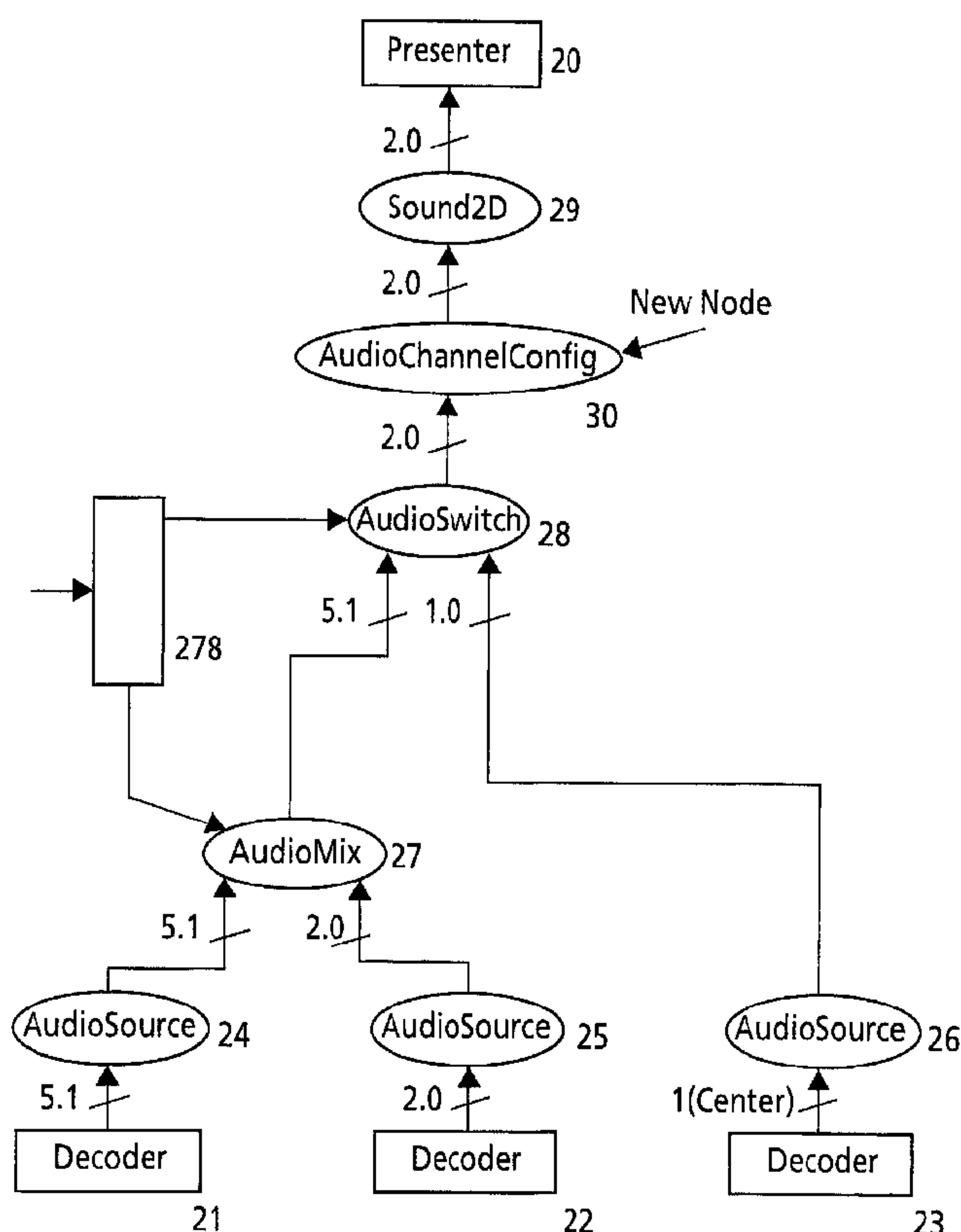




(86) Date de dépôt PCT/PCT Filing Date: 2003/11/24
(87) Date publication PCT/PCT Publication Date: 2004/06/17
(45) Date de délivrance/Issue Date: 2013/02/19
(85) Entrée phase nationale/National Entry: 2005/06/01
(86) N° demande PCT/PCT Application No.: EP 2003/013172
(87) N° publication PCT/PCT Publication No.: 2004/052052
(30) Priorité/Priority: 2002/12/02 (EP02026779.5)

(51) Cl.Int./Int.Cl. *H04S 1/00* (2006.01),
H04S 3/00 (2006.01)
(72) Inventeurs/Inventors:
SCHMIDT, JUERGEN, DE;
SPILLE, JENS, DE;
SCHROEDER, ERNST F., DE;
BOEHM, JOHANNES, DE
(73) Propriétaire/Owner:
THOMSON LICENSING S.A., FR
(74) Agent: FETHERSTONHAUGH & CO.

(54) Titre : PROCEDE ET DISPOSITIF DESTINES AU TRAITEMENT D'AU MOINS DEUX SIGNAUX AUDIO DECODES
RECUS OU LUS A PARTIR D'UN TRAIN DE BITS
(54) Title: METHOD AND APPARATUS FOR PROCESSING TWO OR MORE INITIALLY DECODED AUDIO SIGNALS
RECEIVED OR REPLAYED FROM A BITSTREAM



(57) Abrégé/Abstract:

In the MPEG-4 standard ISO/IEC 14496:2001 several audio objects that can be coded with different MPEG-4 format coding types can together form a composed audio system representing a single soundtrack from the several audio substreams. In a receiver the



(57) **Abrégé(suite)/Abstract(continued):**

multiple audio objects are decoded separately, but not directly played back to a listener. Instead, transmitted instructions for mixdown are used to prepare a single soundtrack. Mixdown conflicts can occur in case the audio signals to be combined have different channel numbers or configurations. According to the invention an additional audio channel configuration node is used that tags the correct channel configuration information items to the decoded audio data streams to be presented. The invention enables the content provider to set the channel configuration in such a way that the presenter at receiver side can produce a correct channel presentation under all circumstances. An escape code value in the channel configuration data facilitates correct handling of not yet defined channel combinations.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
17 June 2004 (17.06.2004)

