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**Datasheet for the decision
of 31 May 2023**

Case Number: T 1906/19 - 3.4.01

Application Number: 13748159.4

Publication Number: 2891212

IPC: H01Q9/04, H01Q5/00, H01Q1/38

Language of the proceedings: EN

Title of invention:
BROADBAND MULTI-STRIP PATCH ANTENNA

Applicant:
Shure Acquisition Holdings, Inc.

Headword:
Broadband multi-strip patch antenna / Shure

Relevant legal provisions:
RPBA 2020 Art. 13
EPC Art. 123(2), 56

Keyword:
Admission - final new request of claims (yes)
Amendments - allowable (yes)
Inventive step - (yes)

Decisions cited:

T 1294/16

Catchword:

The Board understands [the wording of Article 13(2) RPBA 2020] as laying down a basic rule but leaving some limited leeway for exceptions. The basic rule is that amendments are not considered unless there are exceptional circumstances justified by cogent reasons (by the submitting party). The leeway for deviating from this rule lies in the expression "in principle" ("en principe"; "grundsätzlich"), which the Board reads roughly as "as a rule", meaning that the provision's basic rule is not entirely without exception. This leeway, when applied, means that an amendment can be considered despite the absence of exceptional circumstances justified by cogent reasons.



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Case Number: T 1906/19 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 31 May 2023

Appellant: Shure Acquisition Holdings, Inc.
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 17 December
2018 refusing European patent application No.
13748159.4 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair P. Scriven
Members: T. Petelski
C. Almberg

Summary of Facts and Submissions

I. The Examining Division refused the European patent application, because

(a) the subject-matter of claim 1 of each of the (then) main and second auxiliary requests lacked an inventive step over

D1: WO 03/003503 A2, and

(b) claim 1 of each of the (then) first and third auxiliary requests contained subject-matter that extended beyond the application as filed.

II. An appeal was lodged against this decision by the applicant, who requested that the decision be set aside, and that a patent be granted on the basis of a set of claims according to the main request as underlying the decision; or according to a first, second, or third auxiliary request, filed with the statement of grounds of appeal. As a "final request", the appellant also asked that oral proceedings be held.

III. In response to the Board's preliminary opinion, which was negative on inventive step for the main request and on the admission of the auxiliary requests, the proprietor withdrew all its substantive requests and replaced them with a single request labelled as "new main request of claims".

IV. During oral proceedings before the Board, the latter request was replaced by another one with the same labelling, which, in turn, was replaced by a sole claim request labelled "final new request of claims". This sole request is the one, on which this decision is based.

V. Claims 1, 2, 3, and 12 of the sole request read:

1. A broadband antenna assembly (100) comprising:

a ground plane (106);

a ground strip (102) extending from the ground plane (106);

a main patch (101) folded about the ground strip (102) and including a resonant length greater than an overall length of the broadband antenna assembly (100), wherein a first strip (101-1) of the main patch (101) is disposed above the ground strip (102) and forms a first radiating edge (201) with the ground strip (102), and a second strip (101-2) of the main patch (101) is disposed below the ground strip (102) and forms a second radiating edge (202) with the ground plane (106); wherein the first and second radiating edges are disposed at opposing sides of the main patch above and below the ground strip; and

a parasitic patch (103, 104) folded about the ground strip (102) and coupled to the

main patch (101) along at least a portion of a non-radiating edge of the main patch (101), the parasitic patch (103, 104) including a first strip (103-1, 104-1) and a second strip (103-2, 104-2), at least a portion of the first strip (103-1, 104-1) of the parasitic patch (103, 104) disposed above the ground strip (102) and at least a portion of the second strip (103-2, 104-2) of the parasitic patch (103, 104) disposed below the ground strip (102).

2. The broadband antenna assembly (100) of claim 1, wherein the resonant length of the main patch (101) is $\lambda_0/(2\sqrt{\epsilon_r})$ where λ_0 is a free space wavelength of a lowest operating frequency of the antenna and ϵ_r is a relative permittivity of a dielectric material between the main patch (101) and a ground plane (106).

