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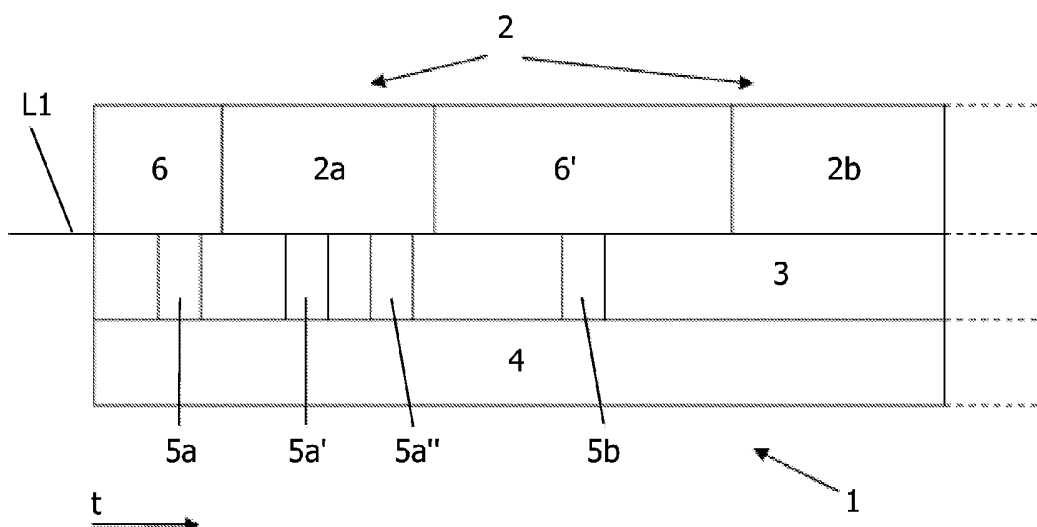
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(54) Title: BROADCASTING SIGNAL CONTAINING MUSIC DATA



(57) Abstract: A broadcasting signal containing music data, wherein the broadcasting signal further contains information about the beginning and the end of at least one individual song and meta data of this song.

Broadcasting Signal Containing Music Data

The invention relates to a broadcasting signal representing an audio signal component.

The invention further relates to a method for recording at least one individual song.

5 The invention further relates to a recording device, which is arranged to record an audio signal component represented by a broadcasting signal.

The invention also relates to a device for generating and broadcasting a broadcasting signal.

10 Broadcasting means the distribution of audio and/or video signals (programs) to a number of recipients ("listeners" or "viewers") that belong to a large group. This group may be the public in general, or a relatively large audience within the public.

Television and radio programs are usually distributed through radio broadcasting or cable, often both simultaneously. However, music or video contents may also
15 be broadcasted via the Internet using TCP/IP. By coding signals and having a decoding equipment in home subscription-based channels and pay-per-view services are also enabled.

Further many devices and methods for recording audio and/or video from a radio or television broadcast are known. Since it is very inconvenient for a user to record songs by manually actuating start and stop commands, devices and methods have become
20 known, which allow a user to automatically record songs and to put them into a play list.

Such a device is known from the document US 2004/0131255 A1. This document discloses a broadcasting signal as mentioned in the first paragraph and a method and a device as mentioned in the second or third paragraph respectively. According to the technical disclosure of this document audio data broadcasted by a music-broadcasting
25 channel are received by means of a TV set. The audio output of the TV set is converted from analog to digital by an A/D converter. The converted digital audio is written to a memory buffer. A song extractor a so called audio parser analyzes the digital audio and marks the beginning and ends of individual songs. The song extractor filters out non musical portions from the digital audio, such as pure speech. Each song marked by the song extractor is

written to a digital music library, which is a storage device such as a hard drive, and subsequently flushed from the memory buffer. Further a video frame grabber captures a video frame being displayed on the TV set such as a video frame. An optical character recognizer extracts characters from the video frame. A meta data generator identifies meta data associated with a current song, within the extracted characters, such as a genre, song title, artist name and album title within the video frame. The meta data identified by the meta data generator are then written to a digital music library, and then they are linked to the corresponding song.

