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D E C I S I O N
of 15 March 1995

Case Number: T 0243/94 - 3.5.2

Application Number: 89306273.7

Publication Number: 0375101

IPC: H01B 7/28

Language of the proceedings: EN

Title of invention:
Power cable with metallic shielding tape and water swellable powder

Applicant:
PIRELLI CABLE CORPORATION

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
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Case Number: T 0243/94 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 15 March 1995

Appellant: PIRELLI CABLE CORPORATION
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Decision under appeal: **Decision of the Examining Division of the European Patent Office dated 26 October 1993 refusing European patent application No. 89 306 273.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: R. G. O'Connell
J.-C. Saisset

Summary of Facts and Submissions

I. The Appellant contests the decision of the Examining Division refusing European patent application No. 89 306 273.7.

The Examining Division held that the subject-matter of Claim 1 filed with letter of 19 January 1993 lacked an inventive step in view of

D2: US-A-4 703 132 (cited in the application) and

D3: US-A-3 943 271.

II. In a communication dated 2 August 1994 the Board drew the Appellant's attention to

D4: DE-A-2 301 535

which, although not considered in the proceedings before the Examining Division, had been cited in the search report, and presented arguments leading to a provisional opinion that the subject matter of Claim 1 lacked an inventive step in view of D2 and D4. It was also pointed out that a feature in Claim 1 - "in conductive contact with adjacent wires" - appeared to contravene Article 123(2) EPC.

III. Oral proceedings were held before the Board on 15 March 1994, at which the Appellant amended Claim 1 by deletion of the feature in dispute. Claims 1 to 5 are now worded as follows:

"1. An electrical power transmission cable (1,1a,1b,1c,1d) comprising

a stranded conductor formed by a plurality of wires (2,3) stranded together,

particles of water-swellable material (5,5a) within the interstices in the conductor,

a semi-conductive stress control layer (4) around the conductor,

a layer of insulation (6) around the stress control layer,

a semi-conductive insulation shield (7) of substantially constant cross-sectional radius around the insulation, and

an elongated metal element (8) radially outwardly of the insulation shield, the elongated metal element having its edges extending longitudinally of the cable and mutually adjacent but with a space between the face (14,15) of one of the edges and the adjacent portion of the element and particles of a water-swellable material (13) at least in the space at the adjacent edges of the element.

2. An electrical power cable according to Claim 1, wherein the metal element is a metal strip and wherein edge portions of the metal strip are overlapped and the space is at the underlying edge face (14).

3. An electrical power cable according to Claim 1, wherein the metal element is a metal strip which is corrugated transversely to its length to provide outwardly extending humps (9) and intermediate valleys (10).

4. An electrical power cable according to Claim 3, wherein edge portions of the metal strip are overlapping.

5. An electrical power cable according to Claim 4, wherein the overlapping edge portions are bonded together by a polymeric adhesive (16)."

Claims 6 to 17 are dependent on Claim 1. Independent Claim 18 is for a method of making the cable of Claim 1. Claims 19 to 22 are dependent on Claim 18.

IV. On a point of procedure, the Appellant objected to the introduction of D4 for the first time into the proceedings at this late stage especially since this document was classified in the search report as of relevance category "A" i.e. "technological background". He agreed nonetheless that it was in his interest for the document to be considered now rather than in an opposition and he also explicitly refrained from requesting remittal to the department of first instance for consideration of D4.

On the substantive issue the Appellant argued, in essence, that while D2 was unquestionably the closest prior art, D4 related to telecommunications cables which were completely different from electrical power cables in construction, application and in the problems arising in use. Although the Appellant manufactured both kinds of cables this manufacture took place at plants which were geographically far apart with little contact between personnel at the different sites. A power cable core comprised stranded conductors in conductive contact, producing a high electric field and subject to cyclical heating and cooling in use. This difference was reflected in the problem underlying the present invention which was to prevent the formation and

propagation of "electrochemical trees" caused by the presence of moisture in the insulation structure of the cable and particularly in regions of localised high electrical stress caused by void formation in the insulation stress control layers; cf. page 1 of the present application. It was to be noted that cable damage was not the only reason for the presence of moisture in the insulation structure - it resulted also from manufacturing, storage and cable splicing operations - a fact which was not recognised in D4 which addressed exclusively the problem of water ingress resulting from cable damage; cf. D4, statement of problem at page 3. Furthermore, telecommunications cables, which D4 was concerned with, had a core comprising a large number of insulated strands in which no heating occurred: no stress control layers were present and the effect of moisture ingress was to increase crosstalk rather than to give rise to electrochemical tree formation. For these reasons D4 was not relevant to assessment of inventive step.

If, however, D4 were to be considered the Appellant argued that in the various embodiments illustrated the water-swellable material was positioned within the cable structure at places chosen to counteract the effects of water ingress resulting from sheath damage rather than to prevent the propagation of moisture in the insulation and structure irrespective of its origin. The layers involved in the make up of the D4 cables and their seams, overlaps, bonding and sealing reflected the different requirements of telecommunications cables, in particular, absence of thermal cycling as in power cables, so that the skilled power cable engineer would not derive from D4 the idea of disposing the elongated metal element and the water-swellable material in the

relationships specified in Claim 1 (main request) nor in the structure specified in the combination of Claims 1 and 4 (auxiliary request).