3. The broadband antenna assembly (100) of claim 1, wherein the first radiating edge (201) is proximate a first end of the broadband antenna assembly (100) and the second radiating edge (202) is proximate a second end of the broadband antenna assembly (100) opposite the first end of the broadband antenna assembly (100).

12. A method for providing a broadband antenna assembly (100) for a wireless system, the method comprising:

providing a ground strip (102), the ground strip (102) extending from a ground plane (106);

providing a main patch (101) electrically isolated from the ground plane (106) and including a first strip (101-1) and a second strip (101-2) the main patch (101) folded about the ground strip (102) and including a resonant length greater than an overall length of the broadband antenna assembly (100);

positioning the main patch (101) about the ground strip (102), wherein at least a portion of the first strip (101-1) of the main patch (101) positioned above the ground strip (102) and forming a first radiating edge (201) with the ground strip (102), and at least a portion of the second strip (101-2) of the main patch (101) positioned below the ground strip (102) and forming a second radiating edge (202) with the ground plane (106); wherein the first and second radiating edges are disposed at opposing sides of the main patch above and below the ground strip; and

coupling a parasitic patch (103, 104) to the main patch (101) along at least a portion of a non-radiating edge of the main patch (101), wherein the parasitic patch (103, 104) is folded about the ground strip (102) and wherein the parasitic patch (103, 104) includes a

first strip (103-1, 104-1) and a second strip (103-2, 104-2), at least a portion of the first strip (103-1, 104-1) of the parasitic patch (103, 104) positioned above the ground strip (102) and at least a portion of the second strip (103-2, 104-2) of the parasitic patch (103, 104) positioned below the ground strip (102).

Reasons for the Decision

The content of the application

1. The application is about a broadband patch antenna assembly. It proposes folding the main patch about a ground patch, to reduce the overall length of the antenna assembly. The main patch has a total resonant length of about half a wavelength and is insulated from ground. In comparison to arrangements in which one end is shorted to ground and in which the length of the main patch is about a quarter wavelength or smaller, the proposed arrangement has a wider bandwidth and a higher efficiency, in part due to the non-shortened set-up, in part due to the presence of two radiating edges (and two radiating slots), while preserving a small overall size due to the folding.

Admission - Article 13 RPBA 2020

2. In its preliminary opinion, issued with the summons to oral proceedings, the Board raised an objection of

added subject-matter against claim 1 of the (then) first auxiliary request. In a written response, the appellant withdrew all its previous requests and submitted a single new request that addressed this objection.

3. During oral proceedings before the Board, a potential problem with another feature of the new request became apparent. This feature had already been introduced in the previous first auxiliary request, but had not been objected to by the Board. The appellant immediately replaced the request by a new version, in which the potentially problematic feature was deleted in claim 1. After noticing that the deletion of the same feature had been overlooked in claim 12, the request was again replaced by a new version, the current sole request, in which this oversight was corrected.
4. Under Article 13(2) RPBA 2020, any amendments to a party's appeal case at this late stage, such as the sole request, shall, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned.
5. The Board understands this wording as laying down a basic rule but leaving some limited leeway for exceptions. The basic rule is that amendments are not considered unless there are exceptional circumstances justified by cogent reasons (by the submitting party). The leeway for deviating from this rule lies in the expression "in principle" ("en principe"; "grundsätzlich"), which the Board reads roughly as "as a rule", meaning that the provision's basic rule is not entirely without exception. This leeway, when applied, means that an amendment can be considered despite the

absence of exceptional circumstances justified by cogent reasons.

6. This textual understanding of Article 13(2) RPBA 2020 is supported by the following systematic and teleological considerations:

(a) Article 13(1) and (2) RPBA 2020 defines the second and third levels of the convergent approach practised by the Boards of Appeal when deciding on admission. Together with the first level specified in Article 12(4) RPBA 2020, Article 13(1) and (2) sets increasingly stringent hurdles for the admission of new requests and other amendments. This stepwise approach for deciding on the admission of amendments would lose some of its coherence and convergence, if the Boards could exercise discretion on the first two levels but not the third. This Board interprets the passage "shall, in principle, not" as indicative of a remaining (though restricted) discretion.

