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(71) Applicant and Inventor: LOVELL-SMITH, Marcus [GB/GB]; 73 FINLAY STREET, LONDON SW6 6HF (GB).
(74) Agent: NABARRO NATHANSON; Miss Barbara E Cookson, Intellectual Property Department EA, Lacon House, 84 Theobald’s Road, London WC1x 8RW (GB).

Declarations under Rule 41.7:
— as to the identity of the inventor (Rule 41.7(i)) for all designations
— as to applicant’s entitlement to apply for and be granted a patent (Rule 41.7(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, ID, IL, IN, IS, JP, KE, KG.

(54) Title: DIGITAL BROADCASTING RECEIVER

(57) Abstract: A docking station (10) contains a digital radio receiver (14) to receive transmissions (2) from a transmitter (4). A separate portable playing device (40) can be plugged into a socket (30) in the docking station (10) in order to enable material stored in a storage means (20) to be transferred to the device (40). The storage means (20) may be removable so that it can be transferred to a portable device (40). A unique identifier stored at each docking station enables the docking station to receive an encrypted signal to program a control means (16) within the docking station (10). The docking station receiver can be used to record programs off air or specifically purchased bundles of content transmitted “out of hours”.

[Continued on next page]
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
Digital Broadcasting Receiver

Background of the Invention

The present invention relates to all digital broadcast systems including, but not limited to terrestrial digital television and radio, including DVB-T, DAB, and satellite and more specifically to receivers and recorders for such broadcasts.

DAB and DVB-T are currently available forms of digital broadcast and for the purposes of illustration, this specification refers to these formats. It will be appreciated that the present invention can be used in the context of any digital broadcast.

Digital broadcast systems allow broadcasters to provide a wide range of materials simultaneously on a single block of frequencies called a multiplex. A multiplex is able to carry many television channels, stereo and mono radio channels as well as services such as text and data.

DAB is now commonly referred to as digital radio. Although it is referred to as radio, the material that can be broadcast is not limited to audio material and could also include text data and graphic data and video material.

The DAB system also provides up to “CD sound” quality and offers a wide diversity of radio stations.

A number of different DAB receivers are currently commercially available.

A consumer must however purchase a DAB specific receiver. These receivers are typically used as car radios, or combined with traditional static or portable radios.

DVB-T is now commonly referred to as digital television. The DVB-T system provides many more and also higher quality television pictures than the traditional analogue television broadcast systems. A number of different DVB-T receivers and recorders are currently commercially available. A consumer must however purchase a DVB-T specific receiver. These receivers are typically referred to as set-top boxes. The term set-top box is used to refer in this specification to any consumer receiver
whether separate from the TV display device as is typically the case at present or integrated into the housing of a TV.

Since the development of the VCR, consumers have been able to record and playback both analogue and digital television broadcasts, and since the development of the programmable VCR, consumers have been able to set their VCR to record both analogue and digital television broadcasts when they are not physically present at the device.

Recently solid state devices have been developed that do not require a consumer to insert a VCR tape into a machine to record an analogue or digital broadcast. These solid-state devices are known as PVRs or Personal Video Recorders. As with a VCR, a consumer is able to record pre-selected television programmes, but also enjoy instant replay and return to the programme without losing any of that programme, or pause a broadcast picture and return without losing any of that programme. PVRs also allow a consumer to record many hours of broadcasts on to the solid-state device, in excess of the capacity of any VCR tape, and furthermore a consumer does not need to remember to insert a VCR tape, or buy multiple VCR tapes.

Finally companies such as Tivo (RTM), ReplayTV and BskyB, through their Sky+ (RTM) set-top box, and others have developed PVR systems that not only allow a consumer to select programmes to record from an Electronic Programme Guide (EPG), but also automatically record programmes that meet a particular genre or consumer profile. For example, as these devices are aware of up-to-date and detailed programme information, these devices will automatically record a weekly serial irrespective of when the broadcaster schedules that serial, even if the broadcaster changes that schedule. Furthermore these devices will record programmes with certain characteristics such as specified actors, sports teams, etc. See for example WO 00/59223 (Tivo, Inc) entitled Data Storage Management and Scheduling System.

