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Datasheet for the decision of 20 June 2008

Case Number: T 0320/06 - 3.4.01

Application Number: 95401420.5

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Title of invention:
Dielectric filter

Patentee:
MURATA MANUFACTURING CO., LTD.

Opponent:
Clark, David

Headword:
-

Relevant legal provisions:
EPC Art. 123(2)

Relevant legal provisions (EPC 1973):
EPC Art. 56

Keyword:
"Inventive step - (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0320/06 - 3.4.01

D E C I S I O N
of the Technical Board of Appeal 3.4.01
of 20 June 2008

Appellant: (Patent Proprietor)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 23 December 2005 revoking European patent No. 0688059 pursuant to Article 102(1) EPC 1973.

Composition of the Board:

Chairman: B. Schachenmann
Members: F. Neumann
P. Fontenay

Summary of Facts and Submissions

I. The appeal lies from the decision of the opposition division revoking European patent number EP 0 688 059.

II. The appellant (proprietor) requested that the decision be set aside and that the European patent be maintained as granted or maintained on the basis of one of Auxiliary Requests I, II, IV or V filed during the opposition proceedings or Auxiliary Request III filed during the oral proceedings before the Board.

The respondent (opponent) requested that the appeal be dismissed.

III. During the appeal procedure, the following documents were referred to:

D1: JP-A-59 051 606 and the corresponding Patent Abstracts of Japan (PAJ) abstract,
D2: English translation of D1,
D3: US-A-3 505 618,
D5: US-A-4 559 508,
D11: WO 92/15123.

IV. Independent claim 1 of the contested patent reads as follows:

"A dielectric filter comprising:
a dielectric block (1) having two opposite end surfaces (1a,1b) and an outer surface;
at least one resonator hole (2) formed in said dielectric block between said end surfaces;

inner conductor(s) (3) formed on a respective inner surface of the or each resonator hole (2);
an outer conductor (4) formed on said outer surface of said dielectric block;
at least one excitation hole (5) formed in said dielectric block adjacent at least one resonator hole (2); and
inner conductor(s) (3) formed on a respective inner surface of the or each excitation hole (5);
one of said end surfaces of said dielectric block being a shorted end surface (1b);
wherein the or each excitation hole (5) is electromagnetically coupled to a respective resonator hole (2) whereby to provide external coupling;
characterised by further comprising input/output electrodes on said shorted end surface of said dielectric block."

The Main Request contained dependent claims 2 to 9 and a claim 10 which was directed to:

"An antenna duplexer, comprising:
the dielectric filter of any one of claims 1 to 9,
at least one of said resonator holes constituting a transmission filter, and
at least one of said resonator holes constituting a reception filter."

The wording of claim 1 of Auxiliary Request I was distinguished from that of the Main Request in that the characterising portion set out that the input/output electrodes were "formed on" said shorted end surface of said dielectric block.

In addition to the amendment made to claim 1 of the first Auxiliary Request, claim 1 of Auxiliary Request II contained the additional feature that "wherein said input/output electrodes (7): are electrically connected with said conductor(s) (3) formed inside said excitation holes(s) (5) and are electrically disconnected from said outer conductor (4)".

The characterising portion of claim 1 of Auxiliary Request III reads:
"characterized in that
(a) nonconductive portion(s) is/are formed in the inner conductor(s) of the resonator hole(s) (2),
said nonconductive portion(s) being located near the end surface (1a) opposite the shorted end surface (1b),
said inner conductor(s) in the excitation hole(s) (5) is/are electrically connected to the outer conductor at the end surface (1a) opposite the shorted end surface (1b),
input/output electrodes (7) are formed on said shorted end surface of said dielectric block (1),
said input/output electrodes (7) being electrically connected with said conductor(s) (3) formed inside said excitation holes(s) (5) and
said input/output electrode(s) (7) being electrically disconnected from said outer conductor (4)."

Each request contained a number of dependent claims and a final claim corresponding to claim 10 of the Main Request.

