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Datasheet for the decision of 23 July 2014

Case Number: T 0880/10 - 3.5.02

Application Number: 02805127.4

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Title of invention:
Semiconductive compositions and cable shields employing same

Applicant:
General Cable Technologies Corporation

Relevant legal provisions:
EPC Art. 54, 56, 83

Keyword:
Novelty (no) - main and first auxiliary requests
Inventive step (no) - second and third auxiliary requests
Sufficiency of disclosure (no) -
fourth to seventh auxiliary requests

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Case Number: T 0880/10 - 3.5.02

D E C I S I O N
of Technical Board of Appeal 3.5.02
of 23 July 2014

Appellant: (Applicant)	GENERAL CABLE TECHNOLOGIES CORPORATION 4 Tesseneer Drive Highland Heights, KY 41076 (US)
Representative:	Rupp, Christian Mitscherlich PartmbB Patent- und Rechtsanwälte Postfach 33 06 09 80066 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 24 November 2009 refusing European patent application No. 02805127.4 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	P. Mühlens
Members:	R. Lord
	H. Bronold

Summary of Facts and Submissions

I. This is an appeal of the applicant against the decision of the examining division to refuse European patent application No. 02 805 127.4. The reasons given for the refusal were that the main request did not meet the requirements of Articles 84 and 123(2) EPC, and that subject-matter of claim 1 according to each of the requests then on file did not involve an inventive step according to Article 56 EPC.

II. The following document of the prior art cited during the procedure before the examining division is relevant for this decision:

D4: US 6 086 792 A.

III. Oral proceedings before the board took place on 23 July 2014. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the claims of the main request or on the basis of the claims of one of the auxiliary requests I to VII, all filed with letter dated 20 June 2014.

IV. Claim 1 according to the appellant's main request reads as follows:

"A cable comprising a conductive core and a semiconducting layer surrounding the conductive core, said semiconducting layer comprising:

a) about 55 percent to about 75 percent by weight of a base polymer selected from copolymers of ethylene and a mono-unsaturated ester, copolymers of ethylene and one or more α-olefins having three to six carbon atoms, ethylene/alpha-olefin/diene

terpolymers, EPR and EDPM rubbers, low density polyethylene, and linear low density polyethylene; and

b) about 25 percent to about 45 percent by weight of carbon black having particle size of from about 18 nm to about 21 nm (as measured by ASTM D 3849-89), an Iodine number of from about 120 mg/g to about 150 mg/g (as measured by ASTM D 1510), a tint strength of at least about 95% (as measured by ASTM D 3265) and a DBP number of from abut 90 cm^3/100g to about 170 cm^3/100g (as measured by ASTM D 2414)."

Claim 1 according to the appellant's auxiliary request I differs from that of the main request in that the list of polymer types in paragraph a) is restricted to only "copolymers of ethylene and a mono-unsaturated ester and copolymers of ethylene and one or more α-olefins having three to six carbon atoms".

Claim 1 according to the appellant's auxiliary request II differs from that of the main request in that paragraph a) reads:

"about 55 percent to about 75 [sic] by weight of an ethylene/1-butene resin with a density of from about 0.85 g/cm^3 to about 0.95 g/cm^3 or ethylene vinyl acetate as a base polymer".

Claim 1 according to the appellant's auxiliary request III differs from that of auxiliary request II in that in paragraph a) the ethylene vinyl acetate alternative is deleted.

In each of the appellant's auxiliary requests IV to VII claim 1 differs from that of the corresponding one of

the main request and auxiliary requests I to III in that it specifies in the opening phrase the semiconductive shield only, not the cable, and by the addition at the end of the claim of the definition "and having an accelerated cable life testing (ACLT) Weibull Beta value of 3.0 or more".

V. The appellant essentially argued as follows:

In the light of the general teaching of D4, in particular column 7, lines 23 to 33, it was not implicit that the list of constituents in column 11, lines 48 to 55, was complete, so that it could not then be concluded that this document disclosed a semiconducting layer having the amount of base polymer defined in claim 1 of the main request and in claim 1 of auxiliary request I. That this prior art composition was different from that of the present application was also suggested by the substantial difference between the resistivity values in Table 2 of D4 and Table 3 of the application.

