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Bezeichnung der Erfindung:
Title of invention:
Titre de l'invention : Inductorless monolithic crystal filter network

Klassifikation / Classification / Classement : H03H 9/205

ENTSCHEIDUNG / DECISION

vom / of / du 31 October 1989

Anmelder / Applicant / Demandeur : E-SYSTEMS INC.

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence : E-Systems/X-tal filter

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : "inventive step" (yes)

Leitsatz / Headnote / Sommaire

Case Number : T 186/82 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal
of 31 October 1989

Appellant : E-SYSTEMS INC.
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Decision under appeal : Decision of Examining Division 056 of the European Patent Office dated 12 July 1982 refusing European patent application No. 80 900 142.3 pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : P.K.J. van den Berg
Members : J.A.H. van Voorthuizen
P. Ford

Summary of Facts and Submissions

I. European patent application No. 80 900 142.3, publication No. 0 020 729, published under No. WO 80/01226, having as an International Filing Date 7 December 1979, claiming a right of priority as from 11 December 1978 based on US 968 302, was refused by the Examining Division 2.2.02.056 by decision dated 12 July 1982.

II. That decision was based on Claims 1-15 filed 5 April 1982.

The reasons given for the decision were that Claims 1-3 and 8-15 did not involve an inventive step over the prior art as disclosed in US-A-2 248 776 (Document D1) and US-A-4 099 149 (Document D2) and that Claims 4-7 related to a mathematical method for designing electrical filters and that as such their subject-matter was not patentable pursuant to Article 52(2)(a) EPC.

III. On 10 September 1982 the applicant filed a notice of appeal and paid the fee. A Statement of Grounds together with fresh Claims 1-11 were filed on 18 November 1982.

The Appellant pointed out that in the technical field of wave filters a very small modification of only one of the components can involve a very important change in bandpass characteristics and referred to two patents to Yee, US-A-4 099 149 (D2) cited in the impugned decision and US-A-4 028 647, from which it would follow that if, in the circuit concerned, both finite poles are to be in the lower stop band, the capacitor Cc would be unusually large in capacitance and if both finite poles are in the upper stop band, the capacitor Cc would be unusually small in value.

In Figure 1 of D1 the impedance Z2 can indeed be constructed to any degree of complexity but this Figure 1 clearly does not exhibit the inventive connection of electrodes 6 and 8 and, conversely, Figure 8 which shows this inverted connection does not show an impedance in the connection between the bottom electrodes of the crystal and the reference potential. From the left-hand column of page 3, line 51 on of this citation it is obvious that the reverse poling of the connection in Figure 8 is simply to place the peak of attenuation on the upper side of the transmission band instead of on the lower side. If the inventor of the circuits described in this citation had achieved a response curve of such a favourable shape, as did the Appellant in achieving the response curve shown at B in Figure 14 of the application by the filter circuit of Figure 16 of the application, he surely would have disclosed and claimed it for it is a most desirable feature. Plainly there is not only no teaching to this purpose, but not even the recognition of it.

With regard to D2, it can not be used to supply the deficiency in D1, since there is only one electrode on the base of the crystal in D2. Although Figure 8 of this citation shows two electrodes at the base, only one electrode is contemplated in the actual construction of the filter according to the invention described there, as is clearly shown by its Figure 1a and as defined in its claims.

There is no teaching in D1 whatsoever that if a capacitance is used with the circuit of Figure 1 in the reversed, poled condition a new and unobvious result occurs in which a bandpass amplitude response curve such as that shown in applicant's Figure 14B is obtained. D1 **never combines** the two concepts anywhere. Only the Appellant discloses such a novel circuit with the novel results obtained. Figure 8 of D1 merely serves to point out that its inventor did not recognise the value of placing the common capacitor in that circuit. Further, of the 20 claims in D1, **not one claim** specifically calls for a capacitance in the shunt branch coupling the two common electrodes to an input terminal and an output terminal. Yet its Claim 4 supplies an inductor. Claim 7 adds a capacitor in the bridging branch. But **no claim** calls for a capacitor in the shunt branch.

IV. In a first communication issued 19 March 1985 the rapporteur argued that the then valid claims lacked inventive step over D1.

In D1 on page 2, right column, lines 20-33 the concept of reversed poling is clearly introduced **in connection with Figure** 1 (line 20), as was already pointed out by the Examining Division in their decision to refuse.