With the known device, however, it has proved to be a disadvantage that the audio parser may fail to recognize the beginning and the end of an individual song depending on audio content between songs. A further disadvantage is that the music channel needs to put the audio identification on the screen of the TV set in form of a video frame and that an optical character recognition has to be carried out to get the meta data. Thus a further disadvantage of the known embodiment is that it is expensive and technically very difficult to realize.

It is an object of the invention to provide a signal of the type defined in the opening paragraph, and a method of the type defined in the second paragraph, and devices as defined in the third and fourth paragraph, in which the disadvantages defined above are avoided.

In order to achieve the object defined above, with a broadcasting signal according to the invention characteristic features are provided so that a device according to the invention can be characterized in the way defined below, that is:

A broadcasting signal representing an audio signal component of a song, wherein the broadcasting signal further contains information about the beginning and the end of at least one individual song and optionally also meta data of this song.

In order to achieve the object defined above, with a method according to the invention characteristic features are provided so that a method according to the invention can be characterized in the way defined below, that is:

A method of recording at least one individual song wherein a broadcasting signal according to the invention is used to record the song automatically.

In order to achieve the object defined above, with a recording device according to the invention characteristic features are provided so that a recording device according to the invention can be characterized in the way defined below, that is:

5 A recording device, which is arranged to record an audio signal component of a song represented by a broadcasting signal according to the invention, wherein the recording device is arranged to start and stop the recording of this song automatically by using the information about the beginning and the end of this song and optionally to identify at least one individual song by using the meta data.

10 In order to achieve the object defined above, with a device for generating and broadcasting a broadcasting signal according to the invention characteristic features are provided so that a device for generating and broadcasting a broadcasting signal according to the invention can be characterized in the way defined below, that is:

A device for generating and broadcasting a broadcasting signal wherein the device is arranged to generate a broadcasting signal according to the invention.

15 The characteristic features according to the invention provide the advantage that it is not necessary to analyze any video content to get meta data of a song and that a start/stop recognition for the recording is not influenced by audio heard during song transitions.

20 The measures as claimed in claim 2, provide the advantage that the invention can be implemented very easily in common TV or radio music channels.

The measures as claimed in claim 3, provide the advantage that the invention can be implemented very easily in digital TV, radio or Internet music channels.

The measures as claimed in claim 4 provide the advantage that it is possible to anticipate the end and to cut off/throw away undesired audio before the start of the song.

25 The measures as claimed in claim 5 respectively provide the advantage that no separate broadcasting channel is necessary to transport the additional information concerning the song.

However, it has proved to be particularly advantageous if the measures of claim 6 are provided. According to this solution there may be provided that the sub channel
30 level is between the noise floor of an audio signal containing the music data and the level of the clean audio signal, which means below the audible signal level.

The measures as claimed in claim 8 provide the advantage that automated song recognition and starting and stopping of recording can be realized very easily.

The measures as claimed in claim 9 or claim 12 provide the advantage that the recorded data can be uploaded on a computer or digital rendering device very easily.

The measures as claimed in claim 10 or claim 13 provide the advantage that a recorded song can be rendered by means of a so-called MP3 player.

5 The aspects defined above and further aspects of the invention are apparent from the examples of embodiment to be described hereinafter and are explained with reference to these examples of embodiment.

10 The invention will be described in more detail hereinafter with reference to examples of embodiment but to which the invention is not limited.

Fig. 1 shows a broadcasting signal according to the invention in a schematic form.

15 Fig. 2 shows a broadcasting system with a device for generating and broadcasting a broadcasting signal and a device for recording the broadcasted signal according to the invention.

The figures are schematically drawn and not true to scale.

20 It will be clear for those skilled in the art that alternative but equivalent embodiments of the invention are possible without deviating from the true inventive concept, and that the scope of the invention will be limited by the claims only.

25 Fig. 1 shows invention relevant parts of a broadcasting signal 1 according to the invention that represents an audio signal component of at least one song. Of course the broadcasting signal 1 can also contain a video signal component associated to the audio signal component too, but for simplicity reason in the following the invention is described taking just the audio signal component into consideration.

30 The audio signal component is plotted in the form audio signal level L versus time t , wherein the audio signal level L shows three distinct level bands. The first level band is the so called signal floor 4 that is not used / not usable for representing information. The second level band is located between the upper limit of the signal floor 4 and a signal level L_1 that is the threshold for audible recognizable information. Its use according to the information is explained in more details below. The third level band extends above the level

L1 and represent the audible recognizable information of the audio signal that is music or voice or any other desired audible signal component.