PCT

(10) International Publication Number
WO 2004/052052 A3

(51) International Patent Classification⁷: **H04S 1/00**, 3/00

(21) International Application Number:
PCT/EP2003/013172

(22) International Filing Date:
24 November 2003 (24.11.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02026779.5 2 December 2002 (02.12.2002) EP

(71) Applicant (for all designated States except US): **THOMSON LICENSING S.A.** [FR/FR]; 46, Quai Alphonse le Gallo, F-92100 Boulogne Billancourt (FR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SCHMIDT, Jürgen**

[DE/DE]; Akazienstr. 5b, 31515 Wunstorf (DE). **SPILLE, Jens** [DE/DE]; Kleines Feld 58, 30966 Hemmingen (DE). **SCHRÖDER, Ernst, F.** [DE/DE]; Pinkenburger Str. 25D, 30655 Hannover (DE). **BÖHM, Johannes** [DE/DE]; Akazienweg 54, 37083 Göttingen (DE).

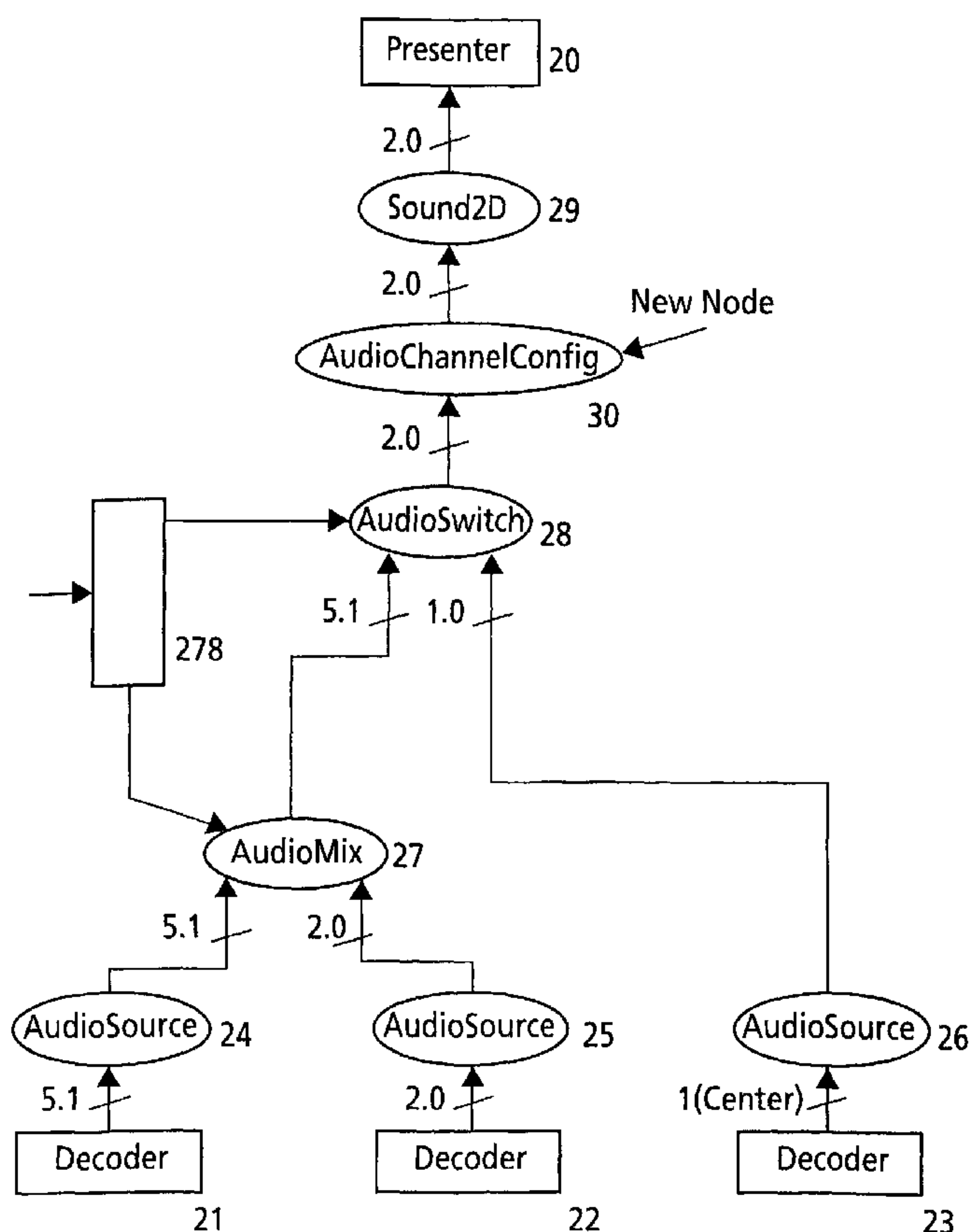
(74) Agent: **HARTNACK, Wolfgang**; Deutsche Thomson-Brandt GmbH, European Patent Operations, Karl-Wiechert-Allee 74, 30625 Hannover (DE).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR PROCESSING AUDIO SIGNALS FROM A BITSTREAM



(57) Abstract: In the MPEG-4 standard ISO/IEC 14496:2001 several audio objects that can be coded with different MPEG-4 format coding types can together form a composed audio system representing a single soundtrack from the several audio substreams. In a receiver the multiple audio objects are decoded separately, but not directly played back to a listener. Instead, transmitted instructions for mixdown are used to prepare a single soundtrack. Mixdown conflicts can occur in case the audio signals to be combined have different channel numbers or configurations. According to the invention an additional audio channel configuration node is used that tags the correct channel configuration information items to the decoded audio data streams to be presented. The invention enables the content provider to set the channel configuration in such a way that the presenter at receiver side can produce a correct channel presentation under all circumstances. An escape code value in the channel configuration data facilitates correct handling of not yet defined channel combinations.

