade polyethylene having a number average molecular weight of 2000 and also with various tackifiers, such as Arkon P-90, a petroleum resin (Example 1), various terpenes (Example 2) and rosin (Example 3), at different ratios, each composition being extruded and inflated by an inflation extruder at a blow-up ratio of 6.5 to form a tacky polyethylene film, which was kept in a room at 20°C or 40°C for 8 days to age it.

4.2 Thus the method according to R4 is intended to enable a reduction in the amount of tackifier resin in a polyolefin based tacky film, such as a "cling" film, by replacing a portion of the tackifier resin by a low-grade polyolefin and ageing the product, so that, through a synergistic effect between the low grade polyolefin and the tackifier there results a maintenance of the overall level of tackiness.

4.2.1 Whilst polypropylene is mentioned as one of the possible polyolefins, all the examples concern

polyethylene. As pointed out by the Respondent (submission received on 6 March 2000, point 3), polyethylene and polypropylene behave in fact quite differently under the processing conditions envisaged in the patent in suit, so that the teaching arising from the examples in connection with polyethylene cannot be extended to polypropylene without substantial modification. Hence, there is no specific disclosure of a method using polypropylene as the polyolefin. Nor do any of the examples disclose the use of a masterbatch, even with polyethylene.

4.2.2 Closer examination of the passage relating to the masterbatch (page 3, lines 50 to 63), furthermore, reveals that it is only stated to contain the additives, since it refers only to "[T]he contents of the tackifier, the low grade polyolefin and the defogging agent...".

4.2.2.1 The argument of the Appellants at the oral proceedings, that "there would be no point in forming the masterbatch except with polypropylene" begs the question, since it was not demonstrated that masterbatches necessarily have to contain the same resin as will be used for the base resin. On the contrary, it is stated in the patent in suit itself, that the polypropylene used in the masterbatch may be different from that used in the final film (page 2, lines 38 to 40). Thus, there is no basis for concluding that in R4 the masterbatch necessarily contains any polypropylene at all.

4.2.2.2 The further argument of the Appellants, that the range of 10 to 90 wt% resin or rosin in the polypropylene

masterbatch was so wide that it "did not amount to a proper feature" is not convincing, since, for the reasons given above, the disclosure of R4 does not make available a masterbatch containing polypropylene in the first place.

4.2.2.3 It follows from the above, that the reference to "high proportions of the tackifier, the low grade polyolefin and the defogging agent" (page 3, lines 55 to 57) cannot be taken as defining a masterbatch composition corresponding to step 6 referred to above.

4.2.3 Nor is there any statement in R4 as to how the masterbatch should be formed. In particular, there is no mention of melt blending, let alone melt blending under high shear. This absence of any reference to shear is not surprising, since none of the additives referred to is stated to have a molecular weight greater than 5000, the low grade polyolefin and the tackifier being specifically chosen as amorphous, low viscosity components, and the antifogging agent being a lubricant (page 2, lines 88 to 104 in conjunction with page 3, lines 23, 24; Example 1).

4.2.3.1 The argument that the use of high shear was disclosed in the reference to "a Bumbury's mixer, a continuous mixer or a blending extruder..." is unconvincing in view of the structure of the disclosure of R4, in which the reference is not made in the context of the masterbatch but to the formation of the final composition. The latter, however, contains all the components including the polyolefin base resin, in contrast to the masterbatch, which is not disclosed as containing the polyolefin base resin. Consequently,



the sequence involved according to R4 excludes the possibility that the above mixers are applied to the masterbatch.

4.2.3.2 This conclusion is not altered by the question of how "high" the shear may be according to the patent in suit, since the masterbatch is not disclosed as being made with the use of shear, and the mixers are not disclosed in relation to masterbatching.

4.2.3.3 Consequently, R4 fails to make available step 2 of the process according to Claim 1 of the patent in suit.

4.2.4 The reliance, by Appellant I on a "whole contents approach" as set out in decision T 666/89 (cf. supra) does not alter this situation, for the following reasons.

