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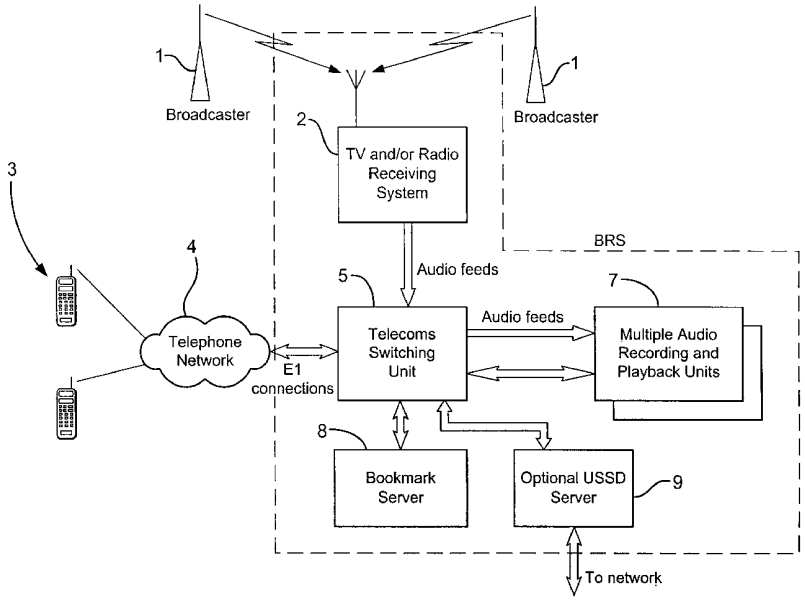

(57) Abstract: In order to provide access to broadcast audio and/or video programmes, a recording/reproducing apparatus (7) records selected broadcast channels with reference to the broadcast time. A communications processor (5) communicates with terminals (3) associated with a telephone network (4). A user of a terminal (3) sends a request for that user to receive a selected broadcast channel starting from a desired time in the programme. The recording/reproducing apparatus (7) reproduces that broadcast channel starting from the requested time, and forwards the programme to the user's terminal (3) via the communications processor (5). A bookmark server (8) may generate bookmarks allowing interrupted transmissions of programmes to be resumed.

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TELECOMMUNICATIONS SERVICES APPARATUS

This invention relates to a telecommunications services apparatus for use with a telecommunications network.

At the present time, efforts are being directed internationally towards the definition and introduction of the next generation of mobile telephony, known as 3G, and research is ongoing into higher bandwidth systems which will evolve from this. It is clear that the mobile terminal will increasingly become the vehicle for all types of information and service delivery to the mobile consumer. Amongst these services will be a requirement for access to current and previously broadcast radio and television. Achieving access to such broadcast material conveniently on a mobile device has some special difficulties, and it is these problems which this invention addresses. This invention is also applicable to fixed telephone network access.

Consider first the means of access to broadcast media which are currently available to consumers. The broadcasting of a huge variety of programme types is such an integral part of the fabric of our society that we take it for granted. As time passes the amount of material available to be watched or listened to increases, and each new technological advance such as Digital Audio Broadcasting or Digital Television allows a further increase in the capacity to transmit material.

As the volume of programme material increases, so does the need for the recipient to be selective. This selectivity may be achieved in a number of ways. To begin with, one may elect to listen to only a limited range of channels, on which it is known that favourite programmes or material of interest are transmitted. This is commonly the mode of usage of people listening to in-car radio, for example. The favoured channels may be tried in turn until a suitable programme is found.

A second mode of use is where one determines in advance which programmes of interest will be broadcast. This could be for example because the schedule is regular and repeats each week, or alternatively one could consult programme listings. Then by tuning in at an appropriate time, the desired programme may be received.

A third mode of use is exemplified by the Video Cassette Recorder (VCR), which is commonly used to record a television transmission for later replay. Again, the normal mode of operation is to record individual programmes according to a pre-determined schedule and to play them back later. This approach can be called 'time-shifted' viewing. However in the case of the VCR, there is a restriction that the programme cannot be replayed until the whole programme has been recorded. In other words, time shifts of less than the programme length are not possible. Furthermore, recording and playback are not possible at the same time, without use of a second VCR.

Both of the preceding options suffer from a timing constraint. Either the user must tune in at an appointed time, or the VCR must be set to record at the correct time. Human capacity to fail to achieve either of these goals is well known. Therefore although we have the means to adopt these modes of receiving broadcasts, the execution is not as straightforward as we might like.

Recording of radio programmes is not well supported in current consumer products. Cassette recorders can be used, but these are not usually programmable to record at a particular time. VCRs can be used to record radio channels attached to satellite or cable broadcasts, but tape is inflexible for replay.

As discussed above, VCRs can provide time-shifted access to TV broadcasts. They may also be used for radio broadcasts if suitably configured though this is not common. The time shift is restricted to periods greater than the programme length.

It is also known that hard-disk or other memory based TV recorders are being produced which will allow concurrent play and record access to broadcast material. However the recording strategy will still be to record selected whole programmes, whether the selection be manual, or assisted by automatic techniques which attempt to determine the user's preferences.

It is also common practice for programme material to be loaded onto servers for users to access in a time-shifted fashion. Again the programmes are loaded as discrete entities. Video-on-demand systems follow this model, and allow time-shifted access to material. This technology often supports staggered start times to limit the number of separate play operations which can be performed simultaneously on the same file. Users

selecting a particular programme have to wait until the next start time, and then share this play with other users. This technique does not allow the programme to be paused and resumed.

