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(74) Agent: SHINSUNG PATENT FIRM; 2-3F, Line Bldg.,
823-30, Yeoksam-dong, Kangnam-ku, Seoul 135-080
(KR).

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(71) Applicant (for all designated States except US): ELEC-
TRONICS AND TELECOMMUNICATIONS RE-
SEARCH INSTITUTE [KR/KR]; 161, Gajeong-dong,
Yuseong-gu, Daejeon 305-350 (KR).

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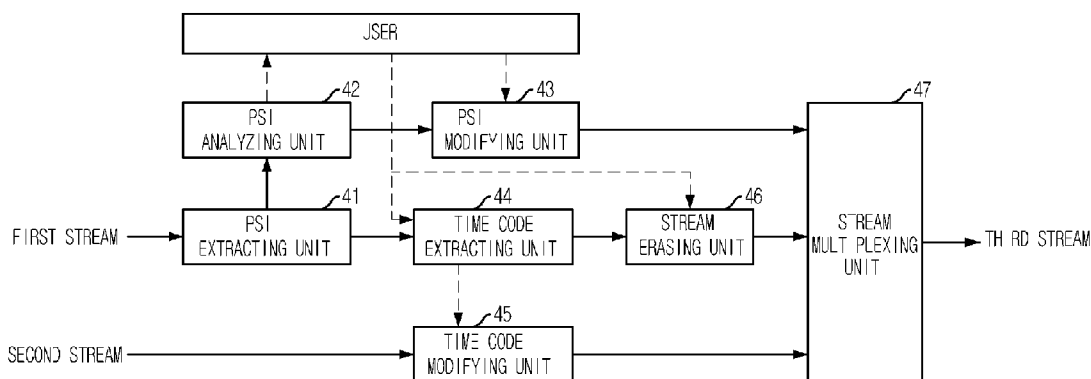
(72) Inventors; and

(75) Inventors/Applicants (for US only): BAE, Byung-Jun
[KR/KR]; #212-405 Saemmeori Apt., Dunsan 2-dong,
Seo-gu, Daejeon 302-777 (KR). KIM, Woo-Suk [KR/KR];
#403-95 Sambu Apt., Taepyeong-dong, Jung-gu, Daejeon
301-150 (KR). AHN, Chung-Hyun [KR/KR]; #101-705
Hyundai Apt., Doryong-dong, Yuseong-gu, Daejeon
305-340 (KR). LEE, Soo-In [KR/KR]; #106-606 Clover
Apt., Dunsan-dong, Seo-gu, Daejeon 302-120 (KR).

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(54) Title: APPARATUS AND METHOD FOR TRANSFORMING TERRESTRIAL DMB STREAM, AND TERRESTRIAL
DMB STREAM TRANSMITTING SYSTEM AND METHOD EMPLOYING THE SAME



(57) Abstract: The present invention provides an apparatus for transforming a terrestrial digital multimedia broadcasting (DMB) stream. The transformation apparatus includes a program specific information (PSI) extracting unit extracting PSI of a first stream and transmitting the first stream to a time code extracting unit a PSI analyzing unit analyzing the PSI of the first stream and acquiring construction information thereof; a PSI modifying unit for modifying the PSI information based on PSI modification information; the time code extracting unit for extracting time code information from the first stream based on stream information; a time code modifying unit for modifying a time code of a second stream based on the time code information; a stream erasing unit for erasing a stream piece of the first stream based on stream erasing information from the user; and a multiplexing unit for multiplexing the modified PSI, the modified first stream and the modified second stream.

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Description

APPARATUS AND METHOD FOR TRANSFORMING TERRESTRIAL DMB STREAM, AND TERRESTRIAL DMB STREAM TRANSMITTING SYSTEM AND METHOD EMPLOYING THE SAME

Technical Field

- [1] The present invention relates to an apparatus and a method for transforming a terrestrial digital multimedia broadcasting (DMB) stream, and a system and method for transmitting the terrestrial DMB stream by using the terrestrial DMB stream transforming apparatus and method.

