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D E C I S I O N
of 10 February 1998

Case Number: T 1002/95 - 3.2.1

Application Number: 85107659.6

Publication Number: 0166385

IPC: F16L 11/08

Language of the proceedings: EN

Title of invention:

Flexible composite pipe for high-temperature fluids

Patentee:

The Furukawa Electric Co., Ltd.

Opponent:

Coflexip

Headword:

-

Relevant legal provisions:

EPC Art. 100(a), (b), 56

EPC R. 57a

Keyword:

"Sufficiency of disclosure (yes)"

"Amendments to a claim previously accepted by the Opposition
Division and not arising from the appeal (allowed)"

"Opposing party adversely affected (no)"

"Inventive step (no)"

Decisions cited:

G 0009/92, G 0004/93, T 0923/92, T 0752/93

Catchword:

Having regard to Rule 57a EPC, a non-appealing patent proprietor is entitled to make amendments on its own volition in cases where these amendments - although occasioned by an opposition ground under Article 100 EPC - do not arise from the opponent's appeal (see points 3.2 to 3.5).



Case Number: T 1002/95 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 10 February 1998

Appellant: Coflexip
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Respondent: The Furukawa Electric Co., Ltd.
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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office posted 31 October
1995 concerning maintenance of European patent
No. 0 166 385 in amended form.

Composition of the Board:

Chairman: F. A. Gumbel
Members: P. Alting van Geusau

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 166 385 in respect of European patent application No. 85 107 659.6, filed on 20 June 1985 and claiming priority from the applications JP 125015/84 and JP 41476/85 filed in Japan on 20 June 1984 and 25 March 1985, respectively, was published on 23 January 1991.

II. Notice of opposition was filed on 22 October 1991 on the grounds of Article 100(a), (b) and (c) EPC.

In respect of an alleged lack of novelty and inventive step the opposition was supported in particular by the following prior art documents:

D1: US-A-4 402 346

D2: Article: "Fluorocopolymer For Plenum Cable Boasts Processing, Performance Benefits", in "Plastics Technology", May 1983, page 19,

D3: Article: "Copolymer Developed By Soltex" in The Journal of Commerce, July 26, 1983,

D4: Article "Jacketing resins protect wire and cable", in "Modern Plastics International", November 1983,

D8: Product information Pennwalt, "Kynar Flex 2800", April 1984, Philadelphia, US.

III. By decision dated 31 October 1995 the Opposition

Division maintained the patent in amended form on the basis of claims 1 to 4 and claims 5 to 10, filed with letters dated 9 May 1995 and 26 August 1994, respectively.

The Opposition Division was of the opinion that, starting from the known use of a flexible composite pipe for transporting high temperature oil or gas from a submarine oil field as was disclosed in D1, none of the other available prior art documents suggested the provision of an inner pipe obtained by extruding polymeric material comprising at least a copolymer resin of polyvinylidene fluoride formed mainly from vinylidene fluoride monomer units, this material having the properties with respect to Izod impact strength and apparent Young's modulus as defined in the amended claim 1.

In respect of the grounds of opposition pursuant to Article 100(b) and (c) EPC the Opposition Division stated that these objections had not been upheld by the appellant (opponent).

IV. On 21 December 1995 a notice of appeal was lodged against that interlocutory decision by the opponent and the appeal fee was paid on 22 December 1995.

Together with the statement of grounds of appeal, filed on 28 February 1995, the appellant introduced

D12: Leaflet: "Les tubes et tuyaux RILSAN et leurs applications", No. 1071/74.

V. In a communication issued in preparation of oral proceedings the Board expressed the preliminary view that the material of the inner pipe defined in claim 1 upheld by the Opposition Division included possibilities which did not fall within the definition of the three possibilities disclosed in the application as originally filed and therefore the subject-matter of the amended patent did not appear to be in conformity with Article 102(3) EPC in respect of the requirement of Article 123(2) EPC. Considering the objection raised by the appellant in respect of Article 100(b) EPC, in particular the alleged resistance to blistering, crack and swell of the material claimed, the Board drew attention to the article

E18: "Blistering and cracking phenomena on polymer materials in "Mariflex", dated April 1987,

filed by the respondent (patent proprietor) with letter dated 24 April 1997. It could be derived from this article that the PVDF material claimed behaved in tests similar to Nylon 11, another material used for inner tubes of flexible conduits, as regards the resistance to blistering, crack and swell (if polymer materials absorb gases and pressurisation and depressurisation cycles are taking place, then blistering and cracking phenomena may occur).