International Patent Application Serial No. W094/00933 describes a system for accessing broadcast material using a standard telephone. However this system is insufficient for application to a mobile network due to some of the problems peculiar to mobile telephony. In the system disclosed in WO94/00933, a recording algorithm is used which overlaps recording, this representing an inefficient use of storage capacity.

According to the present invention, there is provided a telecommunications services apparatus for use with a telecommunications network, said telecommunications services apparatus comprising

a receiver operable to recover at least one broadcast channel from received signals,

a recording and reproducing apparatus operable to record said broadcast channel with reference to the time at which said channel was transmitted,

a communications processor operable to communicate with telecommunications terminals associated with said network, and

a controller operable in combination with said communications processor

to respond to a request from one of said telecommunications terminals, said request being indicative of a request to receive said broadcast channel starting from a desired time when said broadcast channel was transmitted,

to arrange for said recording and reproducing apparatus to reproduce said recorded broadcast channel starting from said requested time when said broadcast channel was transmitted, and

to communicate signals representative of said reproduced broadcast channel starting from said requested time of transmission to said requesting telecommunications terminal.

This invention addresses the requirement of allowing users of a telephone network to obtain access to any type of audio and/or video broadcast, whether it be analog or digital radio, or the sound component of any television channel, or both audio and video of a

television broadcast channel. It allows the user to listen to the audio from any current or previous broadcast, without any restriction regarding programme length, from a defined set of channels over a defined period in the past. For example if (in the UK) BBC Radio4 FM was one of the supported channels, a user would be able to listen to the most recent news broadcast or shipping forecast, whatever time he accessed the system, even if the broadcast in question had just started. All he would have to know is the time that the desired broadcast started. Otherwise, if he made an error in his choice of listening time, he would either miss the programme, or have to wait, whereas, according to embodiments of this invention, he could simply correct his choice of time, and hear the programme immediately. When the system is also configured to receive video, the user of the system would additionally be able to view a current or previous programme from a defined set of television channels.

This facility of being able to select immediate access to a programme, which has either already started or which has been recently transmitted, provides a huge step forward in accessibility to broadcast material for personal use.

One of the problems of mobile telephony is that reception quality is variable, especially at cell handover. Also mobility in a vehicle frequently results in signal quality dropping below the level where the call can be sustained, and the connection may be dropped either by the network, or voluntarily by the user. The present technique deals effectively with this issue by means of a preferred 'bookmark' feature as described below. The present invention avoids the need to overlap recordings, thereby increasing the system capacity and hence the commercial viability of any solution based on this invention.

Embodiments of the invention provide continuous recording of a configurable number of audio and/or video sources or channels. The recording is arranged so that audio and/or video for all of the recorded channels is available for a configurable period after recording. Recorded material older than this period is deleted so that the amount of storage which can used by the system can be pre-determined. Audio and/or video is recorded in such a way that random access to any point in the recording is possible, and in such a way that the access point may be specified as a time, or as a date and time.

This therefore permits playback of a recording from any previous point just by specifying the channel and the start time. From the user's perspective this has tremendous

advantages, because he can now play back any programme previously broadcast (within a defined period in the past) or any programme which is currently being broadcast. An envisaged application of this technique is for provision of radio and television programmes (audio only) for users of a mobile telephone network. By dialling in to a service provided by the mobile operator, users will be able to specify a channel and a time and hear the corresponding audio. For the first time, mobile phone users will be able to have a very convenient freedom of choice about when and where to listen to broadcast programmes, and this promises to enhance the usefulness of the mobile phone in the car. It will be possible to listen to the latest news at any time, or to choose a favourite programme which is normally broadcast at a less convenient time. This technique is particularly attractive to roamers who may be in a different time zone which may make access to programmes otherwise inconvenient or impossible. Moreover no pre-meditation is required on the part of the user to effect the recording as is the case with VCRs. The system keeps continuous recordings of all of the channels available for access at all times. Another envisaged application is the provision of television programmes (audio and video) for users of a mobile telephone network which can support video. With the provision of suitable display screens on the mobile telephones, the users would be able to view the television programmes.

Alternative access techniques are possible. The service can also be made available on the fixed telephone network, or via cable distribution using an interactive programme selection facility. The difference from existing on-demand programme offerings in this case is that programme reception may be concurrent with the original broadcast, and not a replay of a complete programme made available only after the programme had finished.

A key feature of the present technique is the 'bookmark' feature. If the user is listening to (and/or viewing) a time-shifted programme at the time when the call clears, the system maintains a record of the point reached in the programme. When the user next connects to the service, play will continue from a number of seconds prior to where he left off. This is particularly useful to mobile users, whose call connections are frequently terminated involuntarily due for example to poor signal strength. It also makes listening to (and/or viewing) a single programme conveniently divisible into smaller segments, for example during short car journeys, with the system automatically providing the continuity. This feature improves the usability of the system for listening to archive material (e.g.

books, short stories, lectures etc) since the ability to automatically hear or view the material over a number of sessions is a significant benefit.

Calls to the service may be initiated either by the user dialling in, or by the system dialling out to the user following some trigger, which might for example be the user sending an SMS or USSD (Unstructured Supplementary Service Data) message for this purpose.

A further improvement to the idea can be obtained by allowing the user to pre-store identifiers for certain programmes in his telephone terminal. This could be achieved by allowing the user to enter channels and/or times, which could for example be stored as a dial-string for quick-access dialling on a telephone. Once connected to the service, a key-press or key sequence could be used to instruct the terminal to send the pre-stored sequence, causing the system to play the most recently recorded instance of a favourite programme.

