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Datasheet for the decision of 12 July 2013

Case Number: T 2097/09 - 3.4.01

Application Number: 05258004.0

Publication Number: 1703589

IPC: H01Q 9/28, H01Q 1/22

Language of the proceedings: EN

Title of invention:
Tag antenna

Applicant:
Fujitsu Ltd.

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no, all requests)"

Decisions cited:
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Case Number: T 2097/09 - 3.4.01

D E C I S I O N
of the Technical Board of Appeal 3.4.01
of 12 July 2013

Appellant: (Applicant)
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 20 May 2009 refusing European patent application No. 05258004.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: G. Assi
Members: H. Wolfrum
A. Pignatelli

Summary of Facts and Submissions

I. European patent application 05 258 004.0 (publication No. EP 1 703 589) was refused by a decision of the examining division dispatched on 20 May 2009 for the reasons of lack of novelty and inventive step (Articles 52(1), 54(1) and (2) and 56 EPC 1973) of the subject-matter of claim 1 of the request then on file. The examining division relied on documents D1 (US-A1-2005/0024287) and D2 (US-A-5 793 305) for the assessment of novelty and inventive step, respectively.

II. The applicant lodged an appeal against the decision on 8 July 2009. The prescribed appeal fee was paid on 15 July 2009. A statement setting out the grounds of appeal was filed on 17 September 2009.

The appellant based its appeal on sets of claims according to a main request and an auxiliary request, both filed with the statement setting out the grounds of appeal. Moreover, an auxiliary request for oral proceedings was made.

III. On 15 March 2013 the appellant was summoned to oral proceedings.

In an annex accompanying the summons pursuant to Article 15(1) RPBA the Board addressed the issues of added subject-matter (Article 123(2) EPC), clarity (Article 84 EPC 1973), novelty and inventive step (Articles 52(1), 54(1) and (2) and 56 EPC 1973).

IV. In response to the Board's observations the appellant filed by letter of 7 June 2013 new sets of claims 1 to

10, according to a main request and an auxiliary request, respectively, replacing the former requests.

V. In the oral proceedings, which took place on 12 July 2013, the appellant reiterated its requests made in writing. The Board admitted these requests into the proceedings (Article 13(1) RPBA).

VI. Independent claim 1 of the appellant's **main request** reads as follows :

"*1. An RFID tag antenna using the UHF band having a feeding part with a chip mounted thereto, comprising:*

a dipole antenna (10);

said feeding part (11) for said chip, said feeding part connected to the dipole antenna and provided in the center of said dipole antenna; and

an inductance part (12) connected to the dipole antenna in parallel such that both ends of the inductance part are connected to said dipole antenna (10) with said feeding part in the center; wherein

end parts of the dipole antenna are provided with a width larger than a line width of said dipole antenna;

characterised in that:

the dipole antenna (10) has a total electrical length shorter than half of an antenna resonance wavelength;

the inductance part (12) has a length which adjusts the admittance of said tag antenna such that an imaginary part of the admittance of said tag antenna has the same absolute value as the imaginary part of the admittance of said chip,

wherein

the radiation resistance of said dipole antenna (10) becomes almost the same as the resistance of said chip due to loss; and

the length of said inductance part (12) is determined according to the specific dielectric constant and thickness of an object to which one surface of said tag antenna is adhered."

Claim 1 of the **auxiliary request** differs from claim 1 of the main request in that the term "*a total electrical length*" is replaced by the term "*an effective total length*".

Claims 2 to 10 of both requests are dependent claims.

VII. The appellant's arguments, as far as relevant for the present decision, may be summarized as follows :

The term "*effective total length*" referred to on page 6, lines 6 and 7, page 8, lines 33 and 34, and page 10, line 22, of the description as originally filed had to be understood as meaning the "*electrical length*" of the antenna.

On the basis of this understanding, the subject-matter of claim 1 of both requests on file differed from an RFID tag as known from document D1 in those features of the characterizing portion which concerned the length of the antenna with respect to the resonance wavelength, the radiation resistance of the antenna, and the modification of the inductance part to cope with the influence of the dielectric properties of an object to which the antenna is adhered.

Document D1 did not hint at any of these distinguishing features which led to a tag of smaller size and improved efficiency of operation. The electrical length of the known antenna was equal to or greater than half of the antenna resonance wavelength so that the antenna as a whole could not be built as small as the antenna according to the invention. Moreover, for the known antenna the length of the inductance part was chosen to match only the antenna's ohmic resistance to that of the chip whereas for the claimed antenna the antenna's radiation resistance (which was a different resistance, namely one for electromagnetic waves to be emitted from the antenna) was matched to the chip resistance, thus improving the operating efficiency. Finally, as regards the coping with the influence of an object to which the tag antenna is adhered, document D1 in fact taught away from the claimed solution of considering the object's dielectric constant and thickness when determining the length of the inductance part in that the known antenna foresaw the provision of an additional frequency tuning element.

In the absence of any indication as to the claimed measures in any of the other documents of the available prior art, the claimed subject-matter was novel and, unless assessed with the benefit of hindsight, inventive.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rule 99 EPC and is, therefore, admissible.

2. Inventive step

2.1 Claim 1 of the main request mentions the term "*total electrical length*" with regard to the claimed dipole antenna, this term, however, not being explicitly disclosed in the application as filed.

For this reason, in claim 1 of the auxiliary request the term "*total electrical length*" is replaced by "*effective total length*" that is disclosed on page 6, lines 6 and 7, page 8, lines 33 and 34, and page 10, line 22.

