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Datasheet for the decision of 28 April 2015

Case Number: T 0543/13 - 3.2.05

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Title of invention:
Abrasion Protection

Patent Proprietor:
Tyco Electronics UK Limited

Opponent:
Delfingen De Marktrodach GmbH & Co. KG

Relevant legal provisions:
EPC 1973 Art. 54, 56
RPBA Art. 13(1)

Keyword:
Novelty - (yes)
Late-filed document - admitted (yes)
Inventive step - (yes)

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Case Number: T 0543/13 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 28 April 2015

Appellant: (Opponent)	Delfingen De Marktrodach GmbH & Co. KG Großvichtach 2 u. 4 96364 Marktrodach (DE)
Representative:	Jürgen Pröll Maryniok GbR Patent- und Rechtsanwaltssozietät Leibnizstraße 6 95447 Bayreuth (DE)
Respondent: (Patent Proprietor)	Tyco Electronics UK Limited Faraday Road, Dorcan Swindon, Wiltshire SN3 5HH (GB)
Representative:	Timothy John Duckworth J A Kemp 14 South Square Gray's Inn London WC1R 5JJ (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 3 January 2013 concerning maintenance of the European Patent No. 0906536 in amended form.**

Composition of the Board:

Chairman	M. Poock
Members:	S. Bridge
	M. J. Vogel

Summary of Facts and Submissions

I. An appeal was lodged against the interlocutory decision of the opposition division aiming to maintain the European patent No. 0 906 536 in amended form.

II. The opposition was filed against the patent as a whole based on Article 100(a) EPC 1973 (lack of novelty, Article 54 EPC 1973, and lack of inventive step, Article 56 EPC 1973) and Article 100(b) EPC (the invention is not disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art, Article 83 EPC 1973).

III. The appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 0 906 536 be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed.

IV. Oral proceedings were held before the board of appeal on 28 April 2015.

V. The labelling M1 to M12 of the features of claim 1 of the sole request, as evolved by the parties, is as follows:

"M1 A circumferentially-heat-shrinkable sheath of woven fabric,
M2 capable of use on a non-linear shaped conduit,
M3 for example to provide impact cushioning and/or abrasion resistance,
M4 wherein the sheath provides a substantially unobscured outer fabric surface and comprises

M5 hoop filaments extending substantially circumferentially around the sheath, at least some of which hoop filaments are heat-shrinkable, and
M6 multi-filament length filaments extending substantially along the sheath, and wherein
M7 the length filaments are selected to be sufficiently flexible, at least at temperatures to which they are subjected during heat-shrinking of the sheath in use,
M8 for the heat shrinkage of the hoop filaments to crimp the length filaments to any extent causing portions of the length filaments either
M9 (i) to project outwardly from the shrunken fabric sheath to a maximum distance in excess of the maximum projection distance of the thus-shrunken hoop filaments, or
M10 (ii) to increase such excess projection distance if already existing before the heat shrinkage;
M11 whereby portions of the hoop filaments are clearly visible from the exterior of the sheath before heat shrinking and
M12 the length filaments substantially conceal the hoop filaments from exterior view in the fully heat-shrunken sheath."

VI. The following documents are cited in this decision:

E3: US-A-3,669,157;
E8: US-A-2,539,301.

VII. The arguments of the appellant in the written and oral proceedings can be summarised as follows:

According to document E3, there is some change in the longitudinal dimension of the sheath, because the longitudinal dimension A, A' of the fabric is only

described as "*substantially*" unchanged after heat shrinking (column 1 ,line 68 to column 2, line 9; figures 1 to 4). This in turn implies that there must be a corresponding increase in the amount of crimping of the length filaments after heat shrinking, which in turn implies that the outwardly projection of portions of the length filaments increases correspondingly. Thus, document E3 discloses features M9 and M10 of claim 1. In consequence, the subject-matter of claim 1 according to the sole request is not new with respect to document E3.

Late filed document E8 should be admitted into the proceedings, because it discloses the "*crimp hiding*" features M7 to M10 and M12 and is thus relevant to the present case.

Those features of claim 1 which are not already known from document E3 (disclosing features M1 to M5 and M6 partially and M11) are disclosed in document E8 (features M6 to M10 and M12). The skilled person would combine the teaching of these two documents to arrive at the subject-matter of claim 1, because:

- documents E3 and E8 both concern woven fabrics which are heat-shrinkable and claim 1 according to the sole request leaves open whether the sheath is formed before or after heat-shrinking the fabric;
- the skilled person knows what effect the "*crimp hiding*" features disclosed in document E8 have, namely that the crimping (resulting from the heat shrinking) increases the thickness of the fabric, thereby providing added abrasion resistance; and
- that document E8 teaches that the "*tough durable coating*" is not essential (see claims 4 and 5 of document E8).