In the case of a fixed telephone, the pre-stored sequence could be sent by DTMF or ISDN Keypad protocol for example, while on a mobile telephone, the pre-stored sequence could be sent by DTMF or USSD.

USSD messages may be sent during a mobile telephone call. This would allow a user to control channel and time-shift selection during a call to the service, using USSD messages. The user could also set up one or more pre-stored USSD sequences in his terminal, for subsequent sending to the network while in a call to the service. It would be preferable if the pre-stored sequences were allocated to 'hot keys' on the mobile terminal which allowed them to be sent using as few keypresses as possible. These entered or recalled sequences would then be directed by the network to a USSD server which would interpret them and instruct the service to play the selected time-shifted programme.

An alternative way to access selected material would be to allocate different access numbers for the service. This may be referred to as DDI (Direct Dial In) selection. For example particular programmes such as (in the UK) BBC Radio 4 News could be accessed by dialling a dedicated access number. The system could be pre-programmed for all calls to this number to automatically jump to the most recent news program. The start times of

the News programs on this channel would be pre-stored in the system, and the system controller would choose the most recent start time and play from there.

Alternatively, a DDI number range could be assigned to the service where certain digits in the dialled number are representative of the channel and/or time which the user desires to access. For example, the number range +44 1234 xx xx xx could be assigned to the service, whereby xx xx xx could be replaced by CC HH MM, representing the channel and the start time required. The user could then store a few telephone numbers representing the channel and start time of some favourite programmes in his terminal for subsequent rapid dialling.

In these ways a single key press on a telephone could instruct the service to play the last edition of a certain daily weather forecast or news programme, whether or not the user was already in a call to the service.

The invention is applicable to both fixed and mobile networks. The recordings of broadcast material could be made in sufficiently high quality to allow subsequent transcoding and onward transmission to the caller in one of a number of formats. For example, for audio applications, the recorded material could be stored in MPEG Layer 3 audio format (MP3). On demand the recording could then be transmitted as MP3 or encoded with a different encoding scheme and transmitted over a packet-based network to the user's terminal, which could be a telephone or a computer for example, or the recording could be transcoded to 64 kbit/s PCM for transmission over the circuit-switched telephone network to either a fixed ISDN or analog telephone, or to a mobile telephone. A variety of audio encoding schemes is possible for a range of end-user terminal types.

A benefit to the network of this service when compared to other forms of on-demand services, is that because of the user-specified time shift, the loading on the network is more distributed. With a live service where callers can dial in to hear race results or commentary for example, the loading on the network will be concentrated around the time of the event, whereas with time-shifted services callers can access the service when they choose. This lessens the capacity of equipment required, and spreads its usage more evenly.

For particular implementations it may be advantageous to perform processing on the audio and/or video before it reaches the user's terminal. For example, mobile networks may benefit from the source material being companded to limit its dynamic range prior to being encoded for transmission over the radio interface to the mobile station. This processing could be done prior to recording, or on playback. In practice, processing prior to recording may be advantageous, since this is then only done once.

Audio material may come from a number of sources, including but not restricted to—

- Broadcast radio
- Broadcast television
- Satellite or cable feeds
- Live commentary, music or events

The invention will now be described by way of example with reference to the accompanying drawings, throughout which like parts are referred to by like references, and in which:

Figure 1 is a block diagram of a broadcast recording system according to a preferred embodiment of the invention;

Figure 2 is a diagrammatic representation of a record buffer which can be used in the system of Figure 1, the buffer having 170 files per channel;

Figure 3 is a diagrammatic representation of play file mapping for time request; and

Figure 4 is a diagrammatic representation of play file mapping for requested date and time.

A broadcast recording system (BRS) according to a preferred embodiment of the invention is shown in Figure 1. The recording medium may either be RAM-based or disk-based or a combination of the two; as shown, a disk based system is used.

The system will be described in the context of broadcast audio. For broadcast video, similar considerations would apply although the capacity of the recording medium

and the processing ability of the associated equipment would need to be greater than for broadcast audio.

Referring to Figure 1, multiple channels are broadcast by broadcasters 1 to a television and/or radio receiving system 2, such as an Ocean Radio and Television tuner stack (RTV) unit manufactured by Telsis Limited. The receiving system 2 is connected to a telecoms switching unit 5 such as an Ocean fast SSP (service switching point) manufactured by Telsis Limited. Audio feeds are provided between the telecoms switching unit 5 and multiple audio recording and playback units 7 which may be constituted by interactive voice response (IVR) units such as Ocean fast IPs (intelligent peripherals) again manufactured by Telsis Limited. These fast IPs have very large recording capacity on dual redundant hard disks. Over four months of audio can be stored duplicated on each fastIP. A single fastIP can be used standalone or a number of fastIPs may be used with one or more Ocean fastSSP switches in front. The fastSSP provides a large line capacity to allow a number of attached fastIPs to provide service on a single telephone number.

The RTV stack unit forming the receiving system 2 comprises a number of radio and television tuners, each tuned to a single preset channel, and configured to return to this channel should power be lost and later restored. Each provides an analog audio feed, which is converted to a digitally multiplexed E1 telephony connection by a multiplexer. The E1 signal is connected to the switching unit 5 which supplies the channels to each recording and playback unit 7 for recording.

