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**Datasheet for the decision
of 17 January 2020**

Case Number: T 1450/16 - 3.5.03

Application Number: 11193846.0

Publication Number: 2480007

IPC: H04R1/10

Language of the proceedings: EN

Title of invention:

Earphone for sound reproduction

Applicant:

Shure Acquisition Holdings, Inc.

Headword:

Acoustic port of a hearing device/SHURE

Relevant legal provisions:

EPC Art. 56

RPBA Art. 13(1)

Keyword:

Inventive step - main and second auxiliary request (no):
selection of closest prior art to be made by the deciding body
(T 855/15 followed)
Admission of late-filed first auxiliary request - (no): not
clearly allowable

Decisions cited:

R 0005/13, T 0032/81, T 0422/93, T 0026/98, T 1140/09,
T 1523/11, T 1841/11, T 2057/12, T 0025/13, T 1248/13,
T 1462/14, T 0855/15

Headnote:

In the application of the problem-solution approach for the assessment of inventive step, the person skilled in the art within the meaning of Article 56 EPC enters the stage *only when* the objective technical problem has been formulated in view of the selected "closest prior art". Only then can the notional skilled person's relevant technical field and its extent be appropriately defined. Therefore, it cannot be the "skilled person" who selects the closest prior art in the first step of the problem-solution approach. Rather, this selection is to be made by the relevant deciding body, on the basis of the established criteria, in order to avoid any hindsight analysis (see point 2.1.4 of the Reasons).



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Case Number: T 1450/16 - 3.5.03

D E C I S I O N
of Technical Board of Appeal 3.5.03
of 17 January 2020

Appellant: Shure Acquisition Holdings, Inc.
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 12 February
2016 refusing European patent application
No. 11193846.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman K. Bengi-Akyürek
Members: K. Peirs
R. Romandini

Summary of Facts and Submissions

I. This appeal is against the decision of the examining division refusing the present European patent application for lack of inventive step having regard to prior-art document

D1: GB 121 6010 A.

In the appealed decision, reference was also made to the following documents:

D2: WO 95/07014 A1;

D3: US 4 867 267 A;

D4: GB 2 050 757 A;

D5: US 5 887 070 A;

D6: US 2003/081794 A1.

II. The appellant requests that the decision under appeal be set aside and that a patent be granted based on the claims of the main request underlying the decision under appeal (re-filed with the statement of grounds of appeal) or, in the alternative, on the basis of a first auxiliary request, filed during the oral proceedings before the board, or on the basis of a second auxiliary request, filed with the statement of grounds of appeal.

III. At the end of the oral proceedings held on 17 January 2020, the board's decision was announced.

IV. Claim 1 of the **main request** reads as follows:

"An earphone for sound reproduction, comprising:
a housing (6) including a base (10) and a cover (20), the housing providing an enclosure, wherein the enclosure includes an acoustic enclosure (140) that

is in acoustic communication with the acoustic port (38);

a support (80) mounted in the enclosure provided by the housing;

a driver (30) positioned by the support, the driver having a sound port (35), an acoustic port (38) and a volume;

a nozzle (40), the nozzle in sealed acoustic communication with the sound port (35);

an acoustic filter (130) mounted in the nozzle (40), the acoustic filter providing an acoustic resistance; and

a nut (110) for removably mounting the nozzle (40) to the housing (6)."

V. Claim 1 of the **first auxiliary request** comprises all the features of claim 1 of the main request and adds at the end:

"a threaded retainer (100) mounted to the housing and configured to receive the nut (110); and

a ring (120) configured to hold the base and the cover together."

Claim 1 of the **second auxiliary request** reads as follows (amendments to claim 1 of the main request underlined by the board):

"An earphone for sound reproduction, comprising:

a housing (6) including a base (10) and a cover (20), the housing providing an enclosure, wherein the enclosure includes an acoustic enclosure (140) that is in acoustic communication with the acoustic port (38), wherein the acoustic enclosure has a volume that is between 1 and 2 times the driver volume;

a support (80) mounted in the enclosure provided by

the housing;

a driver (30) positioned by the support, the driver having a sound port (35), an acoustic port (38) and a volume;

a nozzle (40), the nozzle in sealed acoustic communication with the sound port (35);
an acoustic filter (130) mounted in the nozzle (40), the acoustic filter providing an acoustic resistance;
and

a nut (110) for removably mounting the nozzle (40) to the housing (6)."