The broadcasting signal 1 contains music information 2 that represents songs 2a, 2b and additional information about the beginning and the end of individual songs 2a, 2b as well as meta information of these songs, which are often referred to as "meta data". All these information about the beginning and the end of the songs 2a, 2b and the respective meta data, such as title, album, interpret etc., will be referred to as additional information in the following text. The additional information are transmitted in a continuous sub channel 3 of the broadcasting signal 1. The broadcasting signal 1 shown in figure 1 is of an analog form for simplicity reason only. It is to mention that the broadcasting signal 1 may also be of the digital form. Consequently the audio signal represented by the broadcasting signal 1 has to be converted into the digital domain before being transmitted by the digital broadcasting signal 1.

The sub channel 3 is superimposed on the audio signal. This means that the sub channel 3 is part of the audio signal. Therefore no separate broadcast channel is necessary to transport the additional information about the songs 2a, 2b. The sub channel 3 lies between the noise floor 4 of the audio signal and the level L1 of the clear audio signal. Thus the information carried in the sub channel 3 is not audible for a user. The additional information is repeated for the whole duration of the respective song 2a, 2b. According to a preferred embodiment of the invention the sub channel 3 is realized by means of spread spectrum techniques, combined with an amplitude control.

Alternatively – not shown in Figure 1 - the sub channel 3 can be realized according to the Radio Data System or Radio Broadcast Data standard respectively. In the latter case the additional information concerning the songs 2a, 2b can for instance be transmitted as a so called Radio Text (RT) in the sub channel 3. RT is a function, known to those skilled in the art, that allows a radio station to transmit free-form textual information such as the title and artist of the currently-playing song that are synchron with the other parts of the transmitted program such as the currently-playing song.

As shown in Fig. 1 the sub channel 3 contains time markers 5a, 5b. The time markers 5a, 5b each include both relative time towards the beginning and the end of the song 2a. The time markers 5a, 5b, each can contain meta data too. So the time marker 5a could represent the information: "the song with the title "X", from the album "Y" of the artist "Z" will start in 10 seconds and will end in 5 min and 15 seconds". The same is true for the time marker 5b. Thus the time marker 5b marks the relative time towards the beginning and the

end of the song 2b. Using the information about the relative time towards the beginning and the end of the songs 2a, 2b makes it possible to anticipate the respective end, and to cut off or throw away undesired audio 6, 6' between the songs.

If there are commercials in between the song 2a or 2b, so that the song 2a or
5 2b is interrupted by commercials, the time markers 5a, 5b advantageously represent information about the relative time towards the beginning and the end of the commercials too. In this case the time marker 5a could represent the information: "the song with the title "X", from the album "Y" of the artist "Z" will start in 10 seconds and will be interrupted by an commercial in 30 seconds that ends in 50 seconds and ends in 5 min and 35 seconds".

10 This leads to a scheme of having relative time starting from zero (0) at the beginning of a song up to the end, together with fixed relative time markers for start and stop of commercials, and for the end of the song, all repeated over and over again.

According to Fig. 2 a broadcasting station generates and transmits the
broadcasting signal 1 to a receiver 10 of a user. The broadcasting signal 1 is generated and
15 transmitted by a means of a device 7 that comprises according to an embodiment of the invention a suitable programmed signal generator 8 connected to a conventional transmitting means 9. The broadcasting signal of Fig. 2 is an analog signal. But, however, the technical teaching of the following is in principal also true for digital signals too.

The receiver 10 of the broadcasting signal 1 shown in Fig. 2 is a conventional
20 TV set. An audio line-out of the receiver 10 is connected to a line-in input of a recording device 11 that is realized by a so called portable MP3 player, which is arranged for reproducing MPEG 1 Layer 3 (MP3) compressed music songs and in addition is arranged for recording music via its line-in input according to said compression scheme or any other appropriate compression scheme executable by the player. The received audio is transmitted
25 from the receiver 10 to the recording device 11. Alternatively to using a conventional TV set for receiving the broadcasting signal 1 a conventional radio set can also be used if the broadcasting signal 1 is transmitted within a radio frequency range.