When compared to the use of the flexible composite pipe disclosed in D1, the issue of inventive step (Article 100(a) EPC) appeared to focus on the question whether it was obvious to the skilled person to use the

copolymer materials Solef 11010 (D2) or Kynar Flex 2800 (D4) as inner tube material in a composite pipe generally known from D1.

Attention was drawn to the fact that in the patent in suit PVDF polymers were acknowledged to have excellent extrudability, heat resistance and chemical resistance and had been used for pipe lining and solid pipes, but that crack forming was a problem with these materials so that they had not been used in flexible conduits.

Against this background the question to be discussed at the oral proceedings was whether D2 and D4 would suggest to the skilled person the use of PVDF based copolymers which have improved mechanical properties, in particular as regards flexibility and impact resistance, when compared to the PVDF homopolymers and some fluoropolymers.

VI. In response to the communication the respondent filed new claims 1 to 4 of which claim 1 reads as follows:

"1. The use of a flexible composite pipe for transporting high temperature oil or gas from a submarine oil field, the pipe comprising:

an inner pipe (3) obtained by extruding polymeric material selected from (i) polyvinylidene fluoride copolymer resin, (ii) a blend of polyvinylidene fluoride copolymer resin and polyvinylidene fluoride resin, and (iii) a composition based on a polyvinylidene copolymer resin, the polymeric material having, when hot pressed into a sheet, an Izod impact strength of not less than 9.81 daN cm/cm (10 kgcm/cm)

and an apparent Young's modulus in tension of not more than 88.3 daN/mm² (90 kg/mm²);

a reinforcing layer (4, 5) formed around said inner pipe; and

a protective sheath layer (6) coated around said reinforcing layer."

VII. In its response dated 31 December 1998 the appellant took the view that acceptance of the new claim 1 would put the appellant in a worse situation than had the appeal not been filed. In view of the case law in accordance with the Enlarged Board of Appeal decisions G 9/92 (OJ EPO 1994, 875) or G 4/93, having the identical text, such amendment could not be accepted.

With letter dated 30 January 1998 a graph showing test results of the resistance to blistering vis-à-vis the gas methane (CH₄) for the PVDF copolymers Kynar 2800 and Solef 11010 was filed.

VIII. Oral proceedings were held on 10 February 1998.

As regards the appellant's objection to amendment of claim 1 so as to bring its subject-matter in line with the requirements of Article 123(2) EPC, the Chairman drew attention to Rule 57a EPC, which new Rule was inserted by decision of the Administrative Council of 13 December 1994 and entered into force on 1 June 1995 (OJ EPO 1995, 9).

The appellant requested that the decision under appeal be set aside and that the patent be revoked.

The respondent requested that the appeal be dismissed and the patent be maintained on the basis of

- claims 1 to 4 filed with letter dated 23 December 1997 and
- claims 5 to 10, description and drawings as maintained by the Opposition Division.

IX. In support of its request the appellant essentially relied upon the following submissions:

Amendments

The decisions G 9/92 and G 4/93 (supra) of the Enlarged Board of Appeal put restrictions on the extent of requests made by a non-appealing party. In particular in case of a non-appealing patent proprietor, it was stated in point 16 of those decisions that amendments to the patent should be restricted to those modifications which arise from the appeal.

Since the deficiency of claim 1 as maintained by the Opposition Division was independent from the objections made by the appellant in the present appeal, the proposed modification of claim 1 so as to satisfy the requirements of Article 123(2) EPC should be rejected.

Moreover, because of the apparent invalidity of the patent in its form as maintained by the Opposition Division, acceptance of the amendments for bringing claim 1 in line with the requirements of Article 123(2) EPC in fact would put the appellant in a worse

situation than it had been if no appeal had been filed. Such a situation amounted to a "*reformatio in peius*" and was, taking into account the conclusions arrived at in the decisions G 9/92, G 4/93 and T 923/92, point 40 (OJ EPO, 1996, 564), not acceptable.