Reasons for the Decision

1. *The application*

The present application is concerned with an earphone including a driver for generating sound, which driver is positioned by a support in a housing having a base and a cover. The driver comprises a sound port for providing sound to a user. In addition, the driver includes an acoustic port which allows sound to leak from the driver towards an internal chamber, which is dimensioned such that the leakage changes the frequency behaviour of the sound heard by the user. A nozzle is present for conveniently wearing the earphone in the ear canal and for guiding sound towards the user's ear drum when in use. The nozzle and the driver are connected via a threaded retainer that mates with a nut to ensure an acoustic seal between the nozzle and the driver.

2. *Main request: claim 1 - inventive step*

The subject-matter of present claim 1 does not involve

an inventive step, for the reasons set out below.

2.1 Selection of closest prior art

2.1.1 The board holds that, of the prior art to hand, document **D1** constitutes the "closest prior art", the reasons being as follows.

2.1.2 The appellant contended that D1 was not the closest prior art on several grounds. It was evident from paragraph [05] of the description as originally filed, in particular from the formulation "[t]o reduce bulkiness and weight, in-the-ear speakers or earphones have been designed to replace headphones", that the claim, being directed to an "earphone for sound reproduction", was in no way intended to cover a "hearing aid". Given that earphones and hearing aids were very different apparatuses, document D1, being directed to a hearing aid of 1968, was an unrealistic starting point for an application directed to an earphone for sound reproduction. In that context, the appellant named several selection criteria developed in the jurisprudence of the boards of appeal for choosing a particular document as the "closest prior art":

- A first selection criterion was that such a document should belong to the **same technical field** as the underlying application. The appellant argued that in the era before the advent of digital hearing devices, such as the 1970s, the 1980s and the 1990s, an earphone was very different from a hearing aid. It stressed that even today no hearing aid manufacturer was selling earphones and concluded that earphones and hearing aids were to be seen only as *neighbouring* fields.

- A second selection criterion was that the prior-art document should consider the **same technical problem** as the application in question. The appellant referred to paragraph [08] of the description as filed to underline that the present application aims "to provide a means for allowing a user to readily customize an earphone so that the sound reproduction fit[s] the user's musical tastes and hearing ability". Document D1, by contrast, dealt with a selection of soft rubber to avoid acoustic leakage and loss of resilience, as stated in lines 32-42 of page 1. Hence, D1 rather addressed material aspects.

- A third selection criterion was the **number of features** that the document has in common with the claim. The appellant argued that D1 was not closer than D5 or D6 in this respect.

From the above, the appellant concluded that **the skilled person would not have chosen document D1 as the closest prior art**. In particular, "the skilled person would not start from a hearing aid when confronted with an earphone" (see statement of grounds of appeal, page 4, first paragraph).

2.1.3 The board is not persuaded by these arguments for the following reasons. Since the proper selection of the closest prior art was an essential issue in the present case, the board finds it helpful to consider in more detail the jurisprudence of the boards of appeal in that respect.

2.1.4 First, the board does not agree with the assumption relied on by the appellant that, according to the basic problem-solution approach, the *person skilled in the*

art may be entrusted with the task of selecting the closest prior art or a suitable starting point for the assessment of inventive step, which is the first step in the multi-stage method of that problem-solution approach (see e.g. R 5/13, Reasons 13). In the board's view, this would mean that the same (fictitious) person as the one who finally assesses the obviousness of a certain claimed subject-matter has already selected their "favourite" prior-art document in order to conduct that assessment. Given that the objective technical problem is to be derived from the distinguishing features established with respect to the selected closest prior art, such a selection would further imply that this skilled person could pose the objective problem to him or herself. However, this would be at odds with the very aim of the problem-solution approach, namely to provide an *objective* method of evaluating inventiveness, avoiding as far as possible an inadmissible hindsight analysis.

