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Case Number : T 22/83 - 3.5.1



**Correction Order of 18 May 1988
to the decisions of the
Technical Board of Appeal 3.5.1
of 6 December 1985 and
11 December 1987**

Appellant : FUJITSU LIMITED
1015, Kamikodanaka Nakahara-ku
JP-Kawasaki-shi Kanagawa 211

Representative : P.J. Allman
Marks & Clerk
Suite 301
Sunlight House
Quay Street
GB-Manchester M3 3JY

Composition of the Board :

Chairman : G. Korsakoff
Members : P.K.J. Van den Berg
P. Ford

In accordance with Rule 89 EPC, the Decision is amended as follows:

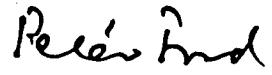
Page 14, line 10 read "page 6" instead of "page 13":

The Registrar:



J. Rückerl

For and on behalf of
the Chairman*:



P. Ford

* pursuant to Article 7(3) Rules of Procedure of the Boards of Appeal.

Veröffentlichung im Amtsblatt	Ja/Nein
Publication in the Official Journal	Yes/No
Publication au Journal Officiel	Qui/Non

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Aktenzeichen / Case Number / N° du recours : T 22/83 - 3.5.1

Anmeldenummer / Filing No / N° de la demande : 80 303 362.0

Veröffentlichungs-Nr. / Publication No / N° de la publication : 026 114

Bezeichnung der Erfindung: Surface acoustic wave device

Title of invention:

Titre de l'invention :

Klassifikation / Classification / Classement : H03H9/64

ENTSCHEIDUNG / DECISIONS

vom / of / du 6 December 1985 and
11 December 1987

Anmelder / Applicant / Demandeur : Fujitsu Ltd.

Patentinhaber / Proprietor of the patent /

Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence : Surface acoustic wave device/Fujitsu

EPÜ / EPC / CBE Article 56

Kennwort / Keyword / Mot clé : "erroneous presentation of prior art by the applicant"

Leitsatz / Headnote / Sommaire

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Case Number : T 22/83 - 3.5.1

D E C I S I O N S
of the Technical Board of Appeal 3.5.1
of 6 December 1985 and
11 December 1987

Appellant : FUJITSU LIMITED
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JP-Kawasaki-shi Kanagawa 211

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Suite 301
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Decision under appeal : Decision of Examining Division 056
of the European Patent Office
dated 16 September 1982 refusing
European patent application
No. 80 303 362.0 pursuant to
Article 97(1) EPC

Composition of the Board :

Chairman : G. Korsakoff
Members : P.K.J. Van den Berg
P. Ford

Summary of Facts and Submissions

- I. European patent application No. 80 303 362.0 (publication No. 0 026 114) claiming a priority as from 25 September 1979, based on JP-12 193 3/79, was refused by decision of Examining Division 056, dated 16 September 1982.
- II. That decision was based on Claim 1, filed 22 May 1982, which differed from the originally filed Claim 1 in formal respects only, and was considered as not exhibiting inventive step with regard to FR-A-2 395 643 (Document A).
- III. The Appellant lodged a Notice of Appeal against this decision on 18 November 1982, after having paid the fee on 16 November 1982. A Statement of Grounds was filed on 17 January 1983.
- IV. Following communications of the rapporteur dated 6 November 1984 and 9 August 1985 and the Appellant's response received 15 July 1985, oral proceedings were held on 6 December 1985. The Appellant's main request made in the oral proceedings was to be granted a patent with amended Claims 1 and 2 as submitted in the oral proceedings and to be allowed to delete original Figure 4 from the description. At the conclusion of the oral proceedings, the Board announced its decision to set aside the decision under appeal and to allow the patent to be granted with Claim 1 as requested. However, for reasons discussed in the oral proceedings, the Appellant was required to submit further amendments by way of clarification of Claim 2 and a suitably amended description to conform to the deletion of the original Figure 4, before the Board would remit the case to the Examining Division with the order to grant a European patent. An entirely revised application comprising

description, pages 1-4, 4a, 5-10 with Claims 1 and 2 and drawings Figures 1-6 was filed on 23 January 1986. Original Figures 4 and 7 were deleted and the remaining ones were renumbered 1-6.

