BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

A		B		C	X

File No.: T 0594/91 - 3.5.1

Application No.: 81 304 803.0

Publication No.: 0 050 478

Classification: H04B 7/185

Title of invention: Satellite communications system and apparatus

D E C I S I O N
of 18 November 1993

Applicant: Equatorial Communications Company

Proprietor of the patent:

Opponent: Agence Spatiale Europeenne
The Secretary of State for Defence in Her Britannic Majesty's Government of the United Kingdom of Great Britain and Northern Ireland
Telecom General Corporation
Deutsche Aerospace Aktiengesellschaft
Alcatel Thomson Faisceaux Hertziens

Headword:

EPC: Art. 56, 84

Keyword: "Clarity (yes), Inventive step (no)"

Headnote
Catchwords

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0594/91 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 18 November 1993

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Decision under appeal:

Decision of the Opposition Division of the European Patent Office dated 31 May 1991 revoking European patent No. 0 050 478 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: P.K.J van den Berg
Members: A.S. Clelland
F. Benussi

Summary of Facts and Submissions

I. European patent No. 0 050 478 claiming a priority date of 20 October 1980 was granted on 15 January 1986 on the basis of European patent application 81 304 803.0, filed on 15 October 1981.

II. Five oppositions were filed, the primary ground of each being that the subject-matter of the patent was not new or did not involve an inventive step (Article 100(a) EPC). More than 60 documents were cited by the Opponents (Respondents), including the following:

D2: IEEE Spectrum, October 1979, pages 30 to 37, Bargellini: "Commercial US satellites".

D4: IBM Journal of Research and Development, Vol.9, No.4, July 1965, pages 241 to 255, Blasbalg: "A comparison of pseudo-noise and conventional modulation for multiple-access satellite communications".

D5: IEEE Transactions on Aerospace and Electronic Systems, Vol.AES-4, No.5, September 1968, pages 774 to 791, Blasbalg: "Air-ground, ground-air communications using pseudo-noise through a satellite".

D6: ELECTRONICS & POWER, March 1980, pages 222, 224, Buckingham: "The spread spectrum controversy".

D7: Magnavox company, pages 5-1, 5-2, Cahn: "Spread spectrum applications and state-of-the-art equipments".

D10: Microwave Systems News, Vol.5, June/July 1975, pages 19, 20, 22, 26, 30, 31, 36 to 40, 42, Cuccia et al.: "The low-cost low-capacity earth terminal".

D11: Defense Communications Agency: "Satellite communications reference data handbook", July 1972, pages 1-10, 6-4, 6-5, 6-20 to 6-23.

D13: Dixon: "Spread spectrum systems", 1976, pages 6, 7, 140, 205 to 210, 265 to 268, Wiley Interscience.

D14: EASCON '69 Conference Record, pages 126 to 132, Drouilhet et al:" TATS - a bandspread modulation-demodulation system for multiple access tactical satellite communication".

D37: Martin: "Communications satellite systems", 1978, pages 22, 53, 145, 365 to 267, Prentice Hall.

D55: EASCON '79 Conference Record, October 1979, Vol.3, pages 617 to 622, Ricardi: "Some factors that influence EHF SATCOM systems".

D56: Telecommunications Journal, Vol.45 - I/1978, Utlaut: "Spread-spectrum principles and possible application to spectrum utilization and allocation".

D59: IEEE Communications Magazine, Vol.17, No.3, May 1979, pages 11 to 18, Viterbi: "Spread spectrum communications - myths and realities".

III. Oral proceedings were held before the Opposition Division on 9 April 1991. The Patent Proprietor (Appellant) requested that the patent be maintained on the basis of Claims 1 and 16 filed with a letter received on 25 March 1991 ("second auxiliary request") with the addition of a reference to the satellites having a predetermined minimal orbital spacing, which appeared in the claims as granted ("modified second auxiliary request"). By its decision pronounced at the end of the oral proceedings and submitted in writing on 31 May 1991 the Opposition Division revoked the patent.