In that regard, the board is aware of case law which at least implicitly indicates that the *skilled person* may select their "own" closest prior art (see e.g. T 1841/11-3.4.03, Reasons 2.6, emphasis by the present board: "... choice of closest prior art, provided that it would be immediately apparent to the **skilled person** that what is disclosed in the document could be adapted to the purpose of the claimed invention in a straightforward manner ..."; T 2057/12-3.4.01, Reasons 3.2.2, last paragraph: "... why the **skilled person** ... would have indeed envisaged selecting a document ... as closest prior art ..."; T 1248/13-3.2.03, Reasons 2.1: "... It is indeed not apparent for which reasons the **skilled person**, who is a technician mainly active in the field of warheads ... would have envisaged applying the teaching of [closest

prior art] D4 ..."). Rather, this board follows the conclusions drawn, for example, in T 422/93-3.3.01 (see Headnote 1) and T 1140/09-3.4.03 (see Reasons 4.4) that the relevant skilled person is to be defined starting from the *objective technical problem*.

As a consequence, in the board's view, the person skilled in the art within the meaning of Article 56 EPC enters the stage *only when* the objective technical problem has already been formulated. Thus, the skilled person under Article 56 EPC is the person qualified to solve the established objective technical problem (see e.g. T 32/81-3.2.01, Reasons 4.2; T 26/98-3.4.01, Reasons 6.3; T 1523/11-3.5.07, Reasons 4.4) and not necessarily the person versed in the field of the *underlying application* or in the field of the *selected closest prior art*, as apparently advocated in T 25/13-3.2.08 (see Reasons 2.4). In conclusion, this board considers that it must be the respective deciding body (whose members cannot be equated with the skilled person as a notional entity; see T 1462/14-3.4.01, Reasons 14 and 15) - be it the examining division, the opposition division or the relevant board of appeal - who selects the closest prior art rather than the skilled person mentioned in Article 56 EPC, in accordance with the findings in T 855/15-3.5.06 (see Reasons 8.2).

- 2.1.5 It is generally accepted that the closest prior art is that prior art which, within a single reference, discloses the combination of features which constitutes the *most promising starting point* for a development leading to the invention. One of the established criteria for selecting that starting point is that the closest prior art should typically relate to the same or at least a similar purpose as that of the claimed

invention (see e.g. T 1841/11-3.4.03, Catchword).

- 2.1.6 In the present case, when starting from claim 1 to select the closest prior art, the board does not accept the appellant's view that D1 is excluded from being a promising starting point since it was not related to the same or similar purpose. The hearing aid of D1 and the earphone of claim 1 both provide sound to a listener via an electro-mechanical acoustic transducer mounted in an electric device having a means for electrical amplification and being worn in the ear. Therefore, the claimed earphone and the hearing aid of D1 relate to the *same* purpose. Moreover, hearing aids and earphones are not to be regarded as *neighbouring* fields, but belong rather to the *same* technical field. This is all the more so since "hearing aids" and "earphones" are similar in structure (see the similar devices shown in the figures of the present application and in D1), in use (i.e. the present case relates mainly to an in-the-ear earphone and D1 relates to a hearing aid that is to be worn in the ear) and in function (i.e. both provide electrically amplified sound to a wearer).
- 2.1.7 In addition, the board can find no indications, either in the decision under appeal or in the appellant's submissions, that **D5** or **D6** would have more features in common with present claim 1.
- 2.1.8 In view of the above, the board considers D1 to be the most suitable starting point for the assessment of inventive step in this case.
- 2.2 Distinguishing features as between claim 1 and D1

2.2.1 The closest prior art **D1** discloses the following limiting features of claim 1 of the main request (as labelled by the board):