The Appellant, therefore, requests the grant of a patent on the basis of these documents of which Claims 1 and 2 read as follows:

1. A surface acoustic wave device comprising:

a substrate (11) made of piezoelectric material and having a plane surface for propagation of surface acoustic waves;

an input transducer (12) formed on said substrate surface, for converting electrical signals into surface acoustic waves, said input transducer including a pair of interdigitated comb-shaped and weighted electrodes;

an output transducer (13) formed on said substrate surface and arranged diagonally to said input transducer, for converting said surface acoustic waves into electrical signals, said output transducer including a pair of interdigitated comb-shaped and weighted electrodes;

a multistrip coupler (14) formed on said substrate surface and interposed between said input and output transducers so as to be substantially orthogonal to the propagation direction of said surface acoustic waves, said coupler including a plurality of parallel conductors; and

a reflecting transducer (15) formed on said substrate surface and arranged opposite to said input transducer with said multistrip coupler therebetween and parallel to

said output transducer, for reflecting the surface acoustic waves received from said multistrip coupler, the reflecting transducer comprising a pair of interdigitated comb-shaped electrodes; characterised in that

said reflecting transducer consists exclusively of electrodes formed on said substrate surface, the multistrip coupler has a high efficiency such that the greater part of the surface acoustic wave emitted by the input transducer reaches the output transducer, said electrodes of said reflecting transducer (15) are weighted and the number of conductors of said multistrip coupler (14) is adjusted, so that the intensities and the frequency characteristics of the surface acoustic waves reflected by said output transducer and said reflecting transducer are equal to each other, and in that the device further comprises phase adjusting strips (16) including a plurality of parallel conductors formed on said substrate surface and interposed between said reflecting transducer (15) and said multistrip coupler (14), for adjusting the phase difference between the surface acoustic waves reflected by the output transducer and the reflecting transducer so as to be $(2n-1) \lambda/2$, where " λ " is a wavelength at a centre frequency of said surface acoustic waves and "n" is a positive integral number, and each of said input and output transducers (12,13) has a construction in which the pitch of the electrodes is $\lambda/4$ and the width of the electrodes is $\lambda/8$, and the said reflecting transducer has a construction in which the pitch of the electrodes is $\lambda/2$ and the width of the electrodes is $\lambda/4$.

2. A device according to Claim 1, which has been manufactured by initially forming the conductors of said multistrip coupler (14) such that the coupler is 100 percent efficient, and then selectively cutting the

conductors of said multistrip coupler so as to equalise the intensity of reflected surface acoustic waves reflected by said output transducer and by said reflecting transducer.

Reasons for the Decision announced at the conclusion of the Oral Proceedings

1. The appeal complies with Articles 106 to 108 and Rule 64 and is, therefore, admissible.
2. The amendments to Claim 1 as submitted in the oral proceedings do not introduce subject-matter and therefore are not open to objection under Article 123(2) EPC.
3. The question whether Figure 4 of the application as originally filed represented prior art must be considered as a preliminary point.
 - (i) On reading the application as filed and even more after reading the Appellant's submissions in this Appeal it is clear that Figure 4 and its description in the application as filed were considered by the Appellant to represent the prior art closest to the invention under consideration.

The invention claimed and as represented in Figure 5 (and Figure 6) of the application as filed differs from what is shown in Figure 4 solely in that the lumped elements (L and R) of Figure 4 are replaced by distributed printed circuit elements, placed on the acoustic medium, forming part of and being integrated in the reflective transducer. This replacement has also been mentioned as the sole problem the invention is stated to solve (page 3 of the description as filed).

If this Figure 4 and that part of the description of the application were to be accepted as such pertinent prior art, the sole feature added to that prior art by the present invention, i.e. replacement of the lumped constant elements by the distributed printed circuit ones would not constitute an inventive step, because the tendency to go from lumped constant element circuits to printed and integrated circuits was already general in the field of electronics at the priority date of the present application and represented normal practice to a person skilled in the art.