These devices receive the necessary scheduling information via an EPG downloaded together with the broadcast programmes, or delivered via a telephone modem into the
set-top box.

It is now commonplace for people to carry individual portable devices to provide entertainment. Such devices range from personal tape players to mobile phones. Such devices may be multi-functional so a mobile phone may be combined with an MP3 player, a camera or a personal digital assistant (PDA).

Technical Problem

The present invention addresses several technical problems.

It is technically challenging for a portable device to achieve continuous reception of any broadcast signal. The download of large data files requires a high quality link and therefore the transfer of data to a moving DAB receiver may prove difficult.

Mobile phone operators have also encountered difficulties in providing data downloads to mobile phones to enable full use of their storage capacity and playback capabilities.

Digital radio transmitters do not yet provide complete coverage and this presents a problem to mobile consumers who may move out of range and lose reception

The cost of digital receivers has been too high to achieve widespread adoption.

Current DAB devices do not store broadcast data and hence do not allow a broadcast to be heard/read at the consumer's convenience.

As with any broadcast system, the constraints of the programming restrict consumer choice as to the time at which a program must be listened to.

At present, the British Broadcasting Corporation finance digital radio broadcasts through the licence fee. Other commercial stations rely on advertising. With “free-to-air” broadcasts, there is a technical problem of providing a mechanism for content providers to obtain revenue for providing material outside the traditional advertising model.
Prior Art

It has been appreciated in US-A1-2002/0002032 (Fleenor) that digital radio presents the possibility of a subscription based service that allows a consumer to program a digital radio receiver to search for material within a live transmission that matches a stored profile.

EP-A-1143647 (Etostem) proposes a solution to the restrictions of programming schedules by offering apparatus for recording a radio broadcast in real time and reproducing the material when the consumer desires to listen to it.

On 27 September 2000, Psion InfoMedia Ltd launched a product called the WAVEFINDER (Registered Trade Mark) consisting of a DAB receiver that connects to a PC. The device allows the user to record MP3 files.

EP-A1-146 747 (BBC) describes a method and apparatus for broadcast and video signal recording, which enables a subscriber to inform the broadcaster of programs they wish to record. A signal is then sent to the home of the subscriber in the multiplex of the broadcast containing an identification code specific to the subscriber's recorder in order to identify the details such as start and finish times of the programs selected.

None of the above proposals provide a complete solution to the technical problems described.

Solution of the Invention

The features of the invention are defined in the appended claims.

In accordance with the system of the present invention, there is provided a digital broadcasting receiver having a housing and comprising means within the housing for receiving digital broadcast materials; removable storage means; recording means for storing received material in said storage means; and means for receiving programming data transmitted by a service provider to control the time, duration and channel of recording by the recording means.
In another aspect the present invention provides a docking station having a housing and comprising means within the housing for receiving digital broadcast material; storage means; recording means for storing received material in said storage means; means for receiving programming data transmitted by a service provider to control the time, duration and channel of recording by the recording means; means for connecting the docking station to a separate portable playing device; and means for transferring stored material to the separate device.

The receiver or the docking station of the invention can be manufactured relatively inexpensively as it does not need to amplify or play the received material. The consumer is able to use a portable device of his own. The storage device can be removed from the receiver and inserted into the portable device in a simple non-technical operation. The concept of the docking station makes the transfer manually simpler. Because digital broadcasts can be recorded in MP3 audio file, text file and binary file formats, it is possible for the receiver or docking station to be used with a variety of existing portable devices capable of playing MP3 and/or other files. These portable devices could be dedicated MP3 players or have additional functions such as mobile phones and personal digital assistants (PDAs). However, the invention would not be limited to MP3 files, it would apply to any format for recorded media (audio, data and video), which is capable of being read by a portable device. Therefore the size and portability of the receiver or docking station ceases to be a significant consideration.

The receiver or docking station also effectively solves the problem of the listening time constraints imposed by live broadcasts by the use of the recording means.

