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D E C I S I O N
of 15 June 2005

Case Number: T 0345/04 - 3.5.3

Application Number: 94304084.0

Publication Number: 0629097

IPC: H04Q 7/04

Language of the proceedings: EN

Title of invention:
Mobile communication apparatus

Applicant:
MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

Opponent:
-

Headword:
Mobile Communication Apparatus/MATSUSHITA

Relevant legal provisions:
EPC Art. 52, 56

Keyword:
"Inventive step - no"

Decisions cited:
-

Catchword:
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Case Number: T 0345/04 - 3.5.3

D E C I S I O N
of the Technical Board of Appeal 3.5.3
of 15 June 2005

Appellant: MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 22 September 2003 refusing European application No. 94304084.0 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: A. S. Clelland
Members: A. J. Madenach
M.-B. Tardo-Dino

Summary of Facts and Submissions

I. The present appeal is from a decision of the examining division to refuse patent application no. 94304084.0. The written decision was dispatched on 22 September 2003.

II. This decision was based on the ground of lack of an inventive step (Art. 52, 56 EPC) in the subject-matter of independent claim 1 with respect to the disclosure of, *inter alia*:

D1: GLOBECOM 91, vol. 2, 2 December 1991 - 5 December 1991, PHOENIX, USA, pages 1006-1011, CHIH-LIN et al., "A Microcell/Macrocell Cellular Architecture for Low- and High-Mobility Wireless Users"

D4: RAMSDALE P A; HARROLD W B: Techniques for Cellular Networks Incorporating Microcells", IEEE International Symposium on Personal, Indoor and Mobile Radio, 1992, pages 169-173

The examining division in their decision considered D1 as the closest prior art and concluded that D1 disclosed all the features of claim 1 apart from the feature that "the frequency re-use factor with which said small zones having the same frequency assigned thereto are designed to operate is larger than said minimum frequency re-use factor".

The examining division argued that the use of a less than or equal to sign in inequality 8 of D1, which gave a limit to the signal-to-interference ratio for the system to operate in an acceptable way, would suggest

to the skilled person that a range of re-use factors could be used. A larger than minimum re-use value would be chosen in order to guarantee an acceptable signal-to-interference factor even under potentially adverse conditions.

The examining division referred also to D4 and considered the reference to "possible co-channel regions [being] separated by at least the minimum re-use distance" on page 170, left column, lines 23 and 24 of D4 would suggest to the skilled person that a re-use factor larger than the minimum re-use factor should be considered.

III. The applicant (appellant) appealed this decision with a letter dated 28 November 2003 and confirmed on 1 December 2003. A corresponding statement of grounds of appeal dated 2 February 2004 was confirmed on 4 February 2004. The appellant requested that the decision under appeal be set aside and a patent be granted based on the claims considered in that decision. As an auxiliary measure, oral proceedings were requested.

The applicant in his grounds of appeal basically argued that the skilled person would naturally aim to use the minimum possible re-use factor. No clear documentary evidence to the contrary had been brought forward. The re-use factor which would provide low interference under real operating conditions as considered under point 2 of the examining division's decision corresponded to the minimum re-use factor as claimed. This minimum re-use factor was not a theoretical minimum as appeared to be understood by the examining

division but the minimum re-use factor in a practically operating system.

IV. Oral proceedings were appointed for 15 June 2005. In an annex to the summons to oral proceedings, dated 14 March 2005, the board gave its preliminary opinion with respect to the claimed subject-matter.

V. With letter of 12 May 2005 the appellant declared that he would not attend the oral proceedings.

VI. Nevertheless, oral proceedings took place on 15 June 2005 as scheduled in the absence of the party. At their end, the chairman announced the board's decision.

VII. Independent claim 1 according to the appellant's sole request and considered in the decision under appeal reads as follows:

"A mobile communication system comprising a personal station (6) having means for accessing both a cellular automobile telephone system (2, 3) and a micro cellular system (4, 5), said cellular automobile telephone system covering a service area which is divided into a plurality of small zones (7) and having a given maximum frequency utilization efficiency defined as a minimum frequency re-use factor of said small zones having a same frequency assigned thereto, said minimum frequency re-use factor being the smallest re-use factor with which the cellular automobile telephone system is capable of operating, and said micro cellular system covering a coverage area which is divided into a plurality of small areas (8) all of which are located within one of said small zones,

characterised in that:

said personal station performs communications in a digital mode;

said means for accessing connects said personal station to said cellular automobile telephone system and said micro cellular system by using a time-division multiplex access mode;

the frequency re-use factor with which said small zones having the same frequency assigned thereto are designed to operate is larger than said minimum frequency re-use factor;

a common frequency band is used by said cellular automobile telephone system and said micro cellular system;

when said personal station is accessing to said micro cellular system, said personal station is assigned a radio channel in said common frequency band, which radio channel is not currently being used in any of said small zones which are neighbours of said personal station."