Starting from the (comparative) examples 3 and 18 of D4, the obvious development would not have been to modify the polymer, but rather to follow the general teaching of that document to make use of a carbon black having a larger particle size, as defined in the claims of that document and in the description at column 2, lines 31 to 57. This however led away from the invention as defined in claim 1 of auxiliary request II. As described in the present application, the combination of the carbon black with selected properties (in particular small particle size) with the selected base polymers enabled improved performance to be achieved, in particular in terms of accelerated water treeing test (AWTT) breakdown, at low cost. The

low cost arose in particular from the use of carbon black with smaller particle size. The improvement in AWTT, which was shown by the results in Table 5 of the application and those presented in the grounds of appeal, was achieved despite the poorer surface smoothness. The claimed selection also resulted in improvements in terms of resistivity and accelerated cable life testing (ACLT).

The argumentation with respect to auxiliary request II applied even more clearly to auxiliary request III, because the claimed ethylene/1-butene resin was not even mentioned in D4. The improved performance arising from this selection was demonstrated by the results in Table 5 of the application.

It was implicit from the application that the ACLT Weibull Beta parameter value of 3.0 or more claimed in auxiliary requests IV to VII was achieved in the examples of the invention. Thus the requirement of Article 83 EPC was satisfied. The available prior art contained no suggestion that this improvement could be achieved using the claimed combination of carbon black and base polymer.

Reasons for the Decision

1. The appeal is admissible.

2. Main request and auxiliary request I - Novelty (Article 54 EPC)

2.1 As is apparent from the title and introductory paragraph, document D4 relates to semiconducting

compositions. The section of that document entitled "Examples" starting in column 9 describes the fabrication of experimental cables comprising conducting cores surrounded by layers of such compositions, and the section entitled "Examples 1 to 14" starting in column 11 describes particular compositions used in those experiments. Specifically, as described in the first paragraph of that latter section, the compositions comprise as base polymer (in the terms of the present application) an ethylene-ethyl acrylate copolymer. This is a copolymer of ethylene and a mono-unsaturated ester, and is thus an example of the polymers listed in paragraph a) of claim 1 of both the main request and auxiliary request I. The compositions described there each further comprise a specified antioxidant and one of a number of defined carbon blacks. As can be seen by inspection of Table 1 of D4, the carbon blacks labelled Comp CB 4 and Comp CB 5 have particle size, iodine number, tint strength and DBP number within the ranges defined in paragraph b) of both of those claims, noting that according to the passage of D4 from column 5, line 57 to column 6, line 47, the test methods for these parameters are also as defined in those claims. Furthermore, the example compositions numbered 3 and 18 in Tables 2 and 3 respectively comprise those two carbon blacks in amounts within the range defined in paragraph b) of those claims. Since the amount of the antioxidant can be assumed to be very small, and since no further constituents of the compositions are indicated, it is implicit also that the amount of the polymer is within the range defined in paragraph a) of those claims. Therefore each of the cables according to these two examples of D4 includes all the technical features of claim 1 according to the appellant's main request and

auxiliary request I, so that the subject-matter of those claims is not new according to Article 54 EPC.

2.2 The appellant argued that it could not be assumed that the list of constituents referred to in column 11 of D4 was exhaustive, particularly in the light of the teaching in column 7, lines 23 to 33 concerning further additives, so that it was not implicit that the amount of polymer in the cited examples was in the range defined in these claims. In this respect the appellant also argued that the difference between the resistivity values in Table 3 of the application and Table 2 of D4 suggested that the prior art compositions must have included other ingredients.

2.2.1 The board does not find these arguments convincing, primarily because the skilled person would normally assume that the disclosure of the composition of an experimental example in a patent document includes all the significant constituents. Thus, since the amounts of carbon black indicated in tables 2 and 3 for the two relevant examples are 38.8 and 36.9 weight percent respectively, and since as noted above the amount of antioxidant can be assumed to be very small, it follows that the amounts of the only other constituent listed in the cited passage in column 11, namely the polymer, must be approximately 61 and 63 weight percent respectively, both of which fall within the claimed range of 55 to 75 weight percent.