4.2.4.1 Decision T 666/89 extends the concept, set out in T 26/85 (OJ EPO 1990, 022), to which it specifically refers, of lack of novelty in the case of overlapping numerical ranges of certain parameters between a claim and a prior art document, to other kinds of overlap, whilst retaining the criterion of whether the skilled person would, in the light of all the technical facts at his disposal, **seriously contemplate** applying the technical teaching of the prior art document in the range of overlap (Reasons for the decision, point 7). The overlap in that case, however, concerned particular, preferred components of a composition falling within a generalisation of such a composition forming part of the disclosure of the prior art document. Furthermore, it was held that there was no disclosure or indication in the prior art document

that particular rules had to be observed when combining the respective components (Reasons for the decision, point 4).

- 4.2.4.2 In the present case, by contrast, it is evident from the fact that all the examples concern polyethylene and not polypropylene, that the latter is not a preferred component. Nor can the disclosure be regarded as free of rules needing to be observed in combining the respective components, since, contrary to the situation in T 666/89, the relevant disclosure concerns a process and not a composition, and the definition of the process imposes a structure on the order in which the steps are to be carried out. This order of steps would have to be rearranged, however, to arrive at the sequence represented by steps 2 to 8 of the process according to Claim 1 of the patent in suit.
- 4.2.5 In summary, R4 fails to disclose individually the step 2, or 6 characterising the process according to Claim 1 of the patent in suit. It follows from this, that the combination of steps 2, 3, 5, 6 and 7 is not made available by R4.
- 4.2.6 Whilst there was considerable discussion, during the oral proceedings before the Board, on the question of whether the films disclosed by R4 were "oriented" films or not, in the sense of step 1 of the process according to the patent in suit, the following may be observed: whilst the disclosure in R4 of a "blow-up" technique carried out in two steps, firstly to a blow-up ratio of 2 to 4 and then to a total ratio of higher than 4, with an increase in the tear strength in the

transverse direction (page 3, lines 94 to 107), read in conjunction with the warning that, when the ageing temperature is too high, the film deteriorates through loss of molecular orientation (page 4, lines 15 to 30), is indicative of a measure of orientation of some kind in the films referred to, such orientation is not specifically disclosed in relation to a polypropylene film. Even if it had been, however, it would not alter the fact that R4 fails to disclose at least features 2, 3, 5, 6 and 7 of the relevant process.

4.2.7 In summary, the subject-matter of Claim 1 of the patent in suit is novel in the light of R4. Since, furthermore, no other objection of lack of novelty was pursued by the Appellants, the Board sees no reason to differ from the finding of the decision under appeal in this connection. Thus, the subject-matter of Claim 1 is held to be novel.

5. *The technical problem*

The patent in suit concerns the production of polypropylene films suitable for twist wrapping applications and those which have improved stiffness, clarity, heat sealability and/or barrier properties (patent in suit, page 2, lines 3 to 5).

5.1 Whilst Appellants I and II, in their written submissions, considered that the closest state of the art was R6, rather than R1 as found by the decision under appeal, it is the established jurisprudence of the Boards of Appeal that an objective definition of the technical problem to be solved should normally start from the technical problem actually described by

the Applicant (T 246/91 of 14 September 1993 and T 495/91 of 20 July 1993, neither published in OJ EPO), an approach which is equally applicable, in the Board's view, to a granted patent.

5.2 According to the acknowledgment of prior art in the patent in suit, the addition of rosins and resin to polyolefin films to improve stiffness, clarity and heat sealability is known, such materials, according to GB-A-1 231 861 (R1 in the present proceedings), being useful in twist-wrapping (page 2, lines 6 to 10). Whilst in some applications these products have been acceptable they have not proved successful in twist wrapping and this is believed to be due to the difficulties in incorporating relatively large amounts of the resin or rosin in the polyolefin (page 2, lines 11 to 13). Thus, it is clear that the problem addressed by the patent in suit starts out from a process as disclosed in R1. The Board thus supports the approach in the decision under appeal, that R1 is the closest state of the art.