Reasons for the Decision

1. The appeal is admissible.

2. In view of the recent entry into force of the EPC 2000, reference is made to Article 7(1), 2nd sentence of the Revision Act of 29 November 2000 ("Act revising the Convention on the Grant of European Patents (European Patent Convention) of 5 October 1973, last revised on 17 December 1991") and the transitional provisions for the amended and new provisions of the EPC (Decision of the Administrative Council of 28 June 2001), from which it may be derived which Articles of the EPC 1973 are still applicable and which Articles of the EPC 2000 shall apply.

3. *Main Request and Auxiliary Request I*

3.1 Added subject-matter (Article 123(2) EPC)

The Board agrees with the objection under Article 123(2) EPC 1973 presented in section 2.4 of the contested decision. The input/output electrodes are consistently disclosed in the original application as being formed on an end surface of the dielectric block *and as being electrically connected with the inner conductors in the excitation holes but disconnected from the outer conductor*. The original application contains no indication that the electrodes may be provided with any other connection configuration. Claim 1 of the Main Request and claim 1 of the first Auxiliary Request both define that the input/output elements are provided on the shorted end surface of the dielectric block but fail to specify how the electrodes are connected to the

conductors. This means that claim 1 of both requests implicitly includes connection configurations other than the specific configuration which was originally disclosed.

The proprietor argued that all features of claim 1 of the Main and first Auxiliary Requests were clearly and unambiguously disclosed in the original application. It was submitted that the above-identified features were not necessary to solve the problem and therefore could be omitted from claim 1.

As argued by the opponent, the Board considers that isolated features may only be extracted from a set of features which had originally been disclosed in combination where no recognisable functional or structural relationship exists among the features. In the present case, a specific electrode configuration, as defined in original claim 4, was disclosed. The features defining this specific configuration are both structurally and functionally linked and therefore once it is defined in the independent claim that electrodes are provided on the surface of the dielectric block, it is also necessary to define how they are connected to the conductors. There is therefore no justification for separating these features.

Consequently, claim 1 of both of these requests implicitly introduces subject matter which extends beyond the content of the application as filed and as such does not satisfy the requirements of Article 123(2) EPC.

4. *Auxiliary Request II*

4.1 Added subject-matter (Article 123(2) EPC)

It was not contested that claim 1 of the second Auxiliary Request meets the requirements of Article 123(2) EPC.

4.2 Inventive step (Article 52(1) EPC, Article 56 EPC 1973):

4.2.1 It was not contested that the Figure 4 embodiment of D3 discloses all structural features of the preamble of claim 1 of the second Auxiliary Request. However, the proprietor held that the excitation holes in D3 are not *electromagnetically* coupled to their respective resonator holes, as defined in the preamble of claim 1. In this respect, the Board is of the opinion that each coated hole of the Figure 4 embodiment of D3 acts as a resonator element and may therefore be considered to be equivalent to an inductive element and a capacitive element. The electric and magnetic fields emanating from these elements are responsible for the coupling between the resonators. Thus the coupling between the excitation hole and the respective resonator hole in the Figure 4 embodiment of D3 will not be purely capacitive, but will inevitably contain a certain inductive component. Thus, the coupling between the excitation holes and the respective resonator holes in D3 may be considered to be - at least in part - electromagnetic.

In addition, the dielectric filter of Figure 4 of D3 comprises input/output electrodes P which extend from the shorted end surface (the rear surface of the filter in Figure 4 of D3) of the dielectric block. It is noted

that the "shorted end surface" is understood to be that surface at which the resonator holes are electrically connected, or shorted, to the outer conductor; in contrast, the "open end surface" is understood to be that surface at which the resonator holes are not electrically connected to the outer conductor. The input/output electrodes P are electrically connected with the conductors inside the excitation holes (see column 3, lines 66-74 of D3) and are electrically disconnected from the outer conductor (as can be seen in Figure 4 of D3 where only the pin P extends through the end of the larger diameter hole H2).