The recording device 11 checks using the additional information contained in the received broadcasting signal 1 the title, author etc. and in particular the starting and
30 stopping time of the songs 2a, 2b. If the marker 5b is received by the recording device 11 the recording device 11 knows that and when the song 2b is sent.

In Fig. 1 the time t elapses from left to right. Thus the marker 5a is received by the recording device 11 chronologically before the song 2a is received. After receiving the marker 5a a control unit 12 of the recording device 11 starts the recording of the song 2a

using an internal watch 13 to detect the time passed after receiving the marker 5a that triggered the watch 13. For example, if the recording device 11 receives the marker 5a that represents the following information: "the song 2b will start in 10 seconds and will end in 5 min and 15 seconds", the control unit 12 will start the recording of the song 2a ten (10) seconds after receiving the marker 5a and will stop the recording after five (5) min and fifteen (15) seconds after receiving the marker 5a automatically. Using the marker 5b the control unit 12 starts the recording of the song 2b in the same way as described above. The songs 2a, 2b are recorded to and stored in a memory 14 of the recording unit 11. According to the embodiment described above the marker 5a is received by the recording device before the song 2a.

But according to the preferred embodiment of the invention and alternatively to the solution described in the preceding paragraph time markers 5a', 5a'' regarding to the song 2a are sent during the whole duration of this song and are limited to appear during that song only. In principle there can be a plurality of time markers 5a', 5a'' in the song 2a. The time markers 5a', 5a'' each contain the relative times to the beginning and end of the song 2a. So the marker 5a' could represent the information: "My relative time interval towards the beginning of the song 2a is 20 seconds and my relative time interval towards the end of the song 2a is 90 seconds." Whereas the marker 5a'' could represent the information: "My relative time interval towards the beginning of the song 2a is 40 seconds and my relative time interval towards the end of the song 2a is 70 seconds." The time markers 5a', 5a'' can be received by the recording device 11 chronologically after the beginning of the song 2a. The correct detection of one of the markers 5a', 5a'' during the song 2a is sufficient to properly record the song 2a if the broadcasting signal 1 is automatically written to a buffer or another memory of the recording device 11 when the broadcasting signal 1 is received by the recording device 11. After detecting one of the markers 5a', 5a'' the control unit 12 filters out the song 2a from the data stored or buffered in the recording device 11 and records it to the memory 14 using one of the markers 5a', 5a'' to detect the beginning and the end of the song 2a. Recorded or buffered commercials and disc jockey talks etc. are thrown away or rejected from being recorded as they are not being identified as being part of the song by utilizing the markers 5a', 5a''.

Preferably the control unit 12 is also arranged to check if the song 2b or 2a is already stored in the recording device 11. In the case that the song 2a or 2b is already stored the control unit 12 will not store this song again.

The control unit 12 can be realized by means of a suitable programmed micro processor.

According to another embodiment of the invention a user can enter to the recording device 11 a list of songs that shall be stored. This list is stored in a memory of the recording device 11, for example in the memory 14. The list contains the meta data of the songs to be stored. In this embodiment the control unit 12 compares the meta data of the songs 2a, 2b with the meta data of the songs in the list. If a desired song 2a, 2b is broadcasted, the respective song 2a, 2b will be recorded and stored in the memory 14 of the recording device 11 automatically.

The recording device 11 further comprises an A/D converter 15 to convert the analog broadcasting signal 1 in a digital data format. Thus the analog songs 2a, 2b are converted into a digital data format and stored in this format in the memory 14 of the recording device 11. Preferably the recording device 11 comprises means not shown in Fig. 2, such as a suitable programmed processor, to convert the song 2b into the MP3 data format and to store the song 2b in this format in the memory 13. According to a preferred embodiment of the invention the recording device 11 further comprises conventional means for rendering MP3 files. The means for rendering the songs 2a, 2b are not shown in Fig. 2. In this case the recording device 11 according to the invention constitutes an MP3 player that gets automatically loaded or refreshed with actual music, ready to play afterwards. The recorded songs are identified by title and author and can be put in a play list or a browsing database.

It is an major advantage of the invention that a music video TV channel can be used as a music shop allowing automatic recording of the audio signal component of a music video that is to say the song.