IV. On 1 August 1991 the Patent Proprietor (Appellant) lodged an appeal against this decision and paid the prescribed fee. The Appellant requested that the impugned decision be set aside and the patent be maintained. A conditional request was made for oral proceedings before the Board. A written statement setting out the grounds of appeal was filed on 2 October 1991.

V. In a letter received by fax on 1 October 1993 the Appellant withdrew the request for oral proceedings. In a subsequent letter received on 5 November 1993 the Appellant stated that his request that the patent be maintained should be interpreted as including the main and first auxiliary requests specified in the letter received on 24 January 1990 and the second auxiliary request. Additionally, in place of the latter request, the modified second auxiliary request should be considered if the Board took the view that objection under Article 123 EPC would otherwise arise.

VI. Claim 1 of the main request reads as follows:

"An earth satellite communications system employing one of a plurality of repeating geostationary satellites having a predetermined minimum orbital spacing, the system comprising the geostationary satellite (3), and wherein messages are transmitted to the satellite to be relayed to a plurality of receiving earth stations (4) each equipped with an antenna (5), the messages being transmitted using spread spectrum processing, characterised in that the antennae (5) have a beamwidth greater than the said minimum orbital spacing, and by a central earth station (14) which transmits the messages to the satellite with a characteristic spread spectrum processing such that each receiving earth station (4), which applies corresponding spread spectrum processing to received messages, detects only messages with the said characteristic spread spectrum processing and ignores messages received from other satellites."

VII. Claim 1 of the first auxiliary request corresponds to that of the main request but includes the words "having a beamwidth depending on the operating frequency and the antenna size" after "antenna (5)".

VIII. Claim 1 as considered by the Opposition Division at the oral proceedings (the modified second auxiliary request) reads:

"An earth satellite communications system employing one of a plurality of repeating geostationary satellites having a predetermined minimum orbital spacing, the system comprising the geostationary satellite (3) and a central earth station (14) which transmits messages to the satellite with a spread spectrum processing to be relayed to a plurality of receiving earth stations (4) each equipped with an antenna (5) and means (30, 239)

for detecting the messages, characterised in that the antenna (5) is a directional antenna of a size resulting in a beamwidth such that the earth station receives said spread spectrum processed messages along with interfering signals from at least one other geostationary satellite, said spread spectrum processing using a characteristic code sequence allowing selection by the earth station of the satellite relaying said spread spectrum processed messages and providing a processing gain sufficient despite the beamwidth of said antenna to substantially suppress said interfering signals."

Claim 16 of all the requests is directed to a receiving earth station for use in an earth satellite communications system and includes features corresponding in substance to those of the respective Claim 1.

IX. The Appellant's arguments in support of the patentability of the subject-matter of Claims 1 and 16 can be summarised as follows:

The invention aims at providing earth stations for geostationary satellite communication, equipped with a relatively small diameter dish antenna. Previously it had been taken for granted that for good reception a relatively large antenna was required to ensure that the antenna main beam was sufficiently narrow to receive only the signal from a single geostationary satellite, since if signals were received from a plurality of satellites interference would occur. The invention goes against this widespread belief. The use of a small antenna - so small that signals from neighbouring satellites are also received without significant attenuation - is made possible by employing spread spectrum modulation, which serves to suppress the

interfering signals. Although this kind of modulation was known as such it had never before been used for this purpose.

X. The Appellant requests that the decision be cancelled and the patent be maintained.

Opponent II - the only Opponent to respond - argued in his letter received on 17 January 1992 that the impugned decision was correct and, by fax of 26 October 1993, requested oral proceedings in case the appeal is not refused.

None of the other Respondents has made an express request.

Reasons for the Decision

1. The appeal is admissible.

2. *Allowability of the amendments*

The Board agrees with the view expressed by the Opposition Division in the minutes of the oral proceedings of 9 April 1991 that the omission of the words "having a predetermined minimum orbital spacing" from Claims 1 and 16 of the second auxiliary request gives rise to objection under Article 123(3) EPC. As will be seen from paragraph 4 below the Board considers that these words have a limitative effect, so that their omission extends the protection conferred. The Board has accordingly considered the modified second auxiliary request.

