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Datasheet for the decision of 12 November 2009

Case Number: T 0007/08 - 3.4.01

Application Number: 98921981.1

Publication Number: 0988661

IPC: H01Q 13/02

Language of the proceedings: EN

Title of invention:
Horn Antenna

Patentee:
Rosemount Tank Radar AB

Opponent:
VEGA Grieshaber KG

Headword:
-

Relevant legal provisions:
EPC Art. 123(2)(3)

Relevant legal provisions (EPC 1973):
EPC Art. 83, 84, 54(1)(2), 56
RPBA Art. 13

Keyword:
"Admissibility of late-filed (yes)"
"Added subject-matter (no)"
"Extension of protection conferred (no)"
"Clarity (yes)"
"Suficiency of disclosure (yes)"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
G 0009/91, G 0002/88, T 0240/04

Catchword:
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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0007/08 - 3.4.01

D E C I S I O N
of the Technical Board of Appeal 3.4.01
of 12 November 2009

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 4 January 2008 revoking European patent No. 0988661 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman: B. Schachenmann
Members: H. Wolfrum
F. Neumann

Summary of Facts and Submissions

I. The appellant (patent proprietor) lodged an appeal against the decision of the opposition division, announced on 19 December 2007 in oral proceedings and dispatched on 4 January 2008, revoking European patent No. 0 988 661.

The notice of appeal was received on 27 December 2007 and the prescribed fee was paid on the same day. On 13 May 2008 a statement of grounds of appeal was filed. The appellant requested maintenance of the patent as granted or, alternatively, maintenance of the patent as granted according to one of eight auxiliary requests.

II. The opposition had invoked the grounds of Articles 100(a) (lack of novelty and inventive step), 100(b) and 100(c) EPC.

The opposition division had based its decision on objections under Article 100(a) EPC concerning lack of novelty or lack or inventive step of the subject-matter of a main request and a first auxiliary request then on file and on an objection under Article 123(2) EPC for a second auxiliary request then on file. Reference was made to prior art as evidenced by Figure 1 of the patent in suit as well as to documents :

M2: JP-A-7 007320 and a corresponding English translation; and

M6: JP-U-60 180105 and a corresponding English translation.

III. Oral proceedings were arranged in accordance with respective requests of the parties.

In response to a communication of the Board sent on 17 July 2009 to the parties as an annex to summons to the oral proceedings, the appellant filed by letter of 12 October 2009 a new main request and six auxiliary requests, replacing the former requests on file.

IV. Oral proceedings were held on 12 November 2009.

As a result of the debate, the appellant filed a new request replacing all former requests on file and requested maintenance of the patent in amended form on the basis of claims 1 and 2 and description columns 1 to 4 filed at the oral proceedings, and Figures 1 and 2 as published.

V. Claim 1 of the appellant's **request** reads as follows:

"*1. Use of a fluid-level-measuring horn antenna in a tank for downward facing operation in an atmosphere causing condensation on the horn antenna and for the transmission of microwaves,*

the horn antenna comprising:

a conical horn (2) having a narrower part;

a transition piece (3a, 3b) from a waveguide to the surrounding atmosphere,

said transition piece being located at a center of the narrower part of the conical horn (2),

said transition piece having a tapering part (3a) with a base;

said waveguide and said transition piece being circular in cross-section;

said transition piece being exposed to the atmosphere in the tank; an annular space (4) between the conical horn (2) and the transition piece (3a, 3b), which fills with water in downward facing operation,

wherein

the tapering part of the transition piece (3a, 3b) is arranged so as to exist outside of the annular space by means of the transition piece (3a, 3b) having a cylindrical part (3b) extending axially a distance into a conical part of the conical horn (2) such that said annular space (4) is between said cylindrical part and the conical horn, said distance being such that additionally condensed water drawn to the annular space (4) will run off, since capillary action and surface tension will not be capable of retaining a larger volume of water than that contained in the annular space (4),

such that any water retained in said annular space (4) will not restrict microwaves transmitted through the transition piece (3a, 3b).