The subject-matter of claim 1 therefore does not involve an inventive step.

VIII. The arguments of the respondent in the written and oral proceedings can be summarised as follows:

Document E3 discloses neither the use of multi-filament length filaments nor the "*crimp hiding*" features of claim 1 according to which the flexibility of the length filaments is chosen such that the length filaments substantially conceal the hoop filaments from exterior view in the fully heat-shrunken sheath. Thus document E3 discloses neither feature M6 fully nor features M7 to M10 and M12 of claim 1. Therefore, the subject-matter of claim 1 is new with respect to document E3.

Late filed document E8 does not disclose a heat shrinkable sheath and belongs to the different technical field of upholstery. Document E8 should not be admitted into the proceedings.

The skilled person has no incentive to combine the teachings of documents E3 and E8, because they are fundamentally incompatible in that document E3 aims to avoid longitudinal shrinkage while document E8 does the exact opposite, namely shrinks the fabric (to give it some stretchability). Even if the skilled person were to attempt to combine the fabrics of documents E3 and E8, the resulting fabric would be necessarily inferior to that disclosed in document E3, because some of the length filaments would have to be replaced by a heat-shrinkable yarn which is, by its very nature, not able to meet the non-shrinking requirements set out in column 2, lines 19 to 24. It is only possible to arrive at the subject-matter of claim 1 when considering

documents E3 and E8 by means of reasoning based on hindsight. The subject-matter of claim 1 therefore involves an inventive step.

Reasons for the Decision

1. *Novelty (Articles 100(a) and 54 EPC 1973)*

1.1 Document E3 concerns "*a tubular woven fabric which may be positioned about an elongated article and radially shrunk by the application of heat into a closely conforming relationship with the elongated article, while maintaining the longitudinal dimension of the fabric*" (column 1, lines 5 to 10).

1.2 Document E3 discusses the nature of the warp yarns in particular in column 2, lines 18 to 24. However, as already pointed out to the parties by the board in the annex to the summons to oral proceedings, document E3 only discloses feature M6 partially, in that the warp yarns are not explicitly described as multi-filament.

1.3 It was argued on behalf of the appellant that, according to document E3, some change of longitudinal dimension nevertheless occurs, because the longitudinal dimension A, A' of the fabric is only "*substantially*" unchanged after heat shrinking (column 1 ,line 68 to column 2, line 9; figures 1 to 4). According to the appellant, this in turn implies that there must be a corresponding increase in the amount of crimping of the length filaments after heat shrinking, i.e. that the outwardly projection of portions of the length filaments is correspondingly augmented, thereby disclosing features M9 and M10 of claim 1.

This reasoning cannot be followed, because features M9 and M10 do not exist in isolation in claim 1. Instead, features M7 to M10 and M12 form a whole, because these features require a *selection* of length filaments of *sufficient flexibility* for the heat shrinkage of the hoop filaments to crimp the length filaments *to the extent* that portions of the length filaments either project outwardly from the shrunken fabric sheath to a maximum distance in excess of the maximum projection distance of the thus-shrunken hoop filaments, or increase such excess projection distance if already existing before the heat shrinkage, wherein the amount of outwardly projection is determined by feature M12 and must be such that "*the length filaments substantially conceal the hoop filaments from exterior view in the fully heat-shrunken sheath*".

In this context, the skilled person seeking to interpret the term "*substantially conceal*" of feature M12 will consult the description and learn from paragraph [0030], that this means that "*the flexibility of the length filaments and the shrinkage forces of the hoop filaments [must] be sufficient to cause the crimped length filaments subsatntially [sic] to conceal the shrunken hoop filaments after the heat-shrinking step. This "hiding" or "burying" of the hoop filaments on heat-shrinking of the sheath enables the length filaments to be selected for their abrasion-resisting properties; and the hoop filaments to be selected for optimum heat-shrink properties without too much regard to abrasion resistance, which may not always be easy to combine with preferred levels of heat-shrink performance. As a result of the more abrasion-resistant length filaments thus being predominantly exposed on the surface of the sheath after shrinking, the abrasion resistance may be effectively increased relative to*

that of the unshrunk sheath, in addition to the desirably close fit around the conduit achieved by the heat-shrinking operation". Furthermore, means for measuring the projection distances are disclosed in paragraph [0031] of the patent in suit.

Substantially maintaining the longitudinal dimension A, A' (figures 1 and 3 of document E3) of the fabric requires that the amount of crimping of the length filaments remains substantially unchanged after heat shrinking. It follows that the amount of augmentation of the outwardly projection of portions of the length filaments is not necessarily sufficient for "*the length filaments [to] substantially conceal the hoop filaments from exterior view in the fully heat-shrunken sheath*" (feature M12) or that the length filaments have to be selected accordingly (features M7 to M10). Thus, document E3 also does not directly and unambiguously disclose the "*crimp hiding*" features M7 to M10 and M12 of claim 1 according to the sole request.