5.3 According to R1, a biaxially oriented, transparent, glossy, stiff film for twist wrapping sweets is formed from a composition comprising:

- (a) from 70% to 95% by weight of a crystalline alpha-olefin polymer and
- (b) from 5% to 30% by weight of an additive having a drop softening point above 70°C,

the additive being a terpene polymer, a compatible hydrogenated hydrocarbon polymer, or a compatible

rosin derivative, the film having a greater degree of orientation in its longitudinal direction than in its transverse direction, and being capable of forming a twist wrap which will retain a level of twist of at least 0.5, preferably at least 0.75, after machine wrapping the film around a sweet and then imparting a twist to the projecting ends of about 1.5 or 2 times. A retained twist of 0.5 corresponds to the flattened projecting ends of wrapping material surrounding the sweet being rotated by 180° and 0.75 to 270°, respectively (page 1, lines 18 to 63).

The composition of the crystalline alpha-olefin polymer and the hydrocarbon polymer or rosin are prepared by the conventional methods of mixing and blending which are used in the plastics industry. For example, the crystalline alpha-olefin polymer in flake, powder or granule form and particles or granules of the rosin derivative may be preliminarily mixed together in a tumbling barrel, or in a Sweetie barrel, or in a ribbon mixer, and the resulting mixture then intimately blended by malaxating on a hot two-roll mill or in a Banbury mixer, or in the barrel of a heated extruding apparatus to prepare the desired "alloy", which may then be directly extruded into film, or reduced to suitable moulding powder granules by conventional comminuting methods for charging to an extrusion apparatus (page 4, lines 62 to 80).

Whilst at least 5% of the hydrocarbon polymer or rosin should be used in order to obtain a material having the properties of transparency and gloss, compositions containing more than 30% of the hydrocarbon polymer have been found to be brittle. In fact, even

compositions containing from 20% to 30% of the hydrocarbon polymer or rosin have a tendency towards brittleness. For this reason, compositions containing less than 20% of the additive are said to be preferred (page 4, lines 81 to 93).

According to typical examples (Examples 1 and 2), a composition comprising 82% polypropylene and 18% of a hydrogenated hydrocarbon polymer obtained by the hydrogenation of the product of catalytic polymerisation of beta-pinene was extruded in the form of a tubular film which was then quenched to room temperature, heated to a temperature at which it could be oriented and stretched 7.2 times in two perpendicular directions by means of the "bubble" process. The tubular film was slit and samples were passed over a series of matt-surfaced rollers heated to 139°C and 145°C, respectively, upon which they were allowed to shrink transversely. Both films were wrapped on a commercial twist wrapping machine and retained a twist of about 0.75 times.

- 5.4 There is no disclosure in the examples of R1 as to how the composition fed to the extruder was mixed. In particular, there is no reference to the use of melt blending under high shear. On the contrary, the only method of such mixing described is in the general reference to "malaxating" (page 4, line 73). According to the unrefuted submission of the Respondent at the oral proceedings before the Board, the step of "malaxating" is one in which dry materials are mixed and softened to form a plastic mass, without being melted. Thus, the reference to the use of a Banbury mixer (page 4, line 74) or other extruder apparatus

for this purpose does not imply melt blending, or even the use of high shear. Consequently, and contrary to the view of Appellant II that the disclosure of R1 differed from the subject-matter of Claim 1 of the patent in suit only in that "masterbatching" was not disclosed (submission filed on 5 August 1997, paragraph 5), the disclosure of R1 fails to make available any of steps 2, 5, 6 or 7 of the claimed subject-matter.

5.5 It is, furthermore, evident that the system of R1 suffers from the disadvantage that there is a tendency to brittleness when incorporating more than 20% resin or rosin into the film, this being a characteristic of the resin or rosin, which becomes apparent when the latter is not homogeneously dispersed in the polypropylene, especially at higher loadings.

5.6 The technical problem objectively arising may thus be seen in the definition of a process capable of incorporating higher proportions of resin or rosin in the polypropylene whilst maintaining or improving its homogeneity of dispersion, to enable greater flexibility in the production of high quality films suitable for twist wrapping applications.

5.7 The solution proposed according to Claim 1 of the patent in suit was to interpose, before the tubular extrusion step exemplified in R1, the additional steps of:

- (i) melt-blending under high shear polypropylene and the resin or rosin to form a concentrate (masterbatch) containing 10 to 90 wt% of the

resin or rosin; and

- (ii) subsequently blending the concentrate with polypropylene,

before extruding the resultant blend to form a film.