Claim 2 is a dependent claim.

VI. The respondent (opponent) objected to the admission of the appellant's request into the proceedings and requested that the appeal be dismissed.

In this context, the respondent raised objections as to lack of clarity (Article 84 EPC 1973), insufficiency of disclosure (Article 83 EPC 1973), added subject-matter (Article 123(2) EPC) and lack of inventive step

(Article 56 EPC 1973). In support of the latter objection, reference was additionally made to documents:

M4: US-A-2 801 413, and
M9: US-A-5 495 218.

Document M9 had been introduced into the proceedings by the board as evidence for the fact that the prior art illustrated in Figure 1 of the patent in suit indeed belonged to the state of the art.

VII. According to the appellant, the amended request complied with the requirements of the EPC. As far as the patentability of the claimed subject-matter was concerned, none of the documents of the cited prior art addressed or even recognized the specific problem underlying the patent, *ie* the presence of condensed water at the transition piece and the negative effect of such condensate on the transmission of microwaves. Document M6, being the only document that was concerned with the problem of condensation of water within a horn antenna, taught a completely different solution.

Reasons for the Decision

1. In the following reference is made to the provisions of the EPC 2000, which entered into force as of 13 December 2007, unless the former provisions of the EPC 1973 still apply to pending applications.

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

3. Admissibility of the appellant's request (Article 13 RPBA)

3.1 The respondent objected to the admissibility of the appellant's request. The final form of the claims of this request was filed in the oral proceedings but was based on a request - the admissibility of which was also contested - filed by the appellant in response to the board's communication. The respondent submitted that the change of category from claims directed to a horn antenna according to the patent as granted to claims concerning a specific use of a horn antenna according to the present request came very late in the opposition appeal proceedings and constituted a significant change of the matters in dispute. The appellant had had ample opportunity to present use claims in the course of the opposition proceedings. It was however a generally observed principle that the purpose of appeal proceedings was predominantly to review the validity of the decision rendered by the first instance and that the factual framework of appeal proceedings should not significantly differ from that of the proceedings in the first instance. Therefore, a party to appeal proceedings was not allowed to significantly change the matters in dispute. In accordance with decision G 9/91 of the Enlarged Board of Appeal and decision T 240/04 the appellant's present request should thus not be admitted into the proceedings under Article 13(1) RPBA.

3.2 The appellant pointed out that a request directed to use claims had in fact already been filed during opposition proceedings. However, in order to get other amendments considered in oral proceedings before the opposition division the appellant had felt obliged to drop such claims. The return now to a request directed to use claims was motivated by the board's critical assessment of the patent as given in the communication annexed to the summons to oral proceedings. At any rate, it was disputed that the limitation of the scope of protection to a specific use could be considered a significant change in the factual framework. Moreover, given the fact that the claimed use formed part of the definition of the horn antenna according to the claims as granted, the new request did not include an element of surprise to the board and the other party.

3.3 Article 13(1) RPBA stipulates that "Any amendment to a party's case after it has filed its grounds of appeal or reply may be admitted and considered at the Board's discretion. The discretion shall be exercised in view of inter alia the complexity of the new subject-matter submitted, the current state of the proceedings and the need for procedural economy."

Article 13(3) RPBA complements this by stating that "*Amendments sought to be made after oral proceedings have been arranged shall not be admitted if they raise issues which the Board or the other party or parties cannot reasonably be expected to deal with without adjournment of the oral proceedings.*"

3.4 In the Board's view, the change from a claim directed to a "Fluid-level-measuring horn antenna for downward

facing operation in an atmosphere causing condensation on the horn antenna and for the transmission of microwaves" (claim 1 of the patent as granted) to a claim concerning the "Use of a fluid-level-measuring horn antenna in a tank for downward facing operation in an atmosphere causing condensation on the horn antenna and for the transmission of microwaves" (present claim 1) amounts to a substantial limitation of the scope of protection but does not constitute a substantial change of the factual framework of appeal proceedings. For this reason, decision G 9/91 (OJ 1993, 408) and the ensuing case law of the boards of appeal (such as T 240/04 which was referred to by the respondent) which define the extent to which the factual framework may be changed in appeal proceedings are not applicable to the present case.

