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(54) **Apparatus and method for providing an identification of a media piece**

(57) An apparatus for providing an identification of a media piece played by a broadcast station comprises an input interface (10) for receiving broadcasted information from a plurality of different broadcast stations, and for receiving a message from a user, the message comprising an identification of a specific broadcast station and time data related to a broadcast time of a requested media piece. Additionally, a piece identification extractor (12) is provided for generating a separate record for each broadcast station, the record for each station comprising media piece identifications and associated broadcast times. Additionally, an information retriever (14) is provided for retrieving the identification of the requested media piece using the identification of the broadcast station and the broadcast time data. A sender (16) then sends an answer to the user, the answer comprising information on the requested media piece.

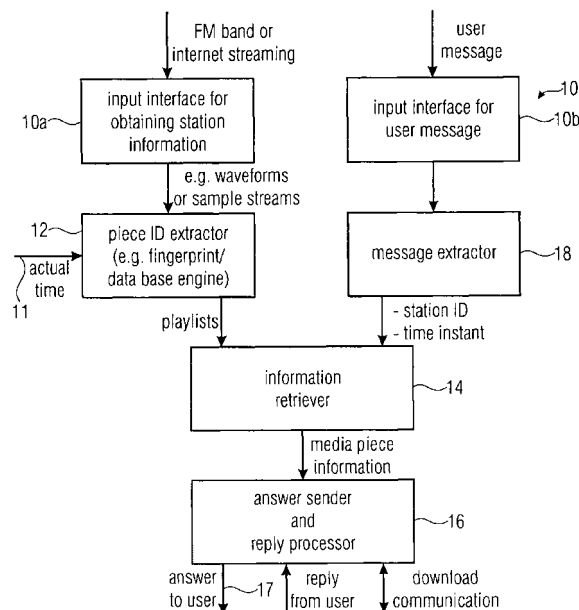


FIGURE 3

Description

[0001] The present invention is related to broadcasting of media pieces by radio or TV stations. It is particularly related to the issue, how a user listening to or watching a certain media piece can get more information on this media piece such as information on the author or title, or how the user can come into possession of this media piece.

[0002] People often hear or see a piece of information played in a radio or television broadcast, but do not hear, see, or otherwise know the name or other identifying information about the piece of information. For example, a listener may have tuned in a radio broadcast after the name of a musical piece was given, or the listener may have had his or her attention diverted at the time the identification of the musical piece was given. If the listener finds the musical piece to be particularly appealing, then he or she may wish to obtain a copy of the musical piece, for example on a commercially available compact disk, audio tape recording, or phonograph record. To do so, of course, the listener must have the name of the musical piece and, most likely, also the name of the composer, the name of the orchestra or other musical group which performed the musical piece, and possibly the name of the company which put out the compact disk, tape recording or phonograph record.

[0003] The listener might obtain the name and other information about the musical piece by placing a telephone call to the radio or television station which provided the broadcast. This, however, requires obtaining the telephone number for the particular station. In addition, there may be times when the listener is not certain of the station to which his or her radio or television set is turned. By way of example, the person may simply turn on the radio to the last station to which it was tuned and not note the station. This is an even greater problem for someone who hears a musical piece on the radio while driving in a car, since at the time the name of the musical piece was given the person's attention may have been diverted, for example by traffic conditions.

[0004] WO 2006/102448 A1 discloses a system and method for acquiring online content via a wireless communication device. A wireless subscriber is able to purchase music or other content from an online content provider. The subscriber sends a short message service (SMS) message to an online content server indicating a desire to purchase content currently playing on a specified radio station. The online content server validates that the end user has a valid account. The online content server then queries the specified radio station web server to identify the specific content by providing title and artist of a current song. The online content service formats an SMS message to the wireless subscriber, which contains the title of the song and the artist and identifies various purchase options. The subscriber response with a SMS message that confirms the particular purchase option and the requested content is downloaded to the subscri-

ers PC or wireless communication device. The radio station web server and an associated website lists programming information including, for example, titles and artists of songs, talk radio programming and the like that has been broadcast, is present broadcast or is schedule for broadcast. For identifying the radio station, the SMS sent by the user specifies the particular radio content the user wishes to have, such as title and artist of a song or radio program. To this end, the wireless communication device captures information embedded in the radio broadcast to identify the title and artist, and this information is forwarded to the content server. Alternatively, this information can be manually entered by the subscriber into the wireless communication device and forwarded to the content server.

[0005] This procedure is disadvantageous in that it is uncomfortable for the user. The user has to enter the requested program into her or his communication device, which means that the user has a lot of interaction to do, and specifically, has the difficult task of knowing what he wants to buy. Furthermore, the online content server is fully dependent on the radio stations. For radio stations that do not have a web server or does not wish to provide the actual program, the concept does not work at all.

