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Aktenzeichen / Case Number / N° du recours : T 53/86 - 3.3.1

Anmeldenummer / Filing No / N° de la demande : 79 302 719.4

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Bezeichnung der Erfindung: A process for producing a crosslinked polyethylene  
Title of invention: insulated cable and an insulated cable so produced  
Titre de l'invention :

Klassifikation / Classification / Classement : H01B 13/24

### ENTSCHEIDUNG / DECISION

vom / of / du 3 May 1988

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /

Titulaire du brevet :

SUMITOMO ELECTRIC INDUSTRIES LIMITED

Einsprechender / Opponent / Opposant :

ASEA AB

Stichwort / Headword / Référence :

EPU / EPC / CBE Article 56

Kennwort / Keyword / Mot clé :

"Inventive step (Yes)"

Leitsatz / Headnote / Sommaire

Europäisches  
Patentamt

Beschwerdekammern

European Patent  
Office

Boards of Appeal

Office européen  
des brevets

Chambres de recours



Case Number : T 53/86 - 3.3.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.1  
of 3 May 1988

**Appellant :** ASEA AB  
(Opponent) S-721 83 Västeras

**Representative :** Boecker, Joachim, Dr.-Ing.  
Rathenauplatz 2-8  
D-6000 Frankfurt a.M. 1

**Respondent :** SUMITOMO ELECTRIC INDUSTRIES LIMITED  
(Proprietor of the patent) 15 Kitahama 5-chome Higashi-ku  
Osaka-shi Osaka-fu  
Japan

**Representative :** Pearce, Anthony Richmond  
Marks & Clerk  
Alpha Tower  
Suffolk Street  
Queensway  
Birmingham B1 1TT  
GB

**Decision under appeal :** Decision of the Opposition Division of the European Patent Office dated 10 December 1985 rejecting the opposition filed against European patent No. 0 012 014 pursuant to Article 102(2) EPC.

**Composition of the Board :**

**Chairman :** K. Jahn

**Members :** J.W. Arbouw

G.D. Paterson

## Summary of Facts and Submissions

- I. European patent No. 12 014, incorporating three claims, was granted on 23 February 1983 on the basis of European patent application No. 79 302 719.4, filed on 29 November 1979 and claiming priority of 1 December 1978 from a Japanese prior application.

Independent Claims 1 and 3 of the patent read:

"1. A process for producing an electrically insulated cable having an outer semiconductor layer which comprises the steps of:-

- (1) providing an internal semiconductive layer and an electrically insulating cross-linked polyethylene layer on an electrical conductor,
- (2) forming the outer semiconductive layer by extrusion of a resin composition comprising 100 parts by weight of a polymer and 5 to 100 parts by weight of a conductive carbon black and a cross-linking agent and
- (3) heating said coated composition to cross-link said resin composition, characterised in that
  - (a) the polymer in said resin composition is selected from homopolyvinylacetate and copolymers of vinyl acetate and ethylene containing at least 55% by weight of vinyl acetate and
  - (b) the cross-linking is carried out at a temperature of at least 230°C.

3. A cross-linked polyethylene insulated cable produced by a process as claimed in Claim 1 or Claim 2."

II. The Opponent filed opposition to the maintenance of the patent on 17 November 1983, requesting revocation on the ground of lack of inventive step having regard to the prior publication of:

(1) FR-A-2 354 616.

This ground of opposition was supported inter alia by reference to:

(2) DE-A-1 665 959.

III. By a decision of 10 December 1985, the Opposition Division rejected the Opposition on the basis that the subject-matter of the patent-in-suit was novel and involved an inventive step. The Opposition Division considered that, faced with the problem of increasing the production rate and improving the peelability of the outer layer, the skilled man would have carried out the process as disclosed in the worked examples, i.e with an ethylene-vinyl acetate copolymer (EVA) having 33 or 40 wt. % vinyl acetate (VA), and would have only increased the curing temperature; having then observed that the peelability was deficient, he would not have found in the prior art an indication to solve this secondary problem.

IV. An appeal was lodged by the Opponent against the decision on 11 February 1986 with the payment of the appropriate fee. A statement of grounds of appeal was submitted on 8 April 1986.

The Appellant submitted that the Opposition Division had misjudged document (1) by relying only on the exemplified

embodiments and disregarding the relevance of the disclosure of the given general range with respect to the VA-content of the EVA copolymer. The skilled man who chooses a composition in the upper half of the range and who increases the curing temperature in order to increase the production rate is simply using the process according to the patent-in-suit.