Sufficiency of disclosure (Article 100(b) EPC)

It was not shown by the respondent that the flexible composite pipe was indeed suitable for the claimed use, in particular as regards its alleged extended resistance to temperatures of more than 100°C at the typical pressure of 300 bars of the oil or gas to be transported.

The respondent alleged that the material identified by "PVDF" in E18 was Kynar 2800, a PVDF copolymer (see D4 and D8), however without providing any verifiable proof to that effect. Moreover the examples shown in D18 concerned tests at about 100°C and a relatively low pressure of 80 bars and therefore did not support the respondent's allegations that the range of PVDF copolymer resins claimed prolongedly resisted to high temperatures of up to 130°C and pressures up to 138 MPa, as mentioned in its letter dated 23 December 1997. The test results filed with letter dated 30 January 1998 showed that the PVDF copolymers Kynar 2800 and Solef 11010 did not meet the respondent's indications of pressure and temperature.

Inventive step (Article 100(a) EPC)

The problem underlying the present patent related to the lining of a flexible conduits so as to make the conduits suitable for transport of high pressure crude oil containing water and having a temperature higher than 100°C. Polyamide, a known lining material for flexible pipes was not suitable for such use because of its low resistance to hydrolysis. Fluoroplastics such as Tefzel, Teflon FEP and Teflon PFA used as lining material in the flexible conduits disclosed in D1 satisfied this need but caused other problems because of their high extrusion temperatures requiring specific extrusion tooling. The skilled person was therefore in search for a material for the inner pipe that was suitable for the intended use and at the same time allowed manufacture of the flexible conduits on conventional extrusion equipment.

Therefore, the moment the skilled person got knowledge of the existence of new fluoroplastics which did not require special processing equipment, in particular Solef 11010 referred to in D2 which was based on PVDF copolymer resin and reported to be economically competitive with Teflon FEP while having good flexibility and low notched Izod impact sensitivity unlike the known PVDF homopolymers, he would certainly try to use such material instead of the known polyamide or fluoroplastic pipe-linings. The fact that the D2 publication related to cable manufacturing did not provide any hindrance to the skilled person to use the material for flexible conduits because manufacturing of cables and conduits was very similar and, as was shown in D12 both uses were commonly known for the polyamide RILSAN. In any case it was mainly the specific properties of flexibility and heat resistance of the lining material itself the skilled person was looking for.

In conclusion, the selection and use of either Kynar 2800 or Solef 11010, both materials falling within the scope of the materials claimed, for the inner lining of the flexible composite pipe known from D1, was obvious to the skilled person and rendered the subject-matter of claim 1 obvious as a whole.

- X. The respondent disputed the appellant's view and its arguments may be summarised as follows:

Amendments

As regards the issue of amendment of a claim upheld by

the Opposition Division in a form which was deficient in respect of the requirement of Article 123(2) EPC, the conclusions arrived at in the decision T 752/93 of 16 July 1996 applied.

Moreover the present amendments did not contravene the principles arrived at in the Enlarged Board of Appeal decision G 9/92 (*supra*).

Sufficiency of disclosure

The subject-matter of the present claim 1 was fully supported by the description and, as could be derived from the examples, tests were performed using an oil heated to a temperature of 120°C and at pressures of more than 200 kg/cm². Furthermore, E18 provided additional evidence of the non-blistering capacities of the PVDF copolymer Kynar 2800 used as material for the inner pipe, as was already submitted in the respondent's letter dated 24 April 1997.

Inventive step

The crucial point to be considered was that the material for forming an inner pipe of a flexible composite conduit for the claimed use should have a good balance of a whole range of characteristics. No such particular range of special characteristics was derivable from the cited documents in respect of the PVDF copolymers known therefrom.