2.2.2 That the disclosure of column 11, lines 48 to 59 of D4 does include also the optional additives (in the sense of column 7, lines 23 to 33) is indicated by the fact that it explicitly mentions one of these (the antioxidant). The board notes moreover that, whereas the present application indicates in paragraph [0027]

that the resistivity measurement is carried out in accordance with ASTM D991, document D4 describes in the passage from column 9, line 40 to column 10, line 64 that this measurement method is not appropriate for such cable coatings, so that a different measurement technique is used. On this basis the board concludes that no clear teaching can be derived from a comparison of these different sets of results, so that the difference between them does not suggest that the compositions of D4 include further unmentioned constituents.

3. Auxiliary requests II and III - Inventive step (Article 56 EPC)

3.1 The cable of claim 1 according to the appellant's auxiliary request II differs from those of D4 discussed above in that the base polymer is either ethylene vinyl acetate or an ethylene/1-butene resin with a specified density. Claim 1 of auxiliary request III is further restricted to only the second of those two alternatives. The board is of the opinion that it would be obvious to the skilled person to replace the ethylene ethyl acrylate copolymer of the cited examples of D4 with either of these two polymers, so that the subject-matter of these claims does not involve an inventive step according to Article 56 EPC.

3.2 Concerning firstly the ethylene vinyl acetate alternative covered by claim 1 of auxiliary request II, the board notes that the main disclosure in D4 relating to the polymer in column 4, lines 21 to 41 identifies a variety of copolymers of ethylene and unsaturated esters, and then states explicitly at column 4, line 46, that ethylene vinyl acetate is a preferred ester, thus providing a clear suggestion to the skilled person

to replace the ethylene ethyl acrylate copolymer of the examples with ethylene vinyl acetate copolymer.

3.3 In this context the appellant has argued that, since the cited examples of D4 are only comparative examples, the obvious development starting from those examples would have been to follow the main teaching of that document to replace the carbon black with one having a larger particle size. The board notes however that the primary reason given in D4 for preferring carbon black with a larger particle size is the resultant improvement in surface smoothness (see the comments at column 13, lines 23 to 28 and column 15, lines 54 to 56 concerning the poor surface smoothness of examples 3 and 18). The board is however of the opinion that these considerations are not relevant to the comparison of the claimed invention with D4, because according to the limited teaching of the present application concerning surface smoothness (essentially just the five results in Table 5), the inventive composition does indeed have a poor surface smoothness, at least compared to Sample 7 in that table, which has the same base polymer as the "Invention" composition, but a carbon black with a larger particle size, specifically one which falls within the range defined in the claims of D4. Since it seems that the present application simply disregards this consequence of the selection of the smaller particle size in the claimed invention, the board considers that this difference between the comparative examples and invention of D4 is not relevant for the assessment of inventive step in the present case. This conclusion is not affected by the fact, that at least in the cases of the experimental results in the application and the grounds of appeal, the poorer surface smoothness does not result in a worsening of the AWTT breakdown, because that is not the only

parameter of relevance for the performance of a cable which could be affected by the surface smoothness.

3.4 The only experimental results presented by the appellant which directly relate to the ethylene vinyl acetate alternative are the AWTT breakdown results presented on page 4 of the grounds of appeal (letter dated 31 March 2010). However, these do not enable any conclusions to be drawn regarding the effect of replacing the ethylene ethyl acrylate copolymer with ethylene vinyl acrylate, because neither uses the same carbon black (CB1) as the sole example in the application using ethylene ethyl acrylate (Sample 6). The improvement by between 25 and 30% in AWTT breakdown resulting from the larger carbon black particle size indicated by these results cannot in the view of the board result in the presence of an inventive step, given the apparent much larger degradation of the smoothness (by a factor of about nine) associated with this change. The only other teaching which can be derived from these results is that in terms of AWTT breakdown, the ethylene vinyl acetate copolymer provides significantly better performance than the polymers used in the experiments presented in table 5 of the application. This cannot however result in the presence of an inventive step, since as indicated above, D4 already indicates that ethylene vinyl acetate copolymer is a preferred polymer.