According to the invention it is possible that the broadcasting station transmits the additional information via the sub channel 3 just for selected songs. This means that an automatic recording is just possible for these selected songs that is synchronized by the aid of said time markers. The broadcasting provider allows the automatic recording of songs by encoding them as described above. So it is up to the broadcasting provider to decide which songs can be copied automatically and which not. All the user has to do for recording the songs is to connect his recording device 11 via the line-in connector to a conventional TV or radio set at the line-out connector.

According to a preferred embodiment of the invention the recording device 11 is enabled for the above mentioned automatic recording service by entering a key delivered

by the broadcasting provider. This key is generated by utilizing of spread spectrum patterns contained in the broadcasting signal 1. The key entered by the user and the spread spectrum patterns contained in the broadcasting signal are checked for correspondence to each other in the recording device 11 in order to have the automatic recording feature enabled. These
5 patterns are changed after a certain time by the broadcasting provider.

Although the invention is described in regard to the recording of song audios it would be in principal possible to record music videos too. Thus the term "song" in the claims and the description does not just mean a pure "audio song" but also a "video song" such as music video containing both audio and video. But nevertheless the main aspect of the
10 invention is to automatically record a song's audios signal component.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be capable of designing many alternative embodiments without departing from the scope of the invention as defined by the appended claims. In the claims, any reference signs placed in parentheses shall not be
15 construed as limiting the claims. The word "comprising" and "comprises", and the like, does not exclude the presence of elements or steps other than those listed in any claim or the specification as a whole. The singular reference of an element does not exclude the plural reference of such elements and vice-versa. In a device claim enumerating several means, several of these means may be embodied by one and the same item of hardware. The mere
20 fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

CLAIMS:

1. A broadcasting signal (1) representing an audio signal component of a song (2a, 2b) , wherein the broadcasting signal (1) further contains information about the beginning and the end of at least one individual song (2a, 2b) and optionally also meta data of this song (2a, 2b).

5

2. A broadcasting signal (1) as claimed in claim 1, wherein the broadcasting signal (1) is an analog signal.

10

3. A broadcasting signal (1) as claimed in claim 1 wherein the broad casting signal (1) is a digital signal.

4. A broadcasting signal (1) as claimed in one of the claims 1 to 3, wherein the broadcasting signal (1) comprises at least one marker (5a, 5b) marking the relative time to the beginning and the end of the at least one individual song (2a, 2b).

15

5. A broadcasting signal (1) as claimed in one of the claims 1 to 4, wherein the information about the beginning and the end of the at least one individual song (2a, 2b) and optionally also the meta data of said song (2a, 2b) are superimposed on the audio signal component the broadcasting signal (1).

20

6. A broadcasting signal (1) as claimed in one of the claims 1 to 5, wherein the information about the beginning and the end of the at least one individual song (2a, 2b) and optionally also the meta data are contained in a sub channel (3) of the broadcasting signal (1).

25

7. A method of recording at least one individual song (2a, 2b), wherein a broadcasting signal (1) according to one of the claims 1 to 6 is used to record the song (2a, 2b) automatically.

8. A method as claimed in claim 7, wherein the meta data of the broadcasting signal (1) are used to identify the song (2a, 2b), and the information about the beginning and the end of this song contained in the broadcasting signal (1) are used to start and stop the recording of the song (2a, 2b).

5

9. A method as claimed in claim 7 or 8, wherein the at least one song (2a, 2b) is recorded in a digital data format.

10. A method as claimed in one of the claims 7 to 9, wherein the at least one song (2a, 2b) is recorded according to the standard MPEG 1 Layer 3 (MP3) data format.

11. A recording device (11), which is arranged to record an audio signal component of a song (2a, 2b) represented by a broadcasting signal (1) as claimed in one of the claims 1 to 6, wherein the recording device (11) is arranged to start and stop the recording of this song (2a, 2b) automatically by using the information about the beginning and the end of this song (2a, 2b) and optionally to identify at least one individual song (2a, 2b) by using the meta data.

12. A recording device (10) as claimed in claim 11, wherein the recording device (10) comprises means (14) for converting a received analog audio signal in a digital data format.

13. A recording device (10) as claimed in claim 11 or 12, wherein the recording device (10) is arranged to convert an audio signal according to the standard MPEG 1 Layer 3 (MP3) into the compressed MP3 data format.

14. A device (7) for generating and broadcasting a broadcasting signal, wherein the device (7) is arranged to generate a broadcasting signal (1) as claimed in one of the claims 1 to 6.

