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Anmeldenummer / Filing No / N° de la demande : 78.300.410.4

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Bezeichnung der Erfindung: Apparatus and method for improving R.F. isolation between adjacent antennas.
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : H01

ENTSCHEIDUNG / DECISION
vom / of / du 9 January 1985

Anmelder / Applicant / Demandeur : Ball Corporation

Patentinhaber / Proprietor of the patent / Titulaire du brevet : ////////////////////

Einsprechender / Opponent / Opposant: ////////////////////

Stichwort / Headword / Référence : "Inventive Step"

EPÜ / EPC / CBE Art. 56, 52(1)

Leitsatz / Headnote / Sommaire

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Case Number: T 35 / 82

DECISION

of the Technical Board of Appeal 3.5.1

of 9 January 1985

Appellant: Ball Corporation
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U S A

Representative: A.R. Collingwood et al
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Decision under appeal: Decision of Examining Division 046 of the European Patent Office dated 22 April 1981 refusing European patent application No 78.300.410.4 pursuant to Article 97(1) EPC

Composition of the Board:

Chairman: G. Korsakoff
Member: J. van Voorthuizen
Member: P. Ford

Summary of Facts and Submissions

I. European Patent application No. 78 300 410.4 filed on 22.09.78 (Publication No. 0 001.883), claiming a priority of 28.10.77 (US) was refused by a Decision of the Examining Division 046 of the European Patent Office of 22.04.81. That decison was based on Claims 1-20 filed on 29.07.80.

II. The reason given for the refusal was that the subject-matter of Claims 1-7, 15, 16, 19, 20 did not involve any inventive step and that the subject matter of Claims 17,18 was not novel having regard to GB-A-1 321 734.

III. The applicant lodged an appeal against this decision on 22.06.81. The appeal fee was paid on the same date. The Statement of Grounds was filed on 10.08.81.

IV. In two communications of 26.10.82 and 09.06.83 the Rapporteur drew applicants attention to a further document US-A-2 103 357 which seemed particularly relevant to the basic idea of claim 1 and formulated objections to a number of the claims concerning the absence of inventive step.

In the Statement of Grounds, in the replies to the said communications and in the course of the oral proceedings held on 02.10.84 the applicant essentially argued that none of the docments cited against the application contained an indication to the person skilled in the art how to arrive at a system of microstrip antenna arrays having a high degree of r.f. isolation as disclosed by the application.

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V. In the oral proceedings, the applicant declared his intention to file a set of amended claims limited in accordance with the opinion of the Board as expressed in these proceedings. Such claims, accompanied by corresponding amendments to the description, were filed on 15.10.84. The applicant requested the grant of a European patent on the basis of these Claims which read as follows:

1. A system of microstrip antenna arrays having improved r.f. isolation therebetween, said system comprising a first array (10, 16) of microstrip r.f. radiators disposed at a first location over an electrically conducting surface (24) and interconnected by microstrip r.f. feedline (18) with an r.f. input terminal (20) so as to transmit input r.f. energy according to a first predetermined radiation pattern; a second array (12, 16) of microstrip r.f. radiators disposed at a second location over said electrically conducting surface (24) for receiving and supplying r.f. energy to an r.f. output terminal (20) according to a second predetermined radiation pattern; the principal lobes of said first and second radiation patterns being directed other than toward said second and first locations respectively but with a predetermined amount of the r.f. engery transmitted from said first array (10, 16) at said first location nevertheless being undesirably received by said second array (12, 16) at said second location; and at least one of said arrays including an additional microstrip radiator (26,28,30) directly electrically connected with said r.f. input or output terminal (20) thereat so as to radiate or receive via a principal radiation

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pattern to be compensating r.f. energy having a magnitude and phase which will substantially cancel said predetermined amount of r.f. energy undesirably received by said second array (12, 16) at said second location.

