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Datasheet for the decision of 22 July 2008

Case Number: T 1274/05 - 3.2.07

Application Number: 95916991.3

Publication Number: 0820353

IPC: B05D 7/14

Language of the proceedings: EN

Title of invention:
Method for extrusion coating a metal strip

Patentee:
Alcoa Inc.

Opponents:
Hydro Aluminium Deutschland GmbH
ARCELOR France
Corus Staal BV
Novelis Deutschland GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 84, 123(2), 123(3)
EPC R. 80, 115(2)
RPBA Art. 13, 15(3)

Relevant legal provisions (EPC 1973):
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Keyword:
"Admissibility of 5 requests filed during oral proceedings (first and fourth auxiliary request - yes; main, second and third auxiliary request - not clearly allowable)"
"Admissibility of amendments (first and fourth auxiliary request - yes)"
"Novelty (first and fourth auxiliary request - yes)"
"Inventive step (first and fourth auxiliary request - no)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1274/05 **-** 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 22 July 2008

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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 25 July 2005 concerning maintenance of European patent No. 0820353 in amended form.

Composition of the Board:

Chairman: H. Meinders
Members: H. Hahn
E. Dufrasne

Summary of Facts and Submissions

I. The opponents I (appellant I) and III (appellant II) lodged appeals against the decision of the Opposition Division to maintain European patent No. 0 820 353 in amended form and requested that the decision be set aside and the patent be revoked.

II. Four oppositions had been filed against the patent in its entirety under Article 100(a) EPC, for lack of novelty (opponents I, III and IV) and inventive step (opponents I to IV), under Article 100(b) EPC (opponent III), that the patent does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by the person skilled in the art, and under Article 100(c) EPC (opponent IV), that the patent as granted extends beyond the content of the application as originally filed.

The Opposition Division held that the amendments made to claims 1 to 9 of the main request as filed at the oral proceedings of 6 May 2004 met the requirements of Articles 123(2) and (3) EPC. According to the minutes of the oral proceedings before the Opposition Division opponent III withdrew its objection under Article 100(b) EPC. The Opposition Division considered that the subject-matter of claim 1 was novel, particularly with respect to E1 (JP-A-5-042 650 and its English translation) in view of the common general knowledge as represented by E20 (Plastics Extrusion Technology, Hanser Publishers, Munich (1988), pages 10-15, 142-173 and 330-341) and E21 (JP-A-06-079 801 and its English translation). Furthermore, the subject-matter of claim 1 was considered to involve an inventive step,

particularly with respect to E1 in view of E20 or E21 or with respect to a combination of E3 (EP-A-0 312 304) and E20.

III. Claim 1 as maintained reads as follows:

"1. A process for extrusion coating a metal strip (174) to produce a coated metal strip comprising:
providing a strip of metal (174) about 0.1778 to 0.356 mm (0.007 to 0.014 inches) thick;
heating said metal strip (174) to at least 121°C (250°F) but not so high as to deleteriously affect the desired properties of the metal strip;
moving said metal strip (174) through a first pair of rolls (180,182) and thereafter through a second pair of rolls (184,186) each of which pair includes a casting roll (182,184) and a backup roll (180,186) which form a nip for said metal strip (174) and a polymer resin to move therethrough to adhere the polymer resin to said metal strip (174),
sequentially extruding a polymer resin onto one side and the same or different polymer resin onto the other side of said heated metal strip (174) and drawing the extruded polymer resins to reduce their thicknesses in draw ratios of 1:1 to 200:1 to form coatings which are at least partially bonded to said metal strip, said coatings each having a thickness in a range of about 0.0076 to 0.038 mm (0.0003 inches to 0.0015 inches);
characterized by
cooling the casting rolls (182,184) to a temperature below the softening point of the polymer resin;
cooling the backup rolls (180,186);

heating said metal strip (174) after it exits said first pair of rolls and before it enters said second pair of rolls;
heating said strip to at least the melting point of said polymer after it exits said second pair of rolls but not so high as to deleteriously affect the desired properties of the metal strip such that said resin bonds to said metal strip;
cooling said coated metal strip to less than about 40°C (104°F) to solidify said resin in a substantially non-crystalline form."

IV. On appeal, appellant I and II argued in respect of lack of inventive step. In addition, appellant II maintained its objections for lack of novelty as well as sufficiency of disclosure.

V. With a communication annexed to the summons to oral proceedings dated 15 April 2008 the Board presented its preliminary opinion based on claim 1 of the patent as maintained by the Opposition Division.

The amendments made to claims 1 and 8 appeared to contravene Article 123(2) EPC and those made to claims 7 to 9 appeared to contravene Rule 80 EPC. Furthermore, the subject-matter of dependent claim 2 appeared to be inconsistent with the definitions of amended claim 1.

With respect to the issue of sufficiency of disclosure the Board stated that it was not apparent from the file that appellant II had not withdrawn its objections under Article 83 and/or 100(b) EPC. Furthermore, it appeared that the objections raised with the appeal in

this context, which could be considered as not having the consent of the proprietor, are, in fact clarity or consistency objections resulting from the amendments in the claims which would be discussed at the oral proceedings, insofar as admissible.

E1 did not appear to be novelty destroying since the subject-matter according to E1 neither specified the metal strip thickness nor the thickness of the polymer resin layers, let alone in combination with the temperature of the strip in the (quench) cooling step nor that the casting rolls and back-up rolls are cooled, while the examples of E1 do not specify the thickness of the tin-free coated steel strip, nor do they specify any cooling of the casting/back-up rolls and mention 60°C warm water as cooling medium. Thus even if said steel plates could be used for containers for canning and aerosol cans the metal strip thickness must not necessarily be within the claimed thickness range of 0.1778-0.356 mm. Furthermore, there was the question whether E1 disclosed the feature: "Heating said strip … to at least the melting point of said polymer", as it states that melting should be avoided, by selecting in the re-heating step a temperature within the range of 160-230°C and a duration of 2-20 seconds.

