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**D E C I S I O N**  
of 18 November 1998

**Case Number:** T 0426/96 - 3.4.2

**Application Number:** 86305314.6

**Publication Number:** 0210770

**IPC:** G02B 6/44, G02B 6/16

**Language of the proceedings:** EN

**Title of invention:**  
Plastics packaged optical fibres

**Patentee:**  
Pirelli General plc

**Opponent:**  
kabelmetal electro GmbH

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56, 123

**Keyword:**  
"Claims - added subject-matter: (no) after amendment"  
"Inventive step: (yes) after amendment"

**Decisions cited:**  
G 0004/92

**Catchword:**  
-



Case Number: T 0426/96 - 3.4.2

**D E C I S I O N**  
**of the Technical Board of Appeal 3.4.2**  
**of 18 November 1998**

**Appellant:** kabelmetal electro GmbH  
(Opponent) Kabelkamp 20  
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30002 Hannover (DE)

**Representative:** -

**Respondent:** Pirelli General plc  
(Proprietor of the patent) 40 Chancery Lane  
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**Representative:** Abbie, Andrew Kenneth  
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**Decision under appeal:** Interlocutory decision of the Opposition Division  
of the European Patent Office posted 15 March  
1996 concerning maintenance of European patent  
No. 0 210 770 in amended form.

**Composition of the Board:**

**Chairman:** E. Turrini  
**Members:** S. V. Steinbrener  
M. Lewenton

## Summary of Facts and Submissions

- I. The appellant (opponent) lodged an appeal against the interlocutory decision of the Opposition Division finding European patent No. 0 210 770 as amended by the patent proprietor during the opposition proceedings to meet the requirements of the EPC.

The opposition filed by the appellant against the patent as a whole was based on Article 100(a) EPC since the subject-matter of the patent in suit allegedly was not novel and lacked an inventive step. As a reaction to the opposition, the patent proprietor requested amendments to the claims occasioned by Article 100(c) EPC.

In its decision, the Opposition Division held that the subject-matter of independent claims 1 and 2 - as further amended on an auxiliary basis during oral proceedings before the first instance - complied with the requirements of Article 123 EPC and was neither anticipated, nor rendered obvious, by the available prior art comprising, *inter alia*, the following documents (in the numbering of the Opposition Division):

D1: GB-A-2 096 353

D2: *Plastics and Rubber International*, Vol. 5, No. 4, August 1980, pages 145 to 149, and

D4: DE-B-27 23 587.

- II. By a communication dated 3 September 1998 pursuant to Article 11(2) of the Rules of Procedure of the Boards of Appeal, the Board expressed its doubts under Article 123(2) EPC about the admissibility of the

claims as amended before the opposition division. Furthermore, at the oral proceedings appointed in accordance with the respective auxiliary requests of both parties, the assessment of inventive step should focus on the issue of whether a skilled person in an attempt to optimise the optical properties of a plastics coated optical fibre according to D1 would be incited by the available prior art to consider certain conventional lower modulus materials for the primary coating to this purpose.

By a letter dated 30 September 1998, the appellant informed the Board that it would not attend the scheduled oral proceedings.

III. Oral proceedings then took place on the agreed date, i.e. 18 November 1998, in the appellant's absence. At the end of the oral proceedings, the decision of the Board was pronounced.

IV. In the notice of appeal, the appellant requested that the European patent be revoked.

V. The respondent requested that the appeal be dismissed and that the patent be maintained in amended form on the basis of the request presented during the oral proceedings.

VI. The wording of claim 1 on file at the time of the present decision reads as follows:

"1. A plastics coated glass optical fibre which contains its optical waveguiding structure within the glass (1), wherein the plastics coating consists of primary, secondary and tertiary coating layers (2, 3 and 4) of relatively high, relatively low and relatively high modulus of elasticity respectively, wherein the primary coating layer (2) is a resin having

a modulus at least two orders of magnitude greater than that of the secondary coating layer (3), wherein the tertiary coating layer (4) has a modulus in the range 400 to 3000 MPa and wherein the primary coating layer (2) is urethane acrylate having a modulus in the range of a few hundred MPa and a thickness of at least 30  $\mu\text{m}$ , the thickness of the secondary coating layer (3) is at least 50  $\mu\text{m}$ , and the thickness of the tertiary coating layer (4) is at least 40  $\mu\text{m}$ ."

Claims 2 to 6 are appended to claim 1.

VII. In the statement of grounds of appeal, the appellant argued as follows:

Independent claims 1 and 2 considered allowable by the opposition division contain subject matter which extends beyond the content of the application as filed (Article 123(2) EPC).