Background Art

- [2] Generally, a terrestrial digital multimedia broadcasting (DMB) is a digital multimedia broadcasting service providing a data service or a moving picture service having a sound quality as good as that of compact disk (CD) and superior receiving quality when a subscriber is in motion.
- [3] Since the terrestrial DMB has a narrow channel bandwidth, the amount of data transmitted through one channel is small. Therefore, a variety of broadcasting services providing multimedia broadcasting services with a small amount of data are developed.
- [4] For example, there is a still image service which does not synchronize a video stream and an audio stream but synchronizes a starting time and a finish time of a program based on an audio broadcasting service.
- [5] The still image service synchronizes the starting time, a finish time and a conversion time of a picture, however, the still image service does not need a lip-sync. Accordingly, a predetermined stream in the entire moving picture broadcasting stream, i.e., the video stream or the audio stream, can be replaced with another predetermined stream.
- [6] However, a conventional terrestrial DMB transmitting system in Fig. 1 cannot provide the above described function. Hereinafter, the conventional terrestrial DMB transmitting system will be described in detail.
- [7] As shown in Fig. 1, the conventional terrestrial DMB transmitting system includes an audio encoder 11, a data encoder 12, a multimedia encoder 13, an ensemble multiplexer 14 and a coder orthogonal frequency division multiplexing (COFDM) encoder 15.
- [8] The audio encoder 11 encodes an audio source.
- [9] The data encoder 12 encodes a data source.

- [10] The multimedia encoder 13 encodes a multimedia source.
- [11] The ensemble multiplexer 14 multiplexes an audio stream encoded in the audio encoder 11, a data stream encoded in the data encoder 12 and a multimedia stream encoded in the multimedia encoder 13 into a broadcasting stream (frame) of the ensemble transport interface standard.
- [12] The COFDM encoder 15 encodes the multiplexed broadcasting stream (frame) in the ensemble multiplexer 14.
- [13] In a DMB service, the conventional terrestrial DMB transmitting system can provide a moving picture broadcasting service having a high transmission rate using a lip-sync by synchronizing a video stream and an audio stream, and a still image service having a low transmission rate.
- [14] However, in the still image service, since a stream piece of a broadcasting stream cannot be replaced with other stream piece, variety types of terrestrial DMB services cannot be provided to the user.
- [15] Herein, the stream piece of a broadcasting stream is defined as a part of the broadcasting stream.

Disclosure of Invention

Technical Problem

- [16] It is, therefore, an object of the present invention to provide an apparatus for transforming a stream piece of a first stream into a second stream based on a request from a user, and a method thereof.
- [17] It is another object of the present invention to provide a system for transmitting the terrestrial DMB employing the apparatus for transforming the terrestrial DMB stream that provides a variety of the terrestrial DMB services to the user by transforming a stream piece of a first stream into a second stream based on a request from a user when a start time, a finish time and a conversion time of picture of an audio stream and a video stream are synchronized and lip-synch is not provided, and a method for transmitting the terrestrial DMB stream using the same.
- [18] Other objects and advantages of the present invention will be clearly understood by the following description and embodiments. Also, it is obvious to those skilled in the art that the objects and advantages of the present invention can be realized by the means as claimed and combinations thereof.

Technical Solution

- [19] In accordance with one aspect of the present invention, there is provided an apparatus for transforming multimedia data into a terrestrial digital multimedia broadcasting (DMB) stream, the apparatus including: a program specific information (PSI) extracting unit for extracting PSI of a first stream and transmitting the first

stream to a time code extracting means; a PSI analyzing unit for analyzing the PSI of the first stream extracted in the PSI extracting unit and acquiring construction information of the first stream; a PSI modifying unit for modifying in the PSI information based on PSI modification information transmitted from outside to thereby generate modified PSI; the time code extracting unit for extracting time code information from the first stream based on stream information having a time code; a time code modifying unit for modifying a time code of a second stream based on the time code information extracted in the time code extracting means; a stream erasing unit for erasing a stream piece of the first stream based on stream erasing information from the user to thereby generate modified first stream; and a multiplexing unit for multiplexing the modified PSI, the modified first stream from the stream erasing unit and the modified second stream.

[20] In accordance with another aspect of the present invention, there is provided a method for transforming multimedia data into a terrestrial digital multimedia broadcasting stream, which includes the steps of: a) acquiring construction information from a first stream by extracting PSI of the first stream and analyzing the extracted PSI; b) modifying the PSI based on PSI modification information received from a user to thereby generate modified PSI; c) extracting time code information from the first stream based on stream information having a time code, and modifying a time code of a second stream based on the time code information to thereby generate modified second stream; d) erasing the stream piece of the first stream based on stream erasing information received from the user to thereby generate modified first stream; and e) multiplexing the modified PSI, the modified first stream and the modified second stream.