(b) This Board is also not convinced that the law maker, as seemingly implied by T 1294/16, has put words without meaning into a provision as important as Article 13(2) RPBA 2020: in such a view, "in principle" would be redundant in view of "unless...". Rather, the Board believes that the law maker had the foresight to see that the otherwise harshly-worded Article 13(2) needed a caveat allowing for consideration of the particular circumstances of a case.

7. In the present case, the appellant did not follow the common practise, when submitting amended requests, of maintaining at least some previous requests (seemingly)

out of fear of being left with no admissible requests. This practice sometimes means the Board and parties have to spend considerable time on requests that even the applicant or proprietor no longer thinks are viable. Instead, the appellant gave the Board a single set of claims to consider. It is true that it was twice further amended during oral proceedings, but the amendments were, in each case (including those filed before oral proceedings), straightforward, within the limits of the debate, and finally led to a set of claims that was, *prima facie*, clearly allowable.

8. The succession of requests in the present case was not detrimental to procedural economy. There was no inconvenience for the Board, and no other party to the proceedings was affected.
9. The primary reason for the convergent approach is procedural economy. It would be unfortunate if it were so strictly applied that appellants, in *ex parte* proceedings, were seriously discouraged from filing a promising and facilitating new request and dropping non-viable requests.
10. The circumstances in this case might, arguably, be exceptional; but whether they are or not, the Board, noting that the criteria under Article 13(1) RPBA 2020 come out favourably for the appellant, exercised the discretion provided by "in principle" in Article 13(2) RPBA 2020 and decided to admit the sole request.

Amendments - Article 123(2) EPC

11. Claim 1 is amended, in comparison to claim 1 as originally filed, in that:

- (a) The antenna assembly is defined as a "broadband" antenna assembly.
- (b) The main patch is defined as being "folded about the ground strip and including a resonant length greater than an overall length of the broadband antenna assembly". Further, the parasitic patch is also defined as being "folded about the ground strip".
- (c) The entire first and second strips of the main patch are disposed above and below the ground strip, respectively, not only at least a portion of them.
- (d) The first and second radiating edges are defined as being "disposed at opposing sides of the main patch above and below the ground strip".

12. Each of these amendments, and the combination of them, has a basis in the application as filed.

- As to (a), the amendment finds a basis in paragraph [0032], which applies to all embodiments. Accordingly, all embodiments described in relation to the Figures show broadband multi-strip antennas (see paragraph [0033], and also [0009] to [0026] in the brief description of the drawings).
- As to (b), the general paragraph [0032], which relates to all embodiments, discloses a folded main patch to achieve a size reduction of the antenna. It becomes clear from the general example shown in Figures 1 to 6 (see also paragraphs [0039] and [0041]) that this folding is a folding of the main patch about the ground strip. This is explicitly

mentioned in paragraphs [0049] and [0050], which describe particular implementations of the general example - and thereby of the folded main strip - of Figures 1 to 6. The amendment relating to the length follows directly from paragraph [0039] and the last sentence of paragraph [0040], and is also apparent from Figures 1 to 9.

- As to (c), the amendment defines an option that was already included in the original formulation "at least a portion". The folding of the main patch about the ground strip implies that some (minor) parts of the strips cannot lie directly above or below the ground strip. Hence, the expressions "above" and "below" must be understood as referring to the respective planes in which the strips lie.

- As to (d), this amendment finds a literal basis in paragraph [0038], which refers to the general example of Figure 1 to 6. Hence, it also applies to the implementations of this example according to Figures 7 to 9. Moreover, it is a compelling consequence of the geometric arrangement of the main patch with respect to the ground plane and ground patch as shown in all Figures.