- (a) an earphone (page 2, lines 7-9: "hearing-aid") for sound reproduction, comprising:
- (b) a housing (page 2, lines 7-9; Figure 1, housing 1 comprising at least elements 3, 4 and 6) including a base (Figure 1, part 3) and a cover (Figure 1, lid 6), the housing providing an enclosure (Figure 1; page 2, lines 9-36), wherein the enclosure includes an acoustic enclosure (implicit from Figure 1);
- (c) a support (implicit from page 2, lines 34-36) mounted in the enclosure provided by the housing;
- (d) a driver (page 2, lines 34-36: "receiver") positioned by the support (implicit from page 2, lines 34-36), the driver having a sound port (page 2, lines 34-36; page 2, lines 56-62 and Figures 1 and 2: the receiver outputs sound which exits the hearing aid via tubes 17, 23 and 5; this receiver output implies the presence of a sound port) and a volume (implicit, otherwise the receiver could not function since the actuator of the driver would have no space to move);
- (e) a nozzle (Figure 1, "ear piece 2"; page 2, lines 7-23), the nozzle being in sealed acoustic communication with the sound port (page 2, lines 37-43: insertion member 10 is made from a tough elastic synthetic material and, as a result, constitutes an acoustically sealed connection between sound duct 17, i.e. the output of the receiver, and nozzle 2);
- (f) an acoustic filter (page 2, lines 56-61; Figure 2, "duct 23") mounted in the nozzle, the acoustic filter providing an acoustic resistance (implicit

from the shape of duct 23 and from the wording "capillary sound duct", page 2, lines 56-61);
(g) a nut (page 1, lines 44-64; page 2, lines 37-48; page 2, lines 37-48: "insertion member 10") for removably ("rotatable coupling"; page 1, lines 63-64) mounting the nozzle to the housing (page 1, lines 70-73; page 2, lines 37-48).

2.2.2 The subject-matter of claim 1 therefore differs from the earphone disclosed in D1 in that (board's underlining)

(h) the claimed driver comprises, in addition to the sound port, an acoustic port;

(i) the claimed acoustic enclosure is in acoustic communication with the acoustic port.

2.3 Objective technical problem

2.3.1 The technical effect achieved by the above distinguishing features may be seen in the sound produced in the driver being allowed to leak into the acoustic enclosure, thereby potentially changing the frequency characteristic of the earphone. Thus, the objective technical problem to be solved by the claimed invention may be framed as "how to provide a change in the frequency characteristics of the hearing aid of D1", rather than the speculative problem of "how to improve the acoustic properties of such a hearing device", as put forward by the appellant (see also point 2.3.4 below).

2.3.2 Based on the above objective problem, the notional skilled person is the person versed in the field of hearing devices in a general sense, i.e. including hearing aids, earphones, etc., rather than solely in

the field of earphones (as argued by the appellant). To answer the question of how broadly the skilled person's relevant technical field should be defined starting from this objective problem, it is important to assess what the relevant skilled person concerned with such a receiver would in fact consider. In the board's view, this skilled person would have immediately understood that the use of the receiver according to the objective problem is not restricted to "hearing aids", but that it can be extended without difficulty to "earphones".

2.3.3 The person skilled in the field of hearing devices would have noticed that D1 does not provide any details about the driver/receiver. Hence, when faced with the above-identified objective problem, the skilled person would have consulted other prior art to obtain more details. In this regard, the board notes that drivers which encompass a sound port *and* an acoustic port were known at the present application's priority date and were used in the field of electromechanical transducers for use in earphones and hearing aids. Merely as examples, the board refers to **D2** (see page 1, lines 6-7; page 2, line 34 to page 3, lines 13; page 7, lines 29 to page 8, lines 2; page 11, lines 6-13; Figure 1, ports 56, 58 on the left and the port in element 17b on the right) and **D3** (see Figure 1, receiver 18 having a port 31 on the left, an outlet of chamber 19A on the right, and a vent 34 on top). The description of the present application as filed also appears to acknowledge that an acoustic port is a known element in the design of a driver for an earphone (see e.g. paragraph [35]). Installing such a driver in the hearing aid of D1 would automatically result in the acoustic enclosure communicating with the acoustic port of the driver.

Applying a known receiver/driver, such as that of D2 or D3, to the hearing aid of D1 would thus not require any inventive skills. Moreover, the fact that such receiver/driver likewise allows the frequency response of the receiver to be changed within an acoustic enclosure that is properly sealed and dimensioned is then merely a bonus effect.

- 2.3.4 The appellant argued that hearing aids are usually concerned with improving high-frequency response, whereas in the present case the technical effect of distinguishing features (h) and (i) improves the low-frequency response.

It is, however, apparent to the board that nothing in claim 1 points to *improving* any frequency response, whether high or low. Even if the appellant's argument were to be accepted, the board is not convinced that a skilled person would not seek to improve the low-frequency behaviour in a hearing aid, since it was well-known at the application's priority date that, for some applications, an improved low-frequency response in a hearing aid is advantageous.

