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Aktenzeichen:  
Case Number: T 36/82  
N° du recours :

**ENTSCHEIDUNG / DECISION**

vom / of / du 25 October 1982

Anmelder:  
Applicant: CSELT Centro Studi e Laboratori Telecomunicazioni S.p.A.  
Demandeur :

Stichwort:  
Headword: Parabolic reflector antenna  
Référence :

EPÜ / EPC / CBE Article 52(1), 56  
"Inventive Step"

**Leitsatz / Headnote / Sommaire**

*Inventive step is not considered to be constituted by efforts directed at the concurrent optimisation of two parameters of a particular device by the simultaneous solution of two equations which are known per se and respectively express these parameters as functions of certain dimensions of the device. The fact that it has proved possible to find a range of values for the dimensions in question which provide an acceptable compromise between the two parameters cannot be considered surprising where there are indications in the prior art suggesting that favourable results might be obtained by the method of calculation applied.*

Europäisches  
Patentamt

Beschwerdekammern

European Patent  
Office

Boards of Appeal

Office européen  
des brevets

Chambres de recours



Case Number: T 36 / 82

**DECISION**  
of the Technical Board of Appeal 3.5.1  
of 25 October 1982

**Appellant:** CSELT Centro Studi e Laboratori Telecomunicazioni S.p.A.  
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**Decision under appeal:** Decision of Examining Division 046 of the European Patent  
Office dated 25 May 1981 refusing European patent  
application No 79 101 368.3 pursuant to Article 97(1)  
EPC

**Composition of the Board:**

**Chairman:** G. Korsakoff  
**Member:** J. van Voorthuizen  
**Member:** L. Gotti Porcinari

Summary of facts and submissions

- I. European patent application No. 79 101 368.3 filed on 4 May 1979 (publication number 0 005 487), claiming priority from an application dated 11 May 1978 (IT), was refused by decision of Examining Division 046 of the European Patent Office dated 25 May 1981. That decision was based on the original claims 1 and 2.
- II. The reason given for the refusal was that the subject-matter of the claims did not involve an inventive step, having regard to an article by the inventors, "Feed design method for reflector antennas", European Microwave Conference, September 1973, and to the general knowledge of a person skilled in the art.
- III. The applicant lodged an appeal against this decision on 23 July 1981. The Statement of Grounds was filed on 15 September 1981.
- IV. In a communication of 5 May 1982 the Rapporteur of the Board of Appeal set out objections to the application in respect of lack of inventive step, in view of the article cited by the Examining Division and of the article by S.I.Ghobrial, "Cross-Polarization in Satellite and Earth-Station Antennas", in Proc. of IEEE, vol. 65, no. 3, March 1977, pages 378 - 387, cited by the applicant.
- V. In the course of the oral proceedings which were held on 25 October 1982, the applicant filed slightly amended claims 1 and 2, which in his opinion presented the invention more clearly than the original claims. Although submitted late, these claims were admitted by the Board of Appeal, as they did not introduce any change as to substance but were merely to be considered

as more clearly formulated. The applicant requested that a patent be granted on the basis of the said claims.

These claims read as follows:

1. Radiowaves antenna basically consisting of a parabolic reflector and a simple cylindrical feed, able to radiate according to mode  $TE_{11}$ , or according to the combination of modes  $TE_{11}$  and  $TM_{11}$ , characterised in that, in case of radiation according to mode  $TE_{11}$ , said reflector has a ratio ( $f/D$ ) between the focal distance ( $f$ ) and the maximum diameter ( $D$ ) comprised between 0,46 and 0,50 and said feed has a ratio ( $\alpha$ ) between the aperture radius ( $a$ ) and the central wavelength ( $\lambda$ ) of the utilized frequency band comprised between 0,52 and 0,60; and in case there is also a component of mode  $TM_{11}$ , the above ratios ( $f/D, \alpha$ ) are within a direct proportional range starting from the range of the values for the single mode  $TE_{11}$  and having a slant  $\frac{\alpha}{f/D} = 1.25$  (Fig. 3).
2. Radiowaves antenna according to claim 1, characterised in that the portion of guide feeding the feed has a square cross-section.