According to the original application documents (see original claim 1 and page 4, lines 7 to 9), the feature of the primary coating layer having a modulus of elasticity in the range of 5 to 100 MPa must be considered essential to the alleged invention. In the above-mentioned claims, this range has been replaced by "a few hundred MPa", i.e. at least 200 MPa, which modulus values do not even overlap with the original range. Therefore, claims 1 and 2 of the impugned decision relate to subject matter entirely different from the plastics coated glass optical fibre forming the invention in the initially filed application documents, and thus are not admissible pursuant to Article 123(2) EPC.

Neither can a basis for said amendment be derived from the passage cited by the opposition division in its interlocutory decision (see page 3, lines 23 ff of the original application documents). In particular, it does not ensue from this passage that a range of "a few hundred MPa" should be essential to the invention in lieu of the originally claimed range. Furthermore, no indication is given of whether the passage applies to all urethane acrylates or even to other coating materials, nor is the limiting value of the modulus disclosed, up to which no deterioration of the optical properties of the fibre is to be expected. Therefore, in view of the originally filed application documents, a skilled person would have no doubts that it is the range of 5 to 100 MPa that will provide optimum properties of the fibre as regards fibre strength and transmission properties.

Since according to original disclosure the primary coating should in any case consist of **UV-curable** resin, extension of claim 2 of the impugned decision to general urethane acrylates which may be thermally cured offends against Article 123(2) EPC as well.

Moreover, the subject matter of both claims differing from the closest prior art, i.e. document D1, only by the modulus range of the primary coating layer and the type of material used for said layer, would not involve an inventive step. Contrary to the opposition division's opinion, it must be concluded from the fibre diameter disclosed in D1 that a glass optical fibre is already considered in the prior art.

Document D4 reports the fact that coatings in general deteriorate the optical properties of fibres, and that the transmission losses are more pronounced with

increasing hardness (or modulus of elasticity) of the coating material. The fibres investigated in D4 inter alia comprised glass fibres coated with a primary layer of thermoplastic resin like polyurethane or epoxy resin.

If the general teaching of D4 were applied to the fibre described in D1, a skilled person would select a material having a modulus value much lower than 2000 MPa for the primary coating in case the transmission properties of the known fibre should be improved. Such materials having lower modulus values are familiar to the skilled person as can be seen from document D2. Moreover, the patent in suit does not give any indication why the claimed conventional coating materials should be particularly advantageous in the present case.

VIII. The respondent's argument at the oral proceedings in support of its request may be summarised as follows:

The subject matter of the contested patent has now been restricted to claim 2 of the impugned decision, i.e. urethane acrylate being the material for the primary coating layer. It is clear from the overall disclosure that the range of moduli for the primary coating defined in original claim 1 was erroneous and should be replaced by "a few hundred MPa" as disclosed at page 3, lines 23 to 28 of the original application documents. By doing so, an overall consistency is achieved.

Neither are the original application documents limited to UV-curable urethane acrylates as may be seen from the passage cited above and from further passages of the description relating to urethane acrylate as such.

Therefore, present claim 1 must be considered to be clearly admissible.

The subject matter of claim 1 differs from document D1 by the material provided for the primary coating and its lower modulus range of a few hundreds MPa.

It is true that document D4 explains the phenomenon of transmission losses of optical fibres due to encapsulation in general. However, this prior art typically relates to the use of a single layer coating which is selected in view of a moderate increase in transmission losses at low temperatures. Although there are examples using two layer coatings, only the outer secondary layer is of interest in D4. The primary coating - if any - consists of the same material as employed in D1 (epoxy resin) and has a thickness of only 5  $\mu\text{m}$ . Thus, even if the teaching of D4 for a two layer configuration were applicable to the three layer structure of D1 - which is not admitted by the respondent - the result would be totally different from the invention with respect to the thickness and modulus ranges of the primary coating.

Document D2 is a general treatise on plastics in fibre optical cables disclosing the fact that cured coatings ranging from soft and flexible to tough and rigid can be obtained on the basis of a variety of coating materials. Moreover, only two layer coatings are considered in D2. Although it is not contested that the claimed coating materials as such were available, selecting the type of primary coating claimed in the present patent for a three layer coating structure from this variety would rely on an ex post-facto analysis in the extreme.



## Reasons for the Decision

### 1. *Admissibility of appeal*

The present appeal is admissible.