The prior art cited by the appellant concerning the

PVDF copolymer resins Solef and Kynar disclosed certain mechanical, flexural, thermal and electrical properties for use as cable jacketing. However, not the slightest hint was given in these prior art documents that these known materials had potential for use under the extreme conditions which have to be endured by flexible composite pipes in accordance with the use claimed. In this respect also the known use of PVDF homopolymers for pipe lining and solid pipes, as was acknowledged in the description of the patent in suit, did not give the skilled person a hint to the use of PVDF copolymers when they became available on the market because they improved only one or two characteristics when compared to PVDF homopolymers.

Concerning the opponent's argument that a skilled person seeking to overcome the disadvantage of inner nylon sheaths would consider materials having specifically improved resistance to temperature, it had to be considered that, whilst nylon 66 has a melting point of 264°C and nylon 6 of 223°C the PVDF resins Solef and Kynar respectively have melting points of only 162°C and 168°C according to the references provided by the appellant. Accordingly, the skilled person would have been prejudiced against using such copolymer resins because of their lower heat resistance when thinking of a replacement of the most common types of nylon.

The teachings of D2 and D4 were therefore not sufficient to enable the skilled person in reaching a tentative conclusion that Solef or Kynar resins might

be suitable as a material for forming an inner pipe of a flexible composite pipe for transporting high temperature oil or gas from a submarine field. In the absence of any other suggestion to the use of PVDF copolymer resins for forming the inner pipe of a flexible composite conduit for that purpose the subject-matter of claim 1 also involved an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. *Preliminary considerations*
 - 2.1 In its notice of appeal the appellant mentioned all three grounds of opposition in accordance with Article 100(a), (b) and (c) EPC raised in the opposition proceedings.

It can be derived from the file that the Opposition Division considered the objections according to Article 100(b) and (c) EPC raised against the granted patent not justified and was of the opinion that the appellant itself had admitted that the subject-matter of the granted claim 1 interpreted in the manner as done by the Opposition Division did not infringe the respective requirements (see the communication dated 22 March 1993, point 1). Since only arguments in respect of lack of inventive step had been submitted by the appellant against the amended claims, the

Opposition Division apparently came to the conclusion that the other grounds of opposition had not been maintained (see the decision under appeal, page 2, 6th paragraph).

However, no evidence is derivable from the file that the objections based on Article 100(b) and (c) EPC indeed had been withdrawn so that the Opposition Division's conclusion must be considered to be based on a misinterpretation of the facts. The Board is of the opinion that in the present case the misinterpretation amounts to a failure of judgement rather than a procedural violation.

Having regard to the power given to the Board by Article 111(1) EPC and the circumstances of the case, in particular its age, the Board considers it appropriate to decide on the issue of Article 100(b) EPC in the present appeal proceedings rather than to refer the case back to the Opposition Division for proper consideration of this further ground of opposition. The objection under Article 100(c) EPC was no longer maintained during the appeal proceedings.

3. *Amendments*

- 3.1 Current claim 1 is based on the originally filed claim 1 concerning a flexible composite pipe and is limited to the use of such a pipe for transporting high temperature oil or gas from a submarine oil field. Such a specific use follows from the statements in the originally filed description on page 1, lines 1 to 4, as well as from the objects to be fulfilled cited on

page 3, lines 5 to 18.

Present claim 1 therefore meets the requirement of Article 123(2) EPC.

Since, when compared to the scope of the granted claim 1, the present claim 1 is limited both in respect of the use of the flexible pipe and in respect of the nature of the polymeric material forming the inner pipe which is now restricted to three specific (i, ii, and iii in claim 1) polymeric materials falling within the granted more general specification of the polymeric material for the inner pipe, also the requirement of Article 123(3) EPC is fulfilled.

The formal acceptability of claim 1 in respect of the requirements of Article 123(2) and (3) EPC was in fact not contested by the appellant.

- 3.2 The appellant objected in general to the admissibility of the further amendment to claim 1 in its form as it was upheld by the Opposition Division because the respondent was not the appealing party. Therefore, unlike the rights it would have had as an appellant, its requests were subject to restrictions as was specifically set out in the Enlarged Board of Appeal decision G 9/92 (supra).

Moreover, because of the deficiency of claim 1 upheld by the Opposition Division in respect of the requirement of Article 123(2) EPC making the patent null and void the appellant considered himself effectively in a worse position than when compared to the situation if no appeal had been filed. Such situation amounted to a "*reformatio in peius*" with respect to the appellant and should not be allowed having regard to G 9/92 and also to the decision T 923/92, point 40 (*supra*).