2. A system as claimed in Claim 1 wherein said at least one additional microstrip radiator (28,30) has a resonant dimension substantially equal to one wave length at the frequency of said transmitted r.f. energy and is oriented so as to direct a substantial portion of the compensating r.f. energy radiated or received therefrom towards the other of said first and second arrays.

3. A system as claimed in Claim 1 or Claim 2 wherein said at least one additional microstrip radiator (28,30) is connected at its midpoint to a microstrip r.f. feedline 18) emanating from said input or output r.f. terminal (20).

4. A system as claimed in Claim 3 wherein said at least one additional microstrip radiator (28,30) is disposed intermediate individual r.f. radiators (16) or said first array (10).

5. A system of microstrip antenna arrays as in anyone of the preceding claims wherein the relative phase of compensating r.f. energy radiated or received by said at least one addtional microstrip radiator (26,-28,30) is determined by the length of microstrip r.f. feedline (18) between its connection and said input or output r.f. terminal (20).

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6. A system as claimed in any preceding claim wherein said at least one additional microstrip radiator comprises two separate radiators (26) having resonant dimensions substantially equal to one-half wavelength at the frequency of said r.f. energy and connected to symmetrical equal phase points of said microstrip r.f. feedline (18).

7. A system of microstrip antenna arrays as in any-one of Claims 1 to 6 wherein said at least on additional microstrip radiator has non-resonant dimensions which are related to the magnitude of compensating r.f. energy needed at the second array (12,16) to substantially cancel said predetermined amount of undesirably received r.f. energy.

8. A system as claimed in any preceding claim wherein said at least one additional microstrip radiator (26,28,30) is constructed and disposed so as to radiate or receive said compensating r.f. energy with an electrical field polarisation normal to said electrically conducting surface (24) common to said first and second arrays (10, 16; 12, 16) of microstrip radiators.

9. A microstrip antenna array comprising a plurality of microstrip radiatiors spaced by a dielectric layer (22) above an electrically conducting surface (24) and connected through an integrally formed microstrip feedline (18) to a common r.f. input terminal (29), and characterised by: at least one further microstrip radiator (26,28,30) integrally formed and connected with said other microstrip radiators (16) and with said microstrip feedline (18), said futher microstrip

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radiator (26,28,30) being sized and disposed along said feedline (18) so as to transmit or recieve compensating r.f. energy in a predetermined direction along a principal lobe of its radiation pattern which is directed differently than the principal lobe of the radiation pattern associated with the remainder of the array and which compensating energy will, at least at one predetermined location, substantially cancel r.f. energy transmitted or received along said predetermined direction from said other microstrip radiators (16).

10. A microstrip antenna array as claimed in Claim 9 wherein said at least one microstrip radiator (26,28,-30) is constructed and disposed so as to radiate or receive said compensating r.f. energy with an electrical field polarisation normal to said common surface (24).

Reasons for the Decision

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

2. Although the Examining Divison properly rejected the application on the ground that claim 1 and a number of further claims before the Examining Division lacked novelty or inventive step, the present claims are not open to such objections as they are now limited to a particular configuration of microstrip antenna arrays which cannot be considered obvious to a person skilled in the art in relation to the state of the art. The present claims, therefore, are considered to be allowable.

3. The amendments to the description duly take account of the prior art and of the new wording of the claims. They are not open to objections whether under Article 123(2) EPC or otherwise.

Order

For these reasons

it is decided that

1. The decision under appeal is set aside

2. The case is remitted to the first instance with the order to grant the European Patent applied for on the basis of the following documents:

   a) Claims 1-10 as filed on 15.10.84

   b) Original description with amendments submitted on 29.07.80 and 15.10.84, under the proviso that the title be amended to read: "Apparatus for improving r.f. isolation between adjacent microstrip antenna arrays" and that the references to the cited GB and US patent documents be in the form: GB-A- ..... and US-A- ..... respectively.

   c) Drawings as originally filed.

The Registrar: The Chairman:

J. Rückerl G. Korsakoff