[21] In accordance with another aspect of the present invention, there is provided a system for transmitting a terrestrial DMB stream, which includes: an audio encoding unit for encoding an audio source; a data encoding unit for encoding a data source; a multimedia encoding unit for encoding a multimedia source received in real-time; a stream transforming unit for replacing a stream piece of a first stream with a second stream to thereby generate a transformed multimedia stream; an ensemble multiplexing unit for multiplexing an audio stream encoded in the audio encoding means, a data stream encoded in the data encoding unit and the transformed multimedia stream into a broadcasting stream that conforms to the ensemble transport interface standard; and an encoding unit for encoding the multiplexed broadcasting stream to thereby generate an encoded broadcasting stream and transmitting the encoded broadcasting stream.

[22] In accordance with another aspect of the present invention, there is provided a method for transmitting a terrestrial DMB stream, which includes the steps of: a) encoding an audio source; b) encoding a data source; c) encoding a multimedia source

received in real-time or a pre-encoded multimedia source; d) replacing a stream piece of a first stream with a second stream to thereby generate a transformed multimedia stream; e) multiplexing the encoded audio stream, the encoded data stream and the transformed multimedia stream into a broadcasting stream that conforms to the ensemble transport interface standard; and f) encoding the multiplexed broadcasting stream and transmitting the encoded broadcasting stream to a transmitter.

Advantageous Effects

- [23] The present invention can provide a variety of a terrestrial DMB services to a user by transforming a stream piece of a first stream into a second stream based on a request from the user when a start time, a finish time and a conversion time of picture of an audio stream and a video stream are synchronized and lip-synch is not provided.

Brief Description of the Drawings

- [24] The above and other objects and features of the present invention will become apparent from the following description of the preferred embodiments given in conjunction with the accompanying drawings, in which:
- [25] Fig. 1 is a block diagram illustrating a conventional terrestrial digital multimedia broadcasting (DMB) transmitting system;
- [26] Fig. 2 is a block diagram illustrating a system for transmitting a terrestrial DMB stream in accordance with a first embodiment of the present invention;
- [27] Fig. 3 is a block diagram illustrating a system for transmitting the terrestrial DMB stream in accordance with a second embodiment of the present invention;
- [28] Fig. 4 is a block diagram illustrating a stream transformer for transforming the terrestrial DMB stream in accordance with an embodiment of the present invention;
- [29] Fig. 5 is a diagram describing a method for transforming terrestrial DMB stream in accordance with the present invention;
- [30] Fig. 6 is a flowchart illustrating a method for transforming the terrestrial DMB stream in accordance with an embodiment of the present invention; and
- [31] Fig. 7 is a flowchart illustrating a method for transmitting the terrestrial DMB stream in accordance with an embodiment of the present invention.

Mode for the Invention

- [32] Other objects and aspects of the invention will become apparent from the following description of the embodiments with reference to the accompanying drawings, which is set forth hereinafter.
- [33] Fig. 2 is a block diagram illustrating a system for transmitting a terrestrial DMB stream in accordance with a first embodiment of the present invention.
- [34] As shown in Fig. 2, the terrestrial DMB stream transmitting system of the present invention includes an audio encoder 21, a data encoder 22, a multimedia encoder 23, a

stream transformer 24, an ensemble multiplexer 25 and a coder orthogonal frequency division multiplexing (COFDM) encoder 26.

[35] The audio encoder 21 encodes an audio source to generate an audio stream.

[36] The data encoder 22 encodes a data source to generate a data stream.

[37] The multimedia encoder 23 encodes a multimedia source.

[38] The stream transformer 24 replaces a stream piece of a multimedia stream encoded in the multimedia encoder 23 with a received stream to thereby generate a transformed multimedia stream.

[39] The ensemble multiplexer 25 multiplexes the audio stream encoded in the audio encoder 21, the data stream encoded in the data encoder 22 and the transformed multimedia stream into a broadcasting stream which is formed of frames that conform to the ensemble transport interface standard.

[40] The COFDM encoder 26 encodes the multiplexed broadcasting stream in the ensemble multiplexer 25 and transmits the encoded broadcasting stream to a transmitter.

[41] Fig. 3 is a block diagram illustrating a system for transmitting a terrestrial DMB stream in accordance with a second embodiment of the present invention.

[42] As shown in Fig. 3, the system for transmitting the terrestrial DMB stream in accordance with the present invention includes an audio encoder 31, a data encoder 32, a stream storage 33, a stream transformer 34, an ensemble multiplexer 35 and a coder orthogonal frequency division multiplexing (COFDM) encoder 36.

[43] The audio encoder 31 encodes an audio source to generate an audio stream.

[44] The data encoder 32 encodes a data source to generate a data stream.

[45] The stream storage 33 stores an encoded multimedia stream.