With respect to inventive step the Board remarked that E1 appeared to represent the closest prior art for aiming to solve the same problem of improving adherence of the polymer layer to the strip and for having most features in common with the process of claim 1. Thus taking account of the distinguishing features as defined above it needed to be discussed as to which technical problem was actually solved by said

distinguishing features and whether or not the solution chosen was rendered obvious and/or suggested by the available prior art documents and/or the common general knowledge of the skilled person.

Furthermore, the feature "heating said strip ... to at least the melting point of said polymer" of claim 1 appeared not to imply that the polymer was actually melted when the temperature is equal to or has reached the melting point temperature of said polymer. This also depended on the length of time the strip is held at that temperature. Therefore the condition of E1, i.e. not to melt the polymer, may well be fulfilled while at the same time reaching the temperature of the melting point for a short period of time (like 2 seconds as in E1).

The statement of the Opposition Division with respect to E21 - which would discourage the skilled person to apply a re-heat temperature of above the melting temperature - was considered to be erroneous since said passage actually disclosed "However, since disassembly of a covering resin and degradation will take place if the reheating temperature T3 turns into **more than melting extrusion resin temperature**, it is not desirable". Thus E21 specified the temperature of the molten extrusion resin but not the melting point thereof. According to the examples of E21 the said melting extrusion resin temperature was 280°C while the re-heating temperature was within the range of 100-160°C.

The respondent's argument that laminating a polymer film represents a different technology which the person

skilled in the art would not consider, appeared not to be credible since such prior art was identified in the application as originally filed which underlies the patent in suit (see the cited US-A-5 093 208). This view appeared to be further supported by the text book E20.

The parties were given the opportunity to file observations to the communication which should be filed well in advance, i.e. at least one month, before the date of the oral proceedings in order to give sufficient time to the Board and the other parties to prepare for the oral proceedings.

Finally the parties were advised to take note of the Rules of Procedure of the Boards of Appeal, particularly of Article 13 RPBA.

VI. With a letter dated 22 June 2008 the respondent submitted comments concerning the Board's annex to the summons together with amended main, first and second auxiliary requests. Furthermore, an English translation of E21 designated E21e2 was submitted and it was announced that the representative would be accompanied by three experts at the oral proceedings.

With letter dated 23 June 2008 appellant I submitted an English translation of E21 designated E21a together with further arguments taking account of the Board's annex to the summons.

With fax dated 23 June 2008 the respondent submitted a third auxiliary request.

With letter dated 14 July 2008 opponent IV informed the Board that it would not attend the oral proceedings.

VII. Oral proceedings before the Board were held on 22 July 2008 in the absence of opponent IV as announced in its letter dated 14 July 2008 and in the absence of opponent II who had not reacted during the appeal procedure at all. At the start of the oral proceedings the respondent replaced its auxiliary requests I and III by new ones. After discussion of the admissibility of the amendments of the main and first to third auxiliary requests, resulting in a further amendment of the third auxiliary request, the respondent withdrew all these requests and continued the proceedings with a new main request and new first to fourth auxiliary requests, as filed at the oral proceedings. In the course of the oral proceedings only the first and fourth auxiliary requests were considered to be formally admissible, which were then discussed with respect to patentability of their subject-matter.

(a) Both appellants requested that the decision under appeal be set aside and that the patent be revoked.

(b) The respondent requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request or, in the alternative, on the basis of one of the first to fourth auxiliary requests, all filed during the oral proceedings.

(c) For these oral proceedings besides E1, E20, and E21 (and its English translations E21a and E21e2) the following documents are relevant:

E9 = DE-A-16 21 848
E18 = EP-A-0 312 302
E19 = EP-A-0 312 309
Annex 5 = US-A-2 861 022

At the end of the oral proceedings the Board announced its decision.

VIII. Claim 1 of the main request (being identical with claim 1 of the first auxiliary request) under consideration reads as follows (amendments compared to claim 1 as granted are in bold, as added by the Board):

"1. A process for extrusion coating a metal strip (174) to produce a coated metal strip comprising:
providing a strip of metal (174) about 0.1778 to 0.356 mm (0.007 to 0.014 inches) thick;
heating said metal strip (174) to at least 121°C (250°F) but not so high as to deleteriously affect the desired properties of the metal strip;
moving said metal strip (174) through a first pair of rolls (180,182) and thereafter through a second pair of rolls (184,186) each of which pair includes a casting roll (182,184) and a backup roll (180,186) which form a nip for said metal strip (174) and a polymer resin to move therethrough to adhere the polymer resin to said metal strip (174),
sequentially extruding a polymer resin onto one side **of said heated metal strip (174), which is to be fed into the nip of said first pair of rolls (180,182),** and the same or different polymer resin onto the other side of said heated metal strip (174)**, which is to be fed into the nip of said second pair of rolls (184,186), after it exits said first pair of rolls (180,182)** and drawing

the extruded polymer resins to reduce their thicknesses in draw ratios of 1:1 to 200:1 to form coatings which are at least partially bonded to said metal strip, said coatings each having a thickness in a range of about 0.0076 to 0.038 mm (0.0003 inches to 0.0015 inches); characterized by
cooling the casting rolls (182,184) to a temperature below the softening point of the polymer resin;
cooling the backup rolls (180,186);
heating said metal strip (174) after it exits said first pair of rolls and before said same or different polymer is extruded onto said other side of the heated metal strip (174);
heating said strip to at least the **melting** point of said **polymer after it exits said second pair of rolls** but not so high as to deleteriously affect the desired properties of the metal strip such that said resin bonds to said metal strip;
cooling said coated metal strip to less than about 40°C (104°F) to solidify said resin in a substantially non-crystalline form."