The meaning of both terms was the object of a discussion during the oral proceedings.

The Board holds that the term "*electrical length*" of an antenna would be technically meaningful for a skilled person, the further specification "*total*" simply implying that both arms of the dipole antenna are considered, as the appellant submitted.

The situation is less clear regarding the other term "*effective total length*". Although it is disclosed per se, as already stated, its meaning does not unambiguously result from the application as filed. The appellant submitted that the skilled person would regard the term "*effective length*" as being synonymous

with "*electrical length*". However, for the purpose of the present decision, this issue may be left open since even assuming that the terms "*electrical length*" and "*effective length*" are indeed synonyms, as the appellant argued and is supposed in the following argumentation, the subject-matter of claim 1 of both the main request and the auxiliary request would lack inventive step.

2.2 Document D1 refers to an RFID tag antenna using the UHF band having a dipole antenna with widened end parts and a feeding part in the center to which an integrated circuit chip is mounted (D1 : Figure 1; paragraphs [0028] to [0030], [0037], [0038], [0055]). In a specific embodiment the dipole antenna has an electrical length which is half of an antenna resonance wavelength (D1 : [0038]). An inductive shorting loop (*ie* an 'inductance part' in the terminology of the present application) is connected to the dipole antenna in parallel to the feeding part. The length and width of the inductance part are selected so as to match the impedance of the chip to the impedance of the radiating structures in that the real component of the chip impedance (*ie* the resistance due to loss) is substantially equal to the real component of the antenna terminal impedance (*ie* the resistance of the dipole antenna) and the reactive component of the chip impedance is opposite in sign and substantially equal to the reactive component of the antenna terminal impedance at the preferred operating or resonant frequency (*ie* the imaginary part of the admittance of the tag antenna has the same absolute value as the imaginary part of the admittance of said chip) (D1 : [0016], [0034], [0038], [0048]).

2.3 Thus the subject-matter of claim 1 of both requests on file differs from the known RFID tag antenna in essence in two respects :

(i) the electrical length of the dipole antenna is shorter that half of an antenna resonance wavelength; and

(ii) the length of the inductance part is determined according to the specific dielectric constant and thickness of an object to which one surface of said tag antenna is adhered.

For a given resonance wavelength of the antenna, difference (i) allows for a further reduction of the antenna size, whereas difference (ii) further improves the quality of impedance matching and thus the antenna's electrical performance.

2.4 Contrary to the appellant's submission, the radiation resistance of the dipole antenna referred to in claim 1 of both requests on file does not constitute an electrical parameter which would differ from the (ohmic) antenna resistance of the known tag antenna simply because a "*radiation resistance*" for emitting electromagnetic waves different from the resistance which the flow of electrons encounters in the antenna's bulk material would not be meaningful. The parameter to be considered would rather be the electrical resistance which the dipole antenna shows in operation (for signal emission as well as for signal reception) due to conductor loss of the antenna (see page 7, line 31 to page 8, line 18, of the application description). In this context, alleged divergences between theoretical calculations and practical measurements of the antenna

resistance, as addressed on page 8, lines 3 to 7, of the application description, cannot alter the above findings but hint, at most, at deficiencies in the theoretical model calculations made.

2.5 Document D1 already deals with the (partial) problem underlying difference (i) in that its teaching also aims at miniaturizing an RFID tag antenna. The skilled person in the technical field at issue is however aware of the fact that miniaturization has to be balanced against operating efficiency because the more the antenna length deviates from the resonance wavelength the more the operating efficiency (sensitivity, signal strength etc.) degrades. D1 discloses an antenna structure with an electrical length of half of the antenna resonance wavelength and a shorter physical length as a compromise between the said two conflicting goals (D1 : [0014], [0032], [0033], [0038]). It would however be immediately apparent to the skilled person that a different balance can be chosen, such as a still shorter antenna length, in particular when a certain demand favours miniaturization over sensitivity.

Moreover, document D1 does not leave the skilled reader in doubt about the fact that optimal impedance matching between the dipole antenna and the chip is of utmost importance for the electrical performance of the tag antenna and that it is the inductance part having a proper length and width which serves this purpose (D1 : [0016], [0017], [0034], [0038], [0048]). In this context, document D1 even expressly reminds the reader of textbook knowledge in that it points to the fact that the dielectric properties of any object in the immediate vicinity of the tag antenna will alter the

performance parameters of the antenna ([0049]). Thus, the skilled person is aware of the fact that an adjoining dielectric object will affect the impedance matching by the inductance part. Therefore, the aforementioned difference (ii) constitutes nothing but the straightforward application of basic textbook knowledge to the design of the inductance part so as to cope with a situation for which the presence of an object with known dielectric properties can already be foreseen at the time of tag design and production. The validity of this assessment is not challenged by the fact that, as correctly pointed out as such by the appellant, document D1 itself does not suggest to modify the length of the inductance part but instead proposes alternative solutions, such as the provision of an additional tuning element. For the sake of completeness it is added that, due to the fact that feature (ii) reflects nothing but common general knowledge, any criticism of hindsight analysis must fail.

2.6 In summary, the subject-matter of claim 1 of both requests on file is rendered obvious by the teaching of document D1 together with common general knowledge of the skilled person.

3. The appellant's main request and auxiliary request thus do not comply with the requirement of Article 56 EPC 1973 and are therefore not allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar The Chairman

D. Meyfarth G. Assi