US 20100146165A1

(19) **United States**

(12) **Patent Application Publication**

Steinberg et al.

(10) **Pub. No.: US 2010/0146165 A1**

(43) **Pub. Date: Jun. 10, 2010**

(54) **REMOTE CONTROL APPARATUS FOR CONSUMER ELECTRONIC APPLIANCES**

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(21) Appl. No.: **12/712,126**

(22) Filed: **Feb. 24, 2010**

Related U.S. Application Data

(63) Continuation of application No. 11/123,972, filed on May 6, 2005, now Pat. No. 7,685,341.

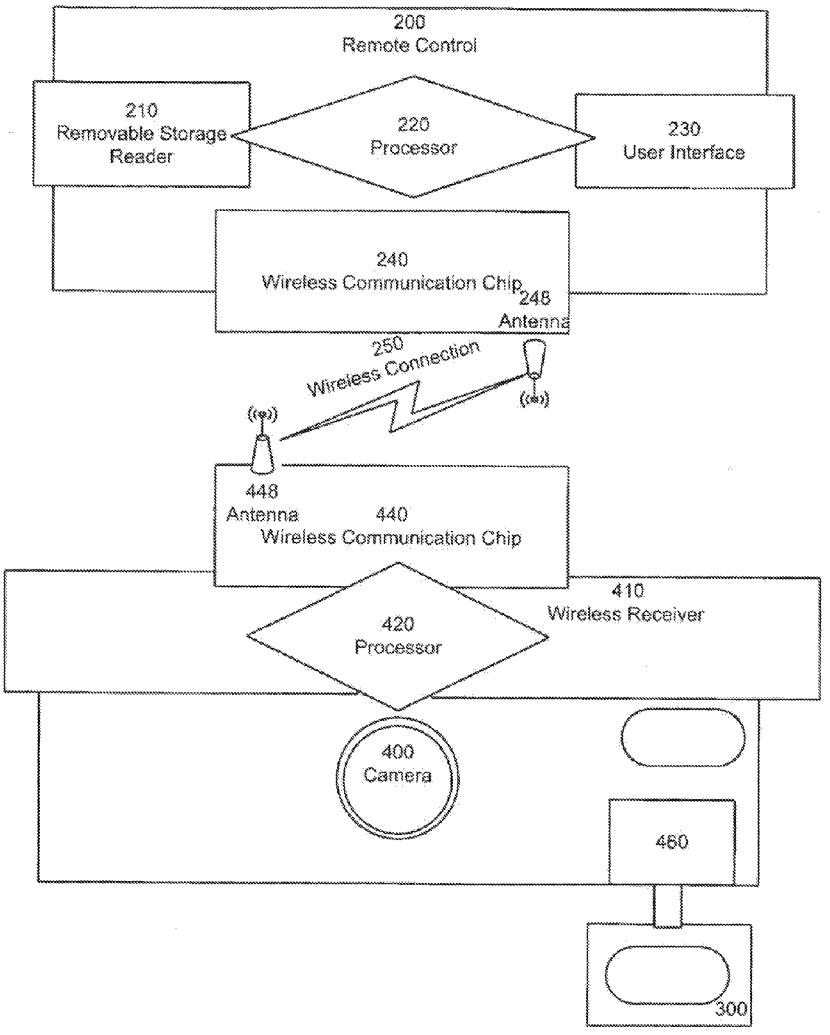
Publication Classification

(51) **Int. Cl.**
H04N 5/222 (2006.01)

(52) **U.S. Cl.** **710/72**

(57) **ABSTRACT**

An apparatus for the remote wireless control of a consumer electronic audio visual appliance such as a TV set, and/or for internet uploading, includes a remote control handset and a wireless receiver for connection to the appliance. The remote control unit is adapted to transmit audio and/or visual data (A/V data) and control codes to the receiver. The receiver is responsive to the A/V data and control codes to control the appliance to play and/or display the A/V data. The remote control unit includes a reader for a storage medium for A/V data, or a cable or wireless interface to an A/V acquisition device such as digital video or digital still camera or digital music player or recorder.