The reference of claims 8 and 9 - in the form as granted they referred to dependent claim 2 - has been amended to refer to claim 1. The first auxiliary request differs from the main request only in that it does not comprise dependent claims 8 and 9. In both the main and the first auxiliary request claim 2 has been deleted, however, without renumbering of the remaining dependent claims.

IX. Claim 1 of the second auxiliary request differs from that of the first auxiliary request in that in the introductory portion the feature "**at the nip of the**

first pair of rolls (180, 182)," has been introduced between the wording "… to be fed into the nip of said first pair of rolls (180, 182)," and "and the same or different polymer resin onto …", and the feature "**at the nip of the second pair of rolls (184, 186),**" has been introduced between the wording "after it exits said first pair of rolls (180, 182)," and "and drawing the extruded polymer resins to reduce …".

The remaining dependent claims 2 to 7 of the second auxiliary request correspond to those of the first auxiliary request with the same proviso that claim 2 has been deleted without renumbering the remaining claims.

X. Claim 1 of the third auxiliary request (being identical with claim 1 of the fourth auxiliary request) differs from claim 1 according to the first auxiliary request in that the feature "**the casting and/or the backup rolls (182, 184; 180, 186) having an elastomeric outer surface**" has been introduced in the characterising portion between the wording "… cooling the backup rolls (180,186)," and "heating said metal strip (174) after …".

The dependent claims 2 to 7 of the fourth auxiliary request are identical with those of the first auxiliary request while the dependent claims 2 to 9 of the third auxiliary request are identical with claims 2 to 9 of the main request.

XI. Appellant I argues essentially as follows:

The features of claim 1 "… which is to fed into the nip of said first pair of rolls" and "… into the nip of said second pair of rolls" allow further steps between the extrusion of the polymer web and its introduction into the nip. In the context of Figures 6 to 14, however, there is only a basis that the webs of polymer "contact the metal strip just ahead of the roll nip" and that they move "downwardly" (see the application as originally filed: WO-A-96 32202, page 17, lines 15 to 18). Thus it is likewise clear that the wording "at the nip …" introduced into claim 1 of the second auxiliary request is only disclosed with respect to the other alternative - which is no longer covered by claim 1 - that the webs contact the metal strip and casting roll substantially simultaneously. Likewise the drawing ratio of 1:1 to 200:1 is taken from the embodiments of Figures 6 to 14 but is only disclosed in connection with a thickness of the extruded web of approximately 0.005-0.030 (0.127-0.254 mm) inches (see page 18, lines 3 to 6). The deletion of the term "portion" from the feature "an elastomeric outer surface portion" of claim 1 of auxiliary requests 3 and 4 has no basis in the originally filed application, either. Hence claim 1 of all five requests contravenes Article 123(2) EPC. Dependent claims 8 and 9 of the main and third auxiliary request which originally referred to the now deleted claim 2 were amended to refer to claim 1. This amendment contravenes at least Rule 80 EPC.

Novelty of claim 1 of the first auxiliary request is no longer contested.

The subject-matter of claim 1 of the first auxiliary request, however, lacks an inventive step over a combination of either E1 and E21 and E20, or over E9 and E21 and E20. Claim 1 solves several different problems and thus contains an aggregation of features not functionally or structurally linked. The cooling of the casting and/or backup rolls serves to avoid the sticking of the polymer film thereon which represents a partial problem different from improving the adherence of the polymer film on the metal strip (see patent, column 12, lines 29 to 32). Such cooling is additionally a common feature of such systems. The respondent has not contested the fact that E1 discloses all features of claim 1 except the thickness and the drawing ratio of the polymer, the thickness of the metal strip, and the cooling of the rolls. The problem to be solved is thus to select an appropriate strip thickness, coating thickness and to improve the adherence of the polymer to the metal strip.

Starting from E1 the skilled person would, in order to improve the adherence of the polymer film, use the additional process parameters described in E21. E21 stems from the same inventor as E1 and aims to solve the same object as the patent in suit (see E21a, paragraph [0020]). E21 discloses a 0.2 mm thick steel strip onto which molten polymer resin is extruded, the temperature of the molten extruded PP or PET is 280°C so that the temperature range for the reheating of the PP or PET coated polymer is >100°C to ≤280°C or >140°C to ≤280°C, respectively, and discloses the cooling to room temperature of the reheated coated strip through water spray (see E21a, paragraphs [0055] to [0057], [0060] and [0062] to [0063]).

Since the melting point of PP is about 166°C the person skilled in the art can derive that he can reheat to the temperature of the melting point. To solve the partial problem with respect to the cooling of the rolls he will use his common general knowledge as represented by E20 (see page 336, chapter 11.4.3.3 and chapter 11.6.1). Thereby the person skilled in the art will arrive at the subject-matter of claim 1 of the first auxiliary request without any inventive skill. Thus claim 1 lacks an inventive step over the combination of the teachings of E1 and E21.

Likewise a combination of the teachings of E9 (page 1, second paragraph to page 2, first sentence; page 7, third paragraph; example 5; Figure 1) and E21, in case that the skilled person were to produce a two-side coated product starting from the process of E9, would lead the skilled person to the process of claim 1 in an obvious manner.

The coating of the casting and/or backup rolls with an elastomer concerns yet another partial problem, i.e. to avoid frequent replacement of the roll surface during its use which, however, represents another obvious measure of the skilled person (see E20, page 338, chapter 11.6.1; and page 339, Figure 5). Hence the process of claim 1 of the fourth auxiliary request lacks also an inventive step.

XII. Appellant II argues essentially as follows:

Dependent claim 8 of the main and third auxiliary request which referred to the deleted claim 2 has been

amended to refer to claim 1 without the features of claim 2 having been added to claim 1, which thus results in an objection under Article 123(3) EPC. There is either a basis for "at the nip …" or "just ahead of the nip" in the published application as originally filed but each is linked with a different alternative so that claim 1 of the second auxiliary request contravenes Article 123(2) EPC.