[46] The stream transformer 34 replaces a stream piece of a multimedia stream stored in the stream storage 33 with a received stream to thereby generate a transformed multimedia stream.

[47] The ensemble multiplexer 35 multiplexes the audio stream encoded in the audio encoder 31, the data stream encoded in the data encoder 32 and the transformed multimedia stream into a broadcasting stream. The broadcasting stream includes frames that conform to the ensemble transport interface standard.

[48] The COFDM encoder 36 encodes the multiplexed broadcasting stream in the ensemble multiplexer 35 to generate encoded stream and transmits the encoded stream to a transmitter.

[49] Fig. 4 is a block diagram illustrating a stream transformer for transforming a terrestrial DMB stream in accordance with the present invention.

[50] In the drawing, a first stream is an encoded stream encoded in the multimedia encoder 23 in real-time or a stored stream in the stream storage 33. In addition, a

second stream represents a replacement stream and a third stream represents a transformed stream that a stream piece of the first stream is replaced with the second stream.

- [51] Meanwhile, the encoded multimedia stream of the terrestrial DMB is a type of a MPEG-2 transport stream (TS). The MPEG-2 TS includes a video stream, an audio stream and program specific information (PSI). Herein, the PSI includes construction information of stream.
- [52] As shown in Fig. 4, the stream transformer for transforming terrestrial DMB stream includes a program specific information(PSI) extracting unit 41, a PSI analyzing unit 42, a PSI modifying unit 43, a time code extracting unit 44, a time code modifying unit 45, a stream erasing unit 46 and a stream multiplexing unit 47.
- [53] The program specific information (PSI) extracting unit 41 transmits the first stream to a time code extracting unit 44 and extracts program specific information (PSI) of the first stream.
- [54] The PSI analyzing unit 42 analyzes the extracted PSI in the PSI extracting unit 41 and acquires construction information of the first stream.
- [55] The PSI modifying unit 43 modifies the extracted PSI based on PSI modification information received from a user to generate modified PSI.
- [56] The time code extracting unit 44 extracts time code information from the first stream based on stream information having a time code received from the user.
- [57] The time code modifying unit 45 modifies a time code of the second stream by using the time code information extracted in the time code extracting unit 44.
- [58] The stream erasing unit 46 erases a corresponding stream piece of the first stream based on stream erasing information received from the user to thereby generate a first modified stream.
- [59] The stream multiplexing unit 47 multiplexes the modified PSI from the PSI modifying unit 43, the first modified stream from the stream erasing unit 46 and the second modified stream from the time code modifying unit 45, to thereby generate the third stream. The second modified stream means the second stream of which time code is modified.
- [60] Herein, the time code modifying unit 45 synchronizes a starting time, a finish time and a conversion time of a picture of the first stream and the second stream for providing natural video service and audio service similar to the moving picture broadcasting service. That is, the time code information of the second stream is modified based on the time code information extracted from the first stream. Since two streams are combined by using the time code information, natural broadcasting service can be provided.
- [61] The time code extracting unit 44 may receive the stream information having a time

code from the PSI analyzing unit 42.

[62] The stream erasing unit 46 may receive the erasing stream information from the PSI modifying unit 43.

[63] Fig. 5 is a diagram describing a method for transforming terrestrial DMB stream in accordance with the present invention.

[64] First, a first stream includes an audio broadcasting data and a plurality of still images (a first still image) which are produced by the terrestrial DMB multimedia broadcasting service standard. When, the first still image of the first stream is needed to be replaced with new still images, the stream transformer for transforming the terrestrial DMB stream of the present invention outputs a third stream by using a second stream having a second still image. The third stream includes the audio broadcasting data and the second still image.

[65] That is, the stream transformer of the present invention receives the first stream including the first still image and the audio broadcasting data and the second stream including the second still image. Then, the stream transformer erases the first still image of the first stream and inserts the second still image into the first stream. Accordingly, the first still image of the first stream is transformed into the second still image of the second stream. Finally, the third stream includes the second still image and the audio broadcasting data.

[66] Fig. 6 is a flowchart illustrating a method for transforming the terrestrial DMB stream in accordance with the present invention.

[67] First, program specific information (PSI) of a first stream is extracted and analyzed to thereby acquire construction information of the first stream at step S601.

[68] At step S602, information on stream to be transformed in the PSI is modified based on PSI modification information received from a user.

[69] At step S603, time code information from a stream piece of the first stream is extracted based on stream information having a time code.

[70] At step S604, a time code of a second stream is modified based on the time code information.

[71] At step S605, the stream piece of the first stream is erased based on stream erasing information received from the user.