5.8 According to Example 1 of the patent in suit, a masterbatch containing 50 wt% isotactic polypropylene having a melt flow of 2.8 g/10 min and 50 wt% of a lower molecular weight hydrogenated hydrocarbon resin having a ring and ball softening point of 140°C, was made by mixing the molten polypropylene and softened resin under high shear conditions in a Werner & Pfleiderer twin screw extruder equipped with two co-rotating inter-meshing screws and heating elements such that melt temperatures in a first mixing zone, a second mixing zone and the die were 170°C, 194°C and 178°C, respectively, to form an extruded strand which was pelletised by cutting under water to form a concentrate having a melt flow index of 30 g/10 min (page 4, line 50 to page 5, line 11).

5.8.1 According to Example 1-a, a mix of 40 wt% of the concentrate and 60 wt% of an isotactic polypropylene having a melt flow index of 2.8 g/10 min was extruded into a film, which was then biaxially oriented. The film had a twist retention of 0.65 (i.e 65%) of a single, 360° initial twist applied by laboratory simulation of candy wrapping operations.

This degree of twist retention compares favourably with that of R1, which amounts to 270° on an initially applied twist of 1.5 to 2 turns, i.e. not better than



0.5 on the same basis as the measurement in Example 1-a of the patent in suit. Consequently, it is evident that the quality of the film produced by the masterbatch system according to the patent in suit is at least as good as that of R1, if not better, in terms of twist retention, and therefore of stiffness.

5.8.2 Furthermore, according to Example 3 of the patent in suit, blends of polypropylene and the lower molecular weight resin containing 50, 60, 70, 80 and 90 wt% of the lower molecular weight resin were made in a kneader, at melt temperatures in the range 180°-200°C, and each of the concentrates was physically mixed with polypropylene in a normal film extruder, in the appropriate ratio to obtain 30 wt% of resin in the mix. It was found that films could be successfully extruded from concentrates containing at least up to 70% resin, whereas an attempt directly to extrude a physical mix of polypropylene containing only 30% resin was completely unsuccessful, owing to the very large differences in the softening/melting temperatures of the polypropylene and the resin and the difference in their rheological properties (page 6, lines 16 to 45).

Thus, it is evident that an **improved** dispersion of resin in polypropylene is obtainable using the melt-blending masterbatch system according to the patent in suit, at **higher loadings** than with the "conventional" methods disclosed in the closest state of the art.

5.8.3 The arguments of Appellant I, that it could not be seen what problem should be solved by the patent in suit (Statement of Grounds of Appeal, page 10, first

paragraph), is not convincing in view of the above finding.

5.8.4 The further argument of this party, that the technical problem was not solved for low amounts of added resin, is also not convincing, since it has not shown this to be the case. The evidence of the patent in suit demonstrates, by contrast, that a uniform dispersion of resin in polypropylene is formed at resin loadings from 50% upwards using the melt blending masterbatch system (Example 3). There is no basis for assuming that a less uniform dispersion would be obtained at lower loadings. The onus was in any case on the Appellants to demonstrate such a failure to solve the technical problem, which they have not discharged.

5.8.5 Consequently, the Board finds it credible that the claimed measures provide an effective solution of the stated problem, over the whole range claimed.

6. *Inventive step*

It is necessary, in this connection, to consider whether the skilled person, starting from R1, would have expected an improved homogeneity of resin/rosin dispersion in polypropylene, at higher loadings, leading to greater flexibility and certainty in the production high quality of twist wrap films, to be obtained by introducing, prior to the film extrusion step exemplified in R1, the additional step of forming a masterbatch containing polypropylene and 10 to 90 wt% resin or rosin by melt blending under high shear.

- 6.1 There is no suggestion to do this in R1 itself, since the latter does not disclose either masterbatching or the use of melt blending under high shear prior to film extrusion.
  
- 6.1.1 The argument that "masterbatching" would be understood by the skilled person as being subsumed under the reference to "conventional methods" of mixing is not supported by the disclosure of R1, which, whilst it mentions more than one step of mixing, does not suggest any change in the polypropylene content of the composition between mixing and extrusion of the final film. On the contrary, it is evident from the general passage relating to "malaxating", that the desired "alloy" is either directly extruded, or granulated for charging to an extrusion apparatus (page 4, lines 62 to 80, especially lines 75 to 80) without any such change of composition being contemplated. Furthermore, it is evident from the examples, that the composition fed to the extruder already has the desired final content of resin/rosin. Hence there is no hint to the use of masterbatching as a "conventional" method of mixing, in the context of the specific disclosure of R1.
  