Novelty of claim 1 of the first auxiliary request is no longer contested.

E1 represents the closest prior art for claim 1 of this request which discloses all features of the claimed process except the heating to at least the melting point during the reheating after exiting the second pair of rolls. E18 and E19 deal with film lamination and teach the person skilled in the art that the adherence of the polymer film can be improved by melting the same. Therefore the person skilled in the art would apply this teaching when trying to improve the adherence of the polymer film when applied according to the process of E1. The respondent's argument that film lamination is not relevant cannot be accepted since E18 mentions both techniques as alternatives and because the respondent quoted Annex 5 which also deals with this technique. Furthermore, the skilled person would look for solutions in similar technical fields such as the laminating field.

The different temperatures specified in Table 1 of E1 for the steel plate at the first T-die 4 and the second T-die 5 cannot be explained by the mass of the extruded resin, as argued by the respondent, since according to

the examples the resin is applied in a thickness of 30 µm onto the steel strip which may have a thickness of e.g. about 0.2 mm, i.e. 200 µm. Consequently, if the temperature of the steel strip in the second T-die is higher there must be a heater between the first and the second T-die. Claim 1 requires in this context only an unspecified "heating". Furthermore, if the skilled person were of the opinion that the temperature of the casting and/or cooling rolls should be controlled he would consider the text book E20. It cannot be that the same result is achieved with the claimed process if the strip would be reheated to 400°C for a longer time period which present claim 1 allows. Thus the problem claimed to be solved will not automatically be solved at all temperatures and heating durations, i.e. it will not be solved over the whole range claimed. Consequently, claim 1 of the first auxiliary request lacks an inventive step.

The additional features concerning the elastomeric coating of the rolls do not add anything inventive to the subject-matter of claim 1 of the fourth auxiliary request since such a measure is obvious to the person skilled in the art as proven by the text book E20 which discloses a rubber coated impression roll (see page 338, chapter 11.6.1 to page 339, and Figure 5). Hence claim 1 of the fourth auxiliary request likewise lacks an inventive step.

XIII. The respondent argues essentially as follows:

The basis for the amendment "… into the nip …" of claim 1 of all requests is page 23, lines 6 to 9 of the originally filed application (WO-A-96 32202) which

discloses "… strip and polymer web can be fed downwardly into the nip between the rolls …" while the passage at page 17 relates to a preferred embodiment. Furthermore, "substantially simultaneously … at the nip" is the same as "… just ahead of the roll nip" since claim 1 covers these alternatives. The whole disclosure of the application as originally filed has to be considered when determining whether or not the requirements of Article 123(2) are fulfilled by claim 1. The amendment of the reference of dependent claims 8 and 9 to claim 1 results from the deletion of claim 2 and should be allowable.

E1 does not disclose the metal strip thickness, the intermediate heating and all features of the characterising portion of claim 1 of the main request. Considering Table 1 of E1 it is questionable whether intermediate heating takes place. The temperature values of Table 1 mean only a temperature graph but do not represent certain process conditions.

The patent in suit aims to provide an improved method for two-side coating of metal strip with polymer resin having a tight adhesion e.g. for producing packaging so that it does not delaminate during subsequent forming of the strip or use of the products produced therefrom (see paragraphs [0005] to [0007]). To solve this problem it is crucial to heat the polymers to at least approximately their melting point (see paragraph [0062]). Thereby the resin at the interface of the metal strip and polymer coating is melted whereby the adhesion is improved (see Annex 5).

The person skilled in the art would not combine the teachings of E1 and E21 because E21 discloses preheating of the strip with specific preheating temperatures (see E21e2, paragraphs [0015] to [0019], [0045], and [0053]). According to E21 the molten resin is poured into the gap between the rolls (see E21e2, claim 1). It is also not clear at which point in the process temperature T3 has been measured (molten resin or extrudate). Furthermore, the reheating at 160-230°C for 2-20 seconds according to E21 is to be interpreted as avoiding melting of the resin so that the teaching of E1 is contradicted by E21. The melting point of PP is at about 160°C and that of PET is at about 250°C and the reheating temperatures are selected accordingly (see E21e2, claims 4 and 5).

E9 discloses only one-side coating of metal strip and thus cannot address the problems associated with two-side coating processes.

Lamination processes represent a distinct technology (see E20, chapter 11.2, first sentence) and were only identified in the application because of the originally filed product claims which were later abandoned.

Therefore the skilled person will not combine the teachings of these two different technologies and he has no incentive to overrule the teaching of E1 not to perform the reheating at or above the melting point of the resin. The cooling of the rolls is only one possibility since the backup rolls could likewise be heated. The reheating of the polymer coated strip to at least the melting point of the polymer provides a technical effect, although it is admitted that it is

actually not known what happens during the reheating. It has to be considered that the mass of the metal strip is much higher than that of the polymer coatings (thickness ratio of strip to polymer coating of about 10:1). Experiments were carried out in a plant with a 300 mm long heating zone at a line speed of 150 m/minute. All that can be said is that there is an improvement of the adherence and a smoothening of the polymer surface. The intermediate heating step is done to replicate the temperature in the first coating nip. Even if the polymer coated strip is heated to a higher temperature than the melting point and for a longer time the desired result is still obtained. The subject-matter of claim 1 of the first auxiliary request thus involves an inventive step.

The effect of the elastomeric outer surface of the rolls is to improve the bonding and coating uniformity (see patent, paragraph [0051]). Chapter 11.6.1 of E20 concerns a laminating process with a different concept and thus this teaching cannot be combined with extrusion coating. Consequently, the subject-matter of claim 1 of the fourth auxiliary request involves an inventive step.

Reasons for the Decision

1. As announced in its letter dated 14 July 2008, opponent IV was not represented at the oral proceedings. Absent any announcement, opponent II was also not represented at the oral proceedings. These parties having been duly summoned, the Board held the oral proceedings in their

absence, according to Rule 115(2) EPC and Article 15(3) RPBA.