[0006] EP 1 098 460 A2 discloses a method of and a system for providing identification of broadcast programs to a person tuned to a broadcasting station which is broadcasting the piece of information. The person sends a first message to a centralized information identification location having a database storing data for identifying pieces of information. The first message describes the piece of information and preferably also identifies the receiving location to which identification of the piece of information is to be sent. In response to the first message, the database is interrogated to identify the piece of information, and a second message is sent to the identified receiving location, including identification of the piece of information. The database at the sever can include various pieces of information, for example sounds of musical pieces, for comparison with the sound of the piece of information provided during the telephone call. Alternatively, or additionally, the database can include playlist from radio and television stations of interest so as to identify the piece of information when the broadcasting station and time of broadcast are known. Identification of a piece of information that was broadcast on an identified broadcasting station can be based on correlating the signal as contained in a telephone call to the server with signals known to have been sent from broadcasting stations using known correlation techniques. To make the result of the comparison more reliable, coding errors caused by non-ideal coding mode methods used in telephoning such as GSM codes can be taken into account by artificially caused similar effects in the reference signals stored in the database that are known to have been sent by the broadcast station, for example by coding/decoding the signal and causing some random error to the signal.

[0007] This concept is disadvantageous in that once

again the user has to perform a significant task, i.e. the user has to record a certain song played by the radio station using his mobile phone and then has to send this recorded song to the music identification center. There, a correlation is performed between pre-stored songs which even have to be pre-distorted in order to reflect the situation that an actual "live recording" by the mobile phone from the user has taken place. Furthermore, recording a song and sending the recorded song to a server incurs a significant battery consumption and may incur significant costs specifically for the mobile phone transmission of a long song.

[0008] US 2004/0203406 A1 discloses the use of a radio data service (RDS) information to automatically access a service provider. Wireless terminals such as mobile phones which provide cellular communication for example for telephoning and short message service (SMS) are more and more able to provide FM radio reception. RDS information received at such a terminal is used to access a service provider via any suitable medium such as email, fax, telephone, SMS message, etc. This enables the end user to the service provider to purchase a copy of a record heard on the radio or to request information about a product advertised on the radio. To this end, the mobile phone receives a radio frequency broadcast and extracts RDS information. Then, the user creates a message containing at least some of the RDS information and optionally input associated with received user input, and this message is finally sent to the service provider. The service provider receives this message, extracts RDS information from the message and routes a message to a contact center agent on the basis of the extracted RDS information.

[0009] The disadvantage of this procedure is that it does not work if RDS data are not available. Additionally, there is a special procedure required for the user mobile phone, since the user mobile phone must be in the position to extract this RDS data and to format this RDS data into a message. Hence, this concept is disadvantageous in that it is uncomfortable for the user and will fail in situations where the RDS data are not defined.

[0010] It is the object of the present invention to provide a flexible and efficient concept for providing an identification of a media piece played by a broadcast station to a user.

[0011] This object is achieved by an apparatus for providing an identification of a media piece played by a broadcast station to a user in accordance with claim 1 or a method of providing an identification of a media piece played by a broadcast station to a user in accordance with claim 14.

[0012] The present invention is based on the finding that as much work as possible has to be taken away from the user device such as a mobile phone or mobile computer or mobile small computer, since all this work consumes valuable battery power, and at the same time creates additional technical requirements, and therefore costs for the mobile phone and additionally creates more

work and involvement on the side of the user, since each piece of work which is put on the user's shoulders in such a communication concept is potentially embarrassing for the user.

5 **[0013]** Instead, in accordance with the present invention, the burden to the user mobile phone and therefore the requirement for battery, storage and processor capability on the user's side is minimized. This means, at the same time that any interactions provided by the user is also set to a minimum degree. On the other hand, the burden for the apparatus for providing an identification which can typically be implemented as a web server at a mobile phone operator or as an independent web server is increased. However, putting the burden of such a process to a centralized web server will not be problematic, since this web server is not a mobile web server and the memory and processor resources of such a web server can be adapted and set to an enormous level with a moderate cost investment.

10 **[0014]** The apparatus for providing the identification comprises an input interface for receiving broadcasted information from a plurality of different broadcast stations, and the apparatus itself performs a generation of a separate record for each broadcast station, where the record for a station comprises media piece identifications and associated broadcast times relating to times at which the media pieces were broadcasted. In view of that, the inventive apparatus is fully self-contained and does not rely on any information regarding the broadcasted data from either the user or from radio stations. Instead, the apparatus only receives the streamed data from radio stations transmitting their programs over the internet or receives the actual FM waveforms transmitted over the air by radio station transmitters. This is all the apparatus for providing an identification needs, and this data is readily available all the time, since broadcasting this data is the key task and key functionality of any broadcast station.

35 **[0015]** Preferably, the apparatus performs a compression of the received input waveforms or digital sample streams to extract the fingerprints using any of the well-known fingerprint techniques. Fingerprints are unique in that they have a strong data compression but are nevertheless sufficiently characteristic for a certain media piece so that this certain media piece can be distinguished from another media piece. A further feature of a fingerprint is that a fingerprint compression is a "one-way" compression. Stated differently, it is not possible to "decode" the fingerprint to again retrieve the original media piece as would be the case in an audio coding/decoding or a video coding/decoding chain.