- 6.1.2 Even if the skilled person were nevertheless, for some other reason, to consider masterbatching in the general context of "conventional" methods of mixing, it is an inescapable prerequisite of masterbatching, that the relevant additive can be dispersed without difficulty in the base material in higher concentrations than are going to be used in the final product. For twist wrapping applications, in this connection, according to the patent in suit, levels of

20% to 30% resin/rosin addition are preferred (page 4, lines 5 to 7). Yet, according to R1, it is at precisely this level of resin/rosin incorporation that difficulties of dispersion, leading to brittleness, arise. Consequently, the teaching of R1 would dissuade the skilled person from attempting the option of a masterbatch of polypropylene with resin/rosin materials for solving the stated problem.

6.1.3 The further argument, that the reference to a "Banbury mixer" amounted to the disclosure of melt blending under high shear is not convincing, for the reasons already given (section 6.4, above).

6.1.4 Finally, the argument of Appellant II that the reference to "high shear" in the patent in suit is indeterminate does not affect the position, since, for the reasons already given, the masterbatching step in which the high shear is to be applied, is itself not suggested by R1 in the first place.

6.1.5 In summary, there is no hint to the solution of the technical problem in the disclosure of R1.

6.2 Nor would the disclosures of the general texts R26, R28 and R29 assist the skilled person to the solution of the stated problem, since they neither concern polypropylene, nor the incorporation into it of sticky substances such as the resin/rosin materials according to R1.

6.3 Whilst it is true that the use of a masterbatch system in connection with the incorporation of particulate additives into polypropylene is disclosed in R12, this

document teaches that there are problems in the dispersion of particulate solids in isotactic polypropylene because of the tendency of the latter to degrade during dispersion operations (column 1, lines 51 to 55; Example 1). Furthermore, whilst the preparation of a masterbatch using atactic polypropylene is disclosed (Example 2), the level of dispersion of the additive is inferior to that using polystyrene (Example 3) or polyethylene (Example 4). Finally, the additives concerned are all particulate, specifically carbon black, which have quite different dispersion characteristics from a tacky material such as a resin or rosin. Indeed, one of the former Opponents argued, in relation to an alleged prejudice arising from R12, "Since the dispersed phase in R12 is entirely different from the rosin in the invention and since the polymer can be the same as in the invention, again R12 does not create any relevant prejudice." (Statement of Grounds of Appeal of former Opponent (05), Mobil, point 7.3, last sentence). Thus, in view of the different nature of the dispersed phase in particular, R12 would not assist the skilled person to solve the technical problem.

6.4 For the same reason, the disclosure, in R30, of a polypropylene masterbatch "Multibase" PPH 7012 A, which is a masterbatch consisting of 70% inorganic filler and 30% virgin polypropylene, is irrelevant to the solution of the technical problem, since an inorganic filler has fundamentally different dispersion properties from those of resin/rosin materials.

6.5 According to R18, a process for preparing solid

polyphase compositions material is characterised in that a propylene polymer of fine (specified) particle size is dispersed in a fluidised amorphous material, heated to dissolve the polypropylene in the amorphous material and then cooled (cf. Claim 1). The process overcomes the problems associated with larger particle size polypropylene and also the difficulty that such compositions, in which the amorphous material is a hydrocarbon resin or rosin, have been limited to a preferred maximum concentration of the latter of about 40%, since above this level, the prior compositions began to exhibit brittleness, demonstrating that the propylene polymer phase was not continuous (page 2, lines 71 to 84).

- 6.5.1 Whilst the disclosure is not particularly concerned with the preparation of films, let alone films suitable for twist wrapping applications, it does address the difficulties associated with dispersing large amounts of resin/rosin materials in polypropylene. Nevertheless, it proposes a completely different solution, which does not involve either masterbatching or the application of shear.
- 6.5.2 Consequently, the teaching of R18 leads away from the solution of the stated problem.
- 6.6 The disclosure of R6, which is specifically referred to in R1 (page 1, line 78), although relating to a transparent, unsupported heat sealable film consisting of a polyolefin, which may be high density polyethylene or a polypropylene, containing 1 to 60% by weight of a terpene polymer having a softening point above 70°C (Claim 1), does not exemplify a

polypropylene film containing more than 25% terpene resin (Example 1). Furthermore, the methods of blending the polyolefin and the terpene are no different from those disclosed in the later document R1. Consequently, R6 adds nothing of value to R1 in relation to the solution of the technical problem.