2. *Admissibility of the five requests filed during oral proceedings (RPBA Article 13, Article 84, 123(2) and (3) EPC)*

During the oral proceedings the respondent withdrew all its previous requests as a result of the discussions of the amendments made to the claims with respect to Article 84 and Article 123(2) EPC and in the end replaced them by a main and first to fourth auxiliary requests (see points VII to X above). Both appellants did not object to the filing of these requests during this debate.

2.1 The dependent claims 8 and 9 of the main and third auxiliary requests have been amended to refer to claim 1. Claims 8 and 9 as granted, however, referred to dependent claim 2 which has been deleted from the main and third auxiliary requests. This amendment amounts to the addition of claims dependent only of claim 1. It is not apparent to the Board as to how a ground of opposition shall be overcome by this amendment. The respondent when asked by the Board did also not bring forward any arguments in this respect. As a consequence this amendment, which is comprised in the main request and the third auxiliary request, contravenes Rule 80 EPC so that the main and third auxiliary requests are clearly not allowable.

2.2 The additional amendment made to claim 1 of the second auxiliary request (see point IX, above) raises further issues with respect to the clarity of claim 1. It is

not clear to the Board what is meant by the introduced terms "… **at** the nip of …" in combination with the features of "extruding a polymer resin **onto** one side of said heated metal strip (174), which is to be fed **into** the nip of said first pair of rolls (180, 182)" and "and the same or different polymer resin **onto** the other side of said heated metal strip (174), which is to be fed …".
Since claim 1 explicitly defines that the polymer resin is extruded **onto** said heated metal strip the Board interprets claim 1 as meaning that the extruded polymer resin contacts the metal strip shortly before, i.e. just ahead, of the roll nip. Consequently, there is no room for the respondent's intention that claim 1 in the present form shall also encompass the alternative, according to which the extruded polymer web contacts the metal strip and the casting roll substantially simultaneously, i.e. said amendment renders claim 1 unclear.

Claim 1 of the second auxiliary request is thus ***prima facie*** not clearly allowable under Article 84 EPC.

2.3 Taking account that the main request, the second and third auxiliary requests filed during the oral proceedings are ***prima facie*** not clearly allowable (see points 2.1 and 2.2 above) the Board exercises its discretion according to Rule 13(1) RPBA to not admit these three requests into the proceedings.

2.4 Claim 1 of the first auxiliary request is based on claims 1, 2, 4, 10, 11 and 24 as originally filed in combination with page 17, lines 15 to 18; page 18, lines 5 and 6, and line 21 to page 19, line 2; page 22,

line 21 to page 23, line 4 and lines 6 to 9; and Figures 6, 8 to 10 and 12 of that application (corresponding to the published WO-A-96 32202). Hence claim 1 of the first auxiliary request is considered to meet the requirements of Article 123(2) EPC.

Since the subject-matter of claim 1 of the first auxiliary request is much more restricted than that of claim 1 as granted (which was based on claims 1, 3, 10, 11 and 24 as originally filed) it is considered to meet also the requirements of Article 123(3) EPC.

Claim 2 has been deleted and dependent claims 3 to 7 of the first auxiliary request are identical with claims 3 to 7 as granted and thus likewise meet the requirements of Articles 123(2) and (3) EPC.

The Board also considers that the amendments made to claim 1 of the first auxiliary request do not render it unclear and thus meet the requirements of Article 84 EPC.

2.4.1 The argument of appellant I that claim 1 of the first auxiliary request would contravene Article 123(2) EPC cannot be accepted for the following reasons.

2.4.2 First of all, the features concerning the combination of the drawing ratio of the extruded polymer web and the thickness of the coated polymer film are derived from a combination of claim 1 ("… said coatings each having a thickness in a range of about **0.0003 inches to 0.0015 inches (0.0076-0.038 mm)**") and claim 24 ("…said first and second polymer webs are drawn to reduce their thickness in draw ratios of about **1:1 to 200:1**") as

originally filed and **not** from page 18, lines 3 to 6 of the description as originally filed. In the quoted passage it is stated that the webs of polymer **may** be 0.005-0.030 inches (0.127-0.254 mm) thick and that the draw ratio may be in the range of about 1:1 to 200:1.

2.4.3 Furthermore, it is clear from the general passages in the description as originally filed (see page 16, line 21 to page 17, line 4 and lines 15 to 19) in the context of Figures 6 to 14 that the casting roll and backup roll form roll nips and that the heated metal strip with the polymer resin extruded thereon is to be fed into said roll nips without mentioning the direction of movement of the metal strip. Claim 1 as originally filed likewise does not specify any direction of movement. Therefore the more specific disclosure with respect to Figure 6 "… **can** be fed downwardly into the nip …" at page 23, lines 6 to 9 of the description as originally filed need not be considered as obligatory.

2.4.4 The feature "heating said strip to at least the melting point of said polymer after it exits said second pair of rolls" of claim 1 is **not** derived from the quoted passage of the description as originally filed (i.e. page 26, lines 8 to 15) but actually has its basis in claim 4 as originally filed which defines "said strip is heated to at least the melting point of said polymer after it exits said second set of rolls".

2.4.5 Consequently, claim 1 of the first auxiliary request is considered to meet the requirements of Articles 123(2) and (3) EPC.

2.5 The additional feature of claim 1 of the fourth auxiliary request "the cooling and/or the backup rolls (182, 184; 180, 186) having an elastomeric outer surface;" (see point X above) has a basis on page 20, lines 2 and 3 in combination with page 19, lines 13 to 15 of the application as originally filed.

Consequently, claim 1 of the fourth auxiliary request is considered to meet the requirements of Articles 123(2) and (3) EPC. The amendment made to claim 1 of the fourth auxiliary request does not render it unclear and therefore also meets the requirements of Article 84 EPC.