On the basis of comparative tests filed for the first time with the grounds of appeal, the Appellant submitted further that

- (a) for a composition with 40% VA, the increase of the curing temperature from 160°C to 250°C has no adverse effect on the peelability;
- (b) with compositions containing 50 or 60% VA, the peelability is unsatisfactory; thus the suggested advantages of the claimed invention were challenged.

V. The Respondent submitted that the skilled man who reads (1) is not incited to choose a VA-content in the upper half of the range, but will choose that of the examples within the preferred range. Then by increasing the curing temperature, he would obtain an outer layer with deficient peelability.

The Respondent criticised the tests introduced by the Appellant on the basis that they raised a completely new issue at the appeal stage. Such tests should have been submitted during the proceedings before the Opposition Division. Furthermore, details of the precise procedure used were not given, and the Respondent was not in a position to obtain similar ingredients and to duplicate the tests. The Respondent requested the Board not to admit the Appellants' tests into the appeal. He produced himself new tests showing that the compositions within the scope of the

patent-in-suit have better peelability, and that the increase of curing temperature has an adverse effect on the peelability of compositions with a low VA content.

- VI. In the oral proceedings on 3 May 1988, only the Respondent was represented. The Appellant was duly summoned but did not appear. The Respondent reaffirmed its views and filed an auxiliary request, comprising two claims and an adapted description. The alternative Claim 1 differs from the granted Claim 1 by the incorporation of the feature of the granted Claim 2 (i.e. the VA content is at least 80% by weight). The alternative Claim 2 corresponds to the granted Claim 3.
- VII. The Appellant requested that the decision under appeal should be set aside and the patent-in-suit revoked. The Respondent requested that the appeal be dismissed, or, as an auxiliary request, that the patent be maintained with the description and claims filed on 3 May 1988.

#### Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is therefore admissible.
2. There is no formal objection to the current version of the claims:

Granted Claims 1-3, according to the main request, are adequately supported by the original documents.

As regard to the auxiliary request, Claim 1 results from the combination of granted Claims 1 and 2 and Claim 2 corresponds to granted Claim 3: these claims do not extend the protection conferred by the patent as granted.

3. As regards the Appellants' submissions, which were based upon comparative tests which were submitted for the first time during the appeal proceedings (see paragraph IV above), the admissibility of such new arguments and new facts is a matter within the discretion of the Board. Having considered these submissions, the Board is not satisfied that they are sufficiently relevant to be admitted at this late stage in the proceedings. In the Board's view, it is important for the fair conduct of opposition proceedings that such experimental evidence be submitted as part of the grounds of opposition during the nine months period provided by Article 99(1) EPC, so that it can be considered and replied to during the normal examination stage of the opposition by the first instance, under Article 101 EPC.

The Board accepts the submissions of the Respondent in this matter, and rejects the Appellants' submissions as inadmissible, under Article 114(2) EPC.

4. The patent-in-suit relates to a process for producing an electrically insulated cable having an easily removable outer semiconductor layer, said process involving a vinyl acetate/ethylene (EVA) copolymer containing at least 55 wt. % (80 wt. % in the auxiliary request) vinyl acetate (VA), the outer semiconductive layer being cross-linked at a temperature of at least 230°C, and to a cross-linked insulated cable produced by that process.

According to the finding of the Board the closest prior art is represented by document (1), which is directed to a process for the manufacture of electrically insulated cables of the same structure having a cross-linked extended outer semi-conductive layer based on EVA copolymers with a

VA content of 20-80 wt. %, preferably 20-60 wt. % (page 2, paragraph 1 and lines 12-15).

Document (1) does not give a general indication with respect to the curing temperature of the extended layer. All the worked examples are operated at 220°C or 160°C. Heating for cross-linking is conducted for a couple of minutes (see page 4, lines 14 and 36; page 5, line 28). According to the comparative examples provided by the Respondent in the patent-in-suit (see page 6, lines 21 and 28) the cross-linking duration at 200°C of an EVA copolymer containing 55% VA is about 30-39 minutes.

5. The subject-matter of the claims according to both requests is not disclosed in any of the prior art documents because these documents do not disclose a curing temperature of at least 230°C, so that novelty is acknowledged. Since novelty has not been questioned by the Appellant, it requires no further considerations.

It has thus to be examined whether the subject-matter of the patent-in-suit involves an inventive step.