Each unit 7 is preferably a fastIP configured to continuously record all of the feeds onto hard disk. In the example system described here there are 9 audio feeds, but the number is variable according to implementation. The preferred embodiment supports recording of 9 channels for 1 week, totalling 1512 hours of digital PCM recording. The audio is digitised and stored at 64 kbit/s per second. It would be possible to use an audio compression scheme such as ADPCM but this can cause audio disturbances when sections of compressed audio are concatenated for playback. With the PCM embodiment, files may be played back consecutively without any disturbance at the boundary. There is then no need for overlapped recordings or limits on the duration of playback as in the previous proposal. The present technique supports continuous playback indefinitely.

To support the bookmark capability, a Bookmark Server (BMS) 8 is connected to the switching unit 5. This stores the bookmark data associated with each caller in a hashing data base, indexed by the caller's CLI.

A USSD Server 9 may also be optionally provided, for control by means of unstructured supplementary service data (USSD) signals.

Mobile terminals (MT) 3 are shown as communicating with a telephone network 4 which also communicates with the switching unit 5.

RECORDING ALGORITHM

In 1 week there are 168 hours. The internal operation of the system uses UTC (Universal Coordinated Time) and so there is no need for the core recording algorithm to consider time zones and daylight saving time. The fast IP divides the week up into intervals. In the preferred embodiment the intervals are 1 hour, but other intervals could be chosen. Each channel is recorded into files which are nominally 1 hour long. The recordings are made in such a way the they can be played back seamlessly, producing a digital output stream which is identical to the recorded input. This record and play capability is integral to the Ocean fastIP, which can independently play files seamlessly from disk on all of its 120 lines simultaneously. The fast IP can also play a file from any point, permitting the conversion of a desired start time to the corresponding point in a file by simple calculation.

To allow files to be safely deleted before re-use, a ring buffer of 170 files is used for each channel. Files are numbered Base + 0 to Base + 169 as shown in Figure 2, where the Base file number differs for each channel. The files for a channel are used in a cyclic order.

A 10 second delay is used between the requested time, and the played material, for two reasons.

1. If the user enters a time exactly on the hour, he will expect to hear all of the beginning of a programme which is synchronised to the hour, for example the Greenwich time signal. The 10 second delay provides a short lead in and ensures that the hour boundary is not missed.

2. It also ensures that the system never tries to play audio which has been recorded less than 10 seconds previously. This allows time for recorded audio to be committed to disk. On the Ocean fast IP this takes of the order of 2.5 seconds.

This 10 second delay is implemented in the record process for reasons of computational efficiency. A file is recorded once, but may be played many times, so the 10 second offset is done during record. The file nominally marked as 19:00 will therefore contain audio for approximately 10 seconds before 19:00 to approximately 10 seconds before 20:00.

PLAY ALGORITHM

Since the current recording's file number is known and the current time is known, for any desired day and hour the appropriate file number can be calculated. The time zone of the system is the time zone where the equipment is located. Daylight saving (DST) compensations are made between the system and the user interface so that the user enters and hears local times with the correct DST offset.

If the user specifies a time only

Let the current time be HH:MM, and let the time requested by a caller for a programme to be played be AA:BB.

If the user specifies a time but not a day or date, then the time is interpreted as being in the last 24 hours. For example if the current time is 19:00, and the user specifies 19:01, then the request is interpreted as 19:01 yesterday. If the user specifies 19:00, then the request is interpreted as 19:00 today, i.e. now.
This time mapping is illustrated in Figure 3.

The algorithm for determining which file to play is as follows:

if requested time > current time

use previous day, i.e.

file to play = ((current file + (AA - HH) - 24) modulo 170) + Base

else

use current day, i.e.

file to play = ((current file + (AA - HH)) modulo 170) + Base

The file is played from a point in the file determined by BB, the minutes component of the time request. Play starts at (BB * 100 / 60) % through the file.

If the user specifies a time and a date

Let the current time be DD:HH:MM, and let the date and time requested by a caller for a programme to be played be CC:AA:BB. The example is described for a system which specifies the day by using the numeric value of the date. Alternatively, for a system which keeps a week's history or less, it may be preferable to specify the day as a number in the range 1..7 representing Monday to Sunday. Time shifted audio announcements could then include for example: 'Seven twenty-three pm on Wednesday.'

If the user specifies a date and time, then this is interpreted as an absolute time. The allowable range is 1 week, inclusively spanning from the current time back to 1 minute after the same time a week ago. For example if the current time is 19:00 on the 27th, and the user specifies 27:19:01, then the request is invalid because it is in the future. If the user specifies 20:19:00, then the request is invalid because the time is before the oldest allowed time (by 1 minute.) Times between these two extremes will be accepted.
This time mapping is illustrated in Figure 4.

The algorithm for determining which file to play is as follows:
if requested time/date > current time/date
request invalid, not available yet
else if requested time/date <= (current time/date - 7 days)
request invalid, recording too old, may be deleted.
else
file to play =
((current file + (AA - HH) - 24((DD - CC) modulo length of previous month)) modulo 170) + Base

The file is played from a point in the file determined by BB, the minutes component of the time request. Play starts at (BB * 100 / 60) % through the file.

TIME SYNCHRONISATION ALGORITHM

The system uses a radio clock to maintain time synchronisation. Recorded file lengths are periodically adjusted to keep recorded files starting sufficiently close to the desired boundary i.e. 10 seconds before the hour. An accuracy of +/- 1 second is adequate. The play back system automatically starts playing the next file when the end of a file is reached. This means that individual file lengths do not have to be all the same or known in advance.