### 2. *Amendments*

2.1 The amendments to the claims made by the respondent during the oral proceedings in the appellant's voluntary absence consist in deleting claim 1 and renumbering the remaining claims of the claim version on which the impugned decision was based. These amendments removed objections under Article 123(2) EPC already raised in the Board's communication annexed to the summons to attend oral proceedings. Since the appellant had to expect a discussion of this issue at the oral proceedings, and the present claims are a subset of the claims considered allowable in the impugned decision, the appellant need not be given a further opportunity to comment under Article 113(1) EPC in accordance with the principles laid down in G 4/92 (OJ EPO 1994, 149).

2.2 Claim 1 now under consideration corresponds to claim 2 as amended before the Opposition Division, the dependent claims directly and indirectly referring back to claim 1.

Apart from amendments of purely formal or editorial nature, present claim 1 differs from claim 2 as granted in that the moduli of the primary coating layer have been restricted from a range of "about 2.0 - 6.0 MPa to a few hundred MPa" to a range of "a few hundred MPa".

The arguments given by the appellant in the context of admissibility of present claim 1 mainly concern the following issues:

- (i) the above substitution of "a few hundred MPa" for the range of moduli of "5 to 100 MPa" provided for the primary coating in the **original** application documents (see in particular original claim 1);  
and
- (ii) the fact that claim 1 is not restricted to **UV-curable** urethane acrylate, as was the case in the original claims.

Although the original application documents are rather concise in both respects, in the Board's view there are clear indications that the originally claimed modulus range of 5 to 100 MPa is inconsistent with the overall disclosure of the application.

From the passage at page 3, lines 23 to 38 of the description as initially filed, a skilled person would learn that silicone rubber has a "low" tensile modulus of about 2.0 to 6.0 MPa (see also page 2, lines 34 to 36 of the application documents in this context) whereas typical urethane acrylate has a "high" modulus of a few hundreds MPa.

Moreover, the passage leads to the following conclusions:

Firstly, the range introduced in claim 2 as granted ("about 2.0 - 6.0 MPa to a few hundred MPa") appears to be a misinterpretation of said passage and is in any case an obvious mistake.

Secondly, since the primary and secondary coatings are preferably urethane acrylate and silicone rubber, respectively (see e.g. original claims 2 and 3), the originally claimed modulus range for the primary coating of "5 to 100 MPa" is not consistent with the modulus values of the respective preferred materials for the primary and secondary coatings. Neither does the original range comply with the desired high/low/high modulus layer structure when taking account of the above moduli for the preferred materials, nor with the requirement that the secondary coating layer has a modulus of at least two orders of magnitude smaller than that of the primary coating (see original claim 1).

All of these inconsistencies disappear if - in accordance with original disclosure (see the passage at page 3 cited above) - modulus values of "a few hundred MPa" are substituted for the original range, the modulus of "about 200 MPa" referred to at page 6, lines 28 to 29 of the description falling under such values. In the Board's view, these values have originally been disclosed for urethane acrylate only which is the sole material specified for the primary coating layer in the original application documents. This fact has now been taken into account in present claim 1.

The appellant's argument having regard to issue (i) does not seem to be based on an objection against the original disclosure of the new range as such but rather on an objection against "essentiality" of said disclosure with respect to the (initial) definition of the invention or - in other words - against redefining the initial invention with the aid of features which have also been originally disclosed, but not in the explicit context of the initial invention.

The Board has doubts about the general validity of such an argument limiting the original disclosure "usable" for amendments to some kind of more specific "essential" disclosure resulting, in particular, from the initial draft of the claims. Article 123(2) EPC does not distinguish between different qualities of disclosure. Rather is it the whole "content of the application as filed" which in general forms the reservoir of features available for characterising or modifying the invention.

While a feature explicitly disclosed to be essential for the invention must not be deleted from a claim without offending against Article 123(2) EPC, features not explicitly disclosed to be essential to the invention may still be used for redefining the invention if these features form part of the content of the application as filed, and, in the understanding of a skilled person, clearly relate to the invention.

In the present case, the validity of this argument, however, need not be further considered since the above-cited passage by its mere formulation ("Furthermore, we have found that...") in fact underlines the relevance of the modulus range of "a few hundred MPa" for the claimed invention when restricted to the preferred embodiments. Moreover, elimination of an inconsistency between the originally claimed subject matter and the preferred embodiments by restricting the claimed subject matter to the preferred embodiments is in any case admissible according to the constant interpretation of Article 123(2) EPC by the boards of appeal (see e.g. the decisions cited in "Case Law of the Boards of Appeal of the European Patent Office", European Patent Office 1996, Section III-A, 1.5.4).