6. Main request.

- 6.1 In the light of the above-mentioned closest prior art, the technical problem underlying the patent-in-suit can be seen in increasing the production rate of the cable while maintaining the peel strength of the outer semiconductive layer. Document (1) does not mention the peel strength; however, the peel strength follows from Table 2, Sample 2 of the patent-in-suit (see page 4, line 45) which in the Board's finding represents the state of the art.

The problem is solved according to the patent-in-suit by using EVA copolymers containing at least 55 wt. % VA and by

performing the cross-linking at a temperature of at least 230°C.

In the view of the results obtained in the Examples 1 and 2, page 6 of the patent-in-suit and in the test, page 4 of the patent-in-suit, Table 2, Samples 1 and 2, the Board is satisfied that this technical problem has been plausibly solved.

- 6.2 As already mentioned, document (1) teaches the use of EVA copolymers comprising 20-80 wt. % VA. Contrary to the opinion of the Respondent (memo of 17 November 1986, page 3) the teaching concerns the use of the whole range and not only the specific examples (33 and 40 wt. % VA) or the preferred range (20-60 wt. % VA). Nothing in document (1) leads the skilled man away from using anything within the whole range, and the Board does not see why the skilled man would disregard the upper half of the disclosed range. As regards the VA content, there is an overlap between the disclosure of document (1) and the claimed solution according to the main request: therefore only the second technical feature, i.e. the curing temperature, could contribute to inventive step.
- 6.3 Document (1) gives no limit as regards the curing temperature and the skilled man would only consider the specifically disclosed temperature of 220°C as an example of what is possible to do. Faced with the problem of increasing the production rate the skilled man would test a limited number of reaction parameters and the increase of curing temperature is certainly the most obvious one, since according to common general knowledge an increase of reaction temperature accelerates cross-linking and therefore production rate. The idea of increasing the curing temperature is furthermore already contained in document (3), which belongs to the same technical field and

recommends a curing temperature of 200-300°C obtained by an infrared heater (see column 1, lines 46-53).

6.4 In the Board's judgement, the subject-matter of the claims therefore lacks inventive step, and is not patentable.

7. Auxiliary request.

7.1 The situation is totally different for the auxiliary request where the technical problem underlying the claimed invention is no more to increase the production rate whilst maintaining the peelability, but to improve the characteristics of the cable and particularly the peelability of the outer semiconductiver layer and the reduction of scorch.

The problem is solved by using EVA copolymers containing at least 80 wt. % VA and by performing the cross-linking at a temperature of at least 230°C.

In the view of the results obtained in the Examples 3 and 4 of the patent-in-suit, page 6 and in the tests, page 5 of the patent-in-suit, Table 4, Samples 7 and 8, the Board is satisfied that this technical problem has been plausibly solved.

7.2 Document (1) teaches that the peelability is dependent, to a great extent, to the amount of the peroxyd used for curing (page 1, lines 21-23). This teaching does not suggest the choice of EVA copolymers with a VA content of more than 80 wt. % as a possible solution for the existing technical problem of improving the peelability.

It has neither been submitted nor is the Board from its own technical knowledge aware that on the basis of common general knowledge it can be predicted that changing the

proportion of both components in the polymer composition improves the peelability.

- 7.3 The Respondent has shown in the patent-in-suit (reference Example 2, page 5, Table 4) that only those semiconductive materials with certain EVA copolymers having a VA content of at least 80 wt. % can provide cables which satisfy conditions under which the outer semiconductive layer can be performed by hand without using any special tool. They present a great difference between peel strength and tensile strength (see Table 4, page 5: 0.9 kg/mm for 90% VA; 0,6 for 80% VA; 0,3 for 60% VA) which makes it possible to peel off the outer layer without breaking it. Furthermore, with a VA content of at least 80 wt. % satisfactory processability is obtained without causing scorch (see page 5, Table 5, last line).

Therefore, having regard to the problem underlying the claimed invention, the prior art did not give any indication that a VA content of at least 80 wt. % and a curing temperature of at least 230°C would improve the characteristics of the cable. Thus, the process of Claim 1 according to the auxiliary request is considered as involving an inventive step.

- 7.4 The subject-matter of Claim 2 is a cable produced by the inventive process of Claim 1. The composition of the cable in connection with its demonstrated superior properties make it novel and inventive over the cable disclosed in (1).

**Order**

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

1. The decision of the Opposition Division is set aside.
2. The main request is refused.
3. The patent is maintained with description and Claims 1 and 2 as filed on 3 May 1988.

**The Registrar:**



**The Chairman:**