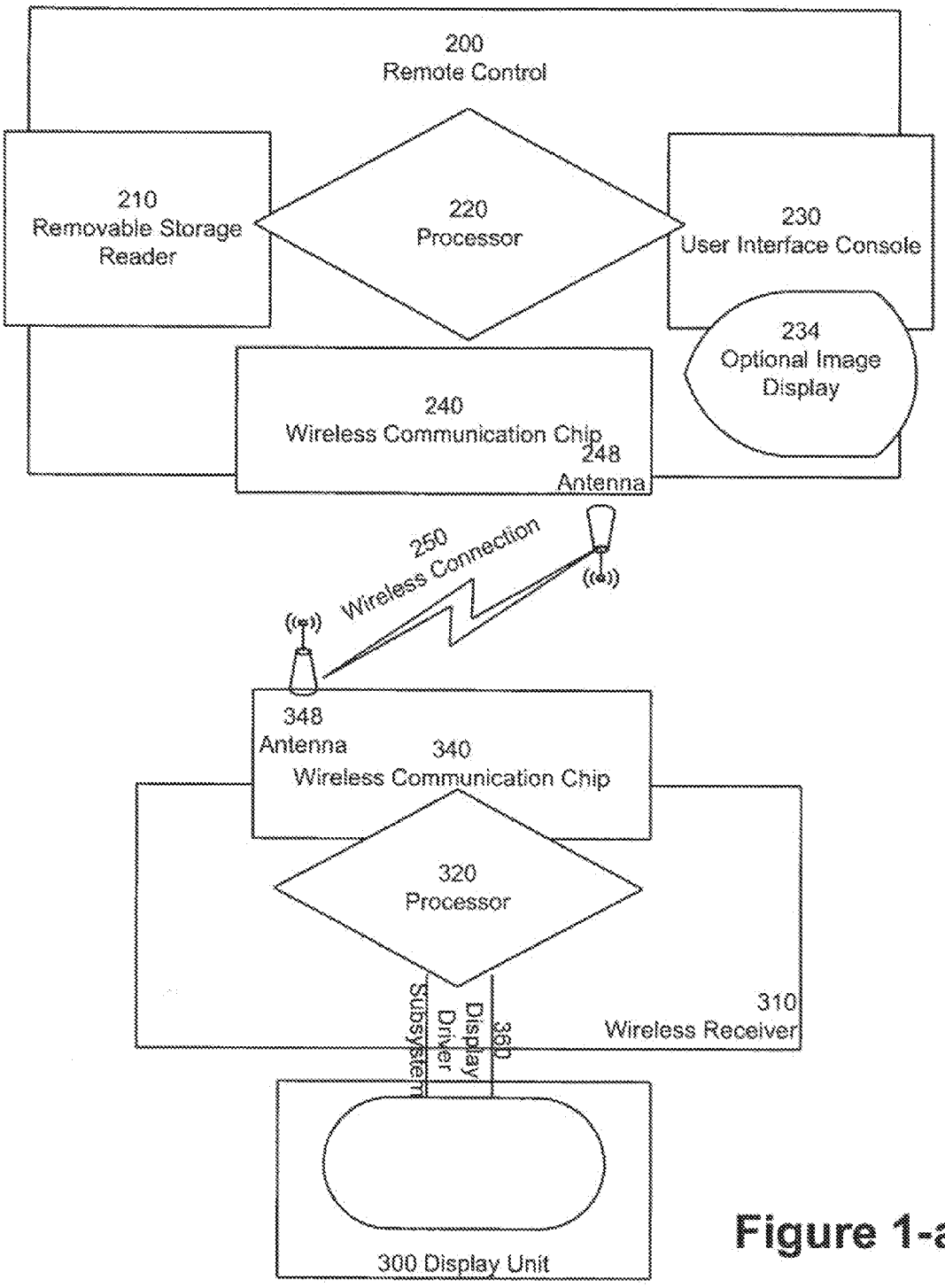

200
Remote Control
210
Removable Storage
Reader
220
Processor
230
User Interface Console
234
Optional Image
Display
240
Wireless Communication Chip
248
Antenna
250
Wireless Connection
348
Antenna
340
Wireless Communication Chip
320
Processor
310
Wireless Receiver
Synchronization
Display
Driver
360
300 Display Unit