Special arrangements are made to compensate for daylight saving changes. Internally the system and file times work in UTC. Requests from users and spoken time messages to users are rendered as system local time with pre-programmed time-zone offset and daylight saving offset where appropriate and are converted to or from UTC by the system. This permits country independence for the implementation of this invention. This characteristic is understood not to have been previously implemented.

System Sizing

The number of channels recorded and the period for which the recording is available are sized according to the storage capacity of the system, while the record and playback bandwidth of the system affects the number of simultaneous users which can be supported. The preferred embodiment of the invention as described above supports 9 channels for 1 week, however an implementation of this invention can be specified to support any desired combination of these system parameters.

User Interface

The preferred embodiment of the invention is intended for use by the customers of a mobile telephone network. The interface available for this is the standard Man-Machine Interface (MMI) of a mobile phone, which consists of 12 DTMF keys and a display. Since the system is an audio application which must also be suitable for use in a car, use of the display is not desirable, and all user prompts should be done with audio.

An example MMI which could be used with this invention is described below. User commands are entered using DTMF keypresses. When the user calls in to the service, the system checks from their CLI whether they have used the system before, and if so,

retrieves their bookmark data. It then announces the channel and continues their audio from the same channel. If they were listening to a time-shifted recording, then provided that point in the recording is still available, the time shifted play will continue following a suitable announcement.

MMI commands

Other MMIs are possible, but this represents a preferred set.

Current Mode of Operation	Command	Function
Idle	Dial in	Announce channel, continue audio
Audio play	*	Play help, return to audio play
	1#.. 9#	Selects channel 1 .. 9, (non time shifted)
	01# .. 99#	Selects channel 1 .. 99, (non time shifted)
	HMM# or HHMM#	play current channel from time 0H:MM or HH:MM in the last 24 hours, up to and including the current time.
	DHHMM# or DDHHMM#	play current channel from date 0D or DD, time HH:MM in the last week, up to and including the current time. Date/times outside this range are invalid.
	#	Pause, play current time or time shifted recording time
	Hang up	Store channel and time-shift status
Paused audio	#	Unpause, return to audio play. If previous play was time-shifted, continue 10 seconds before where it left off, else continue with live audio.
	*	Play help, remain paused
	Hang up	Store channel and time-shift status

Example session

User Action	Audio heard
Dial into service at 11:00am	"Welcome to Radio Choice. Press * at any time for help. BBC Radio One" [---Live AUDIO for BBC Radio 1--- [
#	"Paused" ---AUDIO muted---
#	"BBC Radio One" [---Live AUDIO for BBC Radio 1--- [
4#	"Four. BBC Radio Four" [---Live AUDIO for BBC Radio 4--- [
535#	"Five Thirty Five am" [---Time shifted BBC Radio 4, from 05:35am--- [
1300#	"One pm, Yesterday" [---Time shifted BBC Radio 4, from 13:00 yesterday--- [
*	"Help Mode. To return to the programme press #. Radio Choice is a ...(description)..."
#	"BBC Radio 4, One Oh Seven pm, Yesterday" [---Time shifted BBC Radio 4, from 13:07 yesterday--- [
Hang up	
Redial in later	"Welcome to Radio Choice. Press * at any time for help. BBC Radio 4, One twenty one pm, Yesterday" [---Time shifted BBC Radio 4, from 13:21 yesterday--- [
4#	"Four. BBC Radio Four" [---Live AUDIO for BBC Radio 4--- [
71205#	"Twelve Oh Five pm on the Seventh" [---Time shifted AUDIO for BBC Radio 4, from 12:05 on 7th--- [
Hang up	

CLAIMS

1. A telecommunications services apparatus for use with a telecommunications network, said telecommunications services apparatus comprising

a receiver operable to recover at least one broadcast channel from received signals,

a recording and reproducing apparatus operable to record said broadcast channel with reference to the time at which said channel was transmitted,

a communications processor operable to communicate with telecommunications terminals associated with said network, and

a controller operable in combination with said communications processor

to respond to a request from one of said telecommunications terminals, said request being indicative of a request to receive said broadcast channel starting from a desired time when said broadcast channel was transmitted,

to arrange for said recording and reproducing apparatus to reproduce said recorded broadcast channel starting from said requested time when said broadcast channel was transmitted, and

to communicate signals representative of said reproduced broadcast channel starting from said requested time of transmission to said requesting telecommunications terminal.

2. A telecommunications services apparatus as claimed in Claim 1, wherein said receiver is operable to recover said broadcast channel from received radio signals.

3. A telecommunications services apparatus as claimed in Claims 1 or 2, wherein said receiver is operable to recover a plurality of broadcast channels from said received signals, and said request received by said controller includes an indication of a desired one of said plurality of broadcast channels to be communicated to said requesting telecommunications terminal, said controller arranging for said communications processor to communicate said desired broadcast channel to said requesting telecommunications terminal, reproduced by said recording and reproducing apparatus, starting from said requested time.

4. A telecommunications services apparatus as claimed in any of Claims 1, 2 or 3, wherein said controller is operable to determine a temporal position within said recorded broadcast channel corresponding to the last recorded broadcast channel signals to be

reproduced and communicated to said requesting telecommunications terminal, said telecommunications services apparatus comprising

a data store operatively associated with said controller, said controller operating, consequent upon a break in communication between said requesting telecommunications terminal and said communications processor to store in said data store reference data indicative of said last recorded broadcast channel signals to be reproduced and an identifier identifying said requesting telecommunications terminal.