In his first communication, the Rapporteur invited the Appellant to identify a publication from which the alleged prior art of Figure 4 was known. During the oral proceedings, the Appellant stated that the European Search Report already contained such a citation, i.e. Electronics Letters, 15 June 1972, Vol. 8, No. 12, pages 311-312 "New techniques for the suppression of triple-transit signals in surface acoustic wave delay lines", by F.G. Marshall (Document B).

(ii) The Board could not accept this view *prima facie*, because B describes expressly a 3dB multiconductor coupler and is limited to couplers of the 3dB type, while the application as filed nowhere mentions that Figure 4 illustrates a 3dB coupler. On the contrary, the application as filed already gives the reader the impression (although the description does not confirm that explicitly) that the coupler used in the circuit of original Figure 4 is very much the same as the one used in the invention (original Figure 5). In the view of the Board of Appeal, it is clear that the multiconductor coupler of original Figure 5, i.e. the invention, contains considerably more conductors than a

3dB coupler. This follows from the fact that according to the application, the invention of Figure 5 comprises a coupler of 77 conductor elements which are derived from 110 such elements for a full (100%) transfer of acoustic energy from the input channel to the output channel, the functioning of such couplers as such being thoroughly explained in the US patent 3 836 876 of Marshall, document C, which is cited on page 2 of document A and which was brought into the procedure in the Rapporteur's last communication, where L represents the length required for full (100%) transfer of acoustic energy from the input channel to the output channel and where $1/2 L$ represents the length of the multiconductor element acoustic coupler in the direction of acoustic wave propagation for a 3dB coupler, which distributes the input wave into the output and the reflector channel with equal amplitudes but with phases in quadrature.

Since the application mentions 110 conductors (length L in terms of the US patent cited) for a coupler for 100% transfer from one channel to the other channel, for 3dB coupling the present invention would have needed $1/2 \times 110 = 55$ conductor elements ($1/2 L$). However, the circuit of the invention (original Figure 5) uses 77 such elements and therefore is not a 3dB coupler but contains more conductors. This is still the case if a tolerance of 10% in the number of the conductors of the coupler as mentioned in B were taken into account. During the oral proceedings, the Appellant tried to construe from the drawings of the application that the number of conductor elements of the coupler of original Figure 4 were lower than that of original Figure 5, and that because of that the coupler of Figure 4 must be a 3dB coupler and cannot be a coupler according to the invention as represented in Figure 5, 3dB couplers

being the only type of couplers used so far in this kind of device.

The Board was not convinced by this argumentation because original Figure 5 seems to represent an actual embodiment of the invention under consideration whereas original Figure 4 is only schematic. The Appellant contended that there must have been an error by the draftsman who had simply failed to draw in Figure 4 the number of conductors appropriate for a 3dB coupler.

- (iii) In all the circumstances the Board does not consider itself in a position to decide that the prior art according to original Figure 4 and its description in the application unambiguously comprises the same sort of multiconductor coupler as the invention according to original Figure 5 of the application.
- (iv) The Board further considers that the basis for assessing an invention is the disclosure of that invention in the application as filed and it is well established case law that such assessment has to be carried out in the perspective of the true, objective prior art as defined by Article 54 EPC. Furthermore, Boards of Appeal have frequently allowed statements as to the prior art to be corrected and/or supplemented where necessary.

It follows that an erroneous statement of prior art in a patent application cannot be held against the Applicant and his application. The Board considers this view to be entirely in accordance with Rule 27(1)(c) and 29(1)(a) EPC, because the Applicant in his application is only obliged and can only be held to fulfil the requirements of these Rules to the best of his knowledge and the Board assumes, as long as it has

no proof to the contrary that the Applicant has done so. If the Board considers that an erroneous statement of prior art should be corrected or supplemented it has power to require this to be done.

- (v) In the absence of any evidence, or any clear admission on behalf of the Appellant, that a device according to original Figure 4 of the application provided with a multiconductor coupler 7 other than a 3dB coupler was actually known, the Board must assume for present purposes that such a device was not known in the sense of Article 54 EPC, before the priority date of the application.
- (vi) Under the circumstances, the Board cannot but ignore the contents of original Figure 4 and its description in the application when judging upon the substantive merits of the invention.