By providing a means for the receiver or docking station to receive programming data transmitted by a service provider, preferably as encrypted broadcast signals, to control the time, duration, and channel of recording, the invention becomes an ideal platform for generating revenue by subscription charges. The use of a broadcast encrypted signal ultimately allows the provider of the service, if necessary, to switch off the receiver or docking station to protect its subscription revenue model.
Because the receiver or docking station can be programmed to receive at any time of the day or night, it can record material broadcast when usage is low, for example at night when some of the channels in a digital radio or television multiplex will be off air. These times are referred to in this specification as “out of hours”. It will be appreciated that “out of hours” times may vary depending on the material the broadcaster transmits so for an educational program broadcaster it would be at different times from a popular music broadcaster. These time periods can be used to deliver specialist content selected by the consumer. Advertising provided with such specialist content bundles can be precisely targeted because the advertiser has more access to information relating to the characteristics of the consumer and there would be a high likelihood of the advertisement being heard.

In another aspect the invention provides a system for delivering customer specific digital programming comprising a plurality of digital broadcasting receivers or docking stations, a remotely accessible interface to a broadcast service provider’s system for enabling a customer to make selections in order to create programming data to control the time, duration and channel of recording of said receiver, and means for transmitting the programming data with broadcast material from the broadcaster’s system to said customer’s receiver.

In such a system, the receiver or docking station is a set-top box that does not need to interact with a broadcast EPG, or collect scheduling information via a telephone link; rather the specific scheduling information for each set-top box is transmitted via a separate data control channel within the broadcast information.

This set-top box not only effectively solves the problem of the listening time constraints imposed by live broadcasts by the use of the recording means, but also allows a consumer to select specific programmes or programme genres remotely via an Internet or telephone call centre interface.

By way of example only, a user may be working late at an office and unable to record a particular television programme; by going onto the Internet, the user is able to
instruct the set-top box to record that programme.

Brief Description of the Drawings

In order that the invention may be well understood an embodiment thereof will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 shows a block diagram of a system for receiving and recording customer specific programming in a receiver or docking station; and

Figure 2 shows a block diagram of a receiver in the form of a docking station for a portable playing device.

Detailed Description of a Preferred Embodiment

An Internet site AAA or a call centre BBB provides a means to enter specific customer information such as, inter alia, user name and password, and allows the selection of specific programmes or bundles of programmes which are stored in a database CCC in a service provider’s computer system. These selections are matched against a stored schedule of all upcoming broadcasts DDD. A protocol factory EEE collates the specific selections of each user with the timings and channels of each programme and sends a data stream to a broadcast multiplex FFF that transmits the data stream along with other broadcast programmes.

The data stream FFF and other television broadcasts are transmitted from transmitting equipment 4. These signals 2 are received by receivers within the coverage area. The transmission may partly be over a cable system.

A digital broadcast receiver or set-top box 10 is a digital radio or TV receiver. As shown in Figure 2 the set-top box 10, which is configured as a docking station has an antenna 12 connected to receiver circuitry 14. A microprocessor 16 controls the operation of the set-top box 10. The set-top box 10 also includes storage means 20 and a recording means 22.
The set-top box 10 provides a socket 30 into which a portable device 40 can be plugged. Alternatively at least part of the storage means 20 may be a removable storage card or other form of memory which can be removed from the set-top box 10 and replaced by another. A socket may be provided to allow insertion of such a storage card to which data can be transferred. The set-top box 10 may be connected to a playing device such as a TV that allows playback of the recorded material.

Each set-top box 10 has a unique identifier preset into the storage means 20.

The set-top box described can be used as part of two distinct delivery system modes. In a basic mode, the set-top box 10 receives off-air broadcast material. In an out of hours mode the set-top box 10 downloads a bundle of content. When not activated to record the set-top box remains in a standby condition awaiting programming instructions.

When there are no programming instructions stored in the set-top box the microprocessor will operate to store programs from genres and media types similar to those which the consumer has ordered previously and will offer these to the consumer at a later time. Alternatively the service provider may create and transmit programming data based on the consumer’s previous selections.

**Basic Mode**

In basic mode the set-top box 10 turns on and records a program as it is broadcast.

The selected material is recorded by recording means 22 and stored in storage means 20. When a portable device 40 is plugged into the socket 30, the newly recorded material is transferred, or when a portable storage medium is inserted in a housing the newly recorded material can be transferred, or when a local playing device is connected to the set-top box 10 the newly recorded material is played.