On the other hand, according to the criteria of Articles 13(1) and (3) RPBA, the appellant's present request is indeed late-filed. However, the specific use of the antenna which is now claimed already formed part of the antenna's definition in claim 1 of the patent as granted. Thus, although this use did not constitute a limiting feature for the antenna as such, the present limitation does not increase in any manner the complexity of the case nor does it raise issues which cannot reasonably be dealt with during the oral proceedings. This is even more so the case as, throughout the opposition and appeal proceedings, the appellant's argumentation consistently relied on the specific use of the antenna as an inventive aspect of the claimed subject-matter. Furthermore, the request including the change of category to a use claim was presented well before the date of the oral proceedings.

The further amendments made to present claim 1 during the oral proceedings concern the definition of the geometry and mutual arrangement of antenna elements which, according to the context of the original disclosure, are functionally decisive for successfully overcoming the problem to be solved. These amendments respond to a number of objections under Articles 84 EPC 1973 and 123(2) EPC which came up during the oral proceedings.

For these reasons, after discussion with the parties to the proceedings, the Board decided to exercise its discretion in favour of the appellant and thus to admit the appellant's sole request into the appeal proceedings.

4. Amendments (Articles 123(2) and (3) EPC)

4.1 The use of a horn antenna in a tank for downward facing operation in an atmosphere causing condensation on the antenna is disclosed on page 1, lines 15 to 17 in combination with page 3, lines 20 to 23 of the application as originally filed. The further claim definitions concerning the antenna elements, their mutual arrangement, and in particular the claimed geometry and arrangement of the transition piece are disclosed on page 3, lines 7 to 34, and by the description of Figure 2 on page 4, line 32 to page 5, line 14, of the originally-filed description.

The respondent saw added subject-matter in the fact that claim 1 under consideration attributed the effects of capillary action and surface tension specifically to

the distance by which the cylindrical part of the transition piece extended axially into the conical part of the conical horn, whereas according to page 5, lines 10 to 12, of the description as originally filed said effects were disclosed to be the result of a certain "design" in general. Moreover, the original disclosure did not refer to a transition piece having a circular cross-section in general but only to a transition piece the tapering part of which was conical. Omitting the limitation "conical" from the claim definitions constituted an unallowable intermediate generalisation.

The board notes that the originally-filed description refers to a "design" at several occasions (page 2, lines 15 to 16 and 18 to 25; page 3, lines 14 and 27 to 34; and page 4, line 32 to page 5, line 1, of the description as originally filed). In virtually all of these passages it is made clear that it is the design of the transition piece which is meant. Therefore, there can be no reasonable doubt that the further reference to the "design according to the invention" on page 5, lines 10 to 12, of the original description, in the context of which reference is made to the effects of capillary action and surface tensions, also refers to the transition piece and its special arrangement within the horn. In particular, the design of the horn and the transition piece is such that the axial extent of the cylindrical part is long enough to ensure that the capillary and surface tension effects cannot retain the accumulated water beyond the outer limit of the cylindrical part. Furthermore, the board concurs with the appellant that what matters for the invention according to the originally-filed application documents is the fact that the transition piece is composed of a

specifically arranged cylindrical part which ends in a tapering part, whereas the fact whether the tapering part is conical or not has apparently no effect on the solution of the problem to restrict the occurrence of water to the annular space.

4.2 The change of claim category from a physical entity (a horn antenna) to a specific use thereof substantially limits the scope of protection with respect to that conferred by the patent as granted (G 2/88 (OJ 1990, 93)).