5. A telecommunications services apparatus as claimed in Claim 4, wherein said controller is operable

upon receipt of a resumption request from said telecommunications terminal, said resumption request identifying said requesting telecommunications terminal and indicating a request to resume communication of said requested broadcast channel,

to retrieve from said data store said reference data, and

to arrange for said recording and reproducing apparatus to reproduce said recorded broadcast channel starting from the last of said recorded broadcast channel signals to be reproduced, as indicated by said reference data.

6. A telecommunications services apparatus as claimed in Claim 5, wherein said data store is arranged to store at least one predetermined programme identifier which is representative of one of said recorded broadcast channels and a time at which said broadcast channel was transmitted, said controller being operable consequent upon receipt of a programme request including said programme identifier to retrieve the broadcast channel and the start time from said data store using said programme identifier, and to arrange for said recording and reproducing apparatus to reproduce said recorded broadcast channel starting at said start time, which is communicated to said requesting terminal.

7. A telecommunications services apparatus as claimed in any preceding Claim, comprising

a signal processing apparatus operable to process the reproduced broadcast channel signals to the effect of compensating for distortion in reproduction of the communicated broadcast channel signals at said requesting telecommunications terminal.

8. A telecommunications services apparatus as claimed in any preceding Claim, wherein said telecommunications network includes a mobile radio network, said

telecommunications terminal being a mobile terminal operable to communicate via said mobile radio network.

9. A telecommunications services apparatus as claimed in any preceding Claim, wherein said requested time provides a date and a time of day when said broadcast channel was transmitted.

10. A telecommunications services apparatus as claimed in any preceding Claim, wherein said at least one broadcast channel is an audio channel.

11. A telecommunications services apparatus as claimed in any preceding Claim, wherein said at least one broadcast channel is a video channel.

12. A telecommunications services apparatus as claimed in any preceding Claim, wherein said recording and reproducing apparatus is operable to record said broadcast channel as a continuous recording.

13. A telecommunications services apparatus as claimed in any preceding Claim, wherein the recording operation overwrites the least recently recorded material.

14. A telecommunications services apparatus as claimed in any preceding Claim, wherein said recording and reproducing apparatus is operable to record said broadcast channel as a plurality of files, and to reproduce said files as a concatenation to provide seamless reproduction.

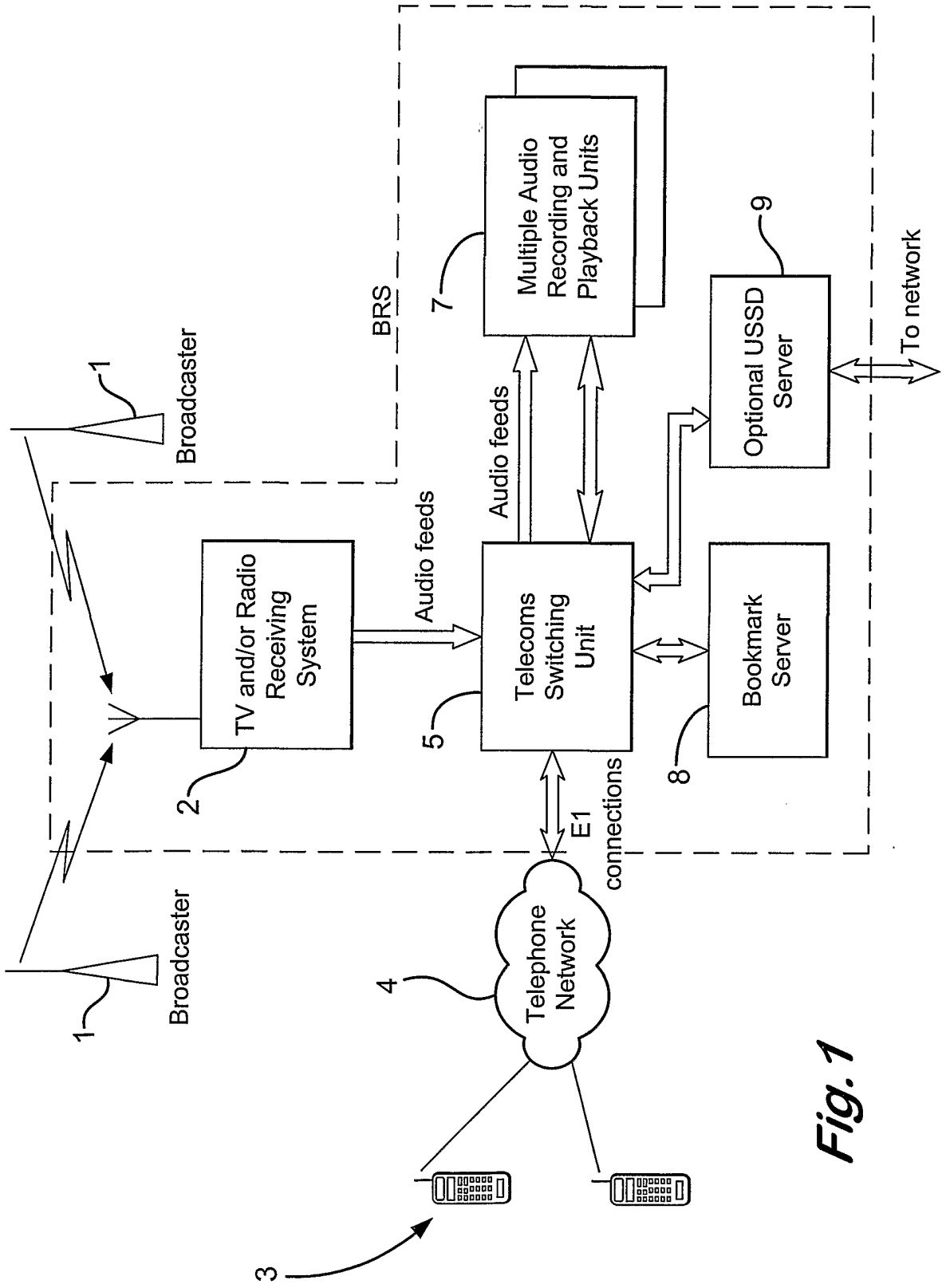
BRS
Broadcaster
1
Broadcaster
1
TV and/or Radio Receiving System
2
Audio feeds
Audio feeds
Multiple Audio Recording and Playback Units
7
Telecoms Switching Unit
5
Optional USSD Server
9
To network
Bookmark Server
8
E1 connections
Telephone Network
4
3