Figure 1-a

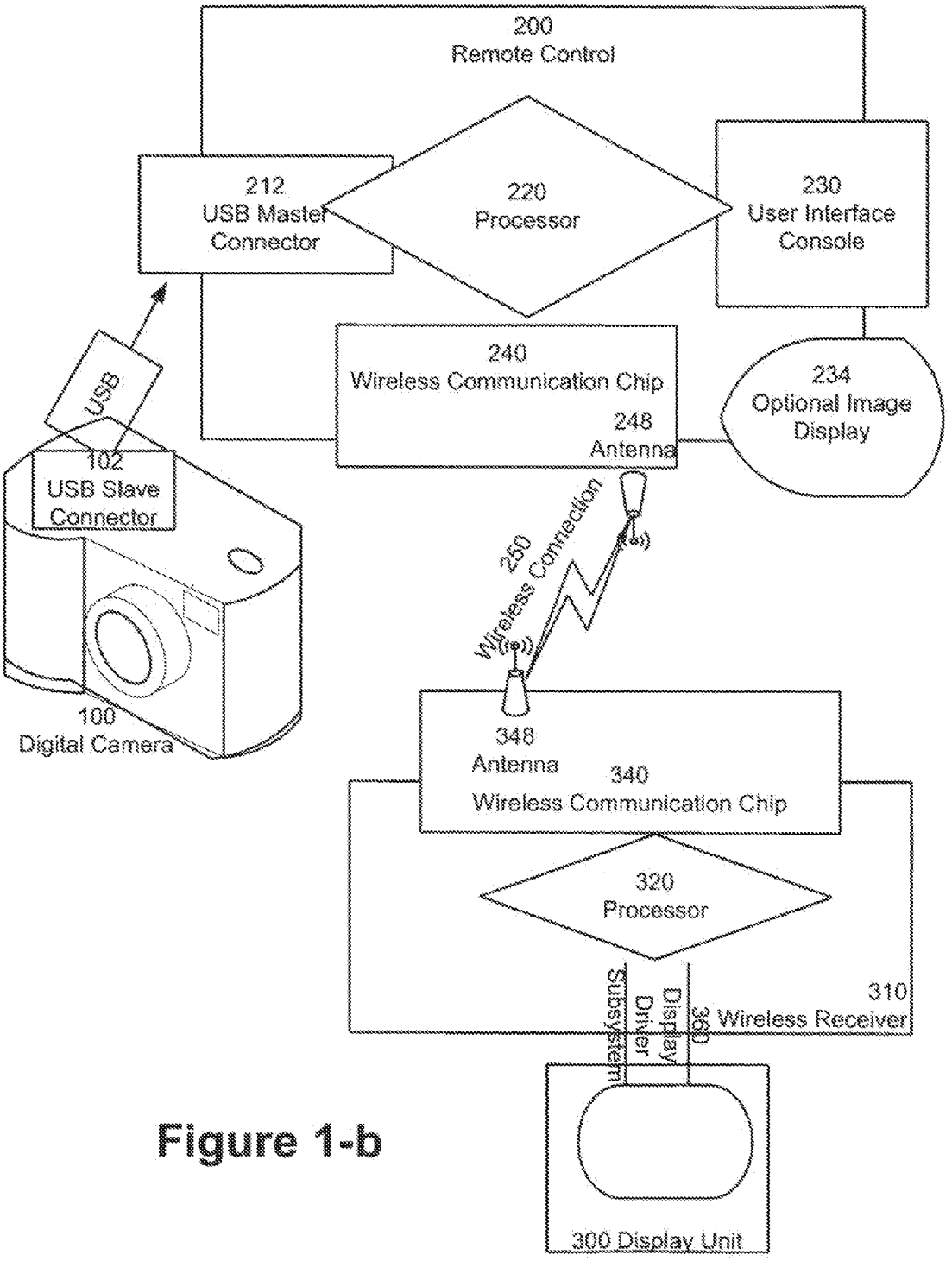

200
Remote Control
212
USB Master
Connector
220
Processor
230
User Interface
Console
240
Wireless Communication Chip
248
Antenna
234
Optional Image
Display
USB
102
USB Slave
Connector
250
Wireless Connection
100
Digital Camera
348
Antenna
340
Wireless Communication Chip
320
Processor
Subsystem
Display
Driver
360
310
Wireless Receiver
300 Display Unit

