

45

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D E C I S I O N
of 3 July 1998

Case Number: T 0554/95 - 3.4.2

Application Number: 84307790.0

Publication Number: 0142971

IPC: H01G 1/10

Language of the proceedings: EN

Title of invention:
Capacitor and method of packaging it

Patentee:
Illinois Tool Works Inc.

Opponent:
Siemens AG

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"

Decisions cited:
T 0106/84

Catchword:
-



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46

Case Number: T 0554/95 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 3 July 1998

Appellant: Siemens AG
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80506 München (DE)

Representative: -

Respondent: Illinois Tool Works Inc.
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 2 May 1995
rejecting the opposition filed against European
patent No. 0 142 971 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: E. Turrini
Members: A. G. Klein
M. Lewenton

Summary of Facts and Submissions

- I. The opposition filed against European patent No. 0 142 971 (application No. 84 307 790.0) was rejected by the Opposition Division.

The opposition was founded on an objection of lack of inventive step of the claimed subject-matter in view in particular of the documents:

GB-A-2 011 717 (R1);
FR-A-2 258 761 (R2);
DE-A-1 764 541 (ES1);
DE-A-1 902 088 (ES2); and
DE-A-2 426 541 (ES4).

- II. The appellant (opponent) filed an appeal against the decision.
- III. Oral proceedings were held before the Board of Appeal on 3 July 1998.

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

The respondent (patentee) for his part requested that the appeal be dismissed and that the patent be maintained.

At the end of the oral proceedings, the decision of the Board was pronounced.

Claim 1, the only independent claim of the set of claims 1 to 3 as granted reads as follows:

- "1. A metal film parallel plate capacitor (10) comprising a plurality of layers of dielectric material (21) each coated with a metallic film

48

(23) and arranged in a stack with the metallic film (23) of each layer being separated by the dielectric material (21) from the metallic film of an adjacent layer, wrapping means (16) extending around all side faces of the stack of layers for protecting the stack of layers from the environment, and electrically conductive coatings (14) applied to and covering end faces of the stack of layers and connected to the metallic films (23), characterised in that the wrapping means (16) provides mechanical support to increase the resistance to delamination of the stack of layers and comprises a thermally insulative tape wound around the stack of layers, or a thermally insulative sleeve of heat shrinkable material applied around and shrunk onto the stack of layers, whereby the capacitor is mountable directly on to a circuit board in a leadless fashion."

IV. In support of his request, the appellant essentially submitted that a metal film parallel plate capacitor as set out in the preamble of claim 1 was known from document R1.

This known capacitor also comprised an electrically and thermally insulative wrapping means comprised of two synthetic foils welded together by means of heated rams. The two foils with the capacitors mounted in between formed a continuous belt from which individual capacitors could be separated only by the consumer. The wrapping means therefore necessarily provided mechanical support to the capacitors, otherwise they would simply fall out of the belt before reaching the end consumer.

Document D1 also stressed the fact that the capacitors could form SMD elements directly mountable on to a circuit board, since they did not need to be provided with electrical connection leads.

Accordingly, the only difference between the claimed subject-matter and the capacitor of document R1 was the fact that the known welded foils were now replaced either by a tape wound around the stack of layers, or by a sleeve of heat shrinkable material applied around and shrunk on to the stack of layers, which were obvious equivalents to the known wrapping means.

The appellant also contested the technical relevance of the claimed wrapping means. He was himself producing and selling large amounts of metal film parallel plate capacitors, which were not provided with any wrapping means and were mounted by the consumers directly onto circuit boards. The absence of any wrapping means did not however lead to any difficulty in terms either of delamination of the stacks of layers, or of thermal destruction.

V. The respondent for his part stressed that at the priority date of the patent in suit metal film parallel plate capacitors had been known for 20 years and had become commodity items. The technical problem of an insufficient resistance to delamination of these capacitors was also well known at this date, and so was one of its main causes, namely the use for the dielectric material layers of blown films obtained by inflating tubes of synthetic material so as to reduce

80

their thickness to about 10 micrometers. These films retained some sort of memory of the bi-axial stretching to which they were subjected in the inflation procedure, resulting in a tendency to shrinking when heat was applied in the manufacturing or use of the capacitors.

Thus, most of the prior art solutions to the problem of delamination consisted either in increasing the bond between adjacent layers of metallic or dielectric material by interconnecting these layers along their edges through sprayed metal, or using adhesives or solvents, or in re-heating the capacitor layers so as to reduce the above-mentioned memory effect. These solutions however all modified the electrical characteristics of the capacitors, reducing their capacitance either by reducing the surface of the metallic layers or by changing the dielectric properties of the insulating films.

