Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 15 October 2020

Case Number: T 2279/15 - 3.4.01

Application Number: 10831783.5

Publication Number: 2503639

IPC: H01Q9/16, H01Q21/10, H01Q5/00, H01Q1/24, H01Q9/04, H01Q21/24

Language of the proceedings: EN

Title of invention:
INSTALLATION METHOD OF RADIATING ELEMENTS DISPOSED ON DIFFERENT PLANES AND ANTENNA USING SAME

Applicant:
KMW Inc.

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (no)

Decisions cited:
T 0694/15

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 2279/15 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 15 October 2020

Appellant: (Applicant)	KMW Inc. 65, Yeongcheon-ri Dongtan-myeon Hwaseong-si Gyronggi-do 445-813 (KR)
Representative:	Grünecker Patent- und Rechtsanwälte PartG mbB Leopoldstraße 4 80802 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 20 July 2015 refusing European patent application No. 10831783.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	B. Noll
Members:	T. Alecu
	R. Winkelhofer

Summary of Facts and Submissions

I. The appeal is against the decision of the Examining Division to refuse European patent application 10831783.5 pursuant to Article 97(2) EPC. The grant of a patent had been requested on the basis of a main request and two auxiliary requests.

II. The Examining Division held that the main request lacked clarity, and that all requests lacked inventive step. Documents drawn upon before the Examining Division were:
D1: US 2006/114168 A1
D4: US 6188373 B1
D7: US2003/011529 A1

III. With the statement of grounds of appeal, the appellant requests that the decision of the Examining Division be set aside and that a patent be granted on the basis of one of the requests already on file.

IV. In a communication accompanying a summons to oral proceedings, the Board informed the appellant of its provisional opinion that the decision of the Examining Division was correct in that all requests lacked an inventive step.

V. The appellant filed no further requests, neither before, nor during the oral proceedings, which took place as scheduled.

VI. Claim 1 of the main request defines (reference signs omitted):
An antenna having radiator elements arranged on different planes, comprising:

a reflective plate;

a first-position radiator element placed on a first plane at a first height over the reflective plate;
a second-position radiator element placed on a second plane at a second height over the reflective plate, the second height being different from the first height; and

power supply cables connected to the first-position radiator element and the second-position radiator element;

a radiator element of another frequency band,
wherein:

a length difference between the power supply cables is determined according to a phase difference between signals radiated in the air from the first-position radiator element and the second-position radiator element by a phase difference between the power supply cables according to a position difference between the planes on which the first-position radiator element and the second-position radiator elements (sic) *are placed,*

the radiator element of another frequency band is a patch-type radiator element having a top patch plate and a bottom patch plate,

the first-position radiator element and the second-position radiator element are of a dipole type, and

the first-position radiator element or the second-position radiator element is stacked on the top patch plate of the radiator element of another frequency band, and use the top patch plate as a ground.

VII. Claim 1 the first auxiliary request differs from that of the main request by further specifying:
and wherein the power supply cable connected to the second-position radiator element is fabricated to a length that compensates for the phase difference.

according to information about a phase variation per a unit length of the power supply cable

VIII. Claim 1 of the second auxiliary request differs from that of the first auxiliary request by further specifying:
wherein at least one corner of the top patch plate is bent.

Reasons for the Decision

Summary of the invention and of the prior art

1. The invention relates to dual-band dual-polarization antennas, in which a radiator element of a first frequency band (high, e.g. 2GHz) is stacked on a radiator element of a second frequency band (low, e.g. 800MHz) (2nd paragraph of the description). These stacked radiator elements are arranged on a reflective plate, and further radiator elements of the second frequency band are arranged in-between, directly on the reflecting plate (3rd paragraph).

2. According to the application, this arrangement is compact, but leads to that the high frequency elements are not disposed at the same height which causes a phase difference in the radiated signal (4th paragraph). The claimed invention proposes to compensate for the height induced phase shifts by the cable lengths (section [Technical Solution]).

Main request: claim construction

3. Firstly, the claim is somewhat unclear, language wise (emphasis by the Board): "*a length difference ... is*

determined according to a phase difference between signals radiated ... by a phase difference between the power supply cables according to a position difference between the planes...".
The Board understands the underlined passage to mean: ... *wherein the phase difference is determined according to...*
This interpretation has been agreed by the appellant.

4. Secondly, the arrangement of the co-located high and low frequency radiator elements is defined by the following two features taken together:
the radiator element of another frequency band is a patch-type radiator element having a top patch plate and a bottom patch plate,
...
the first-position radiator element or the second-position radiator element is stacked on the top patch plate of the radiator element of another frequency band, and use the top patch plate as a ground.

5. This definition implies that the top patch plate is grounded also in relation to the dipole radiator element (see description page 7, 3rd paragraph) and that the active plate of the patch radiator is the lower patch plate (see description page 5, 1st paragraph). Accordingly, the claimed stacked arrangement comprises:
(a) one bottom radiator patch element ("bottom patch plate"),
(b) one top (dipole) radiating element,
(c) and one middle patch element ("top patch plate") serving as ground/reflector for the dipole radiator.

6. Thus, whilst the claim recites the two plates as part of a patch radiator, this definition imposes no effective restriction on the claim scope. The two features only define that the arrangement of stacked antennas comprises the three elements identified here above.

Main request: inventive step (Article 56 EPC)

Starting point in the prior art

7. The Examining Division denied inventive step starting from D1. The appellant submits that D1 would not be the correct closest prior art, but D7.