Fig. 1

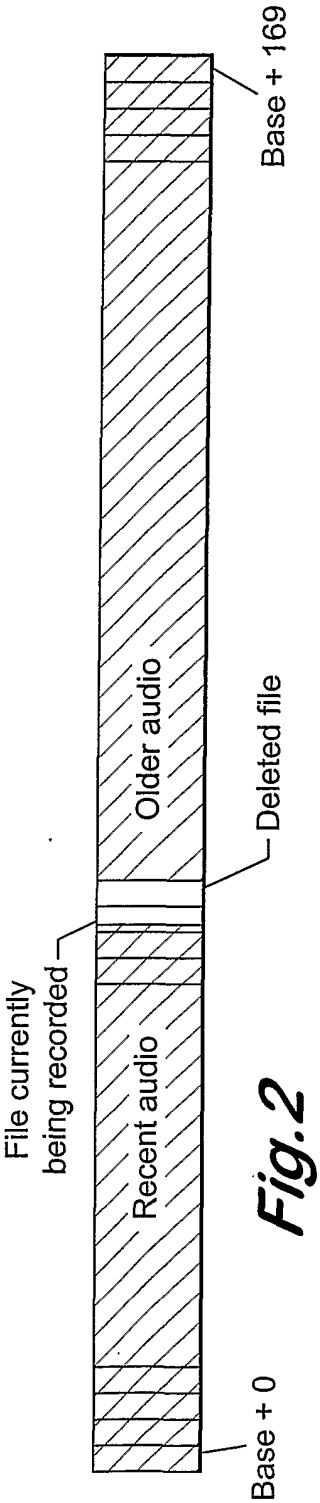
Base + 169
Older audio
Deleted file
File currently
being recorded
Recent audio
Base + 0

Fig.2

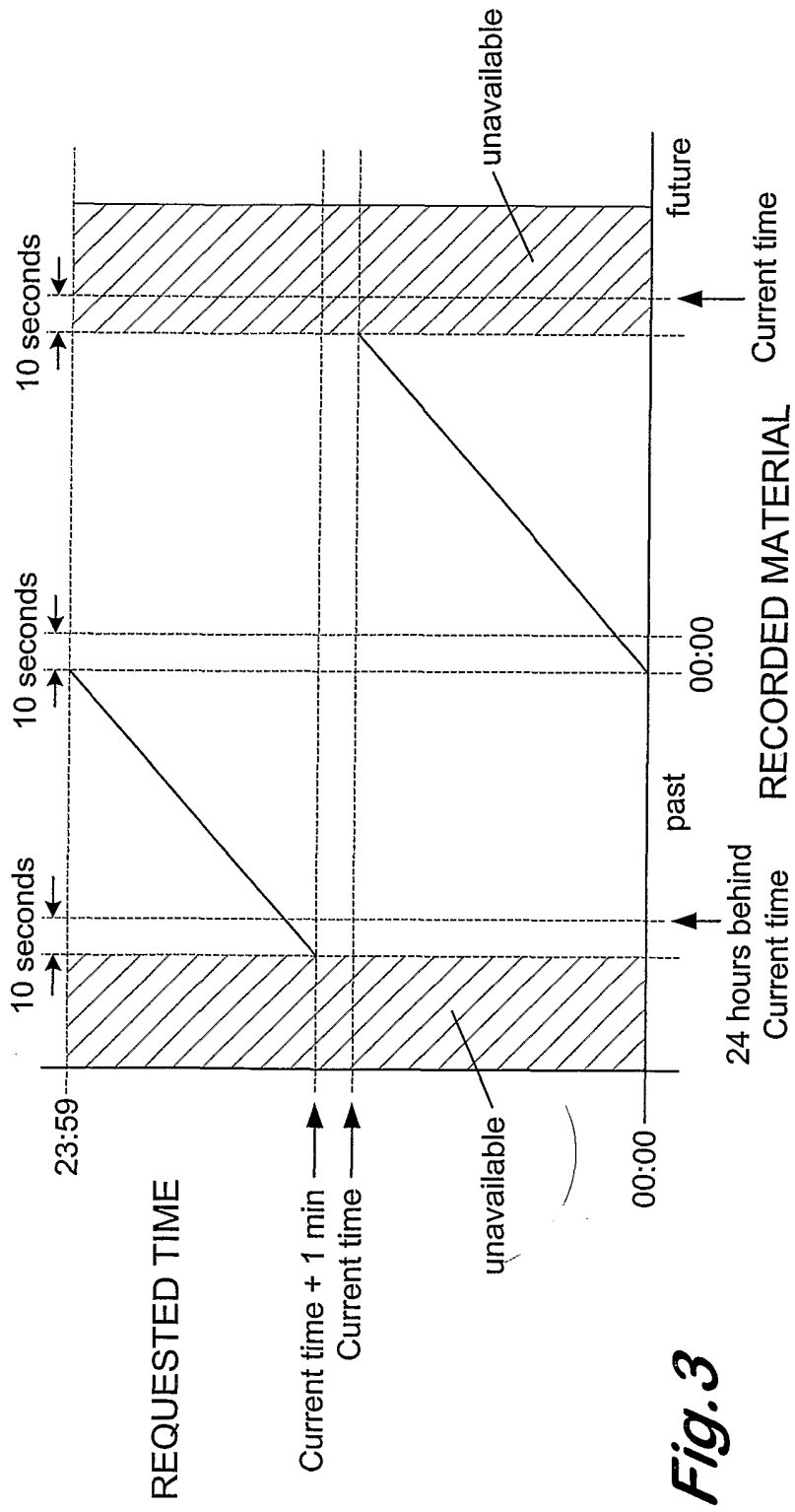
unavailable
future
Current time
10 seconds
10 seconds
10 seconds
00:00
past
24 hours behind
Current time
RECORDED MATERIAL
23:59
REQUESTED TIME
Current time + 1 min
Current time
unavailable
00:00