WO 2004/052052 A3

WO 2004/052052 A3



European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report:
12 August 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Method and Apparatus for processing two or more initially decoded audio signals received or replayed from a bitstream

The invention relates to a method and to an apparatus for
5 processing two or more initially decoded audio signals received or replayed from a bitstream, that each have a different number of channels and/or different channel configurations, and that are combined before being presented in a final channel configuration.

10

Background

In the MPEG-4 standard ISO/IEC 14496:2001, in particular in
15 part 3 Audio and in part 1 Systems, several audio objects that can be coded with different MPEG-4 format coding types can together form a composed audio system representing a single soundtrack from the several audio substreams. User interaction, terminal capability, and speaker configuration
20 may be used when determining how to produce a single soundtrack from the component objects. Audio composition means mixing multiple individual audio objects to create a single soundtrack, e.g. a single channel or a single stereo pair. A set of instructions for mixdown is transmitted or transferred in the bitstream. In a receiver the multiple audio
25 objects are decoded separately, but not directly played back to a listener. Instead, the transmitted instructions for mixdown are used to prepare a single soundtrack from the decoded audio objects. This final soundtrack is then played
30 for the listener.

ISO/IEC 14496:2001 is the second version of the MPEG-4 Audio standard, whereas ISO/IEC 14496 is the first version.

In the above MPEG-4 Audio standard nodes for presenting audio are described. Header streams that contain configuration
35 information, which is necessary for decoding the audio substreams are transported via MPEG-4 Systems. In a simple au-

dio scene the channel configuration of the audio decoder -
for example 5.1 multichannel - can be fed inside the Com-
positor from one node to the following node so that the
channel configuration information can reach the presenter,
5 which is responsible for the correct loudspeaker mapping.
The presenter represents that final part of the audio chain
which is no more under the control of the broadcaster or
content provider, e.g. an audio amplifier having volume con-
trol and the attached loudspeakers.

10 'Node' means a processing step or unit used in the above
MPEG-4 standard, e.g. an interface carrying out time syn-
chronisation between a decoder and subsequent processing
units, or a corresponding interface between the presenter
and an upstream processing unit. In general, in ISO/IEC
15 14496-1:2001 the scene description is represented using a
parametric approach. The description consists of an encoded
hierarchy or tree of nodes with attributes and other infor-
mation including event sources and targets. Leaf nodes in
this tree correspond to elementary audio-visual data,
20 whereas intermediate nodes group this material to form au-
dio-visual objects, and perform e.g. grouping and transfor-
mation on such audio-visual objects (scene description
nodes).

Audio decoders either have a predetermined channel configu-
25 ration by definition, or receive e.g. some configuration in-
formation items for setting their channel configuration.

Invention

30

Normally, in an audio processing tree the channel configura-
tion of the audio decoders can be used for the loudspeaker
mapping occurring after passing the sound node, see ISO/IEC
14496-3:2001, chapter 1.6.3.4 Channel Configuration. There-
35 fore, as shown in Fig. 1, an MPEG-4 player implementation
passes these information items, that are transmitted within

29316-30

3

a received MPEG-4 bitstream, together with the decoder output or outputs through the audio nodes AudioSource and Sound2D to the presenter. The channel configuration data ChannelConfig is to be used by the presenter to make the correct loudspeaker association, especially in case of multi-channel audio ($\text{numChan} > 1$) where the phaseGroup flags in the audio nodes are to be set. However, when combining or composing audio substreams having different channel assignments, e.g. 5.1 multichannel surround sound and 2.0 stereo, some of the audio nodes (AudioMix, AudioSwitch and AudioFX) defined in the current MPEG-4 standard mentioned above can change the fixed channel assignment that is required for the correct channel representation, i.e. such audio nodes have a channel-variant behavior leading to conflicts in the channel configuration transmission.

A problem to be solved by some embodiments of the invention is to deal properly with such channel configuration conflicts such that the presenter can replay sound with the correct or the desired channel assignments.

15 An aspect of the invention provides a method for processing two or more decoded but not yet combined individual audio signals received or replayed from different audio sources, wherein at least two of said decoded audio signals have a different number of channels per decoded audio signal or different channel configurations for channel to speaker mapping or have a different number of channels per decoded
20 audio signal and different channel configurations for channel to speaker mapping, and wherein said decoded audio signals are to be combined by mixing or switching or mixing and switching before being presented in a final channel configuration, and wherein to each one of said decoded audio signals a corresponding specific channel configuration information item representing corresponding number of channels and
25 channel configuration for said each decoded audio signal is attached and the channel configuration information items for said two or more decoded audio signals can represent conflicting numbers of channels per decoded audio signal and conflicting channel configurations, said method comprising: controlling said mixing or switching or mixing and switching such that in case of conflicting numbers of channels and
30 conflicting channel configurations the number of the channels and the configuration

29316-30

4

of the channels to be output following said mixing or switching or mixing and switching is determined by specific mixing or switching or mixing and switching information provided from a content provider or broadcaster that is embedded in at least one of said audio signals, so as to resolve such conflict, and attaching to the
5 combined decoded audio signals to be presented a correspondingly updated channel configuration information item, wherein said correspondingly updated channel configuration information item represents said determined number of channels and configuration.

Another aspect of the invention provides an apparatus for processing two or more
10 decoded but not yet combined individual audio signals received or replayed from different audio sources, wherein at least two of said decoded audio signals have a different number of channels per decoded audio signal or different channel configurations for channel to speaker mapping or have a different number of channels per decoded audio signal and different channel configurations for channel
15 to speaker mapping, and wherein said decoded audio signals are to be combined by mixing or switching or mixing and switching before being presented in a final channel configuration, and wherein to each one of said decoded audio signals a corresponding specific channel configuration information item representing corresponding number of channels and channel configuration for said each decoded
20 audio signal is attached and the channel configuration information items for said two or more decoded audio signals can represent conflicting numbers of channels per decoded audio signal and conflicting channel configurations, said apparatus comprising: at least two audio data decoders that decode audio data received or replayed; means for processing the audio signals decoded by said audio data
25 decoders, wherein at least two of said decoded audio signals each have a different number of channels per decoded audio signal and a different channel configuration for channel to speaker mapping, and wherein said processing includes combination by mixing or switching or mixing and switching; means for presenting the combined decoded audio signals in a final channel configuration; wherein in said processing
30 means said mixing or switching or mixing and switching is controlled such that in

29316-30

4a

case of conflicting numbers of channels and conflicting channel configurations the number of the channels and the configuration of the channels to be output following said mixing or switching or mixing and switching is determined by specific mixing or switching or mixing and switching information provided from a content provider or
5 broadcaster that is embedded in at least one of said audio signals, so as to resolve such conflict; means for attaching to the combined decoded audio signals fed to said presenting means a correspondingly updated channel configuration information item, wherein said correspondingly updated channel configuration information item represents said determined number of channels and configuration.