The only prior art solution relying exclusively on mechanical external retention was disclosed in document ES1, which proposed to stick together extra layers provided on each side of the stack of capacitor layers so as to form thick rigid layers, and to connect them through the lateral coatings made of sprayed metal. This attempt however failed due to an impossibility to achieve good physical contact between the rigid insulating layers and the metal coatings, as was explicitly set out in document ES2, a patent application filed as a supplement to patent application ES1. Document ES2 therefore taught to improve the connection in the construction of document ES1 by providing additional welding of the external layers through a kind of spot welding technique. The holes formed by this technique however also reduced the capacitance of the devices.

81

In contrast, the invention proposed a simple and efficient, purely mechanical solution, in which a wound tape, or a sleeve of heat shrinkable material applied around the stack of layers, provided an external skeleton increasing its resistance to delamination and insulating it from external heat, which was one of the main causes for delamination.

This solution might seem simple, the more so since about 15 years have elapsed as from the filing of the priority application. However, as indicated for instance in decision T 106/84 (OJ EPO 1984, 132), the apparent simplicity of a technical solution might, in particular circumstances, constitute an indication of non-obviousness.

Furthermore, the claimed capacitor had encountered considerable commercial success and had been licensed to major Japanese and European manufacturing companies for an annual revenue amounting to more than 6 million dollars.

Concerning the disclosure in document R1, the respondent denied that the welded foils provided around the capacitor could be subjected to any tensile stress. Otherwise, they would simply tear along the welding lines, where they were molten by heated rams. Document R1 did not suggest that the foils provided any structural support to the stack of layers of the capacitor, which was instead consolidated through the application of pressure, heat and adhesives.

Reasons for the Decision

- 1. The appeal is admissible.
- 2. *Novelty*

Document R1 undisputedly discloses a metal film parallel plate capacitor construction, which exhibits the features set out in the preamble of present claim 1. This capacitor indeed comprises wrapping means constituted by upper and lower sheets of synthetic material 15 and 7, which are welded together by heated rams 17 (see Figure 1 and description page 2, lines 45 to 50) in such away as to form a casing around the stack of layers (see page 2, lines 49 to 50; the welding of foils 15 and 7 results in a "ready-encased capacitor").

With respect to the feature of the characterising portion of claim 1, according to which the wrapping means provides mechanical support to increase the resistance to delamination of the stack of layers, it is noticed that neither the present claim itself nor the description of the patent specify to which extent the resistance to delamination is increased. The respondent admitted at the oral proceedings that some cohesiveness certainly had to be imparted to the stack of layers already before the applying of the wrapping means around the stack, otherwise the latter could not be correctly handled and it would fall apart before being wrapped.

The Board in this respect agrees to the appellant's submission that the welded foils 15 and 7 of document R1 necessarily also increase the cohesiveness of the stack of layers, thus meeting the above general statement of the characterising portion of claim 1.

The same applies to the further feature of the characterising portion of claim 1 that the wrapping means is thermally insulative, whereby the capacitor is mountable directly onto a circuit board in a leadless fashion. As a matter of fact, the present patent does not specify the thermal conductivity of the material of the wrapping means, for which, furthermore, no specific example is given. Accordingly, the above further feature of the characterising portion of claim 1 in the Board's opinion can also be read onto foils 15 and 7 of the capacitor of document R1, which are specified to be electrically insulative, and cannot therefore but provide a certain degree of thermal insulation, as was acknowledged also by the respondent at the oral proceedings. These foils also allow for direct mounting of the capacitor onto printed circuit boards, as is explicitly stated in the document (see column 2, lines 47 to 59).

Thus, the subject-matter of claim 1 is distinguished from the capacitor construction disclosed in document R1 in that the wrapping means comprises either a tape wound around the stack of layers, or a sleeve of heat shrinkable material applied around and shrunk on to it, instead of the welded foils.

The capacitor constructions of documents ES1 and ES2 do not comprise any wrapping means extending around all side faces of the stack of layers.

The remaining citations on the file do not come closer to the claimed subject-matter.

Accordingly, the subject-matter of claim 1 of the attacked patent is considered to be novel in the sense of Article 54 EPC.

84

3. *Inventive step*

3.1 Nearest prior art

Document R1 is the sole citation on the file to disclose a metal film parallel plate capacitor as set out in the preamble of claim 1, which in particular comprises wrapping means extending around all side face of the stack of layers. This capacitor also comprises several of the features of the characterising portion of claim 1, namely the thermally insulating properties of the wrapping means and its inherent contribution to increasing the resistance to delamination of the stack of layers (see point 2 above).