4.3 For the above reasons, the board considers the appellant's request on file to comply with the requirements of Articles 123(2) and (3) EPC.

5. Clarity (Article 84 EPC 1973) and sufficiency of disclosure (Article 83 EPC 1973)

5.1 According to the respondent, the definition in claim 1 of the "distance" by which the transition piece should extend into the conical part of the conical horn was unclear and this lack of clarity gave rise to a problem of sufficiency of disclosure. The claim definition related said distance to a functional feature which was unclear in itself and in contradiction to other claim features which defined the extension of the annular space. More specifically, the respondent wondered how additionally condensed water could be drawn to the annular space (by capillary action) and at the same time run off from said space, because the very same capillary action was not able to retain such water. Moreover, it became clear from Figure 2 of the patent that the condensate in contact with the wall of the

horn's conical part could creep in an axial direction further into the horn than the condensate in contact with the transition piece. Therefore it was impossible to attribute a precise meaning to the claimed distance.

Furthermore, due to the fact that the condensate around the cylindrical surface of the transition piece prevented microwaves exiting or entering the transition piece at that portion, it was not conceivable how the transition piece could be formed and arranged so as to meet the claimed requirement that any water retained in said annular space would not restrict microwaves transmitted through the transition piece.

Since the description did not help to clarify these issues, a skilled person was not in a position to determine a proper shape and arrangement of the transition piece within the horn antenna so as to meet the claim definitions.

5.2 Although the board agrees with the respondent that the geometry and mutual arrangement of the essential antenna elements could have been defined in a more precise and straightforward manner, it becomes nevertheless apparent from the wording of claim 1 that the crucial aspects of the construction are the shape and extension of the annular space which occurs between the transition piece and the conical part of the antenna's horn and where, in the envisaged use of the antenna, condensed water will collect. In this context, the claim definitions leave no doubt that, towards the central axis of the horn, the annular space is confined by the transition piece and, more specifically, by a cylindrical part thereof which extends axially a

certain distance into the conical part of the horn and that it is this distance which separates the base of the tapering part of the transition piece from the narrower part of the horn. The said distance (*ie* the length of cylindrical part of the transition piece which extends into the conical part of the horn) is indeed characterized by functional definitions. However, contrary to the respondent's submission it is clear from these definitions that the said distance has to be at least so great that any build-up of condensed water collecting in the horn remains confined within the annular space around the cylindrical part (with possible excess condensing water dripping off) in such a manner that no such build-up of condensate will occur beyond the base of the tapering part of the transition piece where it would unavoidably impede the transmission of microwaves. Certainly, such a minimum length of the cylindrical part of the transition piece will vary, depending for instance on the angle by which the conical part of the horn widens (and thus the extent of capillary action) as well as on the surface properties of the materials forming the walls of the annular space. In this context, the exact extent of the collected condensate along the conical part of the horn is apparently immaterial. What matters and what is evident from the claim definitions is the axial extent of the collected condensate along the cylindrical part of the transition piece. It is this dimension which defines the extent of the annular space and consequently defines the distance with which the cylindrical part projects into the horn. For these reasons the board has no doubt that the notionally skilled person is in a position to determine, on the basis of the guidance given in claim 1 under

consideration, a suitable distance by which the cylindrical part of the transition piece has to extend into the conical part of the horn so that no condensed water will collect on the surface of the tapering part of the transition piece.

The respondent's further objection against the last feature of claim 1 that water present at the surface of the cylindrical part of the transition piece would inevitably restrict microwaves which allegedly leave or enter the transition piece laterally ignores the fact that the cylindrical part of the transition piece acts as an extension of the waveguide into the conical horn and that it is the tapering part of the transition piece through which microwave radiation is predominantly emitted or captured.