- 10 Some embodiments of the invention disclose different but related ways of solving such channel configuration confusion by using channel-variant audio nodes. An additional audio channel configuration node is used, or its functionality is added to the existing audio mixing and/or switching nodes. This additional audio channel configuration node tags the correct channel configuration information items to the
15 decoded audio data streams that pass through the Sound2D node to the presenter.

In some embodiments, the invention enables the content provider or broadcaster to set the channel configuration in such a way that the presenter at receiver side can produce a correct channel presentation under all circumstances. An escape code value in the channel configuration data facilitates correct handling of not yet defined
20 channel combinations even in case signals having different channel configurations are mixed and/or switched together.

Some embodiments of the invention can also be used in any other multi-channel application wherein the received channel data are passed through a post processing unit having the inherent ability to interchange the received channels at reproduction.

- 25 In principle, some embodiments of the inventive method are suited for processing two or more initially decoded audio signals received or replayed from a bitstream, that each have a different number of channels and/or different channel configurations, and that are combined by mixing and/or switching before being presented in a final channel configuration, wherein to each one of said initially decoded audio signals a

29316-30

4b

corresponding specific channel configuration information is attached, and wherein said mixing and/or switching is controlled such that in case of non-matching number of channels and/or types of channel configurations the number and/or configuration of the channels to be output following said mixing and/or following said switching is
5 determined by related specific mixing and/or switching information provided from a content provider or broadcaster, and wherein to the combined data stream to be presented a correspondingly updated channel configuration information is attached.

In principle some embodiments of the inventive apparatus include:

- at least two audio data decoders that decode audio data received or replayed from
10 a bitstream;
- means for processing the audio signals initially decoded by said audio data decoders, wherein at least two of said decoded audio signals each have a different number of channels and/or a different channel configuration, and wherein

29316-30

4a

the existing audio mixing and/or switching nodes. This additional audio channel configuration node tags the correct channel configuration information items to the decoded audio data streams that pass through the Sound2D node to the presenter.

- 5 In some embodiments, the invention enables the content provider or broadcaster to set the channel configuration in such a way that the presenter at receiver side can produce a correct channel presentation under all circumstances. An escape code value in the channel configuration data facilitates correct handling of not yet defined channel combinations even in case signals having different channel
10 configurations are mixed and/or switched together.

Some embodiments of the invention can also be used in any other multi-channel application wherein the received channel data are passed through a post processing unit having the inherent ability to interchange the received channels at reproduction.

- 15 In principle, some embodiments of the inventive method are suited for processing two or more initially decoded audio signals received or replayed from a bitstream, that each have a different number of channels and/or different channel configurations, and that are combined by mixing and/or switching before being presented in a final channel configuration, wherein to each one of said initially
20 decoded audio signals a corresponding specific channel configuration information is attached, and wherein said mixing and/or switching is controlled such that in case of non-matching number of channels and/or types of channel configurations the number and/or configuration of the channels to be output following said mixing and/or following said switching is determined by related specific mixing and/or
25 switching information provided from a content provider or broadcaster, and wherein to the combined data stream to be presented a correspondingly updated channel configuration information is attached.

In principle some embodiments of the inventive apparatus include:

- at least two audio data decoders that decode audio data received or replayed
30 from a bitstream;

29316-30

4b

- means for processing the audio signals initially decoded by said audio data decoders, wherein at least two of said decoded audio signals each have a different number of channels and/or a different channel configuration, and wherein

29316-30

5

said processing includes combination by mixing and/or switching;

- means for presenting the combined audio signals in a final channel configuration, wherein to each one of said initially
5 decoded audio signals a corresponding specific channel configuration information is attached,

- wherein in said processing means said mixing and/or switching is controlled such that in case of non-matching number of channels and/or types of channel configurations
10 the number and/or configuration of the channels to be output following said mixing and/or following said switching is determined by related specific mixing and/or switching information provided from a content provider or broadcaster, and wherein to the combined data stream fed to said presenting
15 means a correspondingly updated channel configuration information is attached.

20

Drawings

Exemplary embodiments of the invention are described with
25 reference to the accompanying drawings, which show in:
Fig. 1 Transparent channel configuration information flow in a receiver;
Fig. 2 Channel configuration flow conflicts in a receiver;
Fig. 3 Inventive receiver including an additional node
30 AudioChannelConfig.

Exemplary embodiments

35 In Fig. 2 a first decoder 21 provides a decoded '5.1 multichannel' signal via an AudioSource node or interface 24 to

a first input In1 of an AudioMix node or mixing stage 27. A second decoder 22 provides a decoded '2.0 stereo' signal via an AudioSource node or interface 25 to a second input In2 of AudioMix node 27. The AudioMix node 27 represents a multi-channel switch that allows to connect any input channel or channels to any output channel or channels, whereby the effective amplification factors used thereby can have any value between '0'='off' and '1'='on', e.g. '0.5', '0.6' or '0.707'. The output signal from AudioMix node 27 having a '5.1 multichannel' format is fed to a first input of an AudioSwitch node or switcher or mixing stage 28. A third decoder 23 provides a decoded '1 (centre)' signal via an AudioSource node or interface 26 to a second input of AudioSwitch node 28.