Figure 1-b

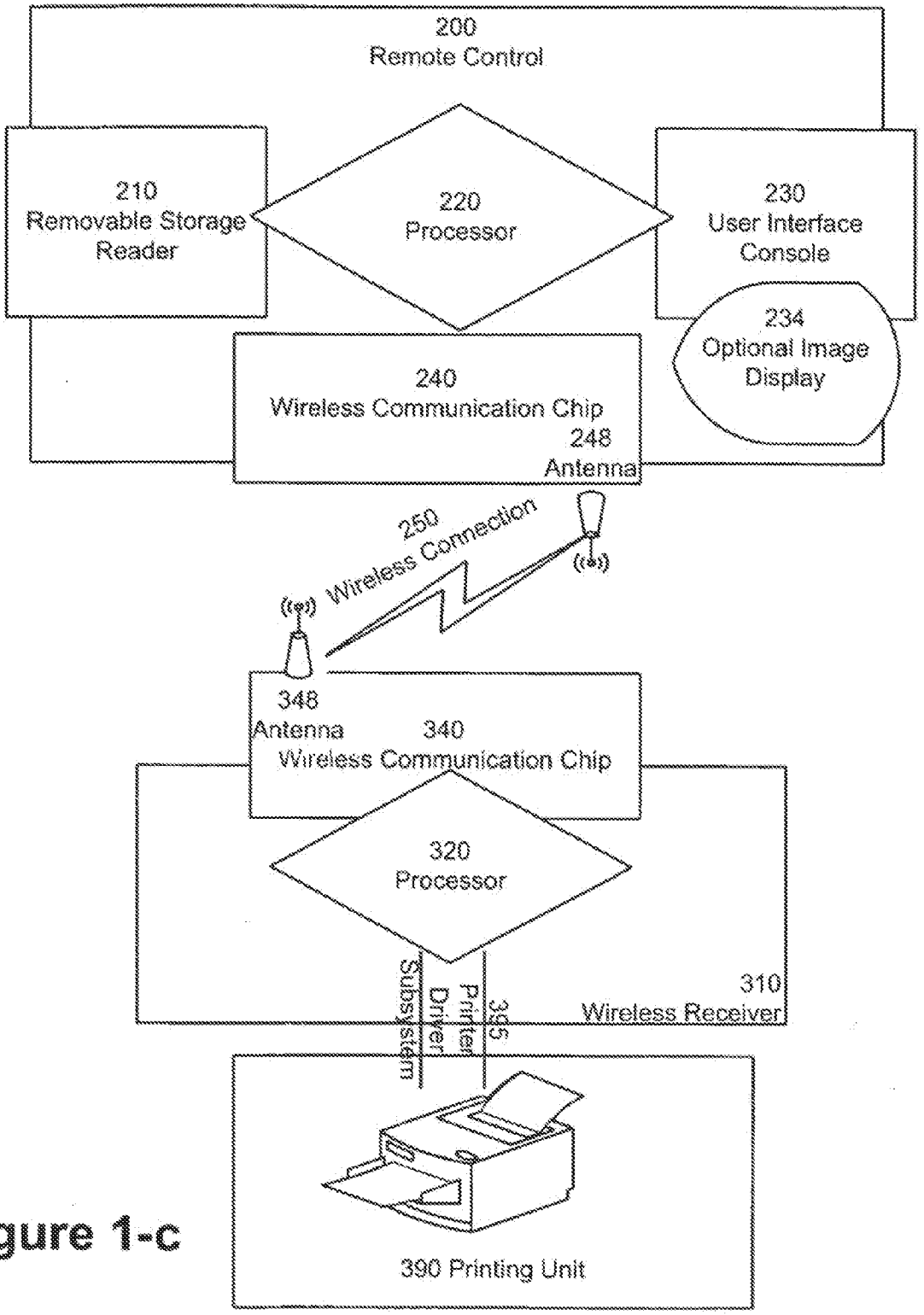

200
Remote Control
210
Removable Storage
Reader
220
Processor
230
User Interface
Console
234
Optional Image
Display
240
Wireless Communication Chip
248
Antenna
250
Wireless Connection
348
Antenna
340
Wireless Communication Chip
320
Processor
310
Wireless Receiver
Subsystem
Printer
Driver
SCSI
390 Printing Unit