The cited passage explains clearly the effect, that such a reversed poling would have on the circuit properties of the circuit of Figure 1. This passage tells in detail how the equivalent lattice-structure of the circuit of Figure 1 would be modified by such reversed poling into another lattice-structure which is the equivalent to the reversed poled circuit of Figure 1.

D1 gives a fairly complete account of circuit design on an image-impedance basis using equivalent lattice networks and plainly shows how the line branch Z_a and the diagonal branch Z_b of an equivalent lattice have to be chosen, especially in relation to each other, to arrive at a desired filter-characteristic (i.e. attenuation frequency curve).

Furthermore, the text of D1 makes it clear that such considerations are intended to apply as well to circuits with reversed poling as to circuits without. Lines 20-23, right column of page 2, already cited, tell the person skilled in the art how the line impedance Z_a and the branch impedance Z_b are modified by reversed poling and it will be evident to him that he can use this concept of reversed poling to arrive at still other reactance-frequency curves for composing further attenuation-frequency curves for his equivalent lattice networks.

Contrary to the Appellant's statement that D1 never combines the two concepts, i.e. the use of an impedance such as Z_2 and reversed poling, its Figure 28 shows such a combination.

In this circuit impedance Z_2 comprises an inductance L_6 and a capacitor C_{14}, its equivalent lattice network being given in Figure 29 and the corresponding reactance-frequency curves for its line branch Z_a and its diagonal branch Z_b being shown in Figure 30.

This circuit constitutes a high-pass filter having two poles at frequencies F_{21} and F_{22}, where the curves of the line branch impedance Z_a and the diagonal impedance Z_b of the equivalent lattice structure cross. These two poles constitute two peaks of attenuation in the attenuation-frequency characteristic of the high-pass filter.

In agreement with what is being stated about the effect of reversed poling in lines 26-32, right column of page 2, the crystal impedance represented by the series connection of L and C, which in Figure 3 is still part of Z_b, has as a consequence of reversed poling been transferred to be included in Za according to Figure 29.

As the impedance Z_2 of Figure 1 is solely incorporated in Z_b (and not in Z_a) of the equivalent lattice according to Figure 3, so is the series circuit of L_6 and C_{14} of Figure 28 solely incorporated in Z_b of the equivalent lattice according to Figure 29. In order to transform the high-pass filter of Figure 28 into a bandpass filter it seems obvious to the person skilled in the art to try to modify curves Z_a and Z_b of Figure 30, as well as their interrelationship accordingly, for instance by eliminating inductance L_6 from the circuit of Figure 28, so that the curve Z_b would remain under the real frequency axis in Figure 30, crossing curve Z_a at a further attenuation pole. Such a filter would evidently show a pass-band between f_{23} and f_{24}, Z_b and Z_a then having the same sign for frequencies higher than f_{24}.

V. In his reply filed 27 September 1985 the Appellant submitted that D1 deals with monolithics as primarily one-pole devices and that **not one** of the equivalent lattice networks illustrated in D1 has more than **one** resonance which is attributable solely to the monolithic. All other resonances are attributable to the external elements added to the monolithic, referring to page 3, left column, lines 23-40. One of the principal advantages of the present invention is that **two-pole** monolithic elements reduce the crystal requirements by a factor of two thereby achieving a comparable or greater factor in filter size reduction.

The Appellant's structure cannot be obtained by reverse poling of Figure 1. If Figure 1 of D1 is reverse poled, and assuming that Z_1 is a capacitor, an entirely different circuit than Appellant's is obtained, as was shown in an attached Figure A.

In the present invention, the bridging element will produce two peaks of attenuation at finite frequencies symmetrically spaced to the passband. This is not the case in the circuit of D1 which explicitly states that it produces a single peak of attenuation. In fact, if two peaks of attenuation are required, it states (page 3, right column, lines 9-13) that **two** units, one of Figure 4 and one of Figure 8, must be used together. To achieve the response of the present invention **twice** the number of crystal elements used according to D1 would be required. Thus, even though a Rhodes (non-minimum phase) response may be possibly obtained by utilising the crystal elements according to D1, the present invention is superior in its economy of elements.