The functionality of this AudioSwitch node 28 is similar to that of the AudioMix node 27, except that the 'amplification factors' used therein can have values '0'='off' or '1'='on' only. AudioMix node 27 and Audio switch node 28 are controlled by a control unit or stage 278 that retrieves and/or evaluates from the bitstream received from a content provider or broadcaster e.g. channel configuration data and other data required in the nodes, and feeds these data items to the nodes. Audio switch node 28 produces or evaluates sequences of switching decisions related to the selection of which input channels are to be passed through as which output audio channels. The corresponding whichChoice data field specifies the corresponding channel selections versus time instants. The audio output signal from AudioSwitch node 28 having a '2.0 stereo' format is passed via a Sound2D node or interface 29 to the input of a presenter or reproduction stage 20.

In Fig. 2 two different conflicts are shown. The first conflict occurs in the mix node 27, where a mix of a stereo signal into the surround channels in a 5.1 configuration is shown. The question is, for example, whether the resulting audio output signal should have 5.1 channels, or the 5.1

surround channels should become 2.0 stereo format channels. In case of selecting a 5.1 output format the straight-forward solution would be to assign input signal L2 to the first output channel 1ch and input signal R2 to the second
5 output channel 2ch. However, there are many other possibilities. The content provider or broadcaster could desire to assign input signal L2 to output channel 4ch and input signal R2 to output channel 5ch instead. However, the current
10 version of the above MPEG-4 standard does not allow such feature.

The second conflict occurs in the sequence of whichChoice data field updates in the AudioSwitch node 28. Within this sequence, channels out of the AudioMix node 27 output and the single channel output from AudioSource node 26 are sequentially selected at specified time instants. The time instants in the whichChoice data field can be defined by e.g. every succeeding frame or group of frames, every predetermined time period (for instance 5 minutes), each time the content provider or broadcaster has preset or commanded, or
20 upon each mouse click of a user. In the example given in Fig. 2, at a first time instant input signal C1 is connected to output channel 1ch and input signal M is connected to output channel 2ch. At a second time instant input signal L1 is connected to output channel 1ch and input signal R1 is
25 connected to output channel 2ch. At a third time instant input signal LS1 is connected to output channel 1ch and input signal RS1 is connected to output channel 2ch. Within this sequence, channels out of the AudioMix node 27 output and the single channel output from AudioSource node 26 are sequentially selected. However, because of the contradictory
30 input information in node 28, no correct output channel configuration can be determined automatically based on the current version of the above MPEG-4 standard.

35 Based on the assumption that the content provider or broadcaster is to solve such conflicts, three inventive solutions

are feasible that are explained in connection with Fig. 3. A first decoder 21 provides a decoded '5.1 multichannel' signal via an AudioSource node or interface 24 to a first input of an AudioMix node or mixing stage 27. A second decoder 22 provides a decoded '2.0 stereo' signal via an AudioSource node or interface 25 to a second input of AudioMix node 27. The output signal from AudioMix node 27 having a '5.1 multichannel' format is fed to a first input of an AudioSwitch node or switcher or mixing stage 28. A third decoder 23 provides a decoded '1 (centre)' signal via an AudioSource node or interface 26 to a second input of AudioSwitch node 28. The decoders may each include at the input an internal or external decoding buffer. The output signal from AudioSwitch node 28 having a '2.0 stereo' format is passed via a Sound2D node or interface 29 to the input of a presenter or reproduction stage 20.

AudioMix node 27 and Audio switch node 28 are controlled by a control unit or stage 278 that retrieves and/or evaluates from the bitstream received from a content provider or broadcaster e.g. channel configuration data and other data required in the nodes, and feeds these data items to the nodes.

A new audio node, called AudioChannelConfig node 30 is introduced between AudioSwitch node 28 and Sound2D node 29. This node has the following properties or function:

```
AudioChannelConfig{
    exposedField    SInt32    numChannel        0
    exposedField    MInt32    phaseGroup        0
    exposedField    MInt32    channelConfig      0
    exposedField    MFloat    channelLocation    0,0
    exposedField    MFloat    channelDirection  0,0
    exposedField    MInt32    polarityPattern    1
},
```

expressed in the MPEG-4 notation. SInt32, MInt32 and MFloat are single field (*SF*, containing a single value) and multiple field (*MF*, containing a multiple values and the

quantity of values) data types that are defined in ISO/IEC 14772-1:1998, subclause 5.2. 'Int32' means an integer number and 'Float' a floating point number. 'exposedField' denotes a data field the content of which can be changed by the content provider or broadcaster per audio scene.

The phaseGroup (specifies phase relationships in the node output, i.e. specifies whether or not there are important phase relationships between multiple audio channels) and the numChannel (number of channels in the node output) fields are re-defined by the content provider due to the functional correlation with the channelConfig field or parameters.

The channelConfig field and the below channel configuration association table can be defined using a set of pre-defined index values, thereby using values from the ISO/IEC 14496-3:2001 audio part standard, chapter 1.6.3.4. According to the invention, it is extended using some values of chapter 0.2.3.2 of the MPEG-2 audio standard ISO/IEC 13818-3:

| index value | No. of channels | audio syntactic elements, listed in order received | Channel to speaker mapping |
|-------------|-----------------|--|---|
| 0 | unspecified | unspecified | channelConfiguration from child node is passed through |
| 1 | - | Escape sequence | The channelLocation, channelDirection and polarityPattern fields are valid |
| 2 | 1 | single_channel_element | centre front speaker |
| 3 | 2 | channel_pair_element | left, right front speakers |
| 4 | 3 | single_channel_element, channel_pair_element | centre front speaker, left, right front speakers |
| 5 | 4 | single_channel_element, channel_pair_element, single_channel_element | centre front speaker, left, right centre front speakers, rear surround speakers |

| | | | |
|------|-----|---|--|
| 6 | 5 | single_channel_element, channel_pair_element, channel_pair_element | centre front speaker, left, right front speakers, left surround, right surround rear speakers |
| 7 | 5+1 | single_channel_element, channel_pair_element, channel_pair_element, lfe_element | centre front speaker, left, right front speakers, left surround, right surround rear speakers, front low frequency ef- fects speaker |
| 8 | 7+1 | single_channel_element, channel_pair_element, channel_pair_element, channel_pair_element, lfe_element | centre front speaker, left, right centre front speakers, left, right outside front speakers, left surround, right surround rear speakers, front low frequency ef- fects speaker |
| 9 | 2/2 | MPEG-2 L, R, LS, RS | left, right front speakers, left surround, right surround rear speakers |
| 10 | 2/1 | MPEG-2 L, R, S | left, right front speakers, rear surround speaker |
| | | | |

Table 1: Channel configuration association

Advantageously, an escape value '1' is defined in this table having e.g. index '1' in the table. If this value occurs,
 5 the desired channel configuration is not listed in the table and therefore the values in the channelLocation, channelDi-
 rection and polarityPattern fields are to be used for as-
 signing the desired channels and their properties. If the
 channelConfig index is an index defined in the table, the
 10 channelLocation, channelDirection and polarityPattern fields
 are vectors of the length zero.