Figure 1-c

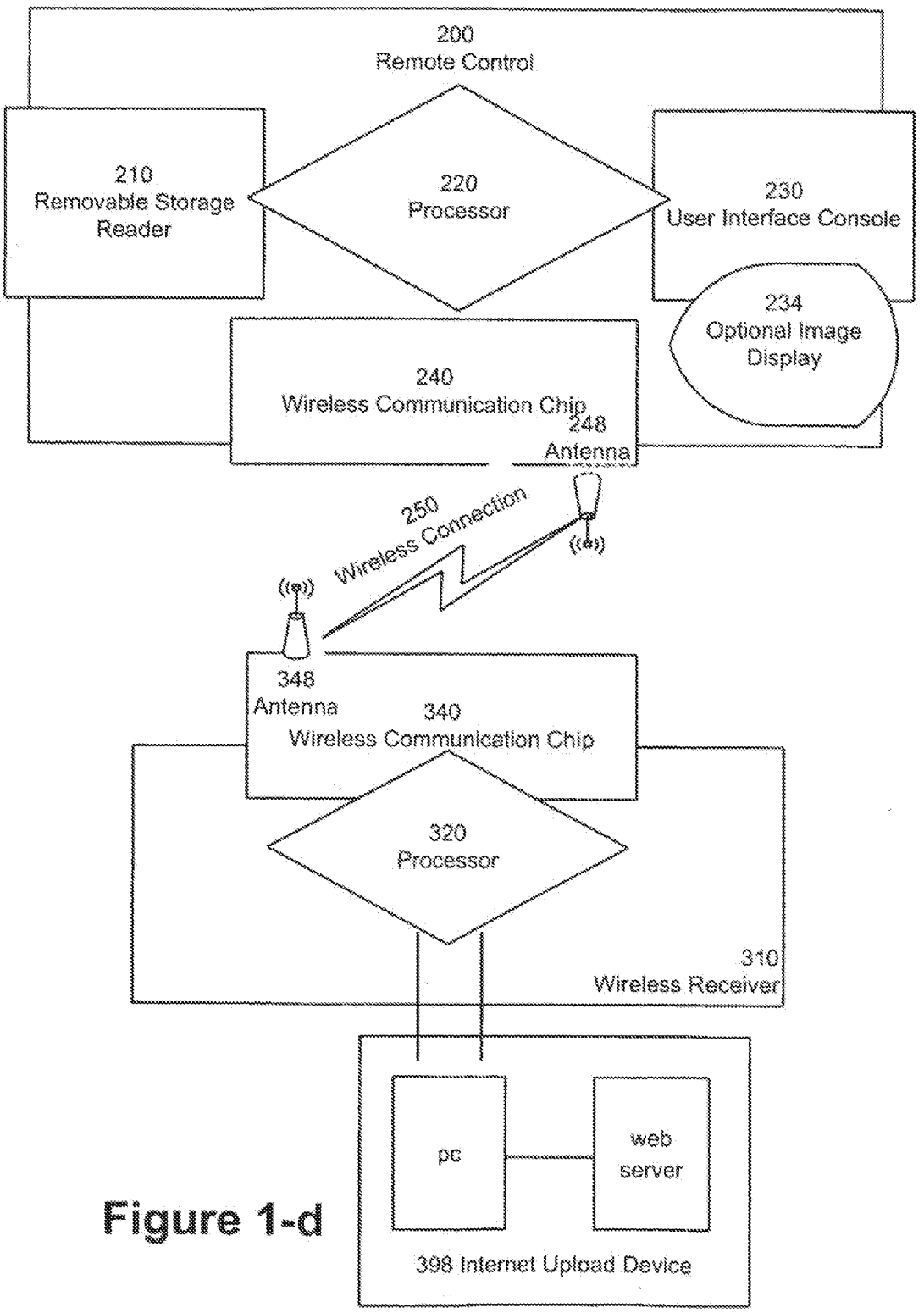

200
Remote Control
210
Removable Storage
Reader
220
Processor
230
User Interface Console
234
Optional Image
Display
240
Wireless Communication Chip
248
Antenna
250
Wireless Connection
348
Antenna
340
Wireless Communication Chip
320
Processor
310
Wireless Receiver
pc
web
server
398 Internet Upload Device

Figure 1-d

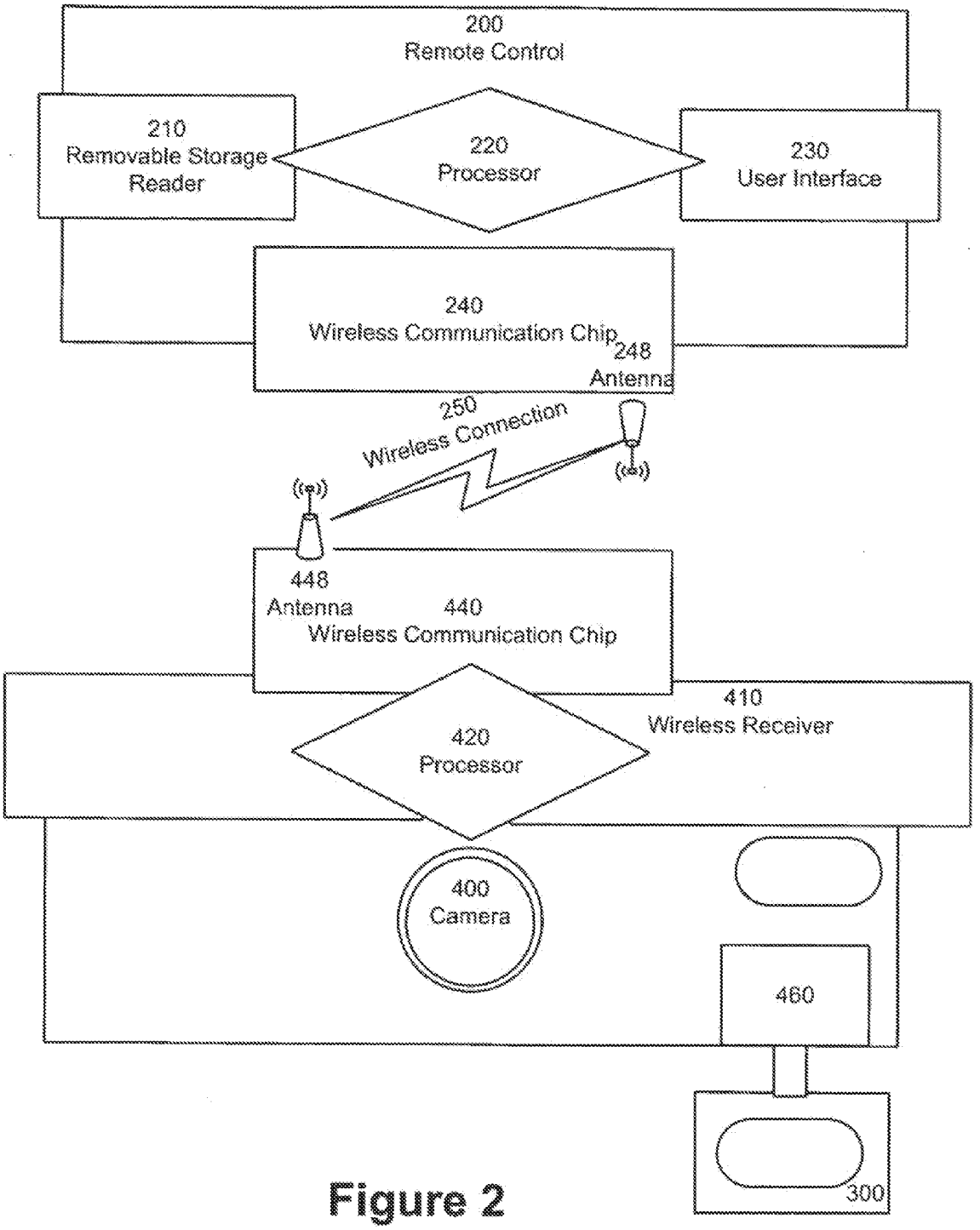

200
Remote Control
210
Removable Storage
Reader
220
Processor
230
User Interface
240
Wireless Communication Chip
248
Antenna
250
Wireless Connection
448
Antenna
440
Wireless Communication Chip
410
Wireless Receiver
420
Processor
400
Camera
460
300