This capacitor construction therefore objectively constitutes the nearest prior art. The Board cannot in this respect endorse the Opposition Division's choice in the appealed decision of document ES1 as disclosing the nearest prior art, because the capacitor it describes does not comprise any wrapping means.

As stated in point 2 above, the capacitor of present claim 1 is distinguished from the nearest prior art described in document R1 essentially in that the wrapping means comprises either a tape wound around the stack of layers, or a sleeve of heat shrinkable material applied around and shrunk onto it.

3.2 Assessment of the technical problem

The welding to each other of two foils of synthetic material to form a wrapping means as is disclosed in document R1 in the Board's opinion already achieves a low-cost mechanical and physical protection of the stack of layers, which is well suited for automatized

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manufacturing and which, unlike the prior art techniques involving the application of adhesives, high temperatures or welding spots evoked by the respondent, does not appear to negatively affect the electrical performance of the capacitor.

Accordingly, the technical problem underlying the alleged invention in the Board's opinion boils down to providing further alternatives to the wrapping means known from document R1.

3.3 Obviousness of the claimed solution

When striving to find adequate alternatives to the wrapping means of the capacitor of document R1, the skilled person would not in the Board's opinion limit his investigation to the techniques used in the prior art for wrapping parallel plate capacitors only, but extend it as well to the techniques used in the conditioning of similar devices subjected to the same environmental and mechanical constraints, like wound-type capacitors in which superimposed layers of metallized sheets of dielectric material are helically wound so as to form a cylindrical capacitor.

Documents R2 and ES4 are dedicated respectively to the encasing of such capacitors, and they disclose the use, to this effect, of either a tape of plastic material wound around the roll of capacitor foils to protect the capacitor against climatic and electrical constraints (see document R2, page 1, lines 4 to 17 and Figure 5) or a sleeve of heat shrinkable material applied around and shrunk on to said roll, so as to achieve a firm positioning of all the capacitor parts within the sleeve relatively to each other and to further provide adequate fluid-tightness (see document ES4, page 4 according to the upper page numbering, third paragraph and Figure 4).

82

The skilled person would in the Board's opinion easily recognize the capability of both the wound tape of document R2 and the sleeve of heat shrinkable material of document ES4 to protect as well the stack of layers of the capacitor of document R1 from the environment, and to contribute to increased resistance to delamination and improved thermal insulation, in the same way as the known welded foils.

Accordingly, replacing such welded foils by any of the alternatives set out in the characterising portion of claim 1 cannot, in the Board's view, be considered to involve an inventive step in the sense of Article 56 EPC.

The respondent, in support of his argumentation in favour of an inventive step being involved by the claimed capacitor, in particular referred to the above-mentioned decision T 106/84, which indeed points at the risk of insufficiently acknowledging the merits of an invention because of its apparent simplicity.

The Board in this respect notices that the cited decision specifically dealt with an invention by which "the utmost simplicity" had been achieved "without the sacrifice of quality" (see point 8.7 of the Reasons). In the present case, however, the claimed alternatives, which involve the winding of a tape or the applying of a heat shrinkable sleeve around individual stacks of capacitor layers, can hardly be considered a simplification over the foil welding technique disclosed in document R1 (on the contrary the claimed alternatives appear more complex, as discussed later),

and the description of the present patent fails to suggest any manufacturing process by which the claimed capacitors could be obtained on a large production scale as easily as in the process of document R1. The cited decision is not therefore considered to be relevant to the present issue.

Incidentally, the apparent complexity of the claimed alternatives cannot in the present case be considered either as an indication of inventive step, on the ground that it would have deterred the skilled person from seriously contemplating applying these alternatives in practice. As a matter of fact, it did not result from the invention that the expected disadvantage of a greater complexity was only an apparent disadvantage, nor that said expected disadvantage had effectively been overcome by a technical feature of the invention. The mere acceptance of an obvious disadvantage cannot by itself justify the presence of an inventive ingenuity.

The respondent also stressed the commercial success of the claimed subject-matter, which was evidenced by an important amount of revenue derived from the licensing of the invention. The respondent's representative however admitted that he did not know the exact terms of the licensing agreements referred to. There is no evidence on the file that the commercial success invoked by the respondent is founded on the claimed capacitor structure rather than, for instance, on a particular technology designed by the respondent for its automatized manufacturing, or on the specific method of attaching leads to said capacitor, which was disclosed and claimed in the original application

58

corresponding to the present patent, but later excised from it and pursued in a divisional patent application to overcome an objection of non-unity raised by the Examining Division. In the absence of any such evidence, the invoked commercial success cannot by itself support the patentability of the claimed capacitor structure.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The European patent No. 0 142 971 is revoked.

The Registrar:

The Chairman:

E. Görgmaier

E. Turrini