In the channelLocation and channelDirection fields a 3D-
 float vector array can be defined, whereby the first 3 float

values (three-dimensional vector) are associated with the first channel, the next 3 float values are associated with the second channel, and so on.

The values are defined as x,y,z values (*right handed coordinate system as used in ISO/IEC 14772-1 (VRML 97)*). The channelLocation values describe the direction and the absolute distance in meter (the absolute distance has been used because simply the user can generate a normalised vector, as usually used in channel configuration). The channelDirection is a unit vector with the same coordinate system. E.g. channelLocation [0, 0, -1] relative to the listening sweet spot means centre speaker in one-meter distance. Three other examples are given in the three lines of table 2:

| channelLocation | | | channelDirection | | | Location |
|--------------------------|--------------------------|--------------------------|-------------------|-------------------|------------------|---------------------------------------|
| X | Y | Z | X | Y | Z | |
| 0 | 0 | -1 | 0 | 0 | 1 | center front speaker |
| $k \cdot \sin(30^\circ)$ | 0 | $k \cdot \cos(60^\circ)$ | $-\sin(30^\circ)$ | 0 | $\cos(60^\circ)$ | right front speaker |
| $k \cdot \sin(45^\circ)$ | $k \cdot \sin(45^\circ)$ | $k \cdot \cos(45^\circ)$ | $\sin(45^\circ)$ | $-\sin(45^\circ)$ | $\cos(45^\circ)$ | Ambisonic Cube (LFU) Left Front Up |

Table 2: Examples for channelLocation and channelDirection

The polarityPattern is an integer vector where the values are restricted to the values given in table 3. This is useful for example in case of Dolby ProLogic sound where the front channels have monopole pattern and the surround channel have dipole characteristic.

The polarityPattern can have values according to table 2.

| Value | Characteristics |
|-------|-----------------|
| 0 | Monopole |
| 1 | Dipole |
| 3 | Cardioid |
| 4 | Headphone |
| ... | ... |

Table 1: polarityPattern association

In an alternative embodiment of the invention, the additional AudioChannelConfig node 30 is not inserted. Instead, the functionality of this node is added to nodes of the type AudioMix 27, AudioSwitch 28 and AudioFX (not depicted).

5

In an further alternative embodiment of the invention, the above values of the phaseGroup fields are additionally defined for the corresponding existing nodes AudioMix, AudioSwitch and AudioFX in the first version ISO/IEC 14496
10 of the MPEG-4 standard. This is a partial solution whereby the values for the phase groups are taken from above table 1 except the escape sequence. Higher values are reserved for private or future use. For example, channels having the phaseGroup 2 are identified as left/right front speakers.

15

29316-30

13

CLAIMS:

1. Method for processing two or more decoded but not yet combined individual audio signals received or replayed from different audio sources, wherein at least two of said decoded audio signals have a different number of channels per
5 decoded audio signal or different channel configurations for channel to speaker mapping or have a different number of channels per decoded audio signal and different channel configurations for channel to speaker mapping, and wherein said decoded audio signals are to be combined by mixing or switching or mixing and switching before being presented in a final channel configuration, and wherein to
10 each one of said decoded audio signals a corresponding specific channel configuration information item representing corresponding number of channels and channel configuration for said each decoded audio signal is attached and the channel configuration information items for said two or more decoded audio signals can represent conflicting numbers of channels per decoded audio signal and conflicting
15 channel configurations, said method comprising:

controlling said mixing or switching or mixing and switching such that in case of conflicting numbers of channels and conflicting channel configurations the number of the channels and the configuration of the channels to be output following said mixing or switching or mixing and switching is determined by specific mixing or
20 switching or mixing and switching information provided from a content provider or broadcaster that is embedded in at least one of said audio signals, so as to resolve such conflict, and

attaching to the combined decoded audio signals to be presented a correspondingly updated channel configuration information item, wherein said
25 correspondingly updated channel configuration information item represents said determined number of channels and configuration.

2. Method according to claim 1, wherein said audio signals have MPEG-4 format.

29316-30

14

3. Apparatus for processing two or more decoded but not yet combined individual audio signals received or replayed from different audio sources, wherein at least two of said decoded audio signals have a different number of channels per decoded audio signal or different channel configurations for channel to speaker mapping or have a different number of channels per decoded audio signal and different channel configurations for channel to speaker mapping, and wherein said decoded audio signals are to be combined by mixing or switching or mixing and switching before being presented in a final channel configuration, and wherein to each one of said decoded audio signals a corresponding specific channel configuration information item representing corresponding number of channels and channel configuration for said each decoded audio signal is attached and the channel configuration information items for said two or more decoded audio signals can represent conflicting numbers of channels per decoded audio signal and conflicting channel configurations, said apparatus comprising:
- 15 at least two audio data decoders that decode audio data received or replayed;
- means for processing the audio signals decoded by said audio data decoders, wherein at least two of said decoded audio signals each have a different number of channels per decoded audio signal and a different channel configuration for channel to speaker mapping, and wherein said processing includes combination by mixing or switching or mixing and switching;
- 20 means for presenting the combined decoded audio signals in a final channel configuration;
- wherein in said processing means said mixing or switching or mixing and switching is controlled such that in case of conflicting numbers of channels and conflicting channel configurations the number of the channels and the configuration of the channels to be output following said mixing or switching or mixing and switching is determined by specific mixing or switching or mixing and switching
- 25