4.2.2 Thus, claim 1 of the second Auxiliary Request is distinguished from the filter depicted in Figure 4 of D3 only in that the electrodes are "formed on" the shorted end surface of the dielectric block.

4.2.3 The objective technical problem to be solved by this difference may be seen to be the provision of an alternative electrode configuration which would permit alternative mounting arrangements of the dielectric block.

4.2.4 Two different electrode arrangements are depicted in Figures 2 and 3 of D1, which also concerns a dielectric filter. In the view of the Board, the electrode structure of Figure 3 of D1 is merely an alternative to the electrode structure of Figure 4 of D3 and has recognised advantages with regards to surface mounting techniques, as explained, for example in D11 (page 1, line 17 to page 2, line 19), this document also relating to a dielectric filter. Since the skilled person would adopt the most appropriate electrode structure for his

specific needs, the use of flat electrodes formed on the end surface of the dielectric block, as known from D1, cannot be considered to involve an inventive step.

The proprietor argued that the skilled person would not modify the pin electrode structure (P in Figure 4) of D3 to adopt the flat electrode structure 9, 10 as depicted in Figure 3 of D1 since the flat electrode structure in D1 was used in conjunction with thin film resonators and not with resonator holes. However, the Board is of the opinion that the specific form which the electrodes take may be considered independently from the structure of the resonator elements. The electrodes serve only to provide input/output connections to the resonator members and their form is dictated solely by the interface with which they are to mate.

The proprietor further argued that the provision of flat electrodes depicted in Figure 3 of D1 would be incompatible with the adjusting plugs of Figure 4 of D3. In particular, it was argued that it was foreseen in D3 that adjusting plugs be arranged in all of the holes (column 4, lines 4-6) and that this configuration would not allow the use of flat electrodes. However, the Board notes that the adjusting plugs in D3 are only provided if adjustment of the filter characteristics is required after manufacture. In other words, if the filter is manufactured to a required specification, then adjustment plugs would not be needed and the question of compatibility with flat electrodes would not arise.

4.2.5 In conclusion, the Board considers that the skilled person would adopt the most suitable electrode structure for his specific requirements. In particular,

in order to provide a filter structure which is suitable for surface mounting applications, the skilled person would modify the pin electrode structure of D3 and employ the flat electrode structure as depicted in Figure 3 of D1. The skilled person would thereby arrive at the subject-matter of claim 1 of the second Auxiliary Request without the use of an inventive step.

5. *Auxiliary Request III*

5.1 Inventive step (Article 52(1) EPC, Article 56 EPC 1973):

5.1.1 It was not contested that the Figure 4 embodiment of D3 represents the closest prior art. From paragraph 4.2.1 above, it may be seen which features of claim 1 of the third Auxiliary Request are unambiguously known from the Figure 4 embodiment of D3.

Considering Figure 4 alone, it may also be seen that a nonconductive portion is formed in each of the inner conductors of the resonator holes H3 to H6 and that these nonconductive portions are located near the end surface opposite the shorted end surface of the dielectric block, whereby the "shorted end surface" is understood to be that surface at which the resonator holes are electrically connected, or shorted, to the outer conductor (the rear surface in Figure 4). Similarly, the conductive film which coats the inside of the excitation holes H2 and H7 does not extend along the entire length of the hole and - in distinction to the claimed subject-matter - is not electrically connected to the outer conductor at the end surface opposite the shorted end surface (i.e. the front surface in Figure 4, referred to in the following as the "open" end surface).

5.1.2 However, the opponent argued that the text of D3 teaches that the conductive coating may indeed extend along the entire length of the excitation hole. In particular, with reference to Figure 1 of D3 (which represents the prior art of D3) and the passage on column 1, lines 60 to 66, it was argued that the cylindrical members 2 and 7, which function as excitation elements, extended right across the box, making connection with the open side (the front wall in Figure 1). In conjunction with the statement on column 3, lines 59 to 60 that the conductive coatings in the holes "replace the cylinders 2 to 7 of Figure 1 and perform the same function", the opponent considered that electrical connection had to be provided between the conductive film inside the excitation hole and the outer conductor on the front surface. Moreover, column 3, lines 12 to 18 contains the statement that the interior walls of the holes are "wholly or partly" coated with conductive film, indicating that it was foreseen that the coating inside the excitation holes did indeed extend to the front surface.