What is being claimed by the applicant is **not** a general structure. It is well known in the art (see Dillon and Lind, "Cascade Synthesis of Polylithic Crystal Filters containing Double-Resonator Monolithic Crystal Filter (MCF) Elements, page 147, right column, bottom) that shunting an MCF section by **either** an inductor or capacitor will produce a pair of real frequency transmission zeros, which are required to achieve the Rhodes type of response. In general, however, the bridging element is an inductor, which makes the actual performance unusable. What the applicant is claiming is the **METHOD** and result of transforming the common, well known structure which is not usable for practical Rhodes filters, to a form which realises the theoretical performance of the Rhodes filters.

Reverse poling is required in the present invention. Without it, the conversion of bridging inductors L_{B1} and L_{B2} to bridging capacitors C_{B1} and C_{b2} is not possible. It is this physical connection which makes possible, as a practical invention, the disclosed embodiment.

VI. After some further correspondence in which tne rapporteur no longer maintained his earlier objections, the Board proposed detailed amendments which would overcome all other outstanding objections.

In his reply received on 22 August 1989 the Appellant filed amendments to the claims and to the description which are in full agreement to the Board's proposals.

VII. The Appellant now requests the grant of a patent on the basis of the following application documents:

Claims 1-8, filed on 22 August 1989
description, pages 1-2 as originally filed
pages 3, 4 bis filed on 22 August 1989
page 4 filed on 9 November 1989
pages 5-30 as originally filed
drawings, sheets 1/9 - 9/9 as originally filed.

Independent Claims 1 and 2 read as follows:

1. A two-pole monolithic crystal band-pass filter element comprising a double resonator monolithic crystal element, said crystal element having, first and second spaced electrodes (12, 16) deposited on one face and third and fourth spaced electrodes (14, 18) deposited on its opposite face in superimposed relationship with said first and second electrodes, said filter element being characterized in that it comprises a first capacitor (CB1) coupled between said first and fourth electrodes (12, 18), means electrically coupling said second and third electrodes (16, 14), said first electrode (12) and a point of reference potential being designated as input terminals, said fourth electrode (18) and point of reference potential being designated as output terminals, and that it further comprises a second capacitor (CS1) coupling said second and third electrodes (16, 14) to said point of reference

potential, thereby forming an inductorless filter element.

2. A polylithic crystal band-pass filter section having real axis transmission zeros comprising: a plurality of monolithic crystal filter elements (24, 26, 28) each comprising a double resonator monolithic crystal element, said crystal element having first and second spaced electrodes (12, 16) deposited on one face thereof, third and fourth spaced electrodes (14, 18) deposited on its opposite face in superimposed relationships with said first and second electrodes, said band-pass filter being characterized in that each of a first and a second (24, 26) of said monolithic crystal filter elements comprises a bridging capacitor (CB1, CB2) coupled between said first and fourth electrodes (12, 18) and a shunt capacitor (CS1, CS2), said shunt capacitor coupling said second and third electrodes (16, 14) to a reference potential, and in that said section further comprises means coupling said fourth electrode (18) of said first element (24) to said first electrode (18) of said first element (24) to said first electrode (12) of said second element (26) whereby the output of said first element (24) is coupled as an input to said second element (26), a third (28) of said monolithic crystal filter elements having its first electrode (12) connected to means electrically connecting it to said fourth electrode (18) of said second element (26) whereby the output of said second element (26) is coupled as an input to said third element (28), sand means electrically connecting said third and fourth electrodes (14, 18) of said third element (28) to said reference potential whereby a load (RL) may be electrically connected between said second electrode (16) of said third element (28) and said

reference potential, thereby forming an inductorless filter section.

Claims 4-8 are dependent on Claim 2.

Reasons for the Decision

1. The appeal complies with Articles 106-108 and Rule 64 EPC and is, therefore, admissible.

2. In connection with the present application the Board has taken into consideration the following prior art:

   D1: US-A-2 248 776, Och
   D2: US-A-4 099 149, Yee
   D3: "Cascade Synthesis of Polylithic Crystal Filters Containing Double Resonator Monolithic Crystal Filter (MCF) Elements" by Dillon and Lind in IEEE Transactions on Circuits and Systems, CAS-23, pages 146-154 (March 1976)
   D4: US-A-3 564 463, Beaver
   D5: "A Low Pass Prototype Network for Microwave Linear Phase Filters" by J.D. Rhodes in IEEE Transactions on Microwave Theory and Techniques, MIT-18, pages 290-301 (June 1970)
   D6: US-A-4 028 647, Yee
   D7: US-A-3 704 433, Garrison et al.