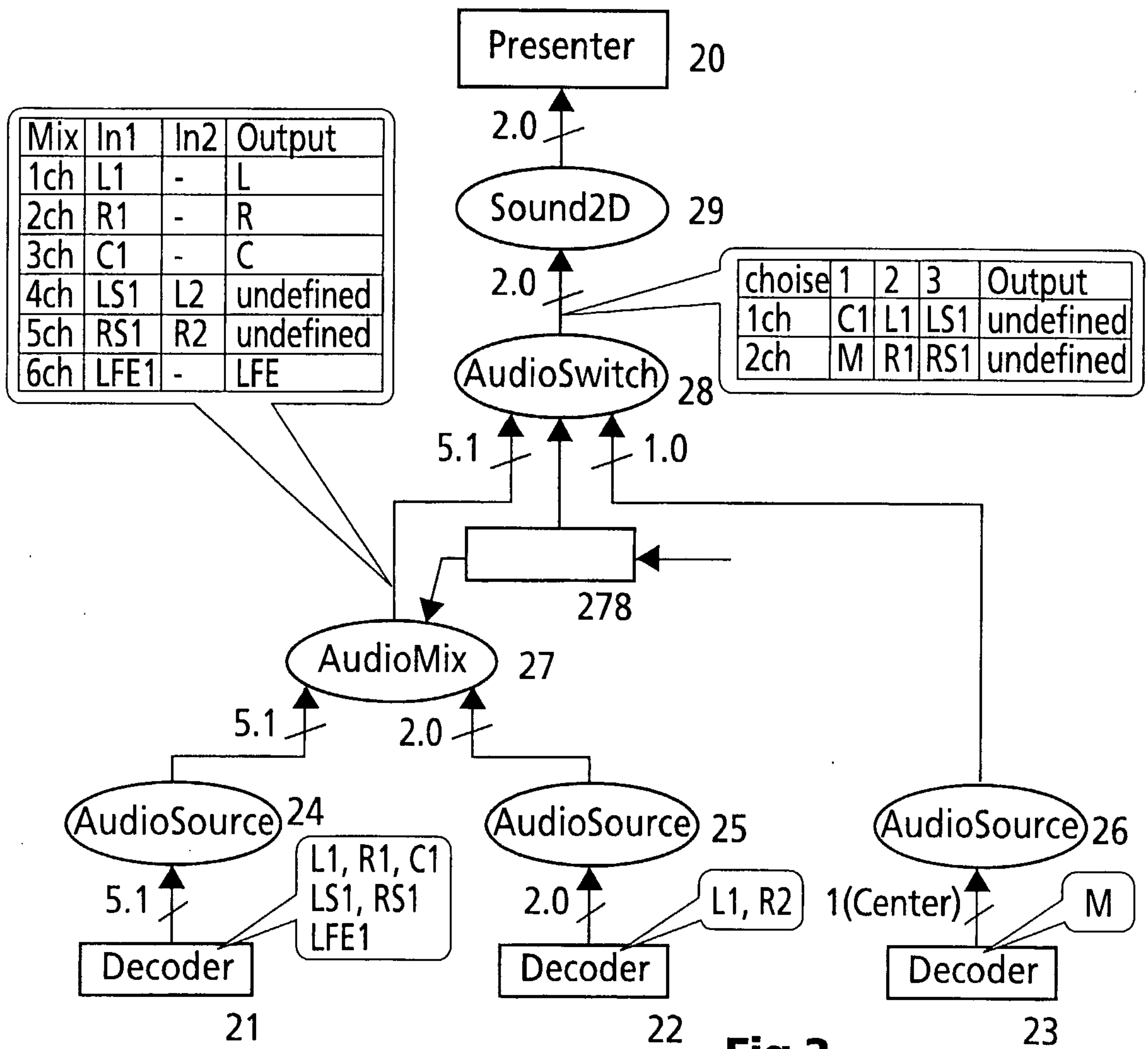
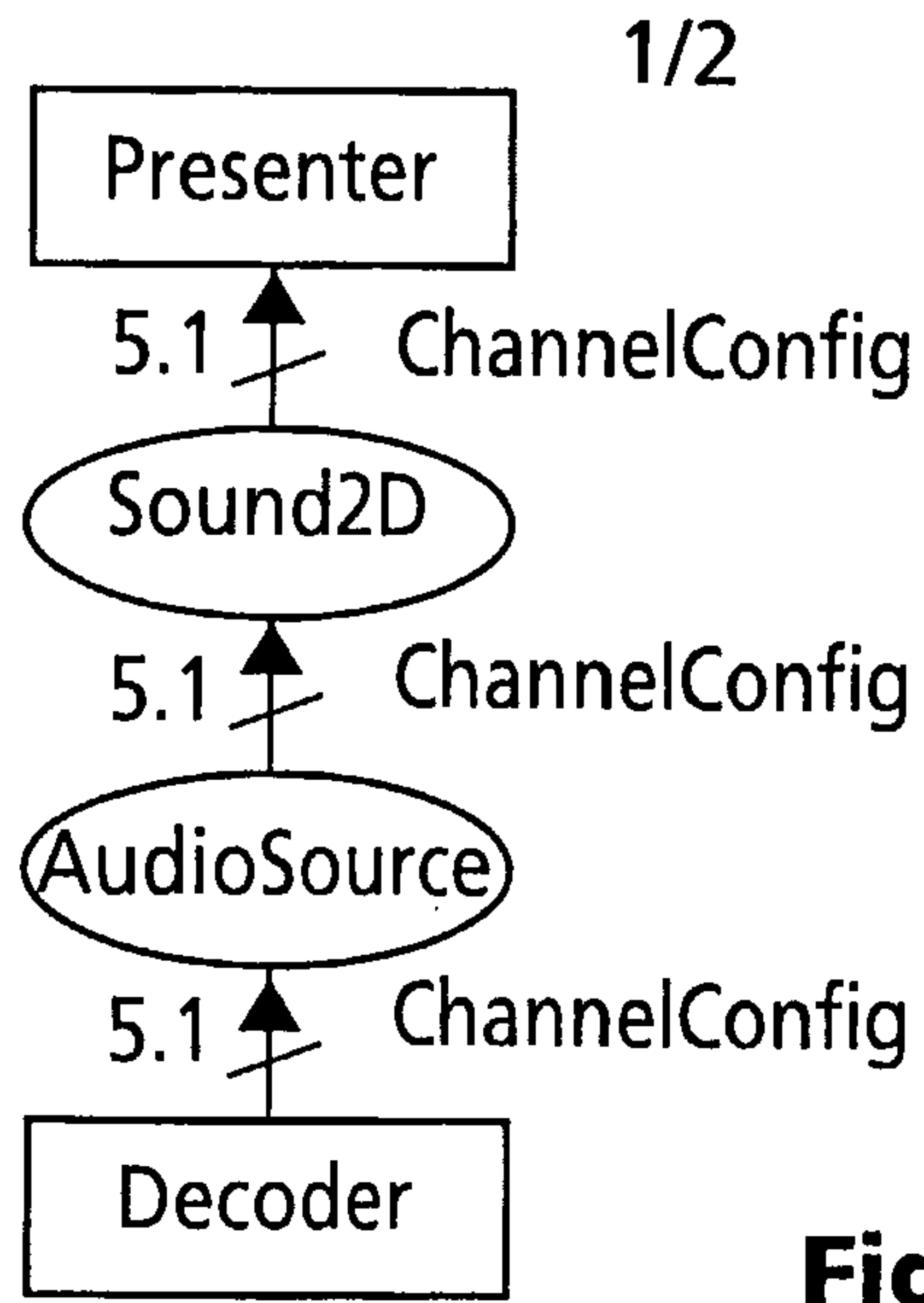
29316-30