1.4 Therefore, the subject-matter of claim 1 is new with respect to document E3 (Articles 100(a) and 54 EPC 1973).

2. *Admissibility of late filed document E8*

Document E8 is entitled "WOVEN GLASS FABRIC AND METHOD OF MAKING SAME" and concerns "*a woven glass fabric having a substantial range of stretch*" (column 1, first 5 lines). This involves "*interweaving the glass fiber threads with heat-shrinkable thermoplastic yarns, so that after the fabric thus produced comes off the loom it can be heated sufficiently to cause the thermoplastic yarns to shrink so that they will contract the woven glass fabric … and yieldingly hold it contrac-*

ted" (column 1, last 17 lines). Even though the field of upholstery is cited as an example of use (column 1, third paragraph), the invention of document E8 may be used in "*other fields where a small amount of stretch is needed*" (column 1, fourth paragraph). Thus, document E8 relates to woven glass fabric in general and is not per se limited to the field of upholstery.

According to document E8, "*the warps and wefts … have a relatively low twist, which permits the yarns and threads to flatten out somewhat in the weave as indicated by the elliptical shape of the threads 12 shown in Fig. 3*" (column 4, first paragraph). This implies that "*the warps and wefts*" are multi-filaments, so that document E8 discloses feature M6.

Document E8 further discloses that "*as the yarns 13 and 14 shrink under the application of heat they tend to move inwardly towards the central plane of the fabric, while at the same time they impart to the larger non-elastic threads 11 and 12 an increased serpentine configuration. […] the crimp of the glass threads is about twice as pronounced as that of the thermoplastic yarns. This causes the faces of the fabric to be formed practically entirely of the glass threads 11 and 12*" (column 6, lines 19 to 30). Thus, document E8 discloses the "*crimp hiding*" features M7 to M10 and M12.

In consequence, document E8 discloses a fabric which is prima facie relevant to the invention of the patent in suit. In consequence, the board uses its discretion under Article 13(1) RPBA to admit document E8 into the proceedings.

3. *Inventive step (Articles 100(a) and 56 EPC 1973)*

3.1 Document E3 discloses a circumferentially heat-shrinkable sheath of woven fabric i.a. for mechanical protection of articles such as pipes (column 2, lines 42 to 51) and discloses features M1 to M5 and M6 (albeit without the use of *multi-filaments*) as well as feature M11. Document E3 represents the closest prior art.

3.2 The subject-matter of claim 1 according to the sole request differs from the sheath of document E3 in:

- the use of multi-filament length filaments (part of feature M6); and
- the "*crimp hiding*" features M7 to M10 and M12, i.e. length filaments whose flexibility is such that the heat shrinkable hoop filaments shrink to such an extent that the crimped length filaments conceal the hoop filaments from exterior view.

3.3 As set out in the patent in suit, the respective technical effects of these differences are as follows:

- "*multi-filament yarns tend to spread out to enhance their surface coverage*" in particular at outside bend radii (column 9, lines 33 to 38); and

- the "*crimp hiding*" feature "*enables the length filaments to be selected for their abrasion-resisting properties, and the hoop filaments to be selected for optimum heat-shrink properties without too much regard to abrasion resistance, which may not always be easy to combine with preferred levels of heat-shrink performance. As a result of the more abrasion-resistant length filaments thus being predominantly exposed on the surface of the sheath after shrinking, the*

abrasion resistance may be effectively increased relative to that of the unshrunk sheath, in addition to the desirably close fit around the conduit achieved by the heat-shrinking operation" (patent in suit, column 8, lines 14 to 27).

Thus, the use of "*multi-filament yarns*" and the "*crimp hiding*" feature contribute towards solving the same objective problem, albeit through different respective technical effects. This objective problem is to provide a circumferentially heat shrinkable sheath having improved mechanical resistance in order to protect a conduit (see patent in suit, paragraphs [0001], [0002] and [0005]).

3.4 The skilled person starting from document E3 and seeking to solve this problem finds that document E3 already claims to have solved this problem (column 2, lines 42 to 51).

3.5 As already noted above, the primary concern of the invention of document E8 is to provide a woven glass fabric with a substantial range of stretch (column 1, first five lines). A certain level of abrasion resistance is implied by the proposed use "*such as covers for cushions and automobile seats and as a cover for folding baby carriage tops and the tops of convertible automobiles*" (column 1, third paragraph) and is provided by "*a tough durable coating film that will cover and protect the glass threads of the woven fabric and keep them from slipping in the fabric, produces a strong durable covering fabric*" (column 2, first paragraph).