3. The objections concerning lack of inventive step, as far as these were based on D1 alone or in combination with D2, cannot be maintained.

   Although, in the view of the Board, D1 clearly also discloses the concept of reversed poling to be applied to its Figure 1, as is unambiguously disclosed on page 2, right-hand column, line 20: "If reversed poling is used in Figure 1", and the

Board recognises that impedances Z_1 and Z_2 of that drawing are described in such general terms that the configuration of capacitors around the crystal element, as described in present Claim 1, might fall within the general concept, according to D1, of its Figure 1 combined with reversed poling, the Board nevertheless finds that the configuration is not obvious after D1, but that it would represent at most a selection and here an inventive selection among the many possible choices of impedances Z_1 and Z_2. This opinion is further supported by the illustration of a large number of possible configurations already presented in the drawings of D1.

Nor can the view be upheld that it would be obvious to a person skilled in the art to modify the circuit of Figure 28 of D1 by eliminating L_6 and choosing the remaining components such that by appropriate manipulation a purely capacitative Z_b-curve is made to cross the Z_a-curve at two different points, representing two poles in accordance with Claim 1, since this would constitute clearly ex post facto analysis.

As far as applying the teachings of D2 to D1, in order to provide the latter circuits with two poles, it seems to the Board that these two citations are not really compatible.

It is true, as the Appellant has pointed out in his letter of 27 September 1985, that D1 deals with monolithics as primarily one-pole devices. Therefore, in order to arrive at a two-pole device, but utilising only one such monolithic crystal element, the circuit would have to be completed by one further resonant or anti-resonant circuit outside the crystal element proper.

D2 starts by describing the prior art leading to the ultimate invention it discloses in column 1, under the heading "Background and prior art of the invention". There it refers to D6, saying that the latter discloses an improved monolithic piezoelectric filter unit having two bilateral electrodes on one surface and a common electrode on the opposite surface with the common electrode connected to the common terminal of the filter unit via a capacitor (Cc), stating furthermore that this capacitor (Cc) in cooperation with the coupling between the two bilateral electrodes introduces a pair of finite poles, one in each of the upper and the lower stop bands on either side of the passband of the filter unit.

In column 2 of D2, the intra-crystal coupling and the capacitors Cb and Cc of its Figure 1a are said to be utilised to produce two finite poles at the frequencies f_1 and f_2 shown in its Figure 1b, the latter being prior art, but that in the invention with which D2 is concerned Cc is utilised solely to substantially cancel intra-crystal coupling and to cause the single AT cut monolithic crystal with the thereon deposited electrodes 11, 12 and 13, to act as a substitute for two single crystal resonators coupled via the capacitor C_b (indicated as C_f in Figure 1a!) and that as a result, **two finite poles** as shown in Figure 1c at **the same frequency** f_1 are produced. In the view of the Board, this result can no longer be considered to lead to a bandpass characteristic with steep edges on both sides, but merely leads to a one-sided pass characteristic, as represented with one very steep side in Figure 1c, having more the shape of a highpass. The application of the teaching of D2 to Figure 8, (the one showing reversed poling) of D1 would indeed lend to the latter circuit, a two-pole character, but only providing a double pole, in accordance with Figure 1c of D2, there being no intra-crystal coupling, either according to the teaching of D2, or to that of D1.

However, present Claim 1 is concerned with a bandpass filter having a two-pole character. For a two-pole bandpass filter it seems only meaningful if these poles are situated on either side of the passband, such that one pole is on one side and the other pole on the other side of the passband.

To that situation, the invention described in D2 no longer applies, but rather the part of D2 indicated therein as prior art, as presented in D6, would apply (i.e. in Figures 1a and 1b of D2). This, however, utilises essentially the intra-crystal coupling (= the acoustic coupling between the two bilateral electrodes), to arrive at two poles at different frequencies, as does the invention, but as is not the case in D1, where the intra-crystal coupling must be considered as nil, since the crystal elements therein possess inherently only one pole. Therefore, there would be no reason for a person skilled in the art to apply the teaching of the prior art part of D2 i.e. the teaching of D6 to the circuits of D1, in particular the latter's Figure 8 combined with its Figure 1.

In his submission referred to, the Appellant made an effort to demonstrate that reverse poling of Figure 1 in D1 will not give the claimed structure. His assertion is mainly based on the presence of shunt capacitors C_1 in Figure 1, which in applying reverse poling would cause the resulting circuit to possess a configuration distinctly different from the one then claimed.