40 **[0016]** The input interface additionally receives a message from a user, where the message comprises an identification of a specific broadcast station and time data related to broadcast time of a media piece requested by the user. Hence, the only task the user has to do is to identify the radio station to which the user is actually tuned in and to then send this data to the apparatus for

providing an identification. This message automatically includes the sending time, since this is, for example, included in an SMS header. Additionally, when the user would do a real telephone call to the server, then the server can also identify the time the connection was established or the user started to establish the connection based on the pre-signaling performed, for example, in a ISDN network. Then, based on the radio station identification and the transmission time of the message, an information retriever can retrieve the record, such as a playlist from a radio station and can then pick the requested media piece based on the transmission time included in the message and based on the actual playlist time associated with a certain media piece in the playlist for the radio station. Then, information on the requested media piece identified by the information retriever is sent back to the user such as via a separate SMS. Alternatively, in a telephone call, the sending back of this information can readily be performed by the telephone front end sending out the data retrieved by the information retriever in the apparatus. This can be done by a real or artificial speech answering machine.

[0017] Further embodiments are subsequently explained with respect to the attached drawings, in which:

Fig. 1 is a flowchart of a preferred method of providing an identification of a media piece played by a broadcast station to a user;

Fig. 2 is a chart identifying the actions and messages sent between a server device such as a computerized internet server and a user device such as a mobile communication device in the possession of the user;

Fig. 3 illustrates a schematic block diagram of the apparatus for providing an identification of a media piece in accordance with an embodiment of the invention; and

Fig. 4 illustrates a preferred implementation of the piece identification extractor from Fig. 3.

[0018] Preferred embodiments allow users to order and bookmark music based on mobile phone interaction. By simply texting the channel name to a short number associated with the apparatus for providing an identification of a media piece, the apparatus will resolve the music playing on the channel preferably using music analysis in real time. Basically, a "sniffing" on the FM band or digital data stream over the internet from radio stations is performed to conduct this analysis.

[0019] In an embodiment, the server such as an internet server listens to all radio/TV stations and recognizes all songs or other media pieces by extracting a fingerprint, where this embodiment does not rely on receiving additional information of the song through information in the stream. Alternatively, the extraction of a fingerprint can

be enhanced by additionally making use of digital information such as RDS data, or when RDS data is available, a fingerprint extraction can be substituted by RDS data extraction as well.

[0020] Specifically, a user listens to a radio program and feels that he wants to have the currently heard song or media piece, or the user just wants to know the name of the creator or the name of the media piece. Then, the user looks at the name of the radio station and preferably sends an SMS with the name of the radio station to the computerized internet server. It is preferred that the user sends the SMS while the song is played on the radio station or within a short period of time after the song has finished playing. Preferably, the short period of time, which is "acknowledged" by the internet server extends to seven minutes or less after the termination time instant of the actual media piece. Preferably, an even shorter period such as five minutes or preferably even two minutes is used as this short period of time after the song has finished playing.

[0021] When the server receives this SMS, the server cross-checks the SMS with the playlist of the requested TV or radio channel and also checks the SMS header to find out the actual time of the request. Then, the server sends out an answer with the name of the song/artists, which preferably additionally comprises an option to buy and download this song/album or generally the requested media piece.

[0022] Preferably, both the FM band of the broadcasting over the air and the internet stream are acquired to extract fingerprints and to generate playlists.

[0023] Subsequently, Fig. 3 will be explained. Fig. 3 illustrates a preferred implementation of an apparatus for providing an identification of a media piece played by a broadcast station to the user. The apparatus comprises an input interface which is illustrated in Fig. 3 for its two tasks. The first task is illustrated as 10a and is the task of obtaining the station information using the FM band or the internet streaming. The second task of the input interface 10, which is indicated by 10b is to receive a user message. The input interface task 10a is preferably implemented by an FM reception front end for receiving over-the-air broadcast radio or television, data. Alternatively, or additionally, an internet streaming front end is included in the interface, which is configured for obtaining an access to a radio station or a TV station or, generally, broadcast station streaming data.

[0024] Furthermore, the apparatus comprises a piece identification extractor 12 for generating a separate record for each broadcast station, the record for a station comprising a media piece identification data and associated broadcast times indicating times, at which the media pieces were broadcasted. Additionally, an information retriever 14 is provided for retrieving the identification of the requested media piece using the identification of the specific broadcast station and the time data. Additionally, the apparatus comprises an answer sender and reply processor 16 for sending an answer 17 to the user, the

answer comprising the information on the requested media piece identified by the information retriever 14. Preferably, a message extractor 18 is provided for operating on data received from the input interface 10b. Specifically, the message extractor is configured for extracting the station identification data and the time instant from the user message.

[0025] When the user messages an SMS, which has an SMS header comprising the transmission time and an SMS body comprising textual information, the message extractor 18 will extract the time information from the SMS header and the radio or television station ID from the SMS body.