2.5.1 The argument of appellant I that claim 1 of the fourth auxiliary request would contravene Article 123(2) EPC cannot be accepted since it is clear to the person skilled in the art when reading the application as originally filed that the surfaces of said rolls may be entirely or only partially coated (i.e. comprising "a surface portion") with said elastomer. Consequently, said wording "having an elastomeric **surface**" covers both alternatives and represents the general disclosure in the application as originally filed.

2.6 Therefore, the amendments made to the first and the fourth auxiliary requests being considered to be formally admissible, these requests are admitted into the proceedings.

3. *Novelty (Article 54 EPC)*

First auxiliary request

3.1 Novelty of the subject-matter of process claim 1 of the first auxiliary request was no longer disputed by both appellants.

The Board is satisfied that none of the prior art documents, particularly E1, discloses a process for extrusion coating a metal strip having all the features of claim 1 (compare in this context point V above).

The Board therefore concludes that the subject-matter of claim 1 of the first auxiliary request is novel (Article 54 EPC).

Fourth auxiliary request

3.2 Claim 1 of the fourth auxiliary request is more restricted than claim 1 of the first auxiliary request (see point X above). Novelty of claim 1 of this request was also not disputed by both appellants.

Consequently, the conclusion of point 3.1 above applies ***a fortiori*** to claim 1 of the fourth auxiliary request. The subject-matter of claim 1 of the fourth auxiliary request is thus novel, too (Article 54 EPC).

4. *Inventive step (Article 56 EPC)*

Fourth auxiliary request

For the sake of clarity the fourth auxiliary request is discussed first.

4.1 E1 is considered to represent the closest prior art for disclosing a process for extrusion coating a metal strip to produce a coated metal strip. The process of E1 includes extruding thermoplastic polyester resin on both sides of a steel plate by a T-die extrusion method wherein after resin has been applied to one side, a second T-die extrusion is conducted while keeping the temperature of the steel plate at the time of application on the other side at 150°C or lower, preferably from 100 to 150°C and wherein after extrusion coating on both sides the combination is reheated for two seconds or longer and up to 20 seconds at a temperature from 160 to 230°C and is then cooled down immediately by warm water of 30 to 70°C in a cooling bath (see Figure 1; claim 1; paragraphs [0005]; [0006], lines 4 and 5; [0009]; [0012] and [0013]). The resulting material, having superior adhesion and processability, can be used for containers for canning and aerosol cans (see paragraph [0001]).

The lower reheating temperature of 160°C or more for at least 2 seconds is chosen to secure the adhesion between the extruded film and the steel strip while the upper re-heating temperature of 230°C or below is chosen because a part of the film will be melted, thus causing voids between the film and the steel plate, while a heating time longer than 20 seconds allows for

the crystallization of the polyester resin to proceed (see paragraph [0014]). It is necessary to cool it down as quickly as possible to obtain a combination superior in adhesion and processability which can be provided by normal cooling but a preferred cooling method is to use warm water of 30°C to 70°C in a cooling bath, in terms of controlling the temperature (see paragraphs [0009] and [0015]). PET may be used as the polyester resin (see paragraph [0016]).

4.1.1 It can be derived from columns 3 and 4 of Table 1 in E1 (although both columns in the translation carry the same designation "Steel Plate Temp. at 1st Laminate" it is self-evident that the fourth column specifies the "Steel Plate Temperature at 2nd laminate" and that the fifth column discloses the reheating temperature of the two-side coated steel plate) and the tests nos. 3, 4 and 9 that the apparatus according to E1 must comprise heating means between the first and the second extrusion T-dies since otherwise an increase of the steel strip temperature from 110°C to 120°C (i.e. 10°C increase), from 130°C to 145°C (i.e. 15°C) or from 130°C to 160°C (i.e. 30°C), for tests nos. 3, 4 and 9 respectively, could not be obtained.

The respondent's arguments to the contrary, particularly that the meaning of these columns would be unclear and that the heat of the extruded molten resin would cause such a temperature increase cannot be accepted. First of all, the meaning of the fourth column is clear due to the temperature of 160°C used in test no. 9, which must have been the temperature of the one-side coated strip at the second T-die since it resulted in a "Roll Pattern", i.e. in roll marks on the

polymer resin already coated onto the strip (see Table 1). Such roll pattern is only discussed in relation to the second T-die when the temperature of the strip is above 150°C, see paragraph [0013]. Furthermore, since the mass of the steel strip (e.g. 0.2 mm thickness = 200 µm) is much greater than that of the applied polymer film (thickness e.g. about 30 µm) it is impossible that the strip temperature can increase in such a manner.

4.1.2 E1 aims to provide a two-side coated steel plate (or strip) having a superior adhesion and processability using a polyester resin and T-die extrusion which can be used for containers for canning and aerosols (see paragraphs [0001] and [0005]).

4.2 Thus the process of claim 1 of the fourth auxiliary request differs from the process according to E1 in that

i) a strip of metal about 0.1778 to 0.356 mm thick is coated,

ii) the extruded polymer is drawn in draw ratios of 1:1 to 200:1 to form the coatings, each of which having a thickness of about 0.0076 to 0.0038 mm,

iii) the casting rolls are cooled to a temperature below the softening point of the polymer resin and that the backup rolls are cooled,

iv) the casting and/or backup rolls have an elastomeric outer surface, and

v) the metal strip is heated after the second extruding coating step to at least the melting point of the polymer but not so high as to deleteriously affect the desired properties of the metal strip such that said resin bonds to said metal strip.

4.2.1 Features i) and ii) make the resulting polymer coated strip material suitable for packaging applications (see patent in suit, column 1, lines 9 to 13; and column 17, line 58 to column 18, line 16).