The Board cannot agree to the Appellant's analysis and is of the view that the teaching of D1 implies that shunt capacitors C_1 ought to be left out from the circuit of Figure 1, before applying reversed poling to it. On page 3, left column, second paragraph, these capacitors are stated to define, to a large extent, the bandwidth obtained, which will be maximum when these capacitors are zero, that is, when they are omitted from the circuit. Later on, after reverse poling is applied, they are introduced again (e.g. as C_4 in Figure 8).

However this may be, after the foregoing the Board is satisfied, that the skilled person **could** not even arrive at the device claimed in the present present Claim 1 on the basis of the teachings of D1 and D2, either apart or combined. He therefore certainly **would** not arrive at the device as claimed on the basis of D1 and/or D2.

4. According to the application as originally filed, the invention relates generally to bandpass filter networks that include double-resonator monolithic crystal filter elements or sections, the advantage of such filter elements or sections being that by their use many functions previously performed by whole networks incorporating crystal structures can be performed by the crystal structure alone, if its characteristics are controlled in the way as taught by D4. The invention relates more in particular to such filter elements and sections which are of the non-minimum phase type (Rhodes-type), and therefore do not require additional equalisers.

The invention aims at providing practical filter circuits of this kind in which the use of low Q-elements, especially inductors, is avoided.

5. The Board now considers D3, cited on page 9 of the application, as the closest prior art.

Firstly, since it proposes the use of double resonator monolithic crystal elements in filter elements and filter sections of the kind as presently claimed.

Secondly because the procedure followed in designing the presently claimed filter elements and filter sections, as described in the description part of the present application is to a large extent based on D3.

D3 also refers to W.D. Beaver's dissertation on monolithic crystal filters.

D4, a patent to the same Beaver, and cited on page 1 of the present application discloses that the characteristics of two crystal resonators can be combined acoustically by mounting two sets of electrodes on a single crystal body, so that the acoustic coupling in that body is being used.

Starting from the lattice low pass prototype MCF section of Figure 2(a) on page 147 of D3, the authors show that in the low pass case both real-axis and imaginary-axis transmission zeros may be obtained by the use of frequency-invariant reactances as shunt elements, in particular they show by the transmission matrix of this network, MCF protocype realisations of the Brune, Darlington C-type and D-type zero-producing sections.

They conclude on page 152, left column, that, generally, if a given transfer function contains transmission zeros both in the finite complex plane and at infinity, then the finite zeros are removed using the said Brune, Darlington C-type or D-type sections; the remaining zeros are then extracted by a simple ladder synthesis procedure to generate the corresponding low-pass or high-pass MCF prototype sections.

Similarly, the present application starts from a low-pass prototype MCF section, as depicted in its Figure 3, which corresponds to the ladder network of Figure 2(b) of D3, the latter being the equivalent of the lattice network of Figure 2(a) of D3.

This shows that the application is entirely inspired by the considerations given in D3.

In the embodiment of the invention given in the application, the applicant starts from a transfer function for a Rhodes-type filter of degree 6 and follows the procedure described in D3 by a zero-removal type of synthesis in which all the elements for a zero producing section are removed from the network input admittance at one time. The final low-pass is then transformed by a narrow-band low-pass to bandpass transformation to the initial bandpass network of Figure 4 of the application (which, however, results in very large values for inductances L_{B1}(= 114, ... μH) and L_{B2} (= 35, ... μH) in shunt with the MCF's at the centre frequency of the bandpass fo = 23, 25 MHz.

D3 gives a similar example. This, however, starts from a low-pass prototype network of degree 4, as depicted in Figure 5(a) on page 152. By similar methods, as in the application, the authors of D3 arrive at what they indicate as a final bandpass polylithic crystal filter equivalent circuit according to Figure 5(b) which also comprises a shunt inductor L_1 of considerable value (= 87, ... uH) and further inductors L_2 and L_3 having values about equally as high.

Up to this point, the description part of the application and D3 follow identical lines of reasoning.

5.1 **Novelty**

From here on, however, the invention diverges from the teaching of D3. Although the latter mentions on page 153, right-hand column, some doubts about the physical realisability of the circuit as developed in its Figure 5(b), these reservations are only concerned with the physical realities of the crystal element proper. These may, according to this passage of D3, strongly diverge from the theoretical model on which Figure 5(b) is based. Nowhere is mentioned any trouble the inductors, in particular L_1, may cause.