4. The main ground for the refusal of the present application by the Examining Division was, that the invention implied no inventive step over Document A.

5. In the Statement of Grounds, the main difference between the invention and A consists, according to the Appellant, in the use of a regenerative transducer as a reflector according to the invention instead of a passive reflector as in A, which results in a higher efficiency of the device (higher than the maximum of 50% according to the prior art).

6. The Board acknowledges that the paragraph bridging pages 7 and 8 of the application as originally filed mentions with regard to the transducers used that it is desired that both the input transducer 12 and the output transducer 13 have constructions in which the pitch of electrodes is

$\lambda/4$, so that reflection of the surface acoustic waves is suppressed as much as possible and that it is also desired that the reflecting transducer 15 has a construction in which the pitch of electrodes is $\lambda/2$, so that the amount of reflection is as great as possible.

The Board further finds that the present invention as now claimed in Claim 1 is using a multiconductor coupler which is not a 3dB coupler, but a coupler which transfers the greater part of the waves coming from the input transducer to the output transducer, so that only a minor part of the waves continues its way to the reflector, resulting in a direct transfer of acoustic waves from the input transducer to the output transducer with an efficiency of more than 50%.

The Board recognises an inventive concept in the combination of such a coupler sending only a minor part of the waves to the reflector and the use as reflector of a regenerative transducer instead of a passive reflector because in that way it is still possible to get reflections of equal amplitude from the output transducer and from the reflecting regenerative transducer, although the latter receives waves of far smaller amplitude than the output transducer.

It is to be noted here that a multiconductor coupler coupling two parallel and adjacent channels in an acoustic surface waves propagating medium which does not distribute the input acoustic waves propagating in one channel into equal amplitude parts in the two coupled channels, i.e. a fractional coupler, is known as such from C. In column 7, lines 46-51 of C, it says that multiconductor couplers can be made for coupling out any desired proportion of the input acoustic waves to another track. Examples of such

couplers which do not distribute on a 50/50 basis are shown in e.g. Figure 9-10, 13 and 26 of C.

However, the application of such a known fractional coupler in a device as known from B; or A (corresponding to US-A-4 146 851), which both use a 3dB coupler exclusively is not obvious. This is the less so, because C, although being the only prior art available showing a fractional coupler and some of its applications, deals at one place with the same problem as the present invention, i.e. eliminating the disadvantages of Triple Transit Effects in a surface acoustic wave device, but nevertheless presents in its sole embodiment of such a device, in its Figure 23, only a 3dB equal distribution coupler and this while at the same time a transducer is being used as a reflector, i.e. a regenerative reflector.

B also uses a transducer as a regenerative reflector in combination with a 3dB coupler. It seems also appropriate to mention here that both citations B and C mention in their text and indicate in their drawings (B, Figure 1), (C, Figure 23) that the reflector has the structure of a transducer, but that this fact is in no way emphasised, while citation A is the only one from which the reader can conclude that the reflection factor from a transducer structure must be different from and higher than that of a passive reflector consisting of independent parallel conductors. However, this information drawn from citation A is rather hidden therein, the explanation in this citation being given with regard to the transducer 12, which in fact is also used as a transducer: it is the output transducer and the obscure statement of higher reflectivity of a transducer in this document is not exploited as an advantage in using such a transducer as the reflector of the device. Instead, here the passive

reflector 14 is used which does not provide regenerative reflections.

7. On the basis of the foregoing, the Board of Appeal is of the opinion that the invention consists primarily in the replacement of the 3dB coupler of the devices known from citations A and B by a "fractional coupler" according to citation C and that these citations do not contain the slightest hint for such a replacement. On the contrary, for example, document C clearly leads away from it, although it is the only document mentioning and describing a fractional coupler. Therefore, the said replacement is not obvious and involves an inventive step.
8. The prior art part of present Claim 1 is clearly based on B, which, like the invention, uses a transducer as a regenerative reflector and which uses a 3dB coupler instead of the fractional coupler mentioned in the characterising part of Claim 1.