8. The analysis and comparison of the two writings yields that both D1 and D7 disclose dual-band antennas with the same general configuration as in the invention, i.e. stacked radiator elements for two bands intercalated with further radiator elements for the higher frequency band.
D1 discloses a configuration (Figures 1 and 2; paragraphs [0032] to [0043]) wherein the high frequency radiator elements are dipoles and the low frequency ones are cup-shaped dipoles; the high frequency radiator element is placed on top of the low frequency radiator element.
In D7 (Figures 4 and 5; paragraphs [0038] and [0044]) both radiator elements could be either dipoles or patches; the low frequency radiator element is placed on top of the high frequency radiator element.

9. The Board does not see why D1 is not a correct starting point for an inventive step analysis. D1, as D7, is concerned with the same general technical problem as the application, i.e. the realization of a dual-band

antenna in a compact space-saving format, with a general arrangement of the radiator elements which is the same as in the application (see here above). They can be both used as starting points. Furthermore, if the invention is obvious starting from one document (D1), then the fact that another (D7) might appear to be more promising cannot change this assessment (Cf. T 694/15, Reasons 13).

Differences over D1

10. The Examining Division identified in the impugned decision three differences with respect to D1. Insofar, the appellant agrees with the decision.

11. The first difference is the feature cited above (point 3.) defining the adjustment of the cable lengths to compensate for the phase difference caused by the difference in height of the two high-frequency radiator elements.

12. The second and third are the first and second of the two features cited in point 4. above. On the basis of the analysis of these two features given therein, these features define three elements as identified above. That element (b) is disclosed by D1 is undisputed by the appellant.

13. The platform of D1 anticipates the middle reflector element (top patch plate as claimed - element (c)), onto which the high-frequency dipole radiator is stacked. The platform upper face is conductive, forms "a plateau", and is thus a conductive "patch", and serves as an auxiliary reflector (D1 paragraph 38), for the dipole on top (D1 paragraph 42).

13.1 The appellant questioned this conclusion, because the platform of D1 could not be equated with a "top patch

plate". According to the appellant, although admittedly the platform of D1 and the claimed patch plate fulfilled the same function in the same way, structurally they were different. The platform of D1 had a support function (elements 4b), had side walls, and was not a patch. The usage of the word patch implied a certain method of manufacturing which made it different from the platform of D1.

13.2 The Board is not persuaded by this argument. The claim is oriented towards a device and not a manufacturing method. The application provides no details as to how the "top patch" is manufactured. Furthermore, the skilled person looking at Figure 3 of the application sees a schematic drawing showing support pillars and partial side walls as well. There is therefore no support in the application for an interpretation of the word "patch" that would imply features other than those explicitly claimed.

14. There are therefore only two differences with respect to D1. The first one is the same as identified by the Examining Division, i.e. cable length adjustment for phase compensation. The second consists in that, in the stacked structure, the lower radiating element is a patch element instead of a cup shaped dipole.

Obviousness

15. The first difference addresses the problem of phase shifts caused by the variation of height of the high frequency radiators over the ground plate. This problem is not in any way influenced by the second difference, because the difference in height results from the choice of co-locating the radiators and will need to be solved irrespective of the type of the second radiator;

it is therefore to be treated separately as to its obviousness.

16. Regarding this first difference, the appellant points out that neither of the cited documents recognized the problem of the height difference causing phase shifts (statement of grounds, page 3). Recognizing that a compensation was required was not obvious.

17. The Board does not find this argument convincing: the person skilled in the art is aware that differences in height lead to a phase difference in the emitted wave. The problem is immediately apparent to the skilled person working in the field, since distance between radiating elements is directly associated to phase shifts due to the propagation characteristic of electromagnetic waves (see e.g. the discussion on the distance of the radiator elements to the reflector in paragraph 38 of D1). They would necessarily need to compensate for it by inducing corresponding phase shifts for shaping/beam-forming the emitted signal to the desired pattern.
Using the cable lengths thereto is common practice, as evidenced by D4 (see Figure 7 and the paragraph bridging columns 13 and 14).

18. As to the second difference, the replacement is an obvious option for the skilled person, as evidenced by D7, embodiment of Figure 5, wherein patches are used to replace dipole structures.

19. The argument was already advanced by the Examining Division (page 9 of the grounds of refusal) and is not, as the appellant seems to believe (pages 4 and 5 of the statement of grounds), that D7 would disclose a dipole

stacked on a patch, or that it would disclose a patch structure with two plates.
It is, rather, merely that the person skilled in the art would regard a patch radiator as an obvious solution when solving the objective technical problem of finding an alternative radiator element to the cup-shape dipole of D1. The other elements mentioned by the appellant, i.e. the second plate used as ground and the stacked dipole, are already part of D1 - namely the platform and the high frequency dipole stacked on it (see above), so they cannot contribute to the definition of this difference and associated objective technical problem.

20. As both modifications are obvious to the skilled person, claim 1 of this request lacks an inventive step.

First auxiliary request

21. The amendment carried out in this request addresses the clarity objection of the Examining Division. It has no impact on the assessment of obviousness as carried out above. Claim 1 of this request lacks an inventive step for the same reasons as claim 1 of the main request.

Second auxiliary request

22. Regarding the amendment in this request: the platform of D1 has bent corners (the side walls), thereby disclosing the added features. The assessment of obviousness as carried out above remains therefore valid. Claim 1 of this request lacks an inventive step as well.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Meyfarth B. Noll

Decision electronically authenticated