Having regard to issue (ii) concerning an amendment already introduced in the pre-grant phase, it is true that the original claims were restricted to "UV-curable" urethane acrylate (see original claim 2 referring back to claim 1). Therefore, the admissibility of said amendment is a question of whether a basis for the present claim broadening can be found in the original disclosure. Generalisations of the claims after the filing date are admissible if they meet the requirements of Article 123 EPC which in accordance with established case law of the boards of appeal *inter alia* requires direct and unambiguous derivability of the amendment from what has been originally disclosed.

Under the circumstances of the present case, the Board is convinced that the overall disclosure of the application as filed is not limited to UV-curable urethane acrylate: neither is there any explicit indication of such a limitation nor would such a limitation be conclusive from the description mentioning at various places the use of this conventional material without specifying the type of curing (see page 2, lines 12 to 26; page 3, lines 23 to 34; and page 9, lines 16 to 21).

In consequence, the subject matter of claim 1 does not extend beyond the content of the application as filed (Article 123(2) EPC). Since the subject matter of claim 1 has been restricted with respect to claim 2 as granted, the requirements of Article 123(3) EPC are also met. Moreover, the amendment does not give rise to clarity problems (Article 84 EPC). Such problems have, indeed, not been referred to by the appellant.

Finally, the amended description submitted at the oral proceedings takes account of amended claim 1 and is also admissible.

### 3. Patentability

#### 3.1 Novelty

The subject-matter of claim 1 is not disclosed in any of the above-cited documents, as can also be seen from the discussion of inventive step below. In particular, none of said documents discloses a three layer coating structure having a primary coating with all of the claimed properties. Novelty has not any longer been contested in the present proceedings.

#### 3.2 Inventive step

3.2.1 Having regard to the issue of inventive step, there was general agreement that document D1 comes closest to the present invention.

This prior art (see Figure 1 and associated text) already discloses:

a plastics coated optical fibre 1

- wherein the plastics coating consists of primary, secondary and tertiary coating layers 3, 4 and 5 of relatively high, relatively low and relatively high modulus of elasticity;
- wherein the primary coating layer 3 is a resin (see D1, page 2, lines 28 to 33) having a modulus at least two orders of magnitude greater than that of the secondary coating layer 4 (see D1, page 2, lines 22 to 24);

- wherein the tertiary coating layer 5 has a modulus in the range 400 to 3000 MPa (see D1, page 2, lines 11 to 13); and
- wherein the thicknesses of the different coatings being at least 30  $\mu\text{m}$ , at least 50  $\mu\text{m}$  and at least 40  $\mu\text{m}$  (see D1, page 2, lines 28 to 47 disclosing thicknesses of 200  $\mu\text{m}$ , 150  $\mu\text{m}$  and 200  $\mu\text{m}$ , respectively).

Moreover, although not explicitly specified in the prior art, from the known diameter of the optical fibre 2 (see D1, page 2, lines 28 and 29) it appears that D1 also relates to a **glass** optical fibre which contains its optical waveguiding structure within the glass. This fact has not been contested by the respondent at the oral proceedings.

The subject matter of claim 1 therefore differs from the prior art in that

- the primary coating layer consists of urethane acrylate whereas the primary coating is made of a thermosetting resin in D1 (see page 2, lines 28 to 33 and claim 4); and
- the primary coating layer has a modulus of a few hundred MPa whereas the modulus of the primary coating in D1 is about 2000 - 4000 MPa (see page 2, lines 6 to 9), i.e. about one order of magnitude higher.

3.2.2 The technical problem solved by these differences may be seen in providing an optical fibre having a sufficient strength to protect it from longitudinal compression induced by differential expansion, without significantly deteriorating the optical properties of the fibre (see page 3, lines 6 to 38 and page 9, lines 16 to 24 of the application as filed).

As is apparent from the discussion below, this problem relating to an optimum compromise has been basically described in the closest prior art and its formulation, thus, cannot contribute to patentability.

3.2.3 Thermosetting and UV-curable primary coatings covering a broad range of modulus values and comprising epoxy resins and polyurethanes which may be based on diacrylate prepolymers are known from documents D2 (see in particular page 146, middle of left-hand column to middle of right-hand column) and D4 (see in particular Figure 2 and Example 2). Both documents relate to two-layer coating systems, the latter mentioning the negative effect of high modulus coatings on the optical properties of the fibre (see D4, column 1, lines 46 to 52).