- 2.3.5 The appellant stated that, besides the above distinguishing features, claim 1 was further distinguished by feature (g), i.e. "a nut for removably mounting the nozzle to the housing". Since the filter was mounted in the nozzle, removal of the nozzle also allowed the removal of the filter and, while features (h) and (i) improved the frequency response, feature (g) made it possible to change the frequency response in accordance with the user's needs or preferences or according to the type of music listened to. Hence, the objective technical problem solved by claim 1 in view of D1 corresponded to the subjective

technical problem as defined in paragraph [08] of the present application as filed, i.e. the provision of a means for allowing the user to readily customise an earphone so that the sound reproduction fits the user's musical tastes and hearing ability.

The board disagrees that feature (g) constitutes a distinguishing feature. The Merriam-Webster dictionary defines a "nut" as "a perforated block usually of metal that has an internal screw thread and is used on a bolt or screw for tightening or holding something". Insertion member 10 of Figure 2 of D1 matches this definition (see page 2, lines 37-48). It has a central conical hole 12 to receive threaded metal tube 13, which removably connects nozzle 2 and the housing including transverse part 4. Insertion member 10 further acoustically seals the receiver of part 4 to nozzle 2 (implicit from the "[though] elastic synthetic material" in lines 37 to 41 of page 1 and from Figure 2), thereby fulfilling the same function as nut 110 described in paragraphs [43] to [45] of the present application as filed.

- 2.3.6 Lastly, the appellant argued that D1 disclosed a permanent connection between ear piece 2 and transverse part 4, referring to page 2, lines 37-42 of D1, which states that "[t]he rotatable coupling shown in sectional view in Figure 2 comprises an insertion member 10 made of tough elastic synthetic material which is rigidly secured, by casting, in the ear piece 2 by a flange 11".

However, the board holds that this rigid connection in fact concerns the connection between nozzle 2 and insertion member 10 and not the connection of nozzle 2 with transverse part 4. This latter connection is

rather provided via threaded metal tube 13, as set out in lines 44-48 of page 2 in D1.

2.4 In conclusion, the main request is not allowable under Article 56 EPC.

3. *First auxiliary request - admissibility*

3.1 Claim 1 of the first auxiliary request differs from claim 1 of the main request in that it further specifies that the earphone comprises (board's underlining)

(j) a threaded retainer mounted to the housing and configured to receive the nut;

(k) a ring configured to hold the base and the cover together.

3.2 According to Article 13(1) RPBA 2007 (see Article 25(3) RPBA 2020), any amendments to a party's case after it has filed its grounds of appeal may only be admitted and considered at the board's discretion. The discretion is to be exercised in view of *inter alia* the complexity of the new subject-matter submitted, the current state of the proceedings and the need for procedural economy. One of the criteria applied by the boards when exercising their discretion is whether or not the new claims are "clearly allowable".

3.3 The appellant contended that the first auxiliary request filed during the oral proceedings before the board was an appropriate reaction to the board's communication under Article 15(1) RPBA 2007. Concerning the basis for the above amendments, the appellant referred to original claim 20 and emphasised that this auxiliary request added further differences with

respect to D1, having a further technical effect of making it easier to remove the nozzle, thereby simplifying maintenance and cleaning of the earphone. The appellant referred in this respect to paragraph [07] of the present application as filed. It also argued that there was no ring in the system of D1.

3.4 While the board acknowledges that the first auxiliary request can be seen as an appropriate reaction to its communication, it is not satisfied that the added features contribute to an inventive step, i.e. that they lead to a clearly allowable claim.

- First, the board notes that the wording of feature (j) has to be understood, e.g. based on Figure 2 of the application, as meaning that the nut is screwed onto retainer 100 (see also paragraphs [43] to [45] of the present description as filed). D1 discloses the same kind of fastening, wherein, according to lines 37 to 47 of page 2, insertion member 10 is screwed onto metal tube 13. Therefore, the threaded retainer 100 of claim 1 is anticipated by metal tube 13 of D1.
- Second, concerning the additional feature (k) relating to a ring, it would be a routine design modification for the skilled person to use an elastic band wrapped around the housing, for instance, in the event that battery cover 6 is difficult to close or to keep closed. Such an elastic band would constitute a ring in accordance with feature (k).