V. The Appellant requested that the decision under appeal be set aside and, as a main request, that a patent be granted on the basis of the description, claims and drawings as refused by the Examining Division, Claim 1 being amended as mentioned above and, by way of auxiliary request, grant of a patent on the basis of an independent claim combining Claims 1 and 4.

Reasons for the Decision

1. The appeal is admissible.

2. *Inventive step*

2.1 The features specified in all but the last paragraph of Claim 1 are explicitly disclosed features of the cable described in D2 which, in the common view of the Board and the Appellant, represents the closest prior art.

2.2 In addition the reference in D2 at column 2, lines 64 to 68, to the option of "further conventional layers, such as another semiconductive screening layer, a metal shield etc." is a disclosure, for the skilled person, of "a ... metal element radially outwardly of the insulation shield" as specified in the first two lines of the last paragraph of Claim 1.

2.3 The cable specified in Claim 1 differs from that known from D2, solely in the following features:

A. the metal element is elongated and has its edges extending longitudinally of the cable and mutually adjacent but with a space between the face of one of the edges and the adjacent portion of the element and

B. it comprises "particles of a water-swellable material at least in the space at the adjacent edges of the element".

2.4 Starting from the cable known from D2, the problem solved by the cable according to the present Claim 1 is to prevent ingress of moisture between the edges of the metal shield surrounding the insulation layers which edges are subject to stresses tending to separate them in manufacture, storage, handling and use in the field.

2.5 As far as the metal shield is concerned, this problem is known, in particular the disadvantages of conventional sealant/fillers e.g. asphalt flooding compounds for such outer metal cable shields, from D4, at least for telecommunications cables, which cables have a similar structure for the outer metal shield and are subject to the same problems in the field as regards mechanical handling and damage leading to ingress of moisture, cf. D4, pages 1 to 3, especially page 2, last paragraph and page 3, bottom half, and the solution proposed therein is that specified in the above identified features A and B of Claim 1. Cf. D4, Figures 1 to 7 and associated description.

2.6 In particular in Figures 1 to 2, D4 teaches a structure for the metal shield disposed radially outwardly of the sheath 14 defining the cable core (corresponding to the core boundary defined by the insulation shield in a

power cable) which structure comprises an elongated metal element 18 having its edges extending longitudinally of the cable and mutually adjacent but with a space 20 between the face of one of the edges and the adjacent portion of the element. Further, for protecting this structure against ingress of moisture D4 teaches disposing particles of a water-swellable material 30 on both faces of the elongated metal element 18 (D4, page 6, second paragraph) and, for best results, distributed around the full periphery of the cable. The cavity in which the material 30 is disposed therefore includes "the space at the edges of the element".

2.7 For the above reasons, it appears to the Board that the person skilled in the art of electrical cables seeking to improve the D2 cable in a routine fashion would find in D4 a teaching as to how the cable could be improved in respect of the functioning of its outer metal shield which would lead him in an obvious way to a cable having all the features of Claim 1.

2.8 The argument of the Appellant that D4 is not relevant because of the differences between power cables and telecommunications cables is not convincing. In truth it is only the cable cores that can be said to be completely different; the sheath materials and structures have a great deal in common, reflecting the fact that, although the consequences of moisture ingress from damage to the cable sheath are different, water is the common enemy of the power cable designer and the telecommunications cable designer as far as the design of cable sheaths for underground cables is concerned. A technical conference dealing with the latter topic would certainly be attended by both designers. The teaching of D4 is specific not to telecommunications cables but to underground electrical cable sheaths, as is reflected in the title and in the wording of the preamble of Claim 1

of D4. A comparison of the statement of problem at page 3 of D4 and the passage at page 8, third paragraph of the description of the present application leads to the conclusion that both documents address, at least inter alia, the problem of moisture ingress resulting from electrical cable sheath damage.

2.9 The Board concludes therefore that the skilled power cable designer would regard D4 as relevant to the problem of improving the D2 cable. This conclusion is reinforced by the consideration that there is no technical impediment to be overcome in adopting the D4 teaching for the D2 cable.

2.10 Appellant's argument in relation to the position of the water-swellable material is not cogent since Claim 1 specifies only that the material is "at least in the space at the adjacent edges of the (elongated metal) element"; cf. point 2.6 above.

3. *Auxiliary request*

3.1 Claim 4, dependent on Claim 1 via Claim 3, adds to Claim 1 the two features

C. that the metal element is a metal strip which is corrugated transversely to its length to provide outwardly extending humps and intermediate valleys, and

D. that the edge portions of the metal strip are overlapping.

3.2 The cable sheath structure specified in the last paragraph of Claim 1 together with both of these features C and D is known from D4, Figures 3 to 4 and associated description at page 8, middle paragraph, having regard to the fact that the combination of the

last paragraph of Claim 1 and feature D has to be interpreted to include "overlapping edge portions bonded together by a polymeric adhesive" in view of Claim 5.

3.3 For reasons analogous to those given above in relation to Claim 1 it would be obvious for the skilled person to apply the teaching of D4 as exemplified by the Figure 3 embodiment to improve the metal shield of the D2 cable and thus arrive at the subject matter defined by the combination of Claims 1 and 4.

4. For the above reasons the Board finds that neither the subject-matter of Claim 1 alone (main request) nor in combination with Claim 4 (auxiliary request) involves an inventive step within the meaning of Article 56 EPC. Consequently a patent cannot be granted on the basis of either request. In these circumstances the independent method Claim 18 need not be considered; in fact it does not involve an inventive step either for reasons analogous to those indicated above.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Kiehl W. J. L. Wheeler