[72] At step S606, the modified PSI, the first modified stream and the second modified stream are multiplexed.

[73] Fig. 7 is a flowchart illustrating a method for transmitting the terrestrial DMB stream in accordance with the present invention.

[74] First, an audio source is encoded at step S701. At step S702, a data source is encoded. At step S703, a multimedia source received in real-time is encoded or a pre-encoded multimedia stream stored in the stream storage 33 is forwarded.

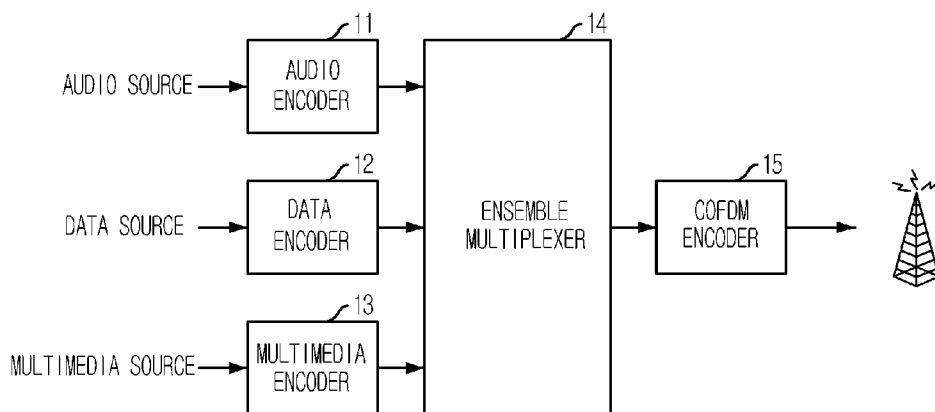
- [75] At step S704, a stream piece of a first stream encoded or forwarded at step S703 is replaced with a second stream to thereby generate a transformed multimedia stream.
- [76] At step S705, the encoded audio stream, the encoded data stream and the transformed multimedia stream are multiplexed into a broadcasting stream based on the ensemble transport interface standard.
- [77] At step S706, the multiplexed broadcasting stream is encoded and the encoded broadcasting stream is transmitted to a transmitter.
- [78] The above described method according to the present invention can be embodied as a program and be stored on a computer readable recording medium. The computer readable recording medium is any data storage device that can store data which can be read by the computer system. The computer readable recording medium includes a read-only memory (ROM), a random-access memory (RAM), a CD-ROM, a floppy disk, a hard disk and an optical magnetic disk.
- [79] The present application contains subject matter related to Korean patent application No. 2005-0062667, filed with the Korean Intellectual Property Office on July 12, 2005, the entire contents of which is incorporated herein by reference.
- [80] While the present invention has been described with respect to certain preferred embodiments, it will be apparent to those skilled in the art that various changes and modifications may be made without departing from the scope of the invention as defined in the following claims.

Claims

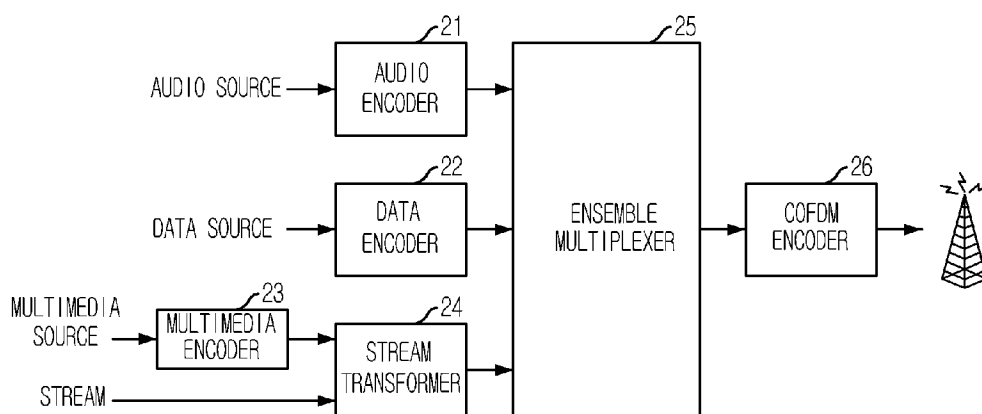
- [1] An apparatus for transforming multimedia data into a terrestrial digital multimedia broadcasting (DMB) stream, comprising:
a program specific information (PSI) extracting means for extracting PSI of a first stream and transmitting the first stream to a time code extracting means;
a PSI analyzing means for analyzing the PSI of the first stream extracted in the PSI extracting means and acquiring construction information of the first stream;
a PSI modifying means for modifying in the PSI information based on PSI modification information transmitted from outside to thereby generate modified PSI;
the time code extracting means for extracting time code information from the first stream based on stream information having a time code;
a time code modifying means for modifying a time code of a second stream based on the time code information extracted in the time code extracting means;
a stream erasing means for erasing a stream piece of the first stream based on stream erasing information from the user to thereby generate modified first stream; and
a multiplexing means for multiplexing the modified PSI, the modified first stream from the stream erasing means and the modified second stream.
- [2] The apparatus as recited in the claim 1, wherein the first stream includes a multimedia stream which is encoded in real-time and a pre-encoded multimedia stream.
- [3] A method for transforming multimedia data into a terrestrial digital multimedia broadcasting stream, comprising the steps of:
a) acquiring construction information from a first stream by extracting program specific information (PSI) of the first stream and analyzing the extracted PSI;
b) modifying the PSI based on PSI modification information received from a user to thereby generate modified PSI;
c) extracting time code information from the first stream based on stream information having a time code, and modifying a time code of a second stream based on the time code information to thereby generate modified second stream;
d) erasing the stream piece of the first stream based on stream erasing information received from the user to thereby generate modified first stream; and
e) multiplexing the modified PSI, the modified first stream and the modified second stream.
- [4] The method as recited in the claim 3, wherein the first stream includes a multimedia stream which is encoded in real-time and a pre-encoded multimedia stream.