13. The amendments to claim 12, in comparison to original claim 24, correspond to the amendments to claim 1. In addition, claim 12 has been amended in that the main patch is defined as being "electrically isolated from the ground plane". This follows directly from the last lines of paragraph [0038] and is also unambiguously derivable from the geometry of the main patch as described in paragraph [0039] and illustrated by Figure 6C.

14. Dependent claim 2 finds a basis in paragraph [0039].
15. Dependent claim 3 contains an amendment that defines the position of the first and second edges to be near opposite ends of the antenna assembly. This amendment was objected to by the Examining Division, in the context of claim 1 of the then first and third auxiliary requests. However, the Board finds that the such defined edge-positions are directly and unambiguously derivable from paragraph [0038] and Figures 2A and 6C, considering the additional definition of the edges being at opposing sides of the main patch above and below the main strip, in claim 1. Figures 2A and 6C show the two edges 201 and 202 at the two slots 601 and 602 to be located near (when compared with the extension of the entire antenna assembly) two opposite ends of the antenna assembly 100, at opposing sides above and below of the main patch.
16. The features defined by the dependent claims 4 to 11 and 13 to 17 find respective bases in original claims 3 to 5, 9 to 11, 23, and 25 - 27.
17. Hence, the subject-matter of the present set of claims does not extend beyond the content of the application as filed.

Inventive step - Article 56 EPC

18. The Examining Division found the subject-matter of claim 1 of the then main and second auxiliary requests not to involve an inventive step, starting from the embodiment according to D1, Figures 16 and 6, in combination with the embodiment according to D1, Figure 10.

19. D1 discloses a patch antenna with a compact size and a "wide bandwidth" (page 1, last paragraph). The broadband behaviour is achieved by placing a plurality of resonance modes close together (in the frequency domain; see page 2, first and only paragraph; the brief description of Figure 2 on page 2 and Figure 2 itself), whereas the small volume is achieved by using the same volume to accommodate different modes (page 2, first paragraph and page 5, second paragraph).

20. Figures 5 and 6 of D1 illustrate two different basic building blocks of the multi-mode embodiments that are illustrated, for example, by Figures 7 to 16. In the single-mode antennas of Figures 5 and 6, the main patch (left-hand side patch or strip in Figures 5 and 6), which is fed with the radio-frequency signal, is shorted to ground on one side. This is the typical design of a shorted-edge patch antenna, which only has a single radiating edge, and in which the resonating length is of the order of lambda-quarter or below.

21. In relation to Figure 10 (and also Figure 11), D1 describes one way of increasing the bandwidth of the basic antenna design of Figure 6. Here, one or more further patches (e.g., patch 20, 21 in Figure 10) are stacked on top of the main patch. Each of these further patches has a different resonating length between the common shortened end and the respective radiating edge, and, therefore, resonates at a different frequency (page 8, first and second full paragraphs).

22. Starting with the third full paragraph on page 9 of D6, another way of increasing the bandwidth of the basic patch antenna design of Figure 6 is described with reference to Figure 16. Here, a main patch 40 is accompanied by adjacent parasitic (i.e., not actively

driven) patches 41, 42, and 43 of similar design but with different resonant frequencies (page 9, third to fifth full paragraphs). In the embodiment of Figure 16, a variant of the basic antenna design of Figure 6 is used, which is shown in Figure 19.

23. The Examining Division considered Figure 16 of D1 as the most promising starting point for an inventive step assessment. The proprietor agrees, and the Board does so as well.
24. The subject-matter of claim 1 differs from the embodiment according to Figure 16 with the basic antenna structure as illustrated by Figure 19 in that:
 - (a) the main patch is folded about the ground strip,
 - (b) the main patch includes a resonant length greater than an overall length of the antenna assembly,
 - (c) a strip of the main patch is disposed above the ground strip and forms a first radiating edge with the ground strip, the first radiating edge being disposed at an opposing side of the main patch from the second radiating edge,
 - (d) the parasitic patch is folded about the ground strip, and
 - (e) the parasitic patch includes a strip, at least a portion of which is disposed above the ground strip.
25. If the basic antenna structure were the one illustrated by Figure 6 instead of the one of Figure 19, difference (c) would change to the strip being disposed below the

ground strip, forming a second radiating edge with the ground plane. Accordingly, difference (e) would also change to a portion of the strip being disposed below the ground strip. This would not change the following argumentation.