4.2.2 Feature iii) provides that the polymer will not stick to the casting roll, whereas the backup roll is cooled to minimize heat damage to the resilient outer layer (see patent in suit, column 10, lines 19 to 21; and column 12, lines 29 to 34).

4.2.3 Feature iv) results in that the pressing of the rolls toward one another presses the metal strip against the resilient material on the backup roll and helps to assure that the polymer web is pressed against the metal strip across the full extent of the roll nip with no gaps in the contact, which is believed to accommodate for any errors in the alignment of the rolls due to non-flatness of the metal strip and to provide for a more uniform distribution of the pressure of the polymer web(s) against the metal strip, for better coating uniformity and bonding (see patent in suit, column 10, line 42 to column 11, line 2).

4.2.4 Feature v) appears to be responsible for the adhesion of the polymer resin to the metal strip (see patent in suit, column 7, line 55 to column 8, line 4; and column 14, lines 20 to 31).

4.3 The problem to be solved by the features distinguishing the subject-matter of claim 1 of the fourth auxiliary request over the process of E1 is thus considered to be the provision of a process for tightly adhering or

welding polymer resin onto both sides of a metal strip which is suitable for use in packaging and other applications (see patent in suit, paragraphs [0005] to [0007]).

4.4 This problem is solved by the process as defined in claim 1 of the fourth auxiliary request.

4.5 The Board, however, considers that the subject-matter of claim 1 of the fourth auxiliary request is rendered obvious and that the said problem has not been solved over the entire range of temperatures claimed in claim 1, for the following reasons:

4.5.1 It is common knowledge of the person skilled in this art to water cool the chill-roll (= casting roll according to the patent in suit) usually to a temperature between 15 and 40°C to avoid that the extrusion-coated polymer film sticks to the roll surface (see E20, page 336, chapter 11.4.3.3).

Likewise it is common practice to feed the extruded thermoplastic polymer film (e) into the nip formed between such chill roll (a) and impression roll (b) to form the final laminate. In order to prevent the temperature of the rubber roll cover from rising, the impression roll (b) (which is a backup roll in the sense of the patent in suit) is water cooled from the inside, and from the outside by a contact cooling roll (c). The contact cooling roll (c) also transfers the nip pressure via the impression roll (b) against the chill roll (a) (see E20, page 338 to page 339, chapter 11.6.1, Figure 5).

Hence the purpose of the rubber cover of the impression roll is exactly the same as in the patent in suit, i.e. to improve the uniformity of the coating when pressing the same against the casting roll. The same conclusions apply to the water cooling of the casting and backup rolls which serves to avoid sticking of the polymer film to the rolls and to protect the rubber cover of the backup roll against temperature damage, respectively.

Thus the features iii) and iv) of claim 1 of the fourth auxiliary request are obvious to the person skilled in the art.

4.5.2 It is also common knowledge of the person skilled in this art to select a thickness of a strip of metal suitable for packaging applications, e.g. according to the examples of E21 a steel sheet of 0.2 mm thickness is chosen (see E21a and E21e2, paragraph [0060]) while according to the examples of E9 aluminium foil having a thickness of 0.2 mm and 0.18 mm is chosen (see E9, examples 1 and 3 to 5). Likewise it belongs to common knowledge of the person skilled in this art to select an appropriate draw ratio of the extruded polymer to form a polymer coating having a thickness suitable for said packaging applications. Such a polymer coating may e.g. have a thickness of 5 µm or below 35 µm (see e.g. E21a and E21e2, paragraph [0010]; see E1, paragraphs [0017] and [0020]; see also E9, page 8, second paragraph).

Thus the features i) and ii) of claim 1 of the fourth auxiliary request are obvious to the person skilled in the art, as well.

4.5.3 Furthermore, as to the feature v) of claim 1 of the fourth auxiliary request the Board is convinced that the person skilled in the art would introduce into the process of E1 the additional process parameters as described in the later filed E21, in order to improve the adherence of the polymer film. First of all, E21 aims to solve the same object as the patent in suit (see E21a and E21e2, paragraph [0020]). In its examples E21 discloses a 0.2 mm thick steel strip onto which molten polymer resin is extruded sequentially on both sides via two T-dies and the temperature of the molten extruded PP or PET is 280°C (see examples). The reheating temperature T3 is preferably so high as to improve the adhesive property of the coated resin, in case of PET said temperature is preferably higher than 140°C but may not be higher than the temperature of the molten extruded resin, i.e. within a range of >140°C to ≤280°C for PET while the corresponding range for PP is >100°C to ≤280°C. E21 discloses cooling to room temperature of the reheated coated strip through water spray (see E21a and E21e2, paragraphs [0055] to [0057], [0060] and [0062] to [0063]).

Since the melting point of PP is about 160°C and that of PET is about 250°C the person skilled in the art is taught by E21 that there is an advantage to reheat the two-side coated metal strip to the temperature of the melting point of the polymer in order to improve the adhesion.

4.5.4 The pre-heating temperature of the metal strip before the first T-die is to be set approximately so high that the temporary adhesion of the resin is possible and in

case of PET it is higher than 90°C (see E21a and E21e2, paragraphs [0043] to [0046]). The pre-heating temperature range of from 90-130°C for coating the second side of the steel trip with PET according to E21 (see paragraph [00024]) concurs with the corresponding broader range of ≥100°C and ≤150°C according to E1 (see paragraph [0013]). In this context the Board remarks that it is to be expected that the person skilled in the art generally would try to use the same pre-heating temperatures for the metal strip for the first and second T-die when applying the same polymer on each side, in order to simplify the process. This fact was admitted by the respondent by stating that the conditions at the first T-die are to be replicated at the second T-die.

