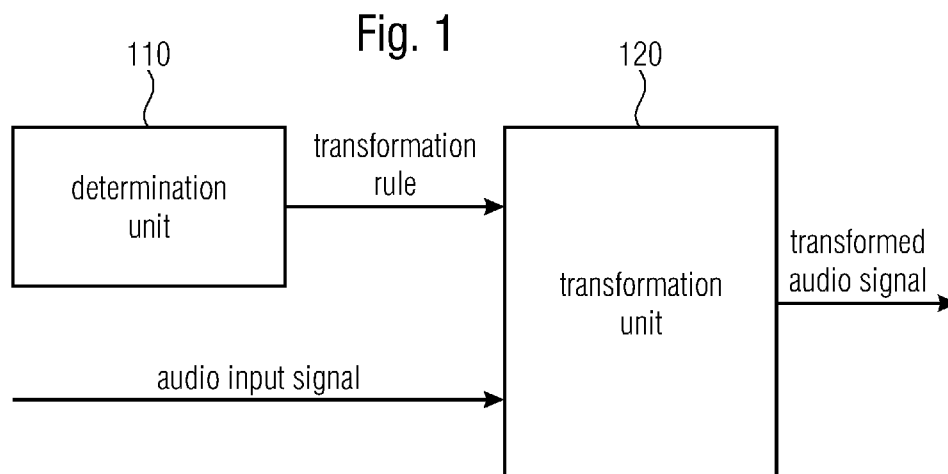




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- (81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.
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(54) **Title:** APPARATUS AND METHOD FOR AUDIO SIGNAL TRANSFORMATION



(57) **Abstract:** An apparatus for audio signal transformation is provided. The apparatus comprises a determination unit (110) configured for determining, using spherical harmonics information, a transformation rule for transforming an audio input signal within a first domain, being different from a spherical harmonics domain. Moreover, the apparatus comprises a transformation unit (120) configured for transforming, using the transformation rule, the audio input signal, being represented in the first domain, to obtain a transformed audio signal being represented in the first domain. The spherical harmonics information comprises information on a plurality of spherical harmonics and/or comprises information being represented in the spherical harmonics domain.



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

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- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. H04S3/00 H04S7/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
H04S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2014 165901 A (NIPPON TELEGRAPH & TELEPHONE) 8 September 2014 (2014-09-08)	1-6, 20-24, 30-33
Y	the whole document	7-16, 25
Y	US 2015/154965 A1 (WUEBBOLT OLIVIER [DE] ET AL) 4 June 2015 (2015-06-04) paragraph [0058]; claim 29; figures 4, 7	7-9, 25
Y	US 2014/247946 A1 (SEN DIPANJAN [US] ET AL) 4 September 2014 (2014-09-04) paragraphs [0005], [0101], [0111], [0147] - [0150]; figure 4A	7-9, 25
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Further documents are listed in the continuation of Box C.

See patent family annex.

- * Special categories of cited documents :
- "A" document defining the general state of the art which is not considered to be of particular relevance
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 - "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 - "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
 - "&" document member of the same patent family

Date of the actual completion of the international search 24 June 2022	Date of mailing of the international search report 06/07/2022
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Fachado Romano, A
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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2021/080059

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>Matthias Kronlachner ET AL: "Spatial transformations for the enhancement of Ambisonic recordings", 2nd International Conference on Spatial Audio, 23 February 2014 (2014-02-23), pages 1-5, XP055137983, Erlangen, Germany Retrieved from the Internet: URL:http://www.matthiaskronlachner.com/wp-content/uploads/2013/01/ICSA2014_KronlachnerZotter_AmbisonicTransformations.pdf [retrieved on 2014-09-03] the whole document</p> <p style="text-align: center;">-----</p>	10-16

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2021/080059

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WO 2014134472 A2	04-09-2014		

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-9, 20-25, 30-33

Apparatus for audio signal transformation comprising means to perform a spatial rotation of the audio input signal.
Method and computer program therefor.

2. claims: 10-16

Apparatus for audio signal transformation comprising means to perform audio beamforming.

3. claims: 17, 26

Apparatus for audio signal transformation comprising means to select the desired transformation.

4. claims: 18, 27

Apparatus for audio signal transformation comprising means for avoiding audio artifacts.

5. claims: 19, 28

Apparatus for audio signal transformation comprising means configured to perform headphone rendering.

6. claim: 29

Decoder comprising means for audio signal transformation.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2021/080059

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
1-16, 20-25, 30-33

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims;; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.