3.5 Concerning the ethylene/1-butene copolymer defined in claim 1 of auxiliary request III, the appellant has correctly noted that this polymer is not specifically mentioned in D4. However, the disclosure of the polymers in that document does include at column 5, lines 2 and 3, a statement that copolymers of ethylene and an alpha-olefin having 3 to 20 carbon atoms are

suitable. 1-butene is simply the second lightest of these alpha-olefins, so as such represents a straightforward and hence obvious choice in this category. The limited test data available does not enable the board to conclude that the selection of this polymer from amongst those available results in any improvement in performance which could lead to this being considered as a purposive selection. Considering firstly the results in table 5 of the application, the board notes that the ethylene/1-butene polymer is used in the sample "Invention" and in samples 7 and 9 (since according to the "Inventor's Declaration" accompanying the submission dated 20 June 2014, these polymers are the same), but that samples 6 and 8 use different carbon blacks, so that no conclusions can be drawn by comparison of these groups concerning any possible advantages arising from the selection of the ethylene/ 1-butene copolymer. Comparison with the results presented in the grounds of appeal, as discussed in paragraph 3.3 above, suggest only that this polymer has significantly poorer performance in terms of AWTT breakdown than ethylene vinyl acetate, and thus also cannot support the presence of an inventive step. Concerning the question as to whether it would have been obvious starting from the identified (comparative) examples of D4 to replace the polymer or the carbon black, the above arguments in paragraph 3.3 apply correspondingly.

3.6 The appellant has also presented arguments with respect to these two requests concerning other properties of the cables. In particular, the application indicates that the claimed invention has the advantage of using lower cost materials. During the oral proceedings before the board the appellant indicated that this advantage related to the carbon black, since carbon

blacks with a larger particle size were more expensive. However, noting the point discussed above in paragraph 3.3 relating to the effect of particle size on surface smoothness, this selection appears to the board to be nothing more than a conventional price-performance trade-off. In his written submissions the appellant also referred to improvements in terms of resistivity and accelerated cable life testing (ACLT). However, all of the test results provided for these two parameters (see tables 3 and 5 of the application) are for semiconducting compositions and cables in which the base polymer is the ethylene/1-butene resin. There are thus no comparative tests which would allow any conclusions to be drawn as to whether this polymer selection resulted in improved performance in terms of these properties.

4. Auxiliary requests IV to VII - Sufficiency of disclosure (Article 83 EPC)

4.1 In each of these requests claim 1 differs from that of the corresponding request as discussed above by the addition of a definition that the semiconductive shield has "an accelerated cable life testing (ACLT) Weibull Beta value of 3.0 or more". In the originally filed application this parameter was mentioned only in the second sentence of paragraph [0025] and in claims 15 and 16, the former referring in particular to a value of 1.5 or more (corresponding to claim 15), and a preferred value of 3.0 or more (corresponding to claim 16). However, the application provides no teaching as to which of the described semiconductive shields provides either of those values, or as to how to select the base polymer and/or the carbon black in order to achieve them. Given the nature of this parameter (which relates to the variation of failure rate over time),

the board is also of the opinion that the necessary information would not form part of the common general knowledge of the skilled person. The board considers therefore that as far as the claims containing this definition are concerned, the application does not disclose the claimed invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art, thus not meeting the requirement of Article 83 EPC.

4.2 The appellant has argued that it is implicit in the application that at least the described example of the invention (i.e. that labelled "Invention" in the tables) provides the claimed Weibull Beta value. The board does not find this argument convincing. It is possible that it could be assumed that this example provides at least the lower value of 1.5 mentioned in paragraph [0025] and original claim 15 (although the board considers that even this is not certain), but any conclusion as to whether it provides the higher value now claimed is pure speculation. Furthermore, in the absence of any other teaching in the application, even if that were assumed to be the case, that would mean that the claim was enabled only with respect to one specific carbon black (ASTM N110) combined with one specific base polymer (General Cable LS571E), with no teaching as to whether or how the Weibull Beta value could be achieved with any other materials otherwise within the scope of the claim. The remainder of the arguments presented by the appellant in this respect related in fact to inventive step, so are not relevant to this objection.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Kiehl

P. Mühlens

Decision electronically authenticated