6.7 The disclosure of R4 is concerned with a different problem from that of the patent in suit, since it aims at providing a tacky film of the "cling" film type. This is diametrically opposite in its properties to the kind of film aimed at in the patent in suit, which has to meet specific twist wrap criteria, the latter including, according to the unchallenged submission of the Respondent at the oral proceedings before the Board, the requirement of protecting the sweet from moisture so that it will not stick to the paper. Consequently, the skilled person faced with the technical problem would not regard the disclosure of R4 as relevant to his purpose.

6.7.1 Even if the attention of the skilled person were to fall, for some other reason, on the disclosure of R4, the purpose of the method it describes is to enable the use of even less tackifier, without loss of tackiness. Consequently, there is no incentive to incorporate large amounts of tackifier, since this has a detrimental effect on the strength of the film (page 1, lines 39 to 42).

6.7.2 In the latter connection, in the reference to masterbatching, the maximum amount of tackifier according to the document is 6% (Claim 1). Even if one were, to the advantage of Appellant I, to regard the

low grade polyolefin component as falling within the term "resin" in Claim 1 of the patent in suit, the maximum incorporated amount of such additives contemplated by R4 would be 12 wt%. Whilst the reference to "masterbatching" on page 3, relied upon in the attack on novelty, mentions "high proportions of the tackifier...." (section ....., above), there is, for the reasons already given, no basis for concluding that such a masterbatch contains polypropylene, as required by the solution of the technical problem, or, if it did, how such incorporation might be achieved.

6.7.3 Consequently, the aim of R4 is not relevant to the technical problem, nor is the means disclosed relevant to its solution.

6.8 The general argument that it would in any case have been attractive, from a commercial point of view, to apply a masterbatch system of some kind to the system of R1, and once having hit upon this approach, it would merely have been a matter of trial and error to find the best way of making the masterbatch, is not supported by the fact that whereas all the means, and in particular the use of masterbatching, had been known since about 1960 (R28), over twenty years passed without this having been done. Such an idea in any case depends, for its attractiveness, on the assurance that masterbatches containing sufficient levels of resin/rosin material for dilution to 20 to 30%, i.e. loadings of 50 to 60% of such material, can be prepared without difficulty. Such a notion, however, runs contrary to the consistent teaching of R1, R12 and R18 that there is a limit of effective dispersion incorporation of such additives in polypropylene, and



this is somewhere about half of what is economically required.

- 6.9 The further argument, that the skilled person could have made the masterbatch with resin/rosin additions limited to lower amounts, say 12 to 25%, whilst remaining within the terms of the patent in suit, is unconvincing from the commercial point of view, since such a content of resin/rosin would be equal to or less than that required in the final film for application in twist wrap applications, so that the masterbatching would simply be an additional, redundant operation.
- 6.10 Nor has it been shown, from the technical point of view, that the skilled person would have realised that a better dispersion than that according to R1 would be obtained even at lower concentrations of additive (sections 6.8.4, 6.8.5, above, above).
- 6.11 In other words, the solution of the technical problem does not arise in an obvious way, starting from R1 as closest state of the art.
- 6.12 Nor would the result have been altered by starting, in accordance with the view of Appellant I, from R6 as closest state of the art, since the latter document does not add anything relevant to the later, more detailed disclosure of R1 (section 7.6, above).
- 6.13 Consequently, the subject-matter of Claim 1, and, by the same token, that of dependent Claims 2 to 7 involves an inventive step.

7. In view of this finding, the main request of the Respondent must be allowed. It was therefore, not necessary for the Board to consider the admissibility of the first, second and third auxiliary requests which the Respondent sought to introduce at the oral proceedings before the Board.

## **Order**

**For these reasons it is decided that:**

The appeals are dismissed.

The Registrar:

The Chairman:

E. Görgmaier

C. Gérardin