15

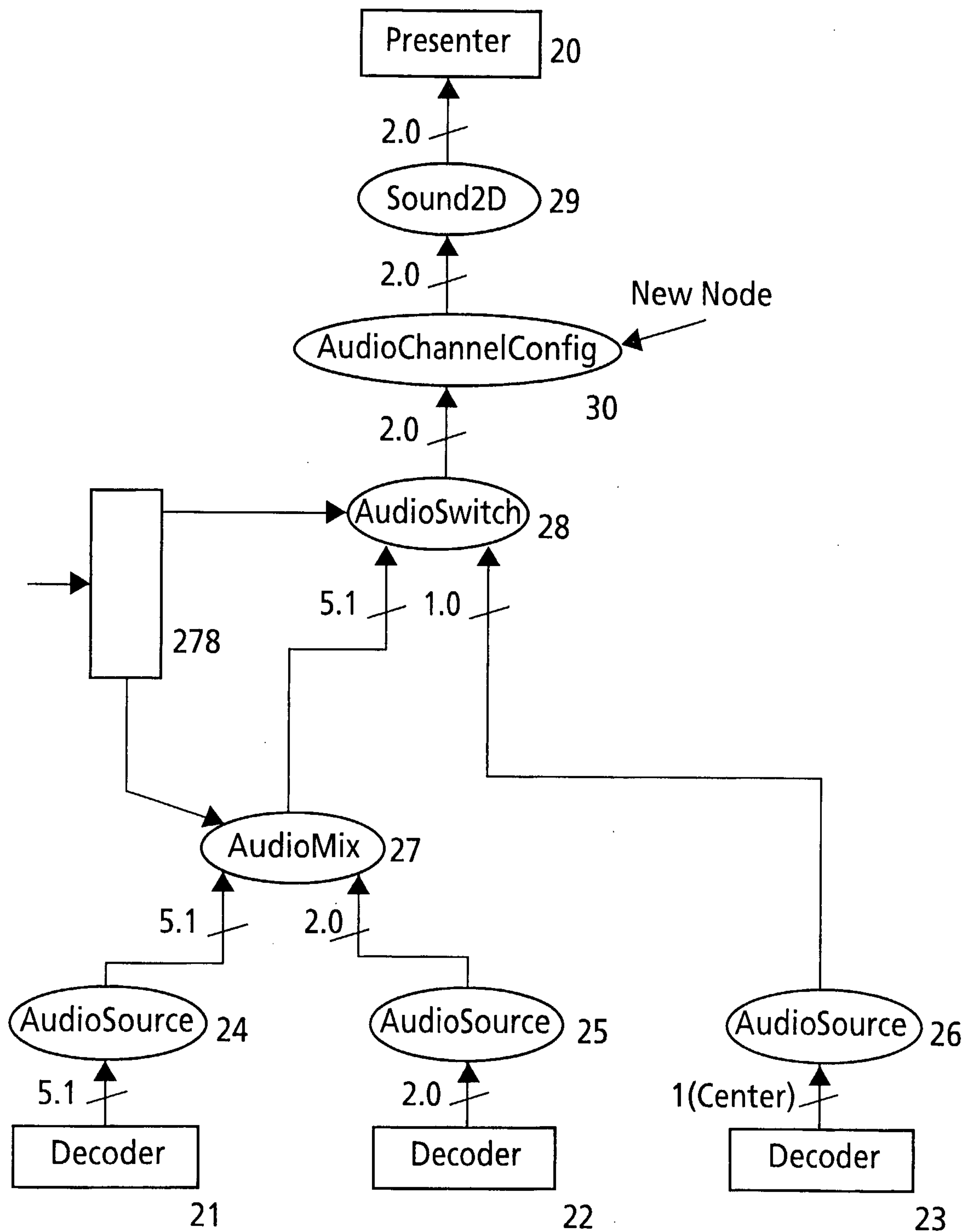
information provided from a content provider or broadcaster that is embedded in at least one of said audio signals, so as to resolve such conflict;

means for attaching to the combined decoded audio signals fed to said presenting means a correspondingly updated channel configuration information item,
5 wherein said correspondingly updated channel configuration information item represents said determined number of channels and configuration.

4. Apparatus according to claim 3, wherein said audio signals have MPEG-4 format.



2/2

**Fig.3**