- [5] A system for transmitting a terrestrial DMB stream, comprising:
an audio encoding means for encoding an audio source;
a data encoding means for encoding a data source;
a multimedia encoding means for encoding a multimedia source received in real-time;
a stream transforming means for replacing a stream piece of a first stream with a second stream to thereby generate a transformed multimedia stream;
an ensemble multiplexing means for multiplexing an audio stream encoded in the audio encoding means, a data stream encoded in the data encoding means and the transformed multimedia stream into a broadcasting stream that conforms to the ensemble transport interface standard; and
an encoding means for encoding the multiplexed broadcasting stream to thereby generate a encoded broadcasting stream and transmitting the encoded broadcasting stream.
- [6] The system as recited in the claim 5, further comprising:
a stream storing means for storing a pre-encoded multimedia stream.
- [7] The system as recited in the claim 5, wherein the first stream includes a multimedia stream which is encoded in real-time and a pre-encoded multimedia stream.
- [8] A method for transmitting a terrestrial DMB stream, comprising the steps of:
a) encoding an audio source;
b) encoding a data source;
c) encoding a multimedia source received in real-time or a pre-encoded multimedia source;
d) replacing a stream piece of a first stream with a second stream to thereby generate a transformed multimedia stream;
e) multiplexing the encoded audio stream, the encoded data stream and the transformed multimedia stream into a broadcasting stream that conforms to the ensemble transport interface standard; and
f) encoding the multiplexed broadcasting stream and transmitting the encoded broadcasting stream to a transmitter.
- [9] The method as recited in the claim 8, wherein the first stream includes a multimedia stream which is encoded in real-time and a pre-encoded multimedia stream.

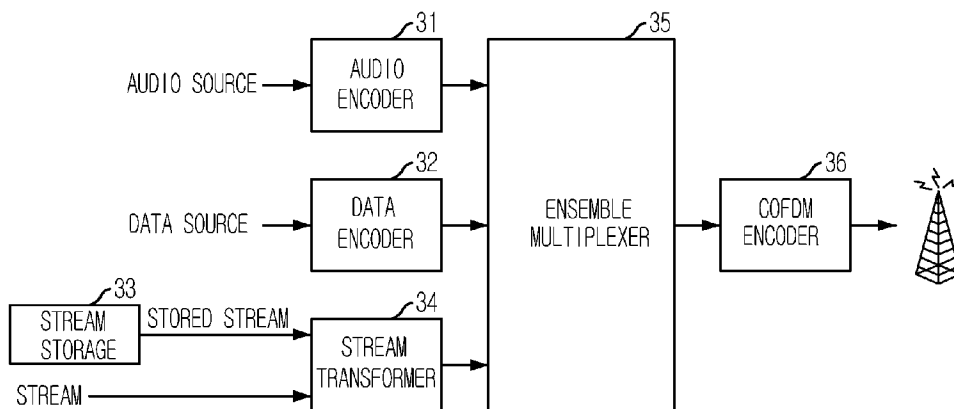
[Fig. 1]