4.5.5 E1 teaches to improve the adherence of the coated film by reheating the coated metal strip to a temperature from 160°C to 230°C for a period of 2 to 20 seconds (see paragraph [0006]). In this context E1 discloses that the lower limit value of 160°C or below for less than 2 seconds cannot assure the adhesion, whereas if reheating is carried out at 230°C or more, a part of the film will be melt, thus causing voids between the film and the steel plate, and therefore the heating should be conducted at 230°C or below (see paragraph [0014]).

Since the experiments of E1 were carried out with a polyethylene terephtalate isophtalate copolymer resin (isophtalate/terephtalate ratio 1/4) which has a melting point lower than that of (pure) PET - it is not surprising that heating to 230°C or more results in melting of the coated polymer. Furthermore, as outlined

in E1 it is the combination of time and temperature which results in melting of the polymer film (see paragraph [0014]). In this context it has additionally to be considered that polymers generally have no clear melting point but a melting range (see Annex 5, column 3, lines 5 to 9). Consequently, said passage in E1 cannot be interpreted such that the coated metal strip is **not** heated to a point where the melting of the polymer can begin. Heating for a very short period such as e.g. 2 seconds to such a temperature is, however, expected to result in a more softened and viscous polymer film but not in a partial or complete melting thereof.

4.5.6 The respondent argued that the reheating of the strip to at least the melting point of the polymer results in a melting of the polymer film at its interface with the steel strip (see Annex 5, column 3, lines 19 to 22 and lines 51 to 58). When asked by the Board the expert of the respondent, however, stated in this context that it is unclear what actually happens if the strip is heated to exactly the melting point for a short treatment time such as those used in the patentee's pilot plant, i.e. at 150 m/min line speed and 300 mm length of the reheating oven zone resulting in a treatment time of 0.12 seconds.

Taking account of the expert's statement and of the considerations in point 4.5.5 above the Board is not convinced that melting of the polymer film at the interface to the steel strip actually occurs when the coated metal strip is heated for a very short time to exactly the melting point temperature. In such case, however, the requirement of claim 1 of the fourth

auxiliary request is fulfilled and the condition as set forth by E1 for the reheating, i.e. to avoid melting of part of the film, is likewise fulfilled. Consequently, the subject-matter of feature v) of claim 1 is considered to be rendered obvious by a combination of E1 and E21 and the common knowledge of the person skilled in this art.

4.5.7 Taking account of point 4.5.5 above the Board further considers that the upper limitation of said reheating temperature of said metal strip according to claim 1 of the fourth auxiliary request is defined by the feature "but not so high as to deleteriously affect the desired properties of the metal strip". Claim 1 does not comprise any restriction concerning the length of this heat treatment. Consequently, the reheating temperature and its duration can be freely chosen as long as the desired metal strip properties are not deleteriously affected.

Annex 5 discloses in this respect that "excessive contact time between the film and the hot metal, depending upon the actual thickness of the film, may result in the shrinkage of the film or in actual melting of the entire cross-section of the film and, consequently, tear or destroy the film entirely" (see column 3, lines 53 to 58). The Board thus considers that, if e.g. aluminium strip is used and the reheating of the coated strip would be carried out at 400°C for a longer time period of e.g. 20 to 30 seconds, then the properties of the aluminium strip will not be affected. However, the desired result of obtaining a coated aluminium strip having adherent polymer films on both sides which subsequently can undergo forming operations

will not be obtained. The respondent's statement to the contrary is thus not considered to be credible.

Therefore the problem claimed to be solved will not automatically be solved at all temperatures above the melting point of the polymer as covered by claim 1 of the fourth auxiliary request, i.e. it will not be solved over the whole range of feasible temperatures claimed.

4.5.8 The respondent's further arguments - except that the reheating of the polymer coated strip to a certain temperature above the melting point of the polymer provides a technical effect - cannot be accepted for the following reasons:

Although E21 discloses preheating of the strip with specific preheating temperatures these temperatures concur with those of E1 (see point 4.5.4 above).

According to E21 the molten resin is not poured into the gap between the rolls but it is extruded though the T-die into said gap between the rolls (see E21e2, claim 1) which additionally implies that the polymer film is drawn to a certain extent since otherwise a thickness of 50 µm according to the examples of E21, or a thickness of 5 to 35 µm as mentioned in the context of the prior art therein would otherwise not be possible (see E21a and E21e2, paragraphs [0062] and [0010]).

The question as to whether temperature T3 according to E21 has been measured in the molten resin or at the extrudate is not considered to be particularly relevant

as long as there is the clear teaching that the reheating of the two-side coated strip should be carried out at or below the specified values, i.e. at or below 280°C.

In view of the disclosure of the text book E20 heating of the backup rolls is not considered to be an option for the person skilled in the art (see point 4.5.1 above).

Furthermore, Figure 5 of E20 is explicitly stated to depict "the **extrusion coating** principle" and **not** the laminating technology as alleged by the respondent. The relevant passage describes that the thermoplastic film (e) leaves the die (d) and is coated onto the carrier web (f) in the nip between chill roll (a) and impression roll (b). Furthermore, a three-layer structure may be obtained when a second substrate (g) is fed into the nip. Also the contact point of the **extruded film** can be varied by either moving the **extruder with the die** or the chill roll/impression roll assembly. E20 further states that "Toward the edges the **extruded film** is always thicker" (see pages 338 and 339, chapter 11.6.1).

4.5.9 The subject-matter of claim 1 of the fourth auxiliary request thus lacks an inventive step, and thus does not meet the requirements of Article 56 EPC. The fourth auxiliary request is therefore not allowable.

First auxiliary request

4.6 Since claim 1 of the fourth auxiliary request is narrower in scope than claim 1 of the first auxiliary

request (compare point X, above) the above conclusion with respect to claim 1 of the fourth auxiliary request applies ***a fortiori*** to claim 1 of the first auxiliary request.

The Board therefore concludes that claim 1 of the first auxiliary request does not meet the requirements of Article 56 either. Consequently, the first auxiliary request is not allowable, either.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

G. Nachtigall H. Meinders