[0026] The answer sender and reply processor 16 is preferably configured for managing a reply from a user and for additionally managing a download communication which is required when the user replies that he intends to buy or he would like to have certain media pieces and, particularly, the media piece identified by the information retriever 14. The download communication herein consists in obtaining a packet stream from an internet server to a mobile phone or another mobile device such as a mobile computer at the user. Subsequently, Fig. 1 will be described in order to outline a preferred method for providing an identification of a media piece for a user. In step 20, information on the plurality of radio or TV stations is obtained by listening to the stations. In a step 21, a schedule such as a playlist or record is generated for each station preferably without and metadata or so, but only using the listenable audio or viewable video program data, the schedule indicating an identification and playtime for the media pieces broadcasted by a radio station and listened to in step 20. In step 22, a message such as an SMS is received from a user, the message identifying each radio station and a time instant for a requested media piece. In a step 23, the requested station is extracted and the time instant is extracted from the message as well. In a step 24, the schedule for the requested station and the identification of the piece is retrieved using the station ID and the time instant. To this end, the schedule is provided from step 21 to step 24, which is illustrated by connection 25. In a step 26, an answer is sent to the user including information on the piece and information on how to buy and download the media piece.

[0027] Fig. 3 illustrates the relation and messages and tasks performed by a server device such as an internet computer or computer array 30 and a user device 31, which can be a mobile device, such as a mobile phone, mobile computer, etc. The server 30 listens to the FM band or the internet stream of a plurality of radio stations. To this end, the server is using a broadcast or a multicast communication channel. Concurrently, the server extracts playlists for each station using a fingerprint/database procedure preferably in real time, so that an answer can be sent to the user without a significant delay. The only delay required will occur by fingerprint-processing the broadcasted data and by performing an access to the generated playlists for a certain radio station.

[0028] The processes of listening and extracting performed by the server takes place continuously and, as soon as there is a user who wishes to have a certain media piece or at least information on a certain media piece, the user sends an SMS 32, indicating the station heard by the user over a connection-oriented channel. Other connection-oriented channels such as a speech telephone connection can be used as well. However, an SMS is preferred and the only thing the user has to do is to enter the letter code of a radio station such as "Bayern 3" or "Radio Energy" or the actual frequency into the SMS text body. Then, the server stores this SMS as soon as the server has received the SMS and extracts the station information from the stored SMS text. Additionally, the server extracts the transmission time from the SMS header. Then, the server may introduce a certain delay for the further processing so that the server can complete the playlist generation. Typically, the fingerprint processing will take some more time than the SMS processing, and this time can be equalized. Then, the server selects the schedule for the specific radio station based on the station extracted from the SMS and determines the piece of identification for the transmission time or a time period less than preferably five minutes earlier than the transmission time. Then, in a step 33, the server sends an SMS via the connection-oriented channel having information on the song and how to buy or download the song to the user. The user can do nothing after this step or can reply via a download request which can again be placed on a packet based channel such as the internet or a connection-oriented channel, such as an SMS channel.

[0029] Fig. 4 illustrates a preferred implementation of the piece ID extractor 12. Preferably, the piece ID extractor 12 comprises a fingerprint extractor 12a and a database and an associated database matcher 12b. The fingerprint extractor receives, at its input, a digital or analog signal and extracts a search fingerprint from this signal. To this end, any of the well-known fingerprint extraction algorithms can be performed, where the most preferred fingerprint technique is the time-sequential fingerprint extraction technique using the broadcasted or streamed data itself, where the length of a fingerprint is related to the length of the audio piece in time, and where matching decisions can already be made using a certain portion of a media piece so that, in the end, only a portion of the media piece other than the whole media piece is necessary.

[0030] This search fingerprint, therefore, can also be a time portion of a time-continuous fingerprint, and this search fingerprint is forwarded to the database matcher. The database matcher then performs a fingerprint matching between reference fingerprints resulting in the database and associated media piece identifications, which are the artist or song name or identification data allowing an access to a certain song from which the reference fingerprint was derived.

[0031] At the output of the database matcher, the piece

ID for the search fingerprint is delivered which is then entered into a playlist in association with the actual time which is provided to the piece ID extractor via time line 11, illustrated in Fig. 3.

[0032] Although some aspects have been described in the context of an apparatus, it is clear that these aspects also represent a description of the corresponding method, where a block or device corresponds to a method step or a feature of a method step. Analogously, aspects described in the context of a method step also represent a description of a corresponding block or item or feature of a corresponding apparatus.

[0033] Depending on certain implementation requirements, embodiments of the invention can be implemented in hardware or in software. The implementation can be performed using a digital storage medium, for example a floppy disk, a DVD, a CD, a ROM, a PROM, an EPROM, an EEPROM or a FLASH memory, having electronically readable control signals stored thereon, which cooperate (or are capable of cooperating) with a programmable computer system such that the respective method is performed.