Claim 2 is dependent on claim 1 and specifies minimum and operational frequency re-use factors of four and seven respectively.

Reasons for the decision

1. *Background of the invention*

The present invention relates to a mobile communication system with a two-tier architecture comprising larger cells (small zones in the terminology of claim 1) to serve fast moving users (thus the terminology

"automobile telephone system" for the system formed of the larger cells) and micro cells formed within one of the larger cells serving more stationary users in areas of high demand. Such systems are intended to provide a balance between maximizing the number of users which can be served and reducing the network control associated in particular with handoffs; they are described in D1 and D4 (see the respective abstracts).

2. *Inventive step (Art. 56 EPC)*

2.1 The examining division considered D1 as the single most relevant prior art document. This finding has not been contested by the appellant, and the board sees no reason to differ.

With the sole exception of the last feature of claim 1, the feature analysis of the claim by the examining division with respect to the disclosure of D1 is not disputed by the applicant. The board agrees with the undisputed portion of the examining division's feature analysis.

In detail, D1 discloses a mobile communication system comprising a mobile subscriber, i.e. personal station, having means for accessing both a cellular automobile telephone system and a micro cellular system (page 1006, left column, lines 1-5 and Figure 1), said cellular automobile telephone system covering a service area which is divided into a plurality of small zones (loc. cit.; small zones correspond to macrocells in the terminology of D1) and having a given maximum frequency utilization efficiency defined as a minimum frequency re-use factor of said small zones having a same

frequency assigned thereto, said minimum frequency re-use factor being the smallest re-use factor with which the cellular automobile telephone system is capable of operating. The board notes that this feature is merely a definition of the term "minimum re-use factor" for the small zones; in D1, frequency re-use is used as well, see page 1008, right column, penultimate paragraph, whilst inequality 8 in the same column implies a minimum re-use factor through the direct relationship between re-use factor and signal-to-interference ratio limited by this inequality. The micro cellular system of D1 covers a coverage area which is divided into a plurality of small areas all of which are located within one of said small zones (see Figure 1; as noted above the "small areas" are the areas of the micro cells). The personal station performs communications in a digital mode (see the reference to TDMA and CDMA in the abstract and at page 1006, right column, last paragraph). In one of the four systems described in D1, system III, the means for accessing connects the personal station to the cellular automobile telephone system and said micro cellular system by using a time-division multiplex access mode (see page 1007, left column, lines 22-24), a common frequency band being used by said cellular automobile telephone system and said micro cellular system (loc. cit.).

2.2 With respect to the last feature of claim 1, it is noted that the examining division in their analysis quoted the feature as "when said personal station is accessing a radio channel in said common frequency band, which radio channel is not currently being used in any of said small zones which are neighbours of said

personal station" whereas the feature as actually claimed reads "when said personal station is accessing **to said micro cellular system, said personal station is assigned** a radio channel in said common frequency band, which radio channel is not currently being used in any of said small zones which are neighbours of said personal station", the part in bold having been omitted by the examining division.

This omission gives this feature a slightly different sense as has been pointed out by the appellant in his grounds of appeal, and it is not clear whether the examining division considered the feature as actually claimed or as quoted in their decision. It is therefore necessary to analyse whether this feature in the form as actually claimed is disclosed in D1.

The first part of this last feature, i.e. "when said personal station is accessing to said micro cellular system, said personal station is assigned a radio channel in said common frequency band", is according to the board's understanding a tautology or at least an inevitable consequence of the feature that "a common frequency band is used by said cellular automobile telephone system and said micro cellular system". This is known from D1 as has been shown before.

As regards the second part of the feature, i.e. "which radio channel is not currently being used in any of said small zones which are neighbours of said personal station", the board understands paragraph 4: "Orthogonal Sharing: Systems III and IV" of D1 (the paragraph bridging pages 1010 and 1011), and in particular the term "orthogonal" and "the latter system

imposes frequency reuse factors twice on the microcells" in that paragraph, to imply that frequency re-use has to be excluded between neighbouring microcells and between a given micro cell and neighbouring small cells (in the terminology of claim 1). Thus, this feature is also known from D1. In any case, it does not appear to make technical sense to have a minimum re-use factor for the small cells (in the terminology of claim 1), which usually excludes using the same frequency in neighbouring cells if the frequency is used over the whole of the cells, and allow at the same time frequency re-use between neighbouring cells if the frequency is used in a micro cell within one of the neighbouring cells because the position of the micro cell can be anywhere within the small cell.