Figure 2

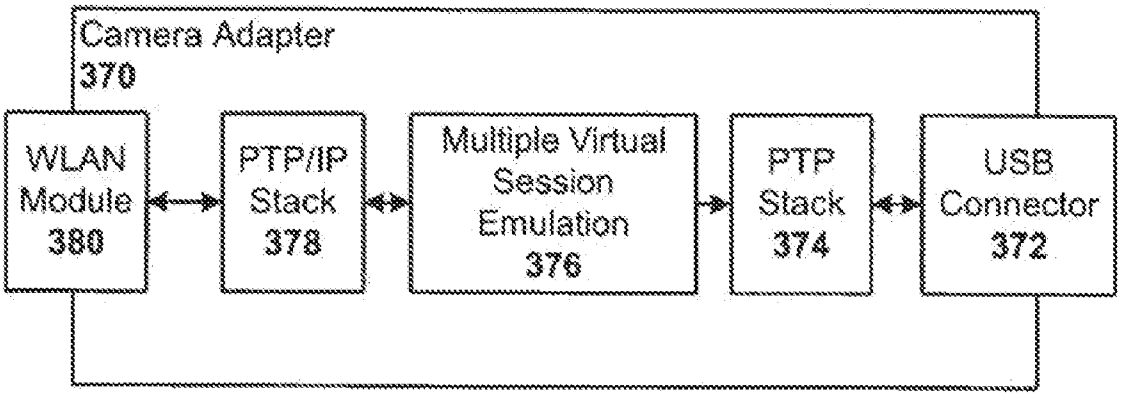

Camera Adapter
370
WLAN
Module
380
PTP/IP
Stack
378
Multiple Virtual
Session
Emulation
376
PTP
Stack
374
USB
Connector
372