- 3.3 Although in the Board's view the above objection is without a factual basis since claim 1 as amended is narrower in scope than that accepted by the Opposition Division the Board would like to give its opinion on the legal issue raised.

As was pointed out during the oral proceedings, new Rule 57a EPC applies in the present case. This Rule, inserted by decision of the Administrative Council of 13 December 1994 and entering into force on 1 June 1995 (OJ EPO 1995, 9) explicitly allows amendment of the description, claims and drawings of a patent provided that the amendments are occasioned by grounds of opposition specified in Article 100 EPC, even if the respective ground has not been invoked by the opponent. There is no time limit for such amendment. Thus the patentee's right to amendment on its own motion also applies to the appeal proceedings. Given the fact that claim 1 upheld by the opposition division is defective in respect of the opposition ground pursuant to Article 100(c) EPC, Rule 57a EPC clearly gives the non-appealing patent proprietor the right to amend claim 1

to remove this ground of opposition.

- 3.4 Moreover, the Board does not follow the appellant's interpretation of the conclusions arrived at in the decision G 9/92 (supra) (or the decision with identical content G 4/93).

In its decision G 9/92 the Enlarged Board of Appeal (see points 15 and 16 in conjunction with points 8, 10 and 11) states that a patent proprietor who has not filed an appeal is only a party to the proceedings and that therefore his requests are subject to limitations and he is "primarily" limited to defend the version of the claims accepted by the Opposition Division.

However, this conclusion cannot be construed to exclude that amendments to the patent may be proposed by the patent proprietor if those amendments are intended to remove deficiencies in respect of the requirements of the EPC which should be fulfilled if the patent is to be maintained in amended form (see Article 102(3) EPC). Such amendments clearly are "appropriate and necessary" in the sense of the considerations given in point 16 of the decision G 9/92 (supra), which is the main condition required by this decision of the Enlarged Board of Appeal in respect of the proposed amendments (see also the decision T 752/93 of 16 July 1996, points 2.3 and 2.4, not published in the OJ, referred to by the respondent).

- 3.5 In any case it should be noted that the decisions G 9/92 and G 4/93 were taken by the Enlarged Board of Appeal prior to the insertion of Rule 57a into the EPC.

Hence the patent proprietor's enhanced right to amendments could not be considered in those decisions.

4. *Sufficiency of disclosure* (Article 100(b) EPC)

4.1 The appellant was of the opinion that the use claimed in claim 1 was not disclosed in a manner sufficiently clear and complete to be carried out by a skilled person in the art since there was no basis for the alleged resistance in respect to temperatures of more than 100°C and pressures of 300 bars occurring during the claimed use of the composite pipe.

4.2 For deciding on the fulfilment of the requirement of Article 100(b) EPC solely the disclosure of the patent and its interpretation by the skilled person is decisive.

From the description of the patent specification can be derived that the composite pipe claimed should withstand temperatures exceeding 100°C and the pressure of oil or gas coming from a submarine oil field. However, no specific values of temperature and pressure or of combinations of those two parameters are included in claim 1. Therefore the minimum requirement for satisfying the claimed use is met if the composite pipe defined in claim 1 can withstand a temperature just above 100°C and a pressure value corresponding to that normally exerted on known flexible composite pipes for transporting high temperature oil or gas from a submarine field.

The Board has no doubt that such requirements are fulfilled by the flexible composite pipe defined in claim 1 because its general mechanical structure is not different from composite pipes known from D1 or D12 and as far as the material of the composite pipe is different from that of these known composite pipes only the inner pipe is concerned. The material for the inner pipe in accordance with the three alternatives claimed is based on PVDF copolymer resin which, when having regard to the properties of the PVDF copolymer Solef 11010 as disclosed in D2, has both good flexibility and thermal stability up to temperatures of 320°F (160°C).

Also taking into account example 7, referred to in the patent specification, the inner pipe material Solef 11010 allowed circulation of oil heated to a temperature of 120°C at a pressure up to 950 Bars.