The Board disagrees with this position. Admittedly, column 1, lines 60 to 66 contains a clear statement that the cylinders 2 and 7 extend right across the box making connection with the side which is nearer the observer. However, in the following paragraph, which discusses the equivalent circuit of the Figure 1 arrangement, it is stated that the capacitances of the tuned circuits are provided by the capacitances between the ends of the cylinders 2 to 7 and the box wall "towards which they project but do not reach". This contradiction means that the reader of D3 cannot be sure that the cylindrical

members 2 and 7 in Figure 1 really do contact the front wall. Moreover, the Board is of the opinion that column 3, lines 12 to 17, which states that the interior walls of the holes are *wholly* or partly coated with conductive film, does not provide an unambiguous teaching that the conductive layer *in the excitation holes* actually extends to the front surface.

With reference to Figure 3 of D3, the opponent pointed out that the connecting members 2' and 7' were in galvanic connection with the outer wall from which they protrude. The opponent saw a certain degree of equivalence between the arrangement of Figures 1 and 3 and insisted that a galvanic connection had therefore to be provided between the excitation cylinders of Figure 1 and the front wall. Consequently, due to the desired functional equivalence of the Figure 1 and Figure 4 embodiments, the conductive coatings inside the excitation holes H2 and H7 of Figure 4 had also to extend to and electrically connect with the front surface.

The Board cannot follow this argument. Even if a galvanic connection were to be provided between the input/output cylinders 2, 7 and the front wall in Figure 1, this does not automatically imply that the coatings in Figure 4 must extend to and electrically connect with the front surface. The function of the input/output cylinders 2 and 7 of Figure 1 is to provide external coupling of the signal to/from the filter. This coupling function will still be provided in the Figure 4 embodiment even if the conductive layers do not contact the front surface, the external coupling being achieved by virtue of the fringing electric and magnetic fields

along the cylinders. Thus, the "same function" referred to in column 3, lines 59 to 60 will indeed be performed by the coated holes H2 and H7 in the form depicted in Figure 4.

Thus, in the view of the Board, D3 contains no direct and unambiguous disclosure of an electrical connection between the inner conductor of the excitation holes H2, H7 and the outer conductor at the front surface of the dielectric block in Figure 4 of D3.

5.1.3 In addition to this distinguishing feature, claim 1 of the third Auxiliary Request is further distinguished from the Figure 4 embodiment of D3 in the fact that the electrodes are "formed on" the shorted end surface of the dielectric block. Applying the same reasoning as presented in section 4.2 above, this feature is not considered to contribute to an inventive step.

5.1.4 Consequently it remains only to be assessed whether the skilled person would consider providing the conductive layer along the entire length of the excitation hole such that the inner conductor is electrically connected to the outer conductor at the front end surface of the dielectric block in Figure 4 of D3 and therefore whether this arrangement would comprise an inventive step.

Presenting essentially the same arguments as outlined above, the opponent submitted that the skilled person would extend the conductive coatings on the inside of the excitation holes H2, H7 to the front end surface in order to emulate the construction of Figure 1 and to achieve the same functionality as the prior art filter. It was submitted that D3 clearly states in column 1,

lines 63 to 66 that the cylindrical members 2 and 7 make connection with the front end of the box 1. The skilled person would therefore apply this teaching directly to the alternative arrangement of Figure 4 and analogously provide connection between the inner conductors H2 and H7 and the front surface of the box.