[0034] Some embodiments according to the invention comprise a data carrier having electronically readable control signals, which are capable of cooperating with a programmable computer system, such that one of the methods described herein is performed.

[0035] Generally, embodiments of the present invention can be implemented as a computer program product with a program code, the program code being operative for performing one of the methods when the computer program product runs on a computer. The program code may for example be stored on a machine readable carrier.

[0036] Other embodiments comprise the computer program for performing one of the methods described herein, stored on a machine readable carrier.

[0037] In other words, an embodiment of the inventive method is, therefore, a computer program having a program code for performing one of the methods described herein, when the computer program runs on a computer.

[0038] A further embodiment of the inventive methods is, therefore, a data carrier (or a digital storage medium, or a computer-readable medium) comprising, recorded thereon, the computer program for performing one of the methods described herein.

[0039] A further embodiment of the inventive method is, therefore, a data stream or a sequence of signals representing the computer program for performing one of the methods described herein. The data stream or the sequence of signals may for example be configured to be transferred via a data communication connection, for example via the Internet.

[0040] A further embodiment comprises a processing means, for example a computer, or a programmable logic device, configured to or adapted to perform one of the methods described herein.

[0041] A further embodiment comprises a computer having installed thereon the computer program for per-

forming one of the methods described herein.

[0042] In some embodiments, a programmable logic device (for example a field programmable gate array) may be used to perform some or all of the functionalities of the methods described herein. In some embodiments, a field programmable gate array may cooperate with a microprocessor in order to perform one of the methods described herein. Generally, the methods are preferably performed by any hardware apparatus.

[0043] The above described embodiments are merely illustrative for the principles of the present invention. It is understood that modifications and variations of the arrangements and the details described herein will be apparent to others skilled in the art. It is the intent, therefore, to be limited only by the scope of the impending patent claims and not by the specific details presented by way of description and explanation of the embodiments herein.

Claims

1. Apparatus for providing an identification of a media piece played by a broadcast station to a user, comprising:

an input interface (10a, 10b) for receiving broadcasted information from a plurality of different broadcast stations, and for receiving a message from a user, the message comprising an identification of a specific broadcast station and the time data relates to a broadcast time of a media piece requested by the user;

a piece identification extractor (12) for generating a separate record for each broadcast station, the record for a station comprises media piece identification data and associated broadcast times related to times, at which the media pieces were broadcasted;

an information retriever (14) for retrieving the identification of the requested media piece using the identification of the specific broadcast station and the time data; and

a sender (16) for sending an answer to the user, the answer comprising information on the requested media piece identified by the information retriever (14).

2. Apparatus in accordance with claim 1, in which the input interface comprises an FM (frequency modulation) front end for receiving over-the-air broadcasted data from the plurality of broadcast stations, or an internet connection module for receiving internet stream data from the plurality of broadcast stations.
3. Apparatus in accordance with claim 1 or 2, in which the piece identification extractor (12) is configured for compressing the broadcasted information to ex-

tract a series of search fingerprints for the broadcasted information, each fingerprint being associated to a broadcasted media piece,
for matching the search fingerprints with a plurality of reference fingerprints in a database, each reference fingerprint having an associated media piece identification, to obtain the media piece identification for the reference fingerprint which matches the search fingerprints.

4. Apparatus according to one of the preceding claims, in which the user message is an SMS (short message service) message comprising an SMS header including an SMS transmission time, and an SMS body having textual information on the radio station, and
wherein the apparatus further comprises a message extractor (18) for extracting the station ID from the SMS body and the time data from the SMS header.
5. Apparatus in accordance with one of the preceding claims, in which the information retriever (14) is configured
for selecting the record for a broadcast station using the identification of the specific broadcast station, and
for selecting the identification for the requested media piece using the record for the specific broadcast station and the time data.
6. Apparatus in accordance with one of the preceding claims,
in which the record comprises a start time and an end time for a broadcasting of a media piece
in which the information retriever is configured for retrieving the identification of the requested media piece, wherein the time data from the user message lies between the start data and a time being later than the end data less than two minutes.
7. Apparatus in accordance with one of the preceding claims, in which the sender is configured for additionally sending information to the user indicating how the user can buy or download the requested media piece.
8. Apparatus in accordance with one of the preceding claims, in which the sender (16) is configured for extracting a sender number from the message and to send the answer to the extracted sender number via a connection-oriented communication channel.
9. Apparatus in accordance with one of the preceding claims, in which the apparatus further comprises a message extractor (18), and
in which the message extractor is configured to operate in parallel with the piece identification extractor (12).

10. Apparatus in accordance with one of the preceding claims, in which the piece identification extractor (12) is configured for operating in real time.

11. Apparatus in accordance with one of the preceding claims, in which the piece identification extractor (12) comprises a clock input (11) for receiving an actual time, wherein the records comprise time stamps for each media piece, the time stamps being derived from the actual time, when the media piece was received by the user interface (10a).