The formulation of the prior art part of Claim 1 is such that the output transducer is staggered with respect to the input transducer and the reflector is opposite the input transducer. This is also the case in B (Marshall) but not in C, Figure 23 (also Marshall), where output transducer and reflective transducer have interchanged their names, i.e. the output transducer 139 is opposite the input transducer 133 and the reflector 141 is staggered with respect to the input transducer 133. Because the coupler is a 3dB coupler, which distributes equal amplitudes to the reflector and the output transducer, this interchange does not make any difference with regard to the surface acoustical waves. However, it does with respect to bulk waves in the acoustic medium. It was exactly to prevent the arrival of bulk waves, with a velocity different from that of the surface waves, at the

output transducer, that the staggered arrangement of the output transducer with respect to the input transducer was chosen according to the present application and also according to B and A.

Therefore, the prior art part of the present Claim 1 is correctly restricted to this staggered configuration.

9. In his last communication accompanying the summons to oral proceedings, the Rapporteur observed that the application did not mention any absorbers for undesired acoustic surface waves.

The presence of such absorbers situated in the right places seems to be indispensable to a proper performance of devices of the kind as claimed in the application.

Objection might, in this context, arise under Article 83 EPC.

The Board put forward this objection expressly during the oral proceedings. The Appellant declared that the use of such absorbers is so common in this technical field, that no specific mentioning was necessary.

The Board of Appeal takes account of the fact that in all three citations A, B and C, which all deal with cancellation of Triple Transit Effects in surface acoustic wave devices and utilising a reflector adjacent to the output transducer and a 3dB multiple conductor coupler, there is an absorber of surface acoustic waves adjacent to the input transducer. The Board has decided that no further evidence establishing the common use of such absorbers by the person skilled in the art would be necessary.

Finally, the Board recognises that the person skilled in the art of this technical field, who may be supposed to be aware of the citations mentioned and of the general use of wave absorbers, would undoubtedly be in a position to conclude that an absorber would be needed if the device would not perform properly and would also be able to put it in the right place.

Accordingly, the Board finds that no objection under Article 83 EPC is established.

10. At the conclusion of the oral proceedings, for the reasons discussed with the Appellant, the Board found itself unable to allow the application to proceed to grant without at least further amendment to the then valid Claim 2 and to the introductory part of the description. It therefore confined its decision to setting aside the decision under appeal; allowing Claim 1 in the text submitted during the oral proceedings; and setting a time limit for the submission of further amendments.

Reasons for the Decision to order grant of a patent

1. The deletion of original Figure 4, coupled with the amendments now made to the introductory part of the description serve to remove objection to inaccuracy in representation of the state of the art as discussed in paragraph 3 of the Reasons for the Oral Decision and are, consequently, allowable amendments since they do not contravene Article 123(2) EPC.
2. The amendment now proposed to Claim 2 is also allowable, since it removes an objection raised in the oral proceedings to the clarity of the claim, which was clearly intended to be directed to a device which is in the finished manufactured state, whereas the originally

proposed wording could be interpreted as referring to a device in the semi-finished condition, which was inconsistent with the dependence of the claim from Claim 1 and also with the invention as described. No objection can be taken to the amended claim under Article 123(2) EPC.

3. The Board has noted some minor corrections which should be made:

Description: page 1: line 7, "Figs. 1 through 4" should read "Figs. 1 through 3"
page ~~12~~: line 13, "Fig. 6" should read "Fig. 5".

Claim 2 as submitted on 23 January 1986:

line 19, "manufactued" should read "manufactured".

In addition, the Board considers that US-A-3 836 876 (Document "C") should be acknowledged in the description as describing a "fractional coupler".

4. Subject to the above, the application documents filed on 23 January 1986 satisfy the requirements of the European Patent Convention and comply with the requirements of the Board made known to the Appellant during the Oral Proceedings.

Order

For these reasons, it is decided that

1. The decision of the Examining Division is set aside.
2. The case is remitted to the first instance with the order to grant a European patent on the basis of the documents

filed on 23 January 1986 with further amendments as mentioned under the foregoing point 3.

The Registrar

S. Fabiani

S. Fabiani

for and on behalf of
the Chairman*

Peter Ford

Peter Ford

*pursuant to Article 7(3) Rules of Procedure of the Boards of Appeal.