The Board cannot follow this argument, because, as pointed out above, it is by no means clear from D3 that the cylindrical rods 2 and 7 are in fact electrically connected to the front face of the box 1. The contradictory statements on column 1, lines 63 to 66 and column 2, lines 11 to 14 lead to a certain doubt as to whether the rods 2 and 7 do in fact electrically contact the front wall.

The opponent further argued that D5 shows that the conductor on the inner surface of the excitation hole extended along the entire length of the hole to reach the bottom end surface in Figure 9. With knowledge of D5, the skilled person would therefore have considered extending the conductor coating on the inner surface of the excitation hole H2, H7 in D3 along the entire length of the hole to reach the front end surface. However, the Board notes that D5 contains no explanation as to why the excitation hole is coated along its whole length. Therefore D5 cannot be seen to provide the skilled person with any incentive for modifying the partly-coated excitation hole of D3. Furthermore, the arrangement of the outer conductor in D5 is different to that of D3: from column 5, lines 35 to 40, together with Figure 9 of D5 it can be seen that the top surface of the dielectric block is not provided with a conductive layer. Consequently in D5 the excitation holes O3, O4

are not electrically connected to the outer conductor Es, Eb *at the open end surface* (i.e. at the top surface in Figure 9) since no outer conductor is provided at this end: electrical connection between the excitation holes O3, O4 and the outer conductor Es, Eb in D5 is only at the shorted end surface (i.e. the bottom surface in Figure 9). In view of this difference between the filters of D5 and D3, the Board does not consider that the skilled person would - simply on the basis that D5 discloses fully-coated excitation holes - extend the excitation hole coating in D3 along its whole length.

5.1.5 The opposition division held that D3 contemplates two alternative arrangements for the excitation elements, i.e. shorted at the open end surface or disconnected from the open end surface, and that the adoption of either one of these alternatives would be a simple matter of choice for the skilled person. The Board does not agree. Even if it were to be unambiguously contemplated that the cylindrical rods 2, 7 were in electrical connection with the front wall of the box in the Figure 1 embodiment, it cannot be said that the same arrangement is contemplated for the connection of the conductive layers in the excitation holes H2 and H7 of Figure 4. D3 discloses one embodiment whereby (at most) cylindrical rods make electrical connection to the outer conductor at the open end of the box (i.e. at the front wall in Figure 1) and a second embodiment whereby conductively lined holes are employed, the coatings inside the excitation holes being disconnected from the outer conductor at the open end of the dielectric block (i.e. at the front surface in Figure 4). D3 does not suggest that features of these two embodiments can be mixed. Indeed, any modification to the dimensions of the

holes and/or coatings will have an impact on the characteristics of the filter. In the absence of any motivation (which, on the basis of the arguments presented, the Board has failed to identify) for modifying the Figure 4 arrangement, the Board is of the opinion that the skilled person would not extend the coatings of the excitation holes in Figure 4 of D3 to the front surface.

5.1.6 The aim of the invention of the contested patent was to improve the external coupling. In the absence of any indication in the prior art that the external coupling achieved by the arrangement of Figure 4 of D3 is insufficient, and even more so in the absence of any indication in the prior art that the external coupling could be improved by connecting the excitation hole conductors in the manner defined in claim 1, the subject matter of claim 1 cannot be seen to be obvious. As shown above, none of the arguments presented could convince the Board that the skilled person would consider adapting the arrangement of Figure 4 of D3 in order to improve the external coupling of the filter of D3 or that the measures taken would be obvious.

Claim 1 of the third Auxiliary Request therefore comprises an inventive step. Claims 2 to 7 are dependent on claim 1 and, for this reason, are also considered as involving an inventive step.

5.2 The description and the drawings will have to be adapted to the amended claims.

5.3 The issue of Article 123(2) EPC was raised during the oral proceedings. In view of G 10/91 it would only have

been possible to pursue this objection with the consent of the patentee. Consent was not given.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division for further prosecution on the basis of the set of claims filed at the oral proceedings as Auxiliary Request III.

The Registrar The Chairman

R. Schumacher B. Schachenmann