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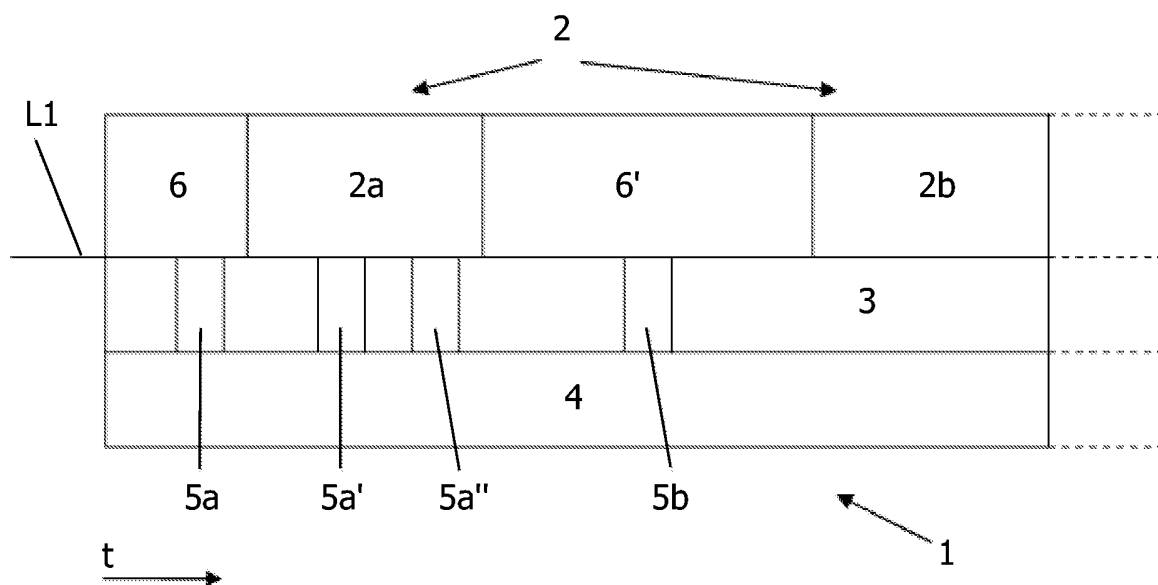


FIG. 1

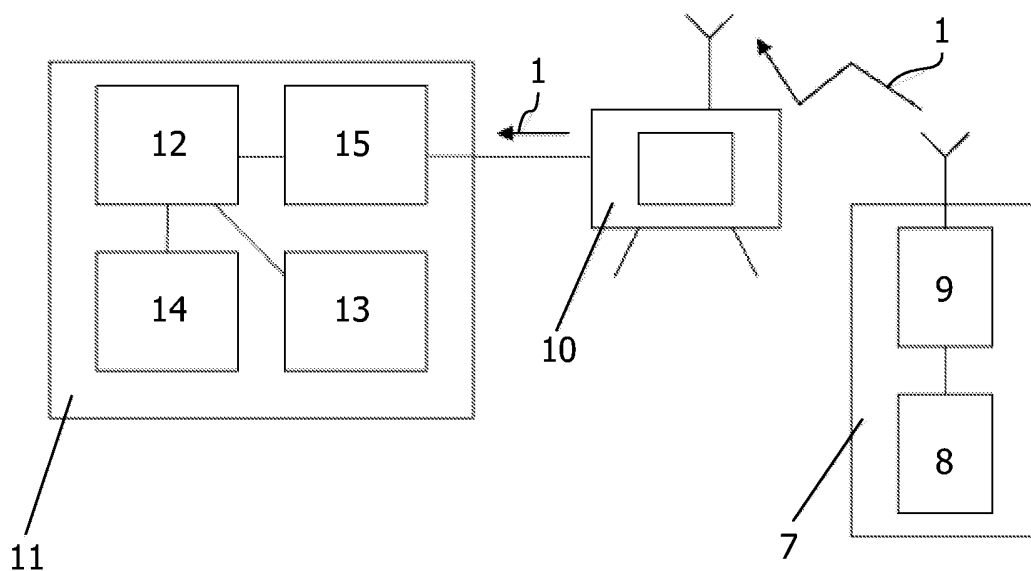


FIG. 2