For the above reasons, the board has come to the conclusion that the appellant's request meets the requirements of Articles 83 and 84 EPC 1973.

6. Novelty and inventive step (Articles 54(1) and (2) and 56 EPC 1973)

6.1 It is common ground between the parties that, in view of the amendments made to the patent, document M9 constitutes the closest prior art because it is the sole document of the cited prior art which shows the use of a fluid-level-measuring horn antenna exposed to an atmosphere in a tank for downward facing operation and for the transmission of microwaves.

6.2 According to the respondent, the antenna which was used according to document M9 contained not only all those

features which preceded the word "wherein" in claim 1 under consideration but showed in addition a transition piece the tapering part thereof being arranged to exist at least to a significant extent outside a water-fillable annular space, in particular in situations where little condensation of water occurred. Moreover, as could be gathered from Figures 3, 5 and 7 of M9, the transition piece possessed a cylindrical part, which extended a small distance axially into the conical part of the conical horn and thus formed an annular space within the meaning of claim 1 under consideration. Given the vagueness of the claim definitions at hand, it was impossible to tell whether the known antenna also met the functional definitions of present claim 1 when being used, because it was not clear whether or not the build-up of condensate would be limited to the annular space formed by the cylindrical part of the transition piece and that additionally condensed water would run off.

At any rate, starting from document M9, a skilled person would be naturally tempted to improve the quality of operation and thus would have turned to other existing prior art in this respect. In this context, he would have learned from document M4 that the directive characteristic of a horn antenna could be improved by a transition piece which extended axially a considerable distance into the conical part of the conical horn before it merged into a tapering part. Applying such a structure and arrangement of the transition piece to the fluid-level-measuring tank antenna of document M9 in order to improve the antenna's directivity would have directly led the skilled person to a construction which inevitably

fulfilled the claimed functions : a direct consequence of this construction was the prevention of a build-up of condensate on the tapering part of the transition piece.

Alternatively, observing a problem with water condensation in the horn of document M9, the skilled person would have looked for other geometries of horn antennas used in humid environments and thus would have found in each of documents M2 and M6 examples of horn antennas having a transition piece a cylindrical part of which significantly extended axially into the conical horn.

6.3 In the board's view, document M9 discloses a fluid-level-measuring horn antenna and its use in a tank for downward facing operation in accordance with the features which precede the word "wherein" in present claim 1 (Figures 3, 5 and 7 with the corresponding description). Contrary to the opinion expressed by the appellant during the oral proceedings, the board considers it implicit to the indication of an intended use as a microwave level gauge in a container such as a rail car, or in chemical processing vessels, waste storage tanks, ships and barges (column 1, lines 13 to 20) that operation of the known antenna is envisaged in an atmosphere causing condensation of water so that the annular space which exists between the conical horn and the transition piece inevitably fills with condensed water.

However, the board cannot agree that document M9 teaches any of the features and functions defined in claim 1 subsequent to the word "wherein". In the

absence of any indication in M9 as to the problem of water condensation in the annular space around the transition piece where it enters the conical part of the horn, to a possible role of the cylindrical part of the transition piece in forming such an annular space, or to the need of keeping the tapering part of the transition piece entirely outside the water-fillable annular space, any - at best minuscule - extension of the cylindrical part into the conical part of the horn, as it could appear from a meticulous inspection of Figure 3 of M9, would certainly go unnoticed by a skilled reader of the document. In fact, there is simply no clear and unambiguous teaching derivable from M9 of the structure and arrangement of the transition piece as set out in claim 1 under consideration, let alone of the claimed associated effects of keeping the build-up of condensed water away from the tapering part of the transition piece.

6.4 Therefore, the subject-matter of claim 1 under consideration is novel with respect to the teaching of document M9. Likewise it is novel with respect to any of the other documents of the cited prior art, at least for the simple reason that none of these documents discloses the claimed use of a horn antenna for measuring the fluid level in a tank.