2.3 According to the decision of the examining division, the subject-matter of claim 1 differs from the disclosure of D1 by the feature "the frequency re-use factor with which said small zones having the same frequency assigned thereto are designed to operate is larger than said minimum frequency re-use factor". In view of the analysis under points 2.1 and 2.2 above it will be clear that the board agrees with this finding. The board notes that the term "minimum frequency re-use factor" defined as being "the smallest re-use factor with which the cellular automobile system is capable of operating" could, prima facie, be objected to as being not clear since there is no well-defined understanding of what is meant by "capable of operating" (Art. 84 EPC). The board, however, is aware that similar expressions have been used in the prior art and refers to D4, page 170, left column, lines 21-27, which gives

the minimum re-use factor for a specific GSM system. In agreement with the appellant the board understands this expression to mean the minimum re-use factor in real systems and not the theoretically possible lowest re-use factor.

2.4 The problem solved by this feature can be seen in an increased margin against interference (column 10, lines 12-14; references in this decision are to the published application) and is well appreciated in the art. It is well understood in the art that there exists a trade-off between an increased margin against interference and the overall capacity of a cellular system, see for example D4 at page 170, left column, lines 10-27 which refers to "at least" the minimum re-use distance, implying that higher re-use factors can be used.

It is part of routine system design when setting up a new cellular phone system to establish the appropriate re-use factor. Doing this, the skilled person could be expected to take into account not only theoretical considerations but also field trials. In particular in the case of a system not yet practically implemented (see column 1, lines 9-13), the skilled person would explore the limits of the re-use factor with a view to optimizing the above trade-off. As noted above, D4 suggests using "**at least** the minimum re-use distance" of one of the sub-systems (emphasis added by the board; the system of the small zones in the terminology of claim 1) in order to achieve the best result for the carrier-to-interference ratio and capacity of the whole system. Following the teaching of D4, the skilled person would start out from the minimum re-use distance

of the sub-system and explore higher re-use distances as suggested by D4 whilst observing the resulting carrier-interference-ratio and capacity.

In the board's opinion, the performance of such routine system optimisation does not justify an inventive step in the sense of Art. 56 EPC.

2.5 The appellant has argued in his grounds of appeal basically along two lines in support of an inventive step.

The first argument is based on the assumption that the examining division misunderstood the term "minimum re-use factor" in claim 1 to mean the theoretically possible minimum re-use factor which does not consider a safety margin for real systems, whereas the "minimum re-use factor" according to claim 1 was the re-use factor for real systems. The system claimed in claim 1 required a re-use factor larger than this real system minimum re-use factor.

According to the board's understanding of page 170, left column, lines 15-24 of D4 the minimum re-use factor considered in D4 is already the minimum re-use factor for real systems, i.e. the theoretical minimum re-use factor plus a margin. With this assumption, the wording "at least the minimum re-use distance" in the above citation must be interpreted to suggest a re-use factor larger than a real system minimum re-use factor in the sense of claim 1.

The appellant appears to have considered the possibility of such an interpretation of D4 in the second paragraph of page 5 of the statement of grounds of appeal.

According to the appellant's second line of argument, a re-use factor larger than the minimum re-use factor resulted in an unexpected increase in the capacity of the overall system consisting of small and micro cells whereas an increased re-use factor would according to common wisdom reduce the capacity of a cellular phone system. According to D4 the re-use factor was increased in order to improve the interference ratio to the detriment of the signal capacity. The present invention, on the contrary, was based on the insight that a higher re-use factor for the particular system consisting of small cells and micro cells as defined in claim 1 increased the capacity of the overall system, whereas it decreased the capacity of a system consisting of small cells alone. D4 did not suggest anything similar.

The board has difficulty in understanding this argument. According to common interpretation, the term "capacity" means the maximum number of simultaneous phone connections possible in a given cell. The appellant has given no evidence, nor is there any indication in the application as filed, that the "capacity" of the overall system in this sense is increased by the system as claimed. To the board it rather appears that the claimed system increases the likelihood for the micro cells of finding a radio channel which is free from interference, as originally expressed in column 10, lines 22-30. Only in this sense

it is meaningful to speak about an increase of the capacity of the overall system.

The board acknowledges that D4 and the other cited documents are indeed silent about the effect of an increased capacity, understood in the above sense, achieved by increasing the re-use factor in the system according to claim 1. It appears to the Board, however, to be self-evident to the skilled person that the likelihood for the micro cells of finding a radio channel which is free from interference increases as soon as small cells using the same frequency band as the micro cells are further away from the micro cells, in other words, if the re-use factor is increased.

An increased capacity, understood in the sense considered above, is thus not only unsurprising to the skilled person but is also an inevitable by-product of choosing an appropriate re-use factor; making such a choice does not involve inventive activity as has been discussed under point 2.4 above.

3. As a consequence of the above analysis, the board concludes that the subject-matter of claim 1 of the sole request does not fulfil the requirement of Article 56 EPC. Therefore, the appeal must be dismissed.

Order

For these reasons it is decided:

The appeal is dismissed.

The Registrar: The Chairman:

D. Magliano A. S. Clelland