The problem of imparting stretch to a woven glass fabric is solved in document E8 in terms of interweaving

the glass fabric in at least one direction with a small quantity of thermoplastic yarns that have a substantial extensibility, said yarns being heat-shrunken in the fabric to hold the fabric yieldingly contracted so as to impart to the glass fabric the ability to stretch approximately l0% or more (e.g. claim 4).

Although, as already noted above, document E8 discloses the "*crimp hiding*" features M7 to M10 and M12, it does so:

- in a different context, namely that of adding flexibility to a glass fiber fabric, which has been heat shrunk during one step of its process of manufacture; and
- does not draw any conclusions from the fact that, after heat shrinking, "*the faces of the fabric [are] formed practically entirely of the glass threads*" other than explaining the mechanism by which the glass fibre fabric has become stretchable and providing a "*distinct and pleasing surface appearance*" (column 6, lines 19 to 43).

There is no indication in document E8 that the stretchable glass fabric disclosed therein is in itself heat-shrinkable so that statements to the contrary on behalf of the appellant are mere speculation. In addition, whether the sheath is formed before or after heat-shrinking the fabric is not relevant to the fact that the subject-matter of claim 1 of the sole request concerns a fabric which has to be heat-shrinkable.

In consequence, there is no reason for the skilled person to seek to combine the teachings of document E3 with the teaching of document E8 concerning an (already heat-shrunk) stretchable glass fabric when seeking to (further) improve the mechanical resistance of a

circumferentially heat-shrinkable sheath of woven fabric in order to protect a conduit.

3.6 Arguments on behalf of the appellant that claims 4 and 5 of document E8 teach that the "*tough and durable coating*" may be omitted from the fabric of document E8 cannot be followed, because there is no such indication in the description of document E8. The absence of the coating from the wording of a claim is not sufficient to constitute such teaching, because patent claims are only required to reflect the essential features of the invention, which, in the case of document E8, is concerned with stretchability and not with abrasion resistance. The absence of the coating from the wording of claim 4 and 5 of document E8 thus indicates that the coating is not essential in providing stretchability to a glass fibre fabric but does not, as such, teach that the coating may be omitted when manufacturing the final fabric.

3.7 It was argued on behalf of the appellant that the skilled person would realise that the "*crimp hiding*" feature disclosed in document E8 implies an improved abrasion resistance, because the fabric has become thicker through crimping of the length filaments during heat shrinking. This argument cannot be followed, because:

- there is no such teaching in document E8; and
- although for a homogeneous material a greater thickness usually implies a greater abrasion resistance, this is not necessarily the case for a crimped fabric, because crimping merely increases the projection distance of the longitudinal threads. There is no evidence that this makes these threads - and hence the fabric - any more abrasion resistant.

3.8 As already noted above, the primary concern of the invention of document E8 is to provide a woven glass fabric with a substantial range of stretch (column 1, first 5 lines) which implies a change in length after the fabric comes off the loom when it is "*heated sufficiently to cause the thermoplastic yarns to shrink so that they will contract the woven glass fabric, say anywhere from 5 to 20%*" (column 1, last paragraph). This means that the manufacturing process disclosed in document E8 is directly opposed to the aim of document E3 of "*substantially maintaining the same longitudinal dimension*" (column 1, lines 32 to 35). The skilled person is thus discouraged from attempting to combine the teachings of documents E3 and E8.

3.9 Even if the skilled person were motivated to combine the teachings of documents E3 and E8, the resulting fabric would involve using heat-shrinkable threads amongst, and instead of, some of the glass fibres used as longitudinal threads of the sheath of document E3. This is detrimental both to the resistance of the sheath and to substantially maintaining its longitudinal dimension as required in column 2 lines 19 to 24 of document E3. Thus, the skilled person is further discouraged from combining the fabrics of document E3 and E8.

3.10 In conclusion, it requires hindsight for the skilled person to selectively extract feature M6 and the "*crimp hiding*" features M7 to M10 and M12 of document E8 and combine them with the circumferentially-heat-shrinkable sheath of woven fabric according to document E3 while in the process giving up the advantage of maintaining the longitudinal dimension as set out in document E3 in

such a manner as to arrive at the subject-matter of claim 1 of the sole request.

3.11 Instead, the solution of the patent in suit is based on the idea to provide the required level of protection by means of the length filaments of the fabric. This idea, which is realised in the claims through the "*crimp hiding*" features M7 to M10 and M12 and the use of multi-filaments in feature M6, has not been rendered obvious by the available prior art.

The subject-matter of claim 1 therefore involves an inventive step (Articles 100(a) and Article 56 EPC 1973).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Meyfarth M. Poock

Decision electronically authenticated