Figure 3

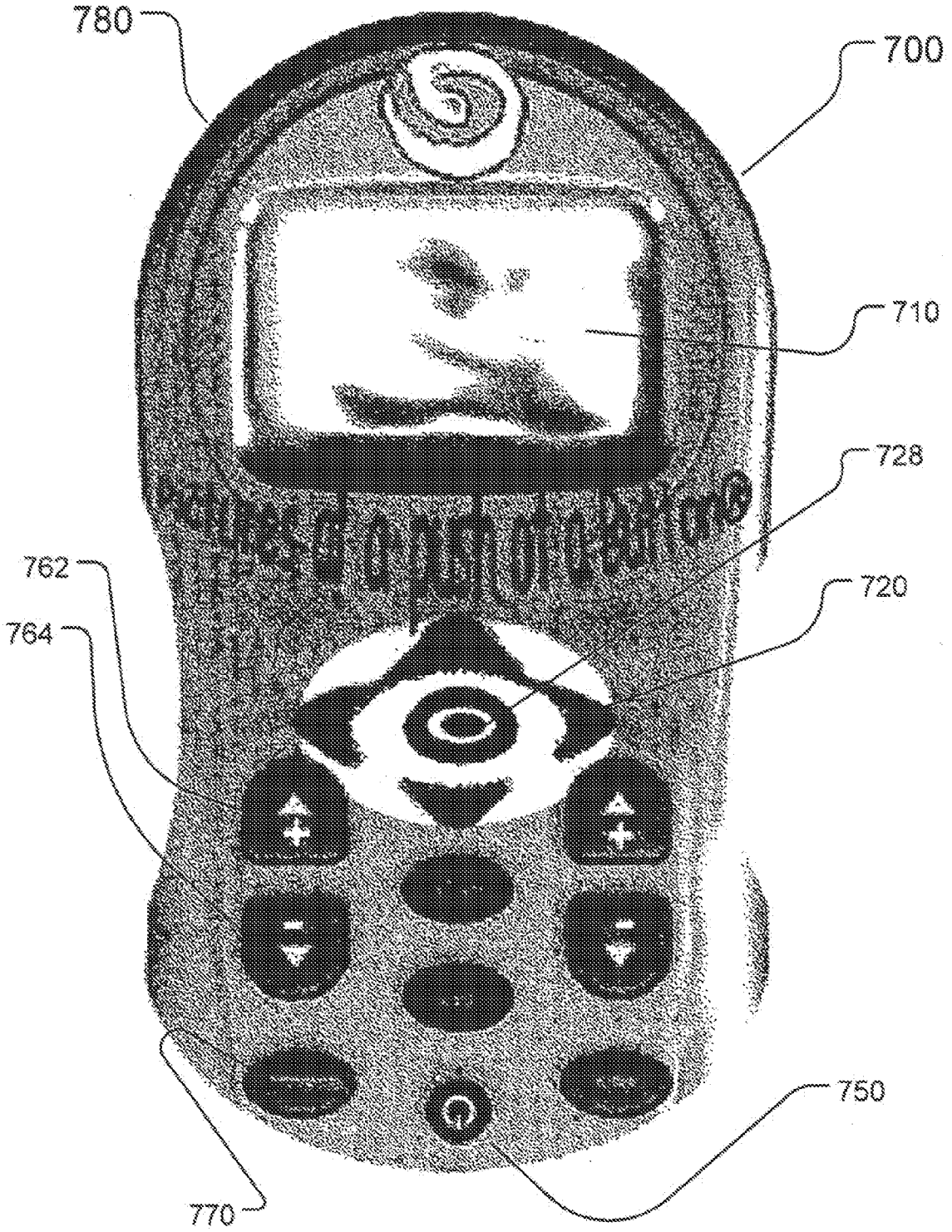


Figure 4

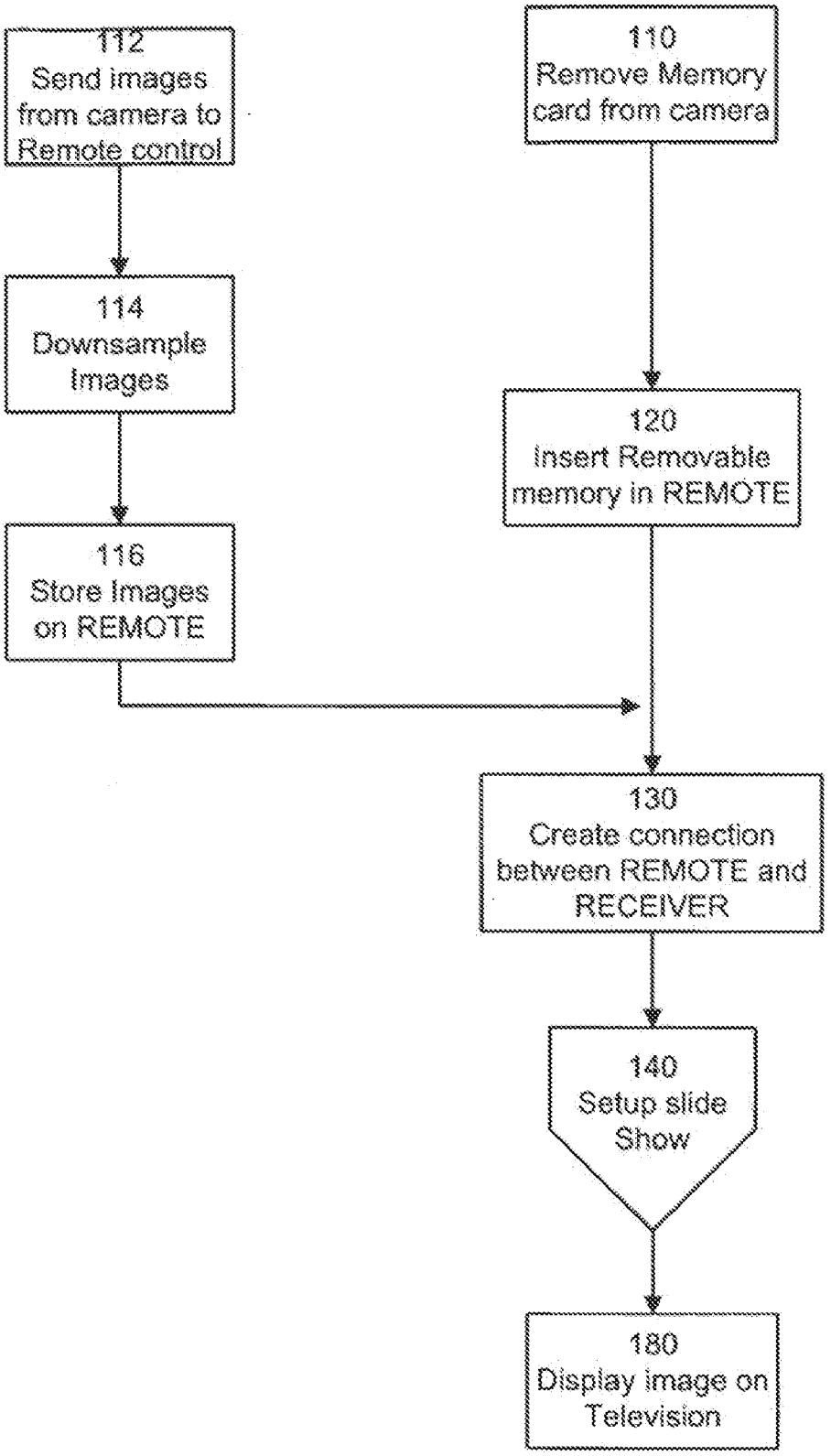

112
Send images from camera to Remote control
110
Remove Memory card from camera
114
Downsample Images
120
Insert Removable memory in REMOTE
116
Store Images on REMOTE
130
Create connection between REMOTE and RECEIVER
140
Setup slide Show
180
Display image on Television

Figure 5

REMOTE CONTROL APPARATUS FOR CONSUMER ELECTRONIC APPLIANCES

PRIORITY

[0001] This application is a continuation (CON) of U.S. patent application Ser. No. 11/123,972, filed May 6, 2005, which is hereby incorporated by reference.