12. Apparatus in accordance with one of the preceding claims, in which the input interface (10a, 10b) is configured for associating received data to a separate record form a broadcast station based on a received carrier frequency for received broadcast information or based on a station ID received via the internet for streamed station data.

13. Apparatus in accordance with one of the preceding claims, in which the piece identification extractor (12) is configured for generating, as the separate records, separate playlists for each radio station using received waveform data from a broadcast transmission or using digital streaming data received from the internet.

14. Method of providing an identification of a media piece played by a broadcast station to a user, comprising:

receiving (10a) broadcasted information from a plurality of different broadcast stations, and receiving (10b) a message from a user, the message comprising an identification of a specific broadcast station and the time data relates to a broadcast time of a media piece requested by the user;
generating (12) a separate record for each broadcast station, the record for a station comprises media piece identification data and associated broadcast times related to times, at which the media pieces were broadcasted;
retrieving (14) the identification of the requested media piece using the identification of the specific broadcast station and the time data; and
sending (16) an answer to the user, the answer comprising information on the requested media piece.

15. Computer program for performing, when running on a computer, a method of providing an identification of a media piece played by a broadcast station to a user in accordance with claim 14.

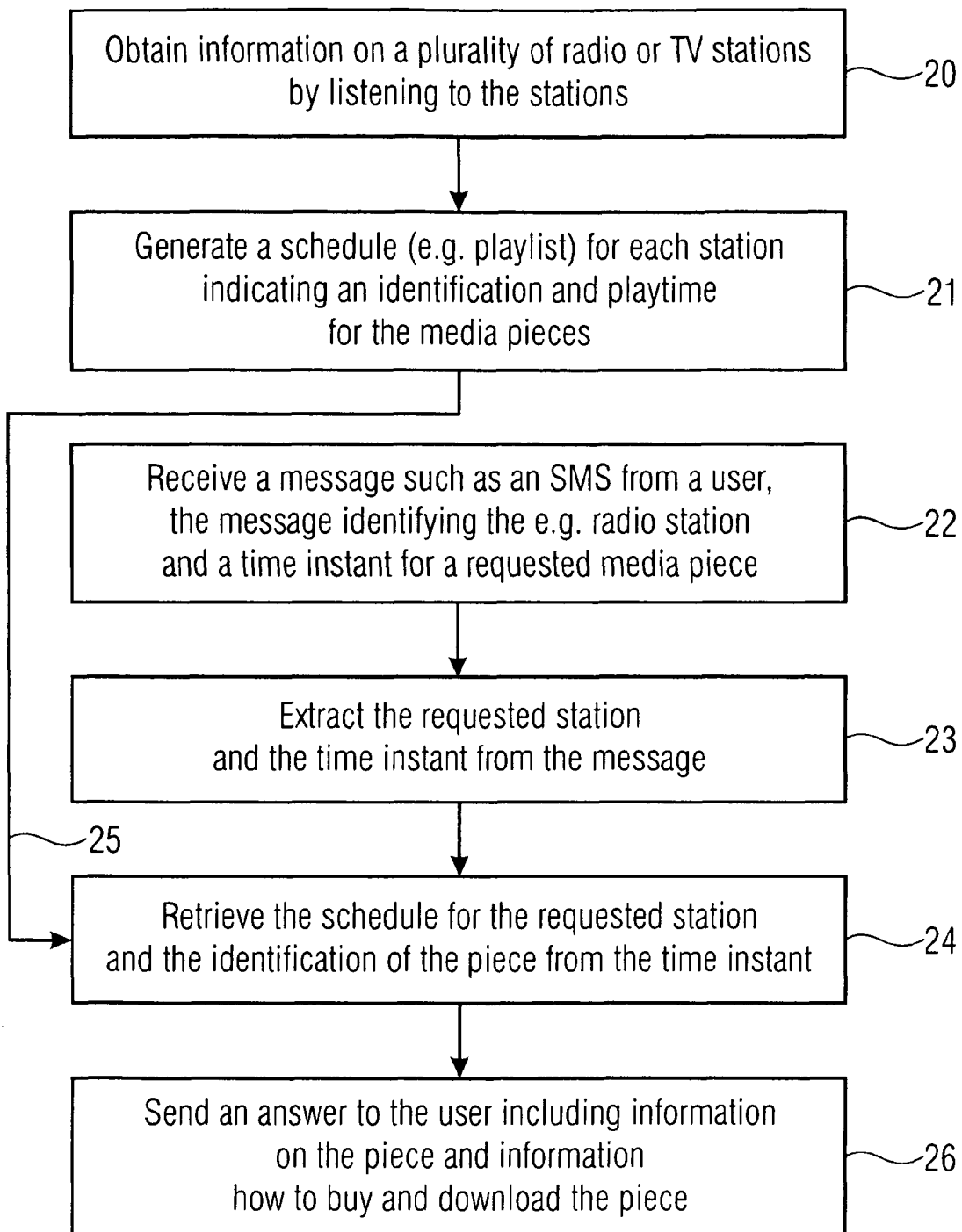
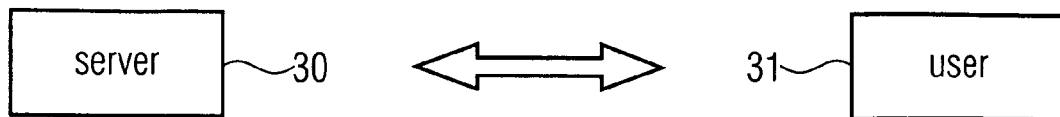