Despite these facts, the Board believes that a modification of the optical fibre disclosed in document D1 so as to arrive at the subject matter of claim 1 would not be obvious to a skilled person.

Document D1 deals with the problem of stresses exerted on the optical fibre by an outer high modulus protective layer which according to D1 may be overcome by providing a covering layer having a very low modulus of elasticity between the fibre and the stiff outer coating layer. However, then the problem of fibre bending due to the very soft covering layer still remains. According to D1, this bending problem is



solved by inserting a further stiff layer between the fibre and the soft covering layer, thus ending up with a high/low/high modulus three layer structure (see D1, page 1, lines 52 to 105). Moreover, there is a clear indication in D1 that the best mechanical protection of the fibre against compression or squeezing can be obtained by adopting greater and greater diameters and thicknesses of the outermost layer, and that such an increase in thickness can be accepted since inadmissible axial loads due to the greater contraction of the thicker outermost layer are avoided by the stiff innermost layer which provides a resistant jacket tending to withstand the bending of the fibre (see D1, page 3, lines 1 to 20).

In order to realise stable good transmission properties of optical fibres over a temperature range extending down to -50 °C, document D4 proposes an elastomer as a coating layer, having a modulus of at least about 20 MPa and a specified limited temperature variation (see D4, claim 1). Although D4 generally explains the negative effect of coatings on the optical properties of fibres and mentions the fact that transmission losses increase with increasing moduli of the coating material (see D4, column 1, line 46 - column 2, line 51), only the influence of outer layer coatings is investigated either by providing one layer protective structures (see D4, Example 1) or by providing two layer protective structures, the inner layer of which consists of thermoplastic resin like polyurethane or epoxy resin and has a thickness of about 5 µm (see D4, Examples 2 and 3). As is the case for the one layer structures, only the outer coating layer is specifically selected whereas the inner layer is not varied.

In consequence, the Board is convinced that a skilled person when attempting to optimise the three layer structure of D1 with respect to the optical properties of the fibre will be guided by the available prior art to concentrate on the outermost or tertiary coating layer which is seen as the almost exclusive target of stress preventing measures. This seems to be particularly true for the sole three layer structure existing in the prior art, i.e that disclosed in D1, where a high strength primary coating layer is considered to be a prerequisite of a further optimisation of the mechanical and optical properties of the fibre by modifying the tertiary coating layer.

Similarly, although fibre stress problems are related to coating hardness it follows from D4 that these stress problems are caused, and exclusively solved, by the outer coating layer design.

Therefore, in the Board's view a skilled person would not get any incentive from the prior art to optimise the innermost or primary coating layer in case the optical properties of the fibre were to be improved. In particular, there is no incentive in document D4 that the general teaching having regard to stress-transmission loss relationship could be successfully applied to the primary coating layer of a three layer structure without hindsight.

Moreover, the inner coating layer of the two layer structures according to D4 may consist of an epoxy resin as is the case for the primary coating layer of D1 having a modulus one order of magnitude higher than that specified in claim 1. Since the inner layer thickness is also at least about one order of magnitude

lower than that provided in claim 1, even a direct application of the inner layer design of said two layer structures of D4 to the primary coating layer of the three layer structure of D1 would not lead to the claimed invention.

It has not been contested by the respondent that the claimed material of the primary coating layer *per se* is known in the technical field concerned, in particular as a material for the inner coating layers of two layer structures (see e.g. the above-cited passage of D2). However, from the broad disclosure of possible materials "ranging from soft and flexible to tough and rigid" no meaningful conclusions can be drawn with respect of the present technical problem.

On the other hand, the selection of the claimed material for the primary coating layer seems to contribute to the objective of optimising the optical properties of the fibre by the added advantage of low hydrogen evolution rate, thus avoiding an increase in the optical attenuation of the fibre (see page 9, lines 16 to 24 of the original application documents).

3.2.4 For the above reasons, the subject-matter of claim 1 is considered to involve the inventive step required by Articles 52(1) and 56 EPC, and claim 1 is accordingly allowable.

3.3 Dependent claims 2 to 6 concerning specific embodiments of claim 1 correspond to claims 3 to 7 as granted and are also allowable.

The description of the patent specification has been adapted to the amended version of claims and also meets the requirements of the EPC.

**Order**

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

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to maintain the patent in amended form as follows:

**Claims:** 1 to 6, presented during the oral proceedings;

**Description and drawings:** presented during the oral proceedings.

The Registrar:

The Chairman:

P. Martorana

E. Turrini