4.3 Although the exact circumstances of the tests carried out by the appellant are not specified, at least the results of these tests in respect of the copolymers Solef 11010 (D2) and Kynar 2800 (D4) as shown in the graph introduced by the appellant with its letter dated 30 January 1998, are not in contradiction with these findings. On the contrary, in so far as this evidence can be considered relevant (because it only concerns the resistance to blistering in respect of the gas methane (CH₄)), apparently pressures up to 480 (Kynar 2800) and 300 bar (Soleff 11010) can be applied at temperatures above 100°C.

4.4 On the other hand, no evidence is available for support

of the respondent's allegations that the composite pipe used in claim 1 prolongedly resisted temperatures of up to 130°C and internal pressures of up to 1380 bar (see the response dated 23 December 1997).

These values have no basis in the patent either, in which it is explicitly stated that further measures are necessary to allow use at high temperature and high pressures at the same time (see page 3, lines 60 to page 4, line 15).

Although this lack of evidence does not affect the issue of sufficiency of disclosure of the subject-matter of claim 1 the alleged facts cannot be taken into account for support of inventive step of the subject-matter claimed (see point 5 below).

5. *Novelty and inventive step (Article 100 EPC)*

5.1 Novelty of the use claimed in claim 1 follows from the fact that the available prior art does not disclose the use of a composite pipe for transporting high temperature oil or gas from a submarine oil field having an inner pipe of polymeric material selected from (i) polyvinylidene fluoride copolymer resin, (ii) a blend of polyvinylidene fluoride copolymer resin and polyvinylidene fluoride resin, and (iii) a composition based on a polyvinylidene copolymer resin, the polymeric material having, when hot pressed into a sheet, an Izod impact strength of not less than 9.81 daN cm/cm (10 kgcm/cm) and an apparent Young's modulus in tension of not more than 88.3 daN/mm² (90 kg/mm²).

In fact, novelty of the claimed use was not in dispute.

5.2 The closest prior art is represented by D1. This document undisputedly discloses the use of a flexible composite pipe for transporting high temperature oil or gas from a submarine oil field (see column 1, lines 10 to 27), the known flexible pipe comprising an inner pipe (12) obtained by extruding polymeric material consisting of fluoroplastics, a reinforcing layer (14) formed around said inner pipe and a protective sheath layer (17) coated around said reinforcing layer.

Although the known flexible pipe is suitable for the intended use of transport of oil or gas from a submarine oil field manufacture of this known flexible pipe is difficult mainly because of the high extrusion temperatures needed and consequently the special equipment necessary for extrusion of the fluoroplastics such as Tefzel, Teflon FEP and Teflon PFA referred to in D1. Furthermore, the resulting high shrinkage of the material induced stresses and led to a risk of crack propagation.

5.3 The object of the present patent is therefore to be seen in the provision of a composite pipe for transporting high temperature oil and gas from a submarine oil field which has a range of properties that are necessary to withstand prolonged exposure to high temperature oil and gas from a submarine field while allowing manufacture on conventional extrusion equipment.

The patent in suit solves this technical problem essentially by providing for the inner pipe of the composite pipe known from D1 a polymeric material selected from (i) polyvinylidene fluoride copolymer resin, (ii) a blend of polyvinylidene fluoride copolymer resin and polyvinylidene fluoride resin, and (iii) a composition based on a polyvinylidene copolymer resin, the polymeric material having, when hot pressed into a sheet, an Izod impact strength of not less than 9.81 daN cm/cm (10 kg cm(cm) and an apparent Young's modulus in tension of not more than 88.3 daN/mm² (90 kg/mm²).

It is undisputed that both Solef 11010 (D2 and D3) and Kynar 2800 (D4) fall within the scope of the materials claimed, at least in respect of alternative (iii).

5.4 The skilled person looking for a solution to the technical problem outlined above is considered to be an expert well acquainted with the manufacture of the type of composite pipes involved in transportation of oil and gas of submarine oil fields and as such is well aware of the range of necessary properties required for the materials used for the manufacture of this particular sort of flexible composite pipes and the respective shortcomings of some specific properties of the materials in use, such as insufficient resistance to hydrolysis in case of Nylon (for example RYLSAN in D12) or difficulties in respect of manufacturing of the pipe in case of certain fluoroplastics (Teflon in D1).