FIGURE 1



- listen to FM band
or internet streaming
of a plurality of stations
(broadcast or multicast channel)

- extract playlists
for each station using
a fingerprint/database
procedure in real time

SMS indicating the station heard by the user
(connection-oriented channel) 32

- store SMS
- extract
station from stored
SMS text and transmission
time from SMS header optionally
after a certain delay to complete playlist generation

- select the schedule and determine
the piece identification(s)
for the transmission time or
a time period less than 5 minutes
earlier than the transmission time

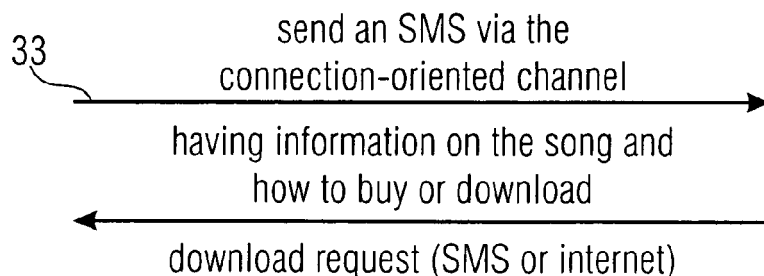


FIGURE 2

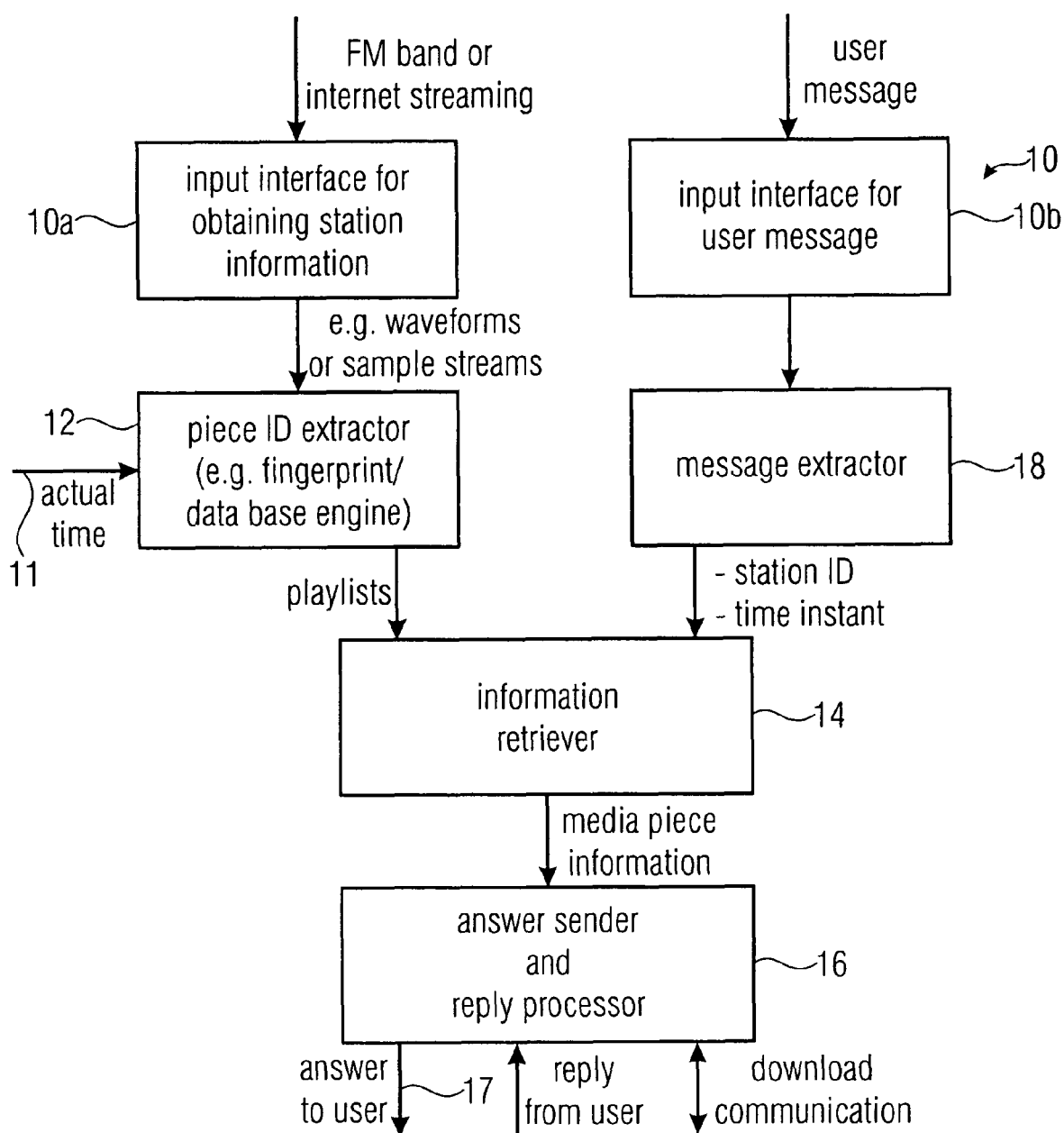


FIGURE 3

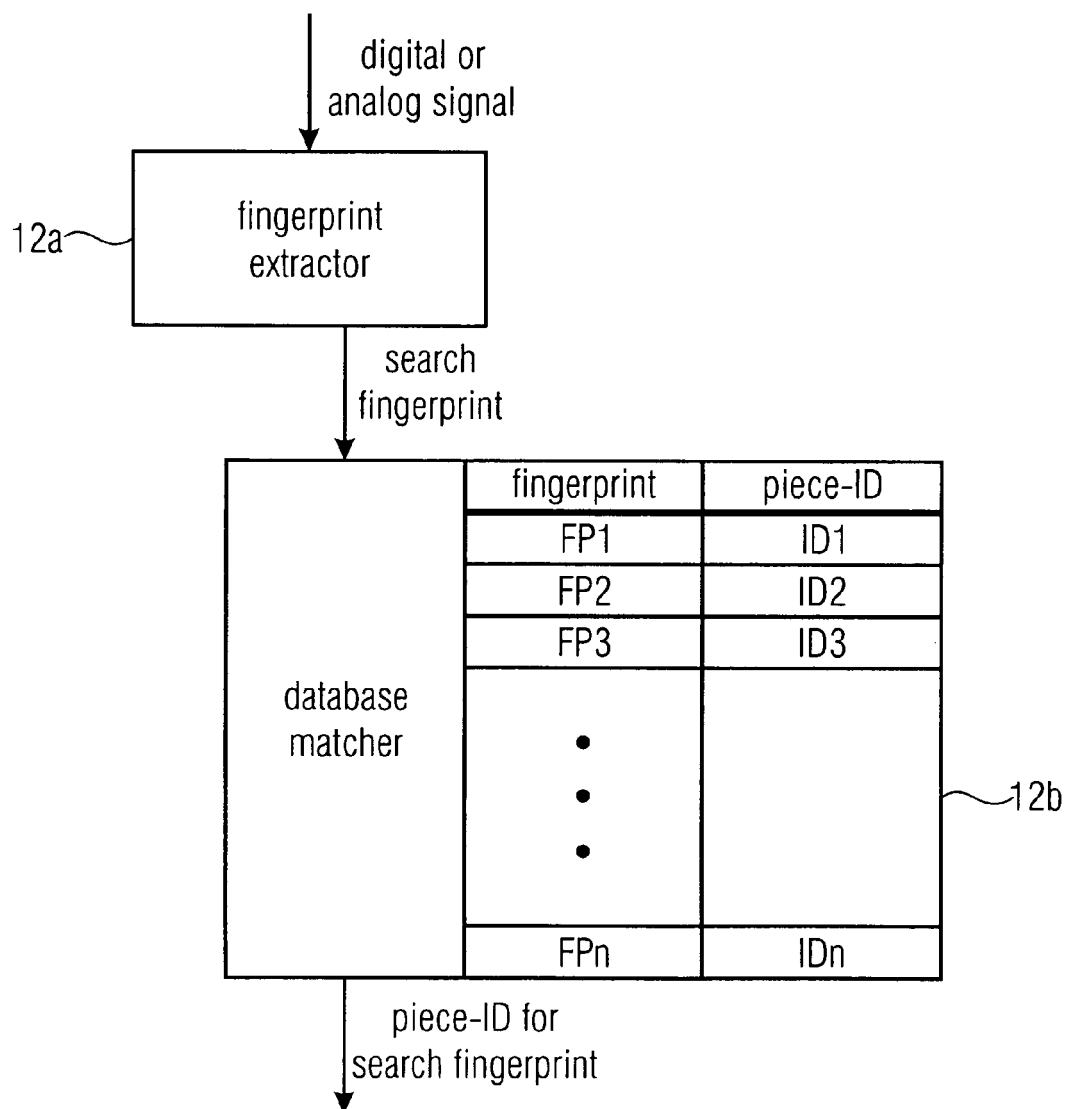


FIGURE 4



EUROPEAN SEARCH REPORT

Application Number
EP 10 16 6028

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2009/205000 A1 (CHRISTENSEN KELLY M [US] ET AL) 13 August 2009 (2009-08-13) * paragraphs [0051] - [0068], [0092] - [0097], [0120] * * figure 9 *	1-15	INV. H04H60/91 H04H60/74 H04H60/58
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