By contrast, the application sets out the problems involved in the realisation of these inductors and by a series of special transformations succeeds in eliminating these disturbing inductors entirely, the said transformations enabling the Appellant to replace them by capacitors of reasonable values, whose realisations do not cause the skilled person any problems.

In doing so, the Appellant arrives at the circuit configuration according to present Claim 1.

The Board is satisfied that present Claim 1 has been put correctly in the two-part form as required by Rule 29 EPC with regard to the closest prior art as represented by D3, in that its characterising features clearly distinguish its subject-matter over D3.

Therefore, that subject-matter is novel. The other documents cited are further remote. The same applies to independent Claim 2 which relates to a filter section comprising a plurality of filter elements according to Claim 1.

5.2 **Inventive step**

The specific series of filter transformations leading to the claimed filter configuration cannot be regarded as obvious to the skilled person on the basis of the general knowledge to be expected of him and in the absence of any suggestion relative to such a specific series in the extensive prior art cited, even if some of these transformations are known in themselves as set out in the description. Moreover, it could not be a priori expected that the said procedure would lead to a very simple filter configuration in which no inductors are required.

At the same time the design procedure exposed in the application permits the invention to be carried out in practice as it sets out the interrelationship between the various physical and electrical components of the non-minimum phase bandpass filter according to the invention and teaches how to arrive at the numerical values of these components which are required in order to realise in a specific case a predefined desired characteristic. Without the knowledge of the application the skilled person would have little reason to comtemplate any combination of the various pieces of prior art, as there exists no a priori evident relationship between the geometry of a filter and the characteristics which it is possible to obtain therewith. Nevertheless, one particular combination of prior art which could **prima facie** be regarded as obvious would be that of D3 and D7.

D7 shows by its Figures 1, 7 and 8 how reverse coupling via a capacitor Cx around a monolithic crystal may be replaced by a simple shunt inductance L_X, so that one might conclude that this document discloses to the skilled person that, vice versa, a shunt inductance may be replaced by a reverse coupling via a capacitor.

This is clearly expressed by lines 15-17 of column 2, which say: "by reversing the terminals of one of the crystal parts, either inductive or capacitive external connecting elements may be employed."

It might then seem obvious to the skilled person to apply this teaching to the disturbing shunt inductance according to Figure 5b of D3, and this the more so since D7 utilises double resonator monolithic crystal elements as does D3.

D7 is, however, primarily concerned with the realisation of a band-elimination filter network comprising a monolithic crystal element, the crystal element comprising two acoustically coupled resonators. Although the circuit may even degenerate into a bandpass filter as depicted in its Figure 3, curve F, the theoretical approach to its design differs from that according to D3 to such an extent that a person skilled in the art may not readily be expected to apply the teaching of D7 to D3. But even if he did, merely replacing the inductance of Figure 5b of D3 by a reversely coupled capacitor according to D7 would certainly not lead to the circuit configuration as claimed, as no capacitor (C_{S1}) coupling the second and third electrodes to a point of reference would be present.

To arrive at a circuit really performing what is aimed at, would require considerations which go clearly beyond the normal routine of a skilled person.

6. From the foregoing, it follows that the invention according to Claim 1 is not only novel within the meaning of Article 54 EPC, since none of the cited prior art documents comprises all the features of that claim.

It also involves inventive step within the meaning of Article 56, since not any combination of prior art documents would enable the skilled person to arrive at the subject-matter of Claim 1, not even in those instances as indicated before, where certain combinations might seem obvious prima facie.

This also applies to independent Claim 2 which comprises a plurality of filter elements according to Claim 1. Claims 1 and 2 are therefore allowable. So are Claims 3-8 which concern further embodiments of the subject-matter according to Claim 2.

Order

For these reasons, it is decided that:

1. The contested decision is set aside.

2. The case is remitted to the department of first instance with the order to grant a patent on the basis of the documents as cited under foregoing item VII of this decision, with the proviso that on page 32, line 9 (i.e. Claim 2) the phrase "a thrid (28)" be replaced by "a third (28)" and that in Claim 2 the phrase "two-pole" be added at the end of the second line so that the part bridging the second and third lines of that claim reads: "a plurality of two-pole monolithic crystal filter elements".

The Registrar: The Chairman:

S. Fabiani P.K.J. van den Berg