Furthermore the skilled person was also aware of the fact that PVDF resins had excellent extrudability, heat

resistance and chemical resistance and had been used for pipe linings (see the patent in suit, page 2, lines 23 to 25). However, mainly because of its high rigidity and cracking tendency, it was not held suitable for flexible pipes (see page 2, lines 26 to 36 of the patent in suit).

Judged against his background, the introduction on the market of Solef 11010 as the industry's first PVDF based copolymer in the journal in accordance with D2 (see also D3), in which publication particular reference is made to the ease of processing on conventional extrusion equipment, the good flexibility and low notched Izod impact sensitivity unlike the PVDF homopolymers and some other fluoropolymers, while flexibility and elongation remained stable over a period of time at temperatures up to 160°C, no doubt the skilled person would be encouraged to try this new material for the inner pipe of D1, because these improved properties of the new material filled the gap of properties searched for.

- 5.5 The respondent argued that D2 and D3 concerned publications which restricted the application of Solef 11010 to plenum wire and cable jacketing, which was an application very remote from the use in flexible composite pipes for transport of oil and gas from a submarine oil field. It was not self-evident that materials used for cable jacketing would be suitable for forming the inner pipe of a composite flexible conduit.

Although D2 (and also D3) refers to the use of Solef 11010 primarily for plenum wire and cable jacketing such a disclosure cannot be considered as an intended or suggested limitation for other uses. Evidently, in view of the apparent economic importance of cable manufacturing such possible use is highlighted when introducing a new material, however, without any suggestion to the skilled person to exclude other applications.

- 5.6 It cannot be accepted either that the skilled person would not consult technical journals of more general kind such as D2 and D3, merely because the flexible composite pipes for submarine use in accordance with the patent was a highly specialised technical field, another argument relied upon by the respondent. On the contrary, a skilled person looking for suggestions in respect of avoiding shortcomings encountered with known materials is to be expected to search on a large available scale for better materials coming on the market.

In view of the range of properties which clearly make the known PVDF polymers particularly suitable for use as pipe lining and the known shortcomings in respect of flexibility and crack propagation, any further development of this known material certainly would merit the attention of the skilled person if these shortcomings were said to be overcome, irrespective of other uses of the material if these uses are not in disagreement with the use of the material as an inner pipe lining. Moreover, the manufacture of pipe linings and linings of cables are both linked to similar

extrusion processing, another important parameter referred to in D2 as an improved property of the new material: no special processing equipment is required because of the lower extrusion temperatures, contrary to the extrusion conditions of many conventional fluoropolymer resins.

Since as outlined above, the skilled person was informed by D2, in addition to the known range of properties necessary for the intended use, with the wanted additional properties in respect of flexibility, improved Izod impact sensitivity, thermal stability and ease of manufacture, so that the selection of Solef 11010 as a material for the inner pipe of the composite pipe in accordance with the pipe known from D1 must be considered obvious to the skilled person.

- 5.7 The respondent also argued that one of the most important characteristics of the material to be selected was its high melting point. It was submitted that in view of the relatively low melting point alone, the skilled person would in fact have been prejudiced against the use of the Solef- and Kynar-type products for forming an inner tube for transporting high-temperature fluid.

In this respect the Board is of the opinion that the skilled person is not led by the melting temperature of the material alone but rather by the thermal stability of the material at the working temperature. In view of the fact that D2 discloses a thermal stability of up to about 160°C (320°F) of the PVDF copolymer Solef

11010, there is no reason for the alleged prejudice in that Solef 11010 would not be suitable as an inner pipe material for use at temperatures exceeding 100°C.

- 5.8 Since the obvious exchange of the fluoroplastics used for the inner pipe of the flexible composite pipe known from D1 by the fluoroplastic Solef 11010 immediately leads to the use in accordance with the present claim 1, the subject-matter of this claim lacks an inventive step within the meaning of Article 56 EPC. For this reason claim 1 is not acceptable and as a consequence the respondent's request must fail.

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:

S. Fabiani

F. Gumbel