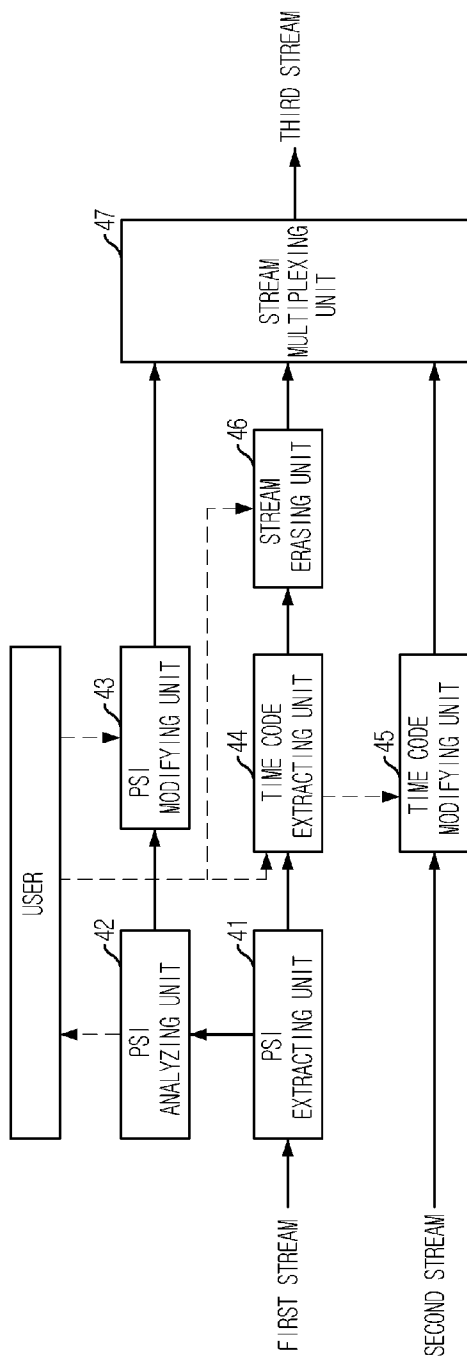
[Fig. 2]



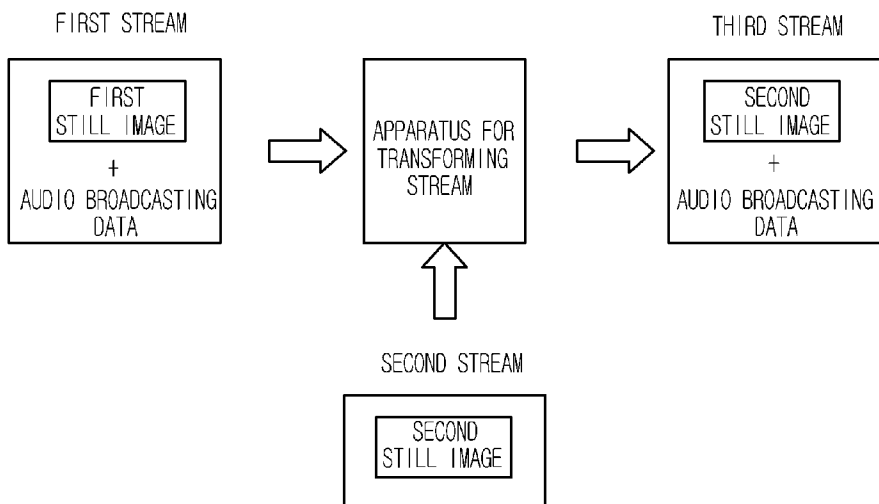
[Fig. 3]