26. The differences (a) to (e) can all be attributed to the basic difference of the main patch (and the parasitic patch) being folded about the ground strip and having a resonant length that must extend at least along a major part of the folded main patch. This, and the fact that the main patch includes two radiating edges, implies that the main patch does not have the shorted-wall geometry of the antenna of D1.
27. The technical effect of the non-shortened and folded geometry of the main patch with two resonating edges lies in the intrinsically larger bandwidth and higher efficiency, when compared to the non-folded main patch with a single radiating edge in D1.
28. Accordingly, the problem lies in providing an increase in bandwidth and efficiency.
29. Starting from the embodiment of Figure 16 of D1, the skilled person might have considered adding further parasitic elements, adjusting the dimensions of the patches (page 9, fourth and fifth full paragraphs), adjusting the coupling between the elements, or adjusting the position of the feed (page 9, third full paragraph, to page 10, first full paragraph). This would not, however, have led to the claimed invention.
30. Even though the skilled person might have considered the replacement of the basic antenna elements in Figure 16 of D1 with those of Figure 10, the resulting antenna

assembly would still not fall within the definition in claim 1. The antenna in Figure 10 has a first resonant frequency, f_1 , with a respective resonant length extending between the shorted edge at the left-hand side of arrow 23 and the radiating edge at the right-hand side of the plate extending in prolongation of arrow 23. The antenna further has a second resonant frequency, f_2 , with a respective resonant length extending between the same, common shorted edge and the right-hand side edge of plate 21. Hence, there is no patch in the antenna assembly of Figure 10 of D1 that has resonant length greater than an overall length of the antenna assembly and that is folded about the ground strip, as it is defined by claim 1 of the patent. Rather, Figure 10 shows two separate patches, each with its own resonant length and frequency, and each with a single radiating edge.

31. It follows that the skilled person, faced with the objective technical problem, would not have arrived at the invention as claimed in claim 1, even when considering a combination of the embodiments of Figures 16 and 10 in D1. Therefore, the Examining Division's objection does not stand against present claim 1, the subject-matter of which involves an inventive step.
32. A corresponding argumentation applies to method claim 12.

Conclusion

33. It follows from the above that the claims do not add subject-matter that extends beyond the content of the application as filed. Further, the subject-matter of

the independent claims 1 and 12, and, therefore, also of the dependent claims, involves an inventive step.

Order

For these reasons it is decided that:

34. The decision under appeal is set aside.
35. The case is remitted to the Examining Division with the order to grant a patent with the text of
 - the final new request of claims 1 - 15 filed at the oral proceedings before the Board (at 11:27), and
 - the amended description pages 1 - 16 filed at the oral proceedings before the Board (at 12:27), and with
 - the drawings 1 - 16 as published.

The Registrar:

The Chair:



D. Meyfarth

P. Scriven

Decision electronically authenticated



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Case Number: T 1906/19 - 3.4.01

D E C I S I O N
of the Technical Board of Appeal 3.4.01
of 28 July 2023
correcting an error in the decision
of 31 May 2023

Appellant: Shure Acquisition Holdings, Inc.
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 17 December
2018 refusing European patent application No.
13748159.4 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair: P. Scriven
Members: T. Petelski
C. AlMBERG

The Order in the decision did not correctly set out the documents on the basis of which the patent was to be granted.

The correct documents are:

- the final new request of claims, 1 - 15, filed at oral proceedings before the Board (at 11:27);
- the amended description pages 1 - 14, clean version, filed at oral proceedings before the Board (at 12:27);
- drawing pages 1/16 - 16/16 as published.

The Registrar:

The Chair:



T. Buschek

P. Scriven

Decision electronically authenticated