3. *Requests*

The claims of the main, first auxiliary and modified second auxiliary requests differ in language rather than substance. It follows that a finding on novelty and inventive step on the claims of one request will apply to the claims of the other requests. The Board has accordingly considered below the claims of the request which in its opinion are most clearly expressed, namely those of the modified second auxiliary request.

4. *Clarity of Claims 1 and 16*

4.1 In the decision under appeal the issue has been raised as to whether the reference to a minimum orbital spacing of satellites might lead to a third party infringing the patent without any act of his own if further satellites were launched. Infringement is however exclusively a matter for national jurisdictions. The Board will therefore confine itself strictly to a consideration of whether the claims are clear in themselves.

4.2 As pointed out by the Opposition Division in the contested decision, it can be argued that the size of the earth station antenna is indeterminate, in that its beamwidth is defined with respect to the orbital spacing of geosynchronous satellites, a parameter over which the earth station builder has no control and which can be changed by administrative fiat.

4.3 It is noted that an analogous question arose in case T 636/88, the disclosure of which made reference to "standard container dimensions"; this expression was considered by an opponent to be insufficient on the grounds that the skilled man was not told which set of standards was relevant and that standards were constantly being revised. In that case the Board held

that the skilled person would recognise which standard was applicable and that a change in standards did not happen overnight, so that at any one point in time the skilled person would have no difficulty in choosing. The Board furthermore refused to comment on the issue of infringement.

4.4 In the present case, the spacing of satellites is a matter of international agreement and any changes would have to be the subject of extensive consultations; moreover, antenna sizes are largely standardised and the skilled person would know what size of antenna is normally considered the minimum acceptable for any given band. Thus, the reference to satellite spacing does not render the scope of the independent claims indeterminate since when directing any given antenna at any given satellite the skilled person would be aware of the satellite spacing for the band and hence what antenna size would be likely to give rise to interference from neighbouring satellites.

5. *Novelty and Inventive Step*

5.1 The subject-matter of Claims 1 and 16 is novel, in that no single document discloses the use of spread-spectrum modulation in the context of a geostationary satellite system in which the receiving station antenna beamwidth is such that the antenna receives interfering signals from adjacent satellites.

5.2 The Board considers that the correct starting point for the present invention is spread spectrum rather than satellite technology. The Board also considers that the cited documents show that at the claimed priority date the advantages to be gained from the general use of spread spectrum were part of the common general knowledge in the communications art. Reference is

directed to D6, which in a discussion on land mobile radio systems refers at page 224, central column, to a "possible vast improvement in spectral efficiency" from using spread spectrum, a theoretical user density of five times that of narrow-band f.m. being mentioned. The same document indicates at page 222, left hand column, that "only in recent years... the necessary high-speed digital hardware has become available, enabling serious consideration to be given to practical systems". D7 discusses spread spectrum in avionics systems and gives as advantages "capability to reject jamming by interfering signals" and "multiple access by many signals in a common RF channel". D56 refers at page 21, right hand column to spread spectrum techniques having a "high interference rejection capability"; D59 makes clear that this capability is not merely with respect to intentional jamming but also unintentional interference from other users (page 11, right hand column).

5.3 These advantages were also appreciated in the field of satellite communications. D5, a paper on air-ground communications via satellite, highlights the advantages to be gained by the use of spread spectrum and concludes by saying that "...[spread spectrum] modulation has now matured to the point where it may very well prove to be the most efficient and least expensive satellite communications technique in existence." D11 and D13, a DoD handbook and a textbook respectively, show that at the priority date spread spectrum was used in satellite communications, D11 stating at page 6-4 that "By proper choice of codes other SSMA transmission simultaneously present at the receiver will cause relatively small interference". D13 states at page 265 that "In space systems, especially communications satellites, which may be stationary and therefore continuously accessible to interference, spread spectrum methods have proved