3.5 Furthermore, the board is not satisfied that the amendments fulfil the requirements of Article 123(2) EPC, since the boot that is mentioned in original

claim 20 together with the threaded retainer and the ring, is inextricably linked to that threaded retainer. This is because this boot is required to provide a seal between the sound port of the driver, the threaded retainer and the nozzle. For this reason alone, claim 1 amounts to an unallowable intermediate generalisation of the original disclosure.

3.6 Consequently, the board holds that the first auxiliary request is not clearly allowable under Articles 56 and 123(2) EPC. In view of the above analysis, it has decided not to admit this auxiliary request into the appeal proceedings under Article 13(1) RPBA 2007.

4. *Second auxiliary request: claim 1 - inventive step*

4.1 Claim 1 of the second auxiliary request differs from claim 1 of the main request in that it further specifies that (board's underlining)

(1) the acoustic enclosure has a volume that is between 1 and 2 times the driver volume.

4.2 Closest prior art D1 discloses features (a) to (g) as set out in point 2.2.1 above.

4.3 Feature (1) is not disclosed in D1 and has, taken in combination with features (h) and (i), the technical effect that an earphone with an enhanced bass reproduction is provided, wherein the effect of the acoustic enclosure on the bass enhancement is optimised (see paragraph [62] of the application as filed).

4.4 The objective technical problem associated with the combination of features (h) to (l) can thus be formulated now as "how to optimise a bass enhancement

in the hearing aid of D1".

- 4.5 The skilled person would have been aware, from their common general knowledge, that this objective problem may be solved by either *electrical* or *mechanical* means. Furthermore, the skilled person would have seen without any difficulty that the hearing aid's housing in D1 is able to accommodate resonating spaces, e.g. in part 3 of housing 1, which part 3 extends transversally to part 4 accommodating the receiver and that it can be placed in the concha of the user (see D1, page 2, lines 9-17). As a result, the skilled person would have readily considered applying a *mechanical* solution to the objective problem.

Moreover, the skilled person would have immediately realised that the use of a known receiver, such as the one mentioned in point 2.3.3 above, allows the space, which is available anyway in part 3, to be used as a resonating chamber. To use that space as a resonating chamber properly, the skilled person would have known from their common general knowledge that this space must be dimensioned appropriately in order for the leaked sound to be able to unfold a resonating behaviour and to enhance the bass-frequency reproduction. Paragraph [62] of the application as filed (see the wording "[a]s is known" at the beginning of that paragraph) acknowledges that it is known that this bass-enhancement effect can be tuned by changing the proportion between the volume of the chamber and the volume of the driver. Moreover, the skilled person would have been able to select a suitable ratio between these volumes within the framework of a routine design, depending on practical circumstances, and thus arrive at a result falling under the claimed ratio.

4.6 The appellant argued that the word "earphone" according to feature (a) in claim 1 meant that a *miniaturised* earphone was to be considered and added that this miniaturisation entailed additional concerns which were not relevant when starting from an old piece of prior art such as D1. It argued that hearing aids in 1968 were bulky and not as miniaturised as nowadays. In particular, although the hearing aid of D1 had sufficient space to provide for resonating cavities, this was no longer the case in a miniaturised earphone. As an example, the appellant referred to **D5**, which involved only a limited space behind the receiver. For such a receiver, it was not obvious to implement a volume as in claim 1. In particular, it was not obvious to use the back space of the receiver to improve the bass response. Further, the dimensions of the volume as specified in feature (1) posed a restriction as to the bass-frequency response one could expect from the earphone.

The board first notes that claim 1 does not require the earphone to be *miniaturised* in any way. Secondly, concerning the volume, it is clear to the board that only a general *ratio* has been indicated to specify this volume, which however does not allow conclusions to be drawn as to the bass-frequency response resulting from this ratio.

4.7 In view of the above, the second auxiliary request is likewise not allowable under Article 56 EPC.

5. *Conclusion*

Given that there is no allowable claim request on file, the appeal is to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chair:



B. Brückner

K. Bengi-Akyürek

Decision electronically authenticated