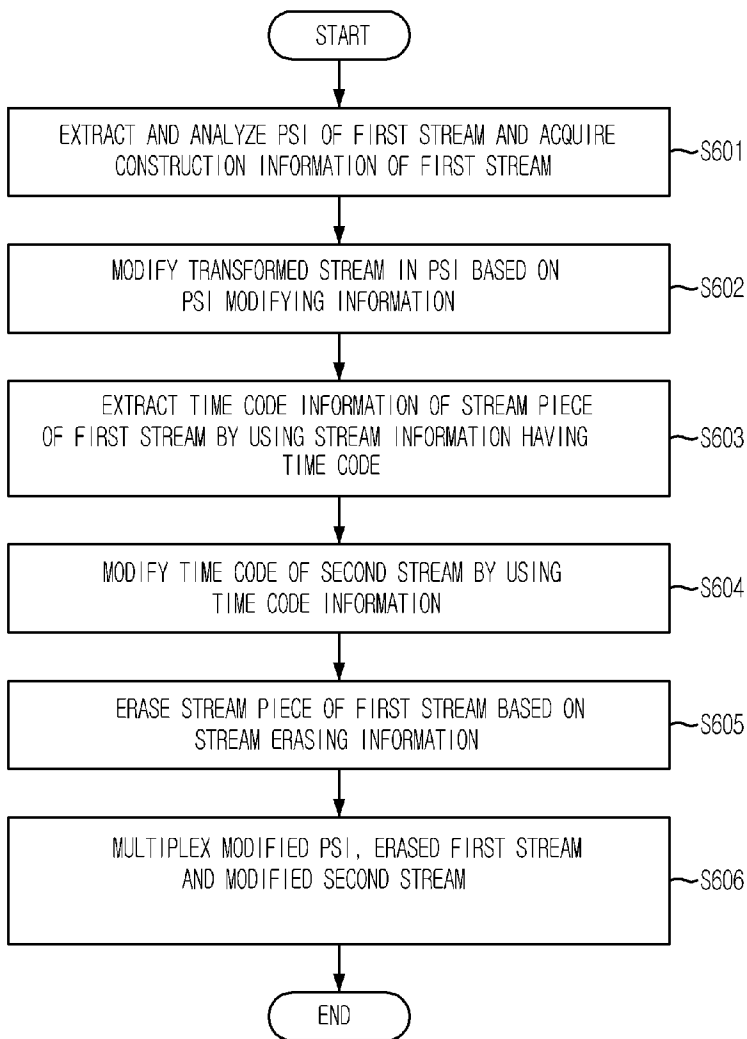
[Fig. 4]



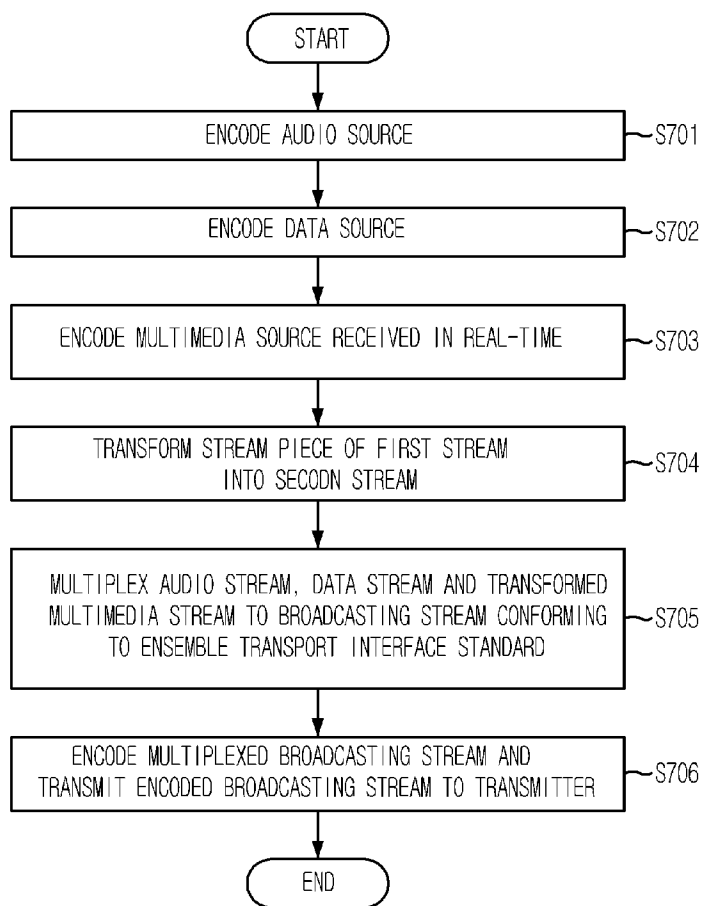
[Fig. 5]



[Fig. 6]



[Fig. 7]



INTERNATIONAL SEARCH REPORT

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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)

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

Korean Patents and applications for inventions since 1975

Korean Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKIPASS Search Terms: PSI, stream, transform, transition

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6,909,743 B (CHRISTOPHER WARD ET AL.) 21 June 2005 Seeabstract and column 2, line 17 - column 22, line 51.	1-9
A	US 6,252,873 B (GRGORY O. VINES) 26 June 2001 Seeabstract and column 3, line 39 - column 10, line 30.	1-9
A	US 6,661,813 B (KATSUMI KARASAWA) 9 Dec 2003 Seeabstract and column 1, line 12 - column 3, line 54.	1-9

 Further documents are listed in the continuation of Box C. See patent family annex.

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Information on patent family members

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