The control means 16 may be programmed remotely by a service provider using a transmitted signal that the set-top box 10 can recognise as destined for it by the presence of its own unique identifier within the message.
A customer subscribes to a program selection service and selects the programs he wishes to record by a telephone BBB or Internet interface AAA. The service provider then transmits a programming signal to the customer's set-top box 10. This can be transmitted as part of the digital radio transmission. Only simple instructions are required for the set-top box. For example, in order to instruct the set-top box to record four distinct programs during a day, it is necessary to identify the start time and the number of minutes for which recording should take place before stopping. If we assume that programs were to start on the hour or half hour there are effectively only 48 distinct start times during the day. Therefore, a two-digit number can store the start time and another two-digit number can represent the number of minutes for which the program is to be recorded. Therefore, for four programs, the programming instruction needed is a 16-digit number plus the channel descriptor. The service provider may encrypt the number so that it can only be interpreted by the customer's set-top box using its unique identifier as a key. It will be appreciated that numerous alternative coding and programming schemes can be provided.

*Out of hours mode*

In out of hours mode, the service provider offers an added value service by bringing together specialised content in bundles containing a range of programs with similar themes. For example, multiple episodes of a serial could be packaged in a bundle. Parliamentary debates on a specific subject could also be packaged into a specialist bundle. The variety of such bundles is limited only by the material available. A customer selects a bundle for purchase using an Internet AAA or a telephone BBB interface and orders and pays for the bundle as a standard e-commerce transaction. The bundle would then be transmitted together with the unique identifier of the customer's set-top box 10 as an encrypted signal that can only be received and recorded by that specific set-top box. The transmission of a bundle could be preceded by an encrypted signal identifying multiple set-top boxes that had ordered the same bundle during the preceding period. Therefore, popular bundles could be provided cheaply to multiple subscribers. Use of encryption and unique identifiers protects the revenue stream of the content provider.
Transfer to Player

The docking station can be controlled to operate in various ways when the separate device 40 is plugged into the socket. For example, the stored material within the portable device 40 could be compared with that in the storage means 20 and any new material in the storage means 20 added to the material stored in the portable device 40. Alternatively, the new material can replace older material.

In another mode of operation the data from the storage means 20 could be streamed live to the player so that the consumer could effectively listen to digital radio off air.

The separate device 40 may be a dedicated MP3 player or may have other functions such as being a portable telephone or pocket computer or other personal portable device. This device must have means for replaying the stored material but does not need any of the receiving circuitry required by a digital radio receiver. The consumer therefore has access to digital radio, or television or satellite broadcasts without having to change his portable player.

In another mode of operation the portable device 40 is solely a removable memory device, and this removable memory device is then transferred to a portable listening/reading device.
Claims

1. A digital broadcasting receiver having a housing and comprising means within the housing for receiving digital broadcast materials; removable storage means; recording means for storing received material in said storage means; and means for receiving programming data transmitted by a service provider to control the time, duration and channel of recording by the recording means.

2. A receiver as claimed in claim 1, which is connected to or part of a local playing device.

3. A receiver as claimed in claim 1, which provides a docking station for a removable playing device.

4. A docking station having a housing and comprising means within the housing for receiving digital broadcast material; storage means; recording means for storing received material in said storage means; means for receiving programming data transmitted by a service provider to control the time, duration and channel of recording by the recording means; means for connecting the docking station to a separate portable playing device; and means for transferring stored material to the separate device.

5. A docking station as claimed in claim 4, wherein at least part of the storage means is removable.

6. A system for delivering customer specific digital programming comprising a plurality of digital broadcasting receivers as claimed in claim 1 and/or docking stations as claimed in claim 4, a remotely accessible interface to a broadcast service provider’s system for enabling a customer to make selections in order to create programming data to control the time, duration and channel of recording of said receiver, and means for transmitting the programming data with broadcast material from the broadcaster’s system to said customer’s receiver.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04N5/00

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)
IPC 7 H04N H04H 611B

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

Electronic database consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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12 May 2003

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Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Riverveld
Tel: (+31-70) 340-2040, Tx: 31 651 spo nl, Fax: (+31-70) 340-3016

Authorized officer
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## INTERNATIONAL SEARCH REPORT

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