6.5 As will be shown in the following, the claimed subject-matter is also not rendered obvious to the skilled person by the cited prior art.

6.5.1 Document M4 refers to an antenna with an elongated transition piece, which is termed "polyrod" and composed of a cylindrical part and a tapering part, and

with a significantly shorter conical horn that encloses the cylindrical part and a portion of the tapering part of the transition piece (Figures 1 and 2; and column 1, lines 17 to 54). The teaching of document M4 seeks an improvement of the directive characteristics of the antenna structure (column 1, lines 21 to 35). Such improvement is expressly attributed to the presence of the horn, which serves to suppress minor lobes at the side of the antenna's main lobe (column 1, lines 51 to 54; column 2, lines 51 to 56; Figures 3 and 4).

However, no attention is paid to the distance by which the cylindrical part of the transition piece extends axially into the conical horn. Therefore, document M4 does not support the appellant's allegation that the skilled person, following the example of document M4, would have considered to improve the directive characteristics of the horn antenna of document M9 by elongating there the cylindrical part of the transition piece so that it would extend a considerable distance axially into the conical horn. Rather, the board shares the appellant's view that the teaching of document M4 does not incite the skilled person to modify the arrangement of the transition piece in the antenna known from document M9 in the claimed manner.

6.5.2 Document M2 shows a horn antenna which has a horn in the form of a truncated quadrangular pyramid and a transition piece in the form of a slab of fixed height which comprises a part of constant width that extends axially into the horn and merges at its free end into a tapered part (Figures 1 to 3 and the corresponding description in the English translation). The document teaches that the voltage-standing-wave-ratio (VSWR) can

be reduced by increasing the width of the slab (sections [0011] to [0015] of the description).

Although the document mentions a possible use of the antenna in vehicle-mounted radar devices (section [0002]), where humidity could be a matter of concern, there is no suggestion that the specific shape and arrangement of the transition piece would have the effect of keeping condensing water away from the tapering piece. Thus, even if the skilled person had recognised a problem with condensing water in the use of an antenna as known from document M9, he would have had no reason to expect to find a solution to this problem from the antenna structure known from document M2. Therefore, the board fails to see that document M2 would provide any motivation which could have incited the skilled person to modify the antenna structure of document M9 in the claimed manner.

6.5.3 Document M6 discloses a horn antenna which is intended to be used in environments where the condensation of water within the horn could lead to serious problems, such as corrosion (page 4, first paragraph of the English translation). The solution to this problem proposed by document M6 consists in the provision of a dielectric window which seals the horn and of an arrangement which allows the sealed interior of the horn to be flushed by dry air (Figure 2 and the corresponding description).

Although it can be gathered from the schematic drawings of Figures 1 to 3 of M6 that the transition piece has a cylindrical part which extends axially a considerable distance into the conical horn, the description does

not pay any attention to this arrangement. Therefore, document M6 may motivate the skilled person to seal the horn antenna of document M9 and flush it with dry air but it does not incite him to change the structure and arrangement of the transition piece in the antenna of document M9 since no reasons for adopting this arrangement have been elaborated in M6.

6.6 For the above reasons, the board considers the subject-matter of claim 1 of the appellant's request to be novel and inventive so that the appellant's request complies with the requirements of Articles 54(1) and (2) and 56 EPC 1973.

Dependent claim 2 relates to an advantageous embodiment of the invention defined in claim 1.

7. The amended description also complies with the requirements of the EPC.

8. In summary, the Board has come to the conclusion that, taking into consideration the amendments made to the patent documents according to the appellant's sole request, the patent and the invention to which it relates meet the requirements of the EPC (Article 101(3)(a) EPC).

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 with the order to maintain the patent in amended form based on claims 1 and 2 and description columns 1 to 4 filed at the oral proceedings of 12 November 2009, and Figures 1 and 2 as published.

The Registrar | The Chairman

R. Schumacher | B. Schachenmann