effective". From table 9.1 at page 266 it appears that by "interference" is meant jamming; the same table however gives "Interference rejection" as an application of spread spectrum in the area of "Signal protection (non-military)". D4, in a comparison of spread spectrum and conventional modulation for satellite communication, states at page 242, right hand column, that an advantage of spread spectrum is that "Interference from signals using the same bandwidth is suppressed... This 'redundancy' property of the signal permits many signals to share a common, broad band". Interference with existing ground-based microwave links is said to be minimized (page 255, left hand column). D14 indicates at page 130, right hand column, that RFI caused by the use of low-gain antennas for satellite reception in an environment of shared frequency allocations between satellites and other equipment could be overcome by the use of spread spectrum. Finally, D50 refers at page 617, right hand column, to the employment in satellite communications of "spread spectrum techniques that improve the communication system's resistance to undesirable signals".

5.4 From the above analysis of the prior art the Board draws the conclusion that it was at the priority date common general knowledge to employ an earth satellite communications system including a satellite and a central earth station which transmits messages to the satellite with a spread spectrum processing to be relayed to a plurality of receiving earth stations each equipped with a directional antenna and means for detecting the messages, said spread spectrum processing using a characteristic code sequence allowing selection by the earth station of the particular satellite relaying said spread spectrum processed messages and providing a processing gain sufficient to substantially suppress interfering signals.

The only remaining subject-matter in Claims 1 and 16 is that the satellite is one of a plurality of repeating geostationary satellites having a predetermined orbital spacing, and that the antenna is of a size resulting in a beamwidth such that the earth station receives said spread spectrum processed messages along with interfering signals from at least one other geostationary satellite.

5.5 A predetermined minimum orbital spacing for geostationary orbital satellites was at the claimed priority date clearly also common general knowledge.

Furthermore, from D2 and D10, both review articles, and from D37, a book, it appears that at the priority date the skilled person would have been well aware of the conflict between on the one hand the limited spectrum resources and limited geostationary orbital space and on the other hand the desirability of smaller ground antennas in order to make satellite communication links more attractive commercially. D2 shows at page 34 how the effective radiated power (e.r.p) of satellites has increased over the years, permitting lower gain (i.e. smaller) antennas to be used, and explicitly states at page 37 that "the trend to smaller, less expensive antennas runs counter to conservation of the synchronous orbit". This document also points in the direction of digital transmission systems (article bridging pages 32 and 33; page 37, last paragraph). D10 states at page 595, left hand column, that "small earth antennas have an enormous future" and goes on to discuss the cost trade-off between e.r.p., antenna diameter and LNB (Low Noise Block) noise figure; the implication, see particularly page 597, "TV Broadcasting from Space", is that reduction of antenna diameter size is desirable in order to reduce costs. D37 refers at page 53 to "a trend toward smaller earth antennas, suggesting fewer

satellite positions" and states at page 145 that "The larger the antennas, the smaller the beam angle, and the closer the satellites without mutual interference". In this textbook it is also considered that in a practical system some interference will occur, since the same page states that "satellite interference is treated as noise in the link calculations...". At pages 365 and 366 the factors that permit lower costs are enumerated and include the following:

"1. Small antenna.
6. Modulation technique which can tolerate a substantial level of noise and interference."

This appears to be a clear invitation to the skilled person, who is faced with the problem of interference from adjacent satellites, to make use of "a modulation technique which can tolerate a substantial level of noise and interference", i.e. spread spectrum.

5.6 The Board accordingly concludes that at the claimed priority date, the skilled person looking for solutions to the problem of reducing antenna size whilst avoiding interference from adjacent geosynchronous satellites would, without the exercise of invention, have appreciated that spread spectrum processing represented an answer to his problem.

5.7 It follows that the subject-matter of each of Claims 1 and 16 of the modified second auxiliary request lacks an inventive step.

5.8 Since the claims of the Appellant's main and first auxiliary requests do not differ in substance from those of the modified second auxiliary request it follows that the above conclusions apply to them also and that the patent as a whole is not allowable.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Kiehl P.K.J. van den Berg