Fig.3

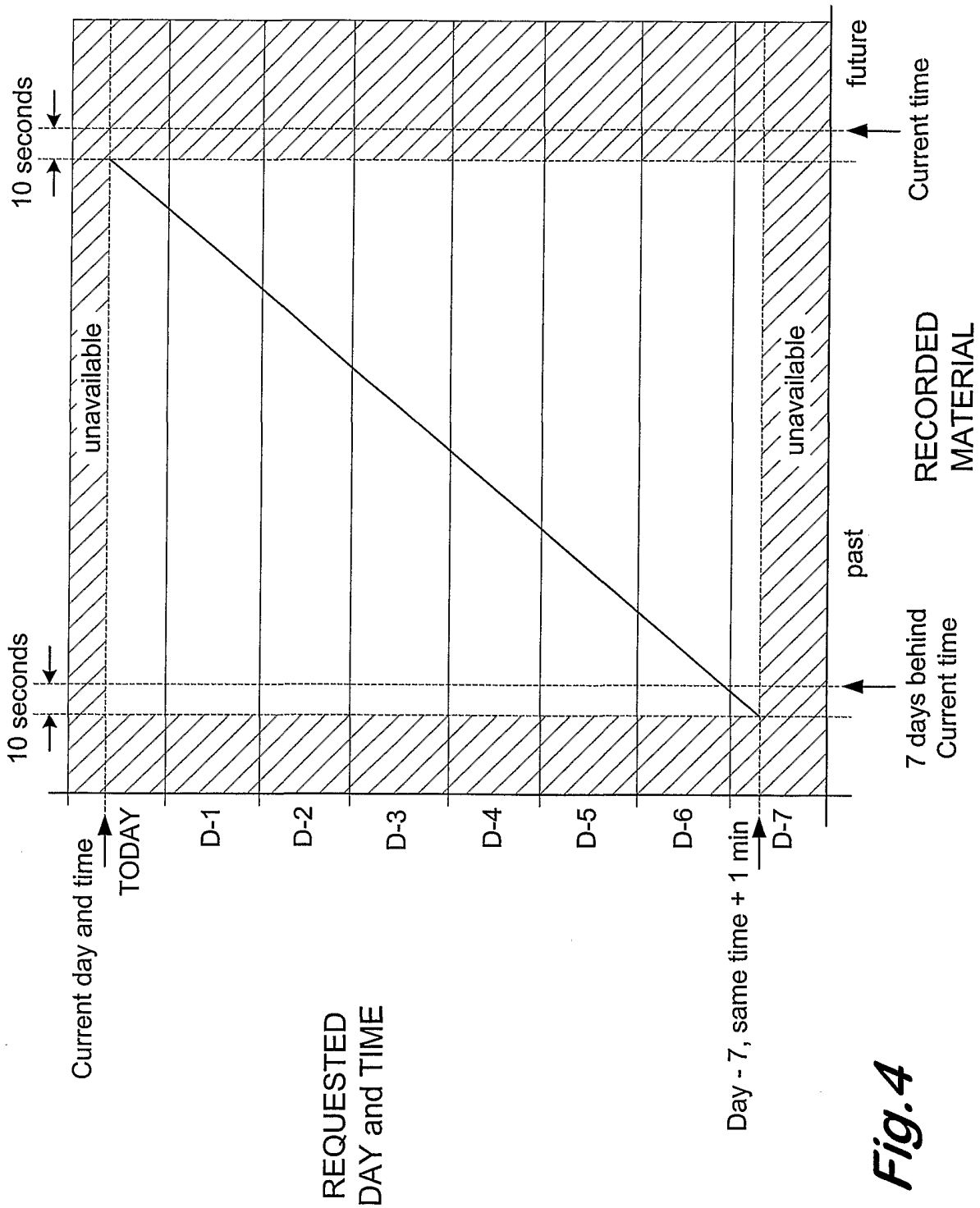
10 seconds
10 seconds
unavailable
unavailable
future
Current time
past
7 days behind
Current time
RECORDED
MATERIAL
Current day and time
TODAY
D-1
D-2
D-3
D-4
D-5
D-6
D-7
Day - 7, same time + 1 min
REQUESTED
DAY and TIME

Fig. 4