VI In the Statement of Grounds, in the reply to the Rapporteur's communication and in the oral proceedings the applicant essentially argues as follows:

It has heretofore not been proposed to construct a reflector antenna having a simple feed which is simultaneously optimised for crosspolarisation level and efficiency, which antenna has a considerable advantage over

the prior art. Moreover an unexpected effect is obtained insofar as it has emerged that efficiency and crosspolarisation level can be simultaneously optimised, at least within a certain range of values for  $\alpha$  and  $f/D$ . The method of arriving at the claimed dimensions is not obvious, as it is based on the combination of a vectorial approach to derive the formula for efficiency and an integral approach permitting a compensation of the crosspolarisation due to the feed by that due to the reflector. Admittedly, the article by Ghobrial mentions the possibility of equating the integral expression for the crosspolarisation component to zero in contrast to the usual method of making the integrand zero, but then the author arrives at a design which is different from that according to the application.

Finally, the analysis made by the Examining Division is theoretical and does not take account of the fact that a number of scientists have already made efforts to optimise antenna performance without, however, having arrived at the simple solution according to the application, the general approach having been to devise sophisticated feeds.

Reasons for the decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.
2. From the article by the inventors referred to above it is known that to obtain maximum efficiency of a front-fed parabolic reflector antenna a certain relationship between  $f/D$  and  $\alpha$  must be maintained. However, it appears from the graphs in that article that a relationship slightly different from the optimum one can be chosen without an appreciable loss in efficiency. It is therefore obvious that in principle other design factors may also be taken into account when determining  $\alpha$  for a given  $f/D$ , and it is common practice that in design work an engineer has to try to find a suitable compromise between different (and possibly conflicting) requirements.
3. A well-known design factor for certain applications of the antennas of the present kind is the level of cross-polarisation. As far as can be seen from the documents cited in the search report and in letters by the applicant, it has not previously been proposed to optimise efficiency and crosspolarisation level simultaneously. High efficiency and a low level of crosspolarisation, however, being generally known as desirable at least for certain applications, it cannot be considered as involving an inventive step to try to optimise these two parameters together.
4. As far as the design method described in the application is concerned, for the determination of the optimum values for the efficiency it rests on a method fully worked out in the above-cited article by the inventors and for the determination of the optimum level of cross-polarisation on the application of a formula for the

.../...

formula was already known per se as admitted by the applicants (see first paragraph on page 2 of applicant's reply of 20 October 1980). In the article by Ghobrial, the possibility is mentioned of equating the whole integral representing the crosspolarisation component to zero, instead of the integrand only, which can be physically interpreted as meaning that "the field at the aperture of the horn feed should be identical to that formed at the focal plane of the reflector when excited by a plane wave". (see page 380 left column line 4 from the bottom - right column line 4)

5. The computation and plotting of graphs for the crosspolarisation level using computer methods appears straightforward and must be considered as lying within the capabilities normally to be expected from a person skilled in this particular art, where computations of a complex nature are quite common.
6. Although perhaps the outcome of these computations could not be predicted beforehand, it does not follow that it is unexpected in the sense that a person skilled in the art would never have expected that there could exist a range of values for  $\alpha$  and  $f/D$  permitting an acceptable compromise between efficiency and crosspolarisation level. It has to be noted in this connection that the range of values for  $\alpha$  and  $\frac{f}{D}$  preferred by the applicant rests on what are considered acceptable values for bandwidth, efficiency and crosspolarisation.
7. It is true that Ghobrial suggests as a general solution a low crosspolarisation feed of a kind different from that according to the application. He goes on to say,

.../...

however, that small conical horn antennas have polarisation characteristics that come close to those of the Huygens' source (i.e. the level of crosspolarisation is very low) but that these are only useful for symmetrical reflectors. This is exactly the configuration which forms the subject of the present application.

Thus, in the opinion of the Board, there was a clear suggestion that the application of the integral approach to an antenna consisting of a small conical feed and a symmetrical reflector could lead to a favourable result.

Under these circumstances, the Board considers that the person skilled in the art would not be deterred from trying out this approach in combination with the known method for optimising the efficiency by the fact that others had already used different approaches to optimise antenna performance.

8. Consequently the subject-matter of claim 1 does not involve inventive step and this claim is therefore not allowable.
9. The conclusion above extends not only to the subject-matter of claim 1 but also to that of claim 2. This claim is dependent from claim 1 and falls with the latter in the absence of any feature introducing subject-matter which could be regarded as non-obvious in the light of the state of the art considered in the proceedings.



For these reasons,

*RF*  
it is decided that the appeal against the decision of the Examining Division 046 of the European Patent Office dated 25 May 1981 is dismissed.

The Registrar:

*J. Klee*  
*JK*

The Chairman:

*G. Kuvshinov*