BACKGROUND

[0002] 1. Field of the Invention

[0003] The invention relates to a wireless remote control apparatus for consumer electronic (CE) appliances, and to systems and methods for transferring and controlling audio and/or visual data (hereinafter "A/V data) from acquisition devices, through a wireless remote control apparatus, and onto an output display devices.

[0004] 2. Description of the Related Art

[0005] Traditionally, domestic homes have contained stand-alone CE appliances such as TV sets or single add-on appliances such as VCR and DVD players which allow the recording of TV shows and playing of pre-recorded movies. However, the last few years have seen a substantial growth in audio and visual content derived from digital appliances and made available to consumers in digital form. Examples include digital cameras for digital imaging and MP3 digital encoding for audio data, as well as digital video cameras. Broadly speaking most consumers now find digital content more flexible and useful than conventional analog media. However, although most digital content can be readily managed and post-processed on a conventional desktop computer, this is not necessarily the best location for a consumer to enjoy such content.

[0006] Accordingly a new generation of peripheral add-on CE appliances have emerged, such as Picture Display Devices and Media Adapters, whose goal is to enable the viewing of digital content using more conventional CE appliances such as a TV set. A Media Adapter is an appliance which can receive digital content over a network connection and convert it to standard RCA, S-Video, HDTV or DV output for presentation on a standard TV set. Typically such an appliance sources its content from a networked desktop computer.

[0007] The PrismIQ Media Adapter (www.prismiq.com) is a good state-of-art example of such an appliance. It allows audio, video and still photo content located on a networked home computer to be viewed on a home TV-set. The PrismIQ features audio and video outputs which allow it to be connected directly to a standard TV set. It may be networked with the home computer via either wired, or wireless network connections. The main PrismIQ appliance can then be managed by the user with a conventional remote control unit, thus allowing the display of digital content on the TV set from a couch in the living room. Even with the PrismIQ, however, digital content is first loaded onto a desktop computer and pre-processed by a specialized server application prior to being accessible by the user from the comfort of his living room.

[0008] Picture Display Devices such as Digital-Album by Nixvue Systems Ltd. (www.nixvue.com), generally include a "set-top box" which plugs physically into a television set and contains one or more readers for a removable storage medium, such as a memory card, containing audio and/or visual data content. Operating picture display devices, however, involves users plugging the removable storage medium into the box, returning to their seats and activating then remote control unit. This becomes awkward if users have multiple removable memory cards that they wish to review or organize. That is, operating picture display devices involves users moving from the couch to the TV set or box in order to switch removable memory cards.

SUMMARY OF THE INVENTION

[0009] An apparatus is provided, in accordance with one aspect of the invention, for remote wireless control of a consumer electronic (CE) appliance and/or of internet uploading. The apparatus for CE control includes a remote control unit and a wireless receiver for direct or indirect connection to the CE appliance. The remote control unit is adapted to transmit audio and/or visual data (hereinafter "A/V data"; visual data including video or still image data, or both) and control codes to the receiver. The receiver is responsive to the A/V data and control codes from the remote control unit to control the appliance to play and/or display the A/V data.

[0010] Preferably, the same remote control unit may also be adapted to directly control the consumer electronic appliance. The remote control unit preferably includes a reader for a removable storage medium for A/V data. The A/V data transmitted to the receiver is read from the storage medium. Alternatively, the remote control unit may include a cable or wireless interface for signal connecting to an A/V acquisition device, such as a digital still camera, digital video camera or digital audio player, e.g., using an industry accepted interface.

[0011] In one embodiment a remote control handset and a memory card reader subsystem are combined into an integrated appliance. In another embodiment, a remote control handset and an interface to a digital media acquisition device are combined into another integrated appliance. These integrated appliances allow digital media, particularly digital images, to be accessed directly by a consumer from a removable memory card, or an acquisition device, and to be subsequently transmitted over a wireless link for direct display on a TV set or other digital display appliance. This has the advantageous of eliminating the need for the user to move from the couch to the TV set just to switch removable memory cards.

[0012] The apparatus for control of an internet uploading device (e.g., a pc computer connected to a web server) includes a remote control unit and a wireless receiver for direct or indirect control of an internet uploading device. The remote control unit is adapted to transmit internet content and control codes to the receiver. The receiver is responsive to the content and control codes from the remote control unit to control the uploading of the internet content, e.g., to a web page or database. Other features described with respect to the CE appliance control apparatus may be utilized in the internet upload apparatus.

[0013] A method for the remote wireless control of a consumer electronic (CE) appliance is also provided. A/V data is received from an A/V acquisition device at an interface of a remove control unit. The A/V data and control codes are transmitted to a wireless receiver coupled to a CE appliance. The receiver is configured to be responsive to the data and control codes received from the remote control unit to control the CE appliance to play and/or display or otherwise output

the A/V data. Other features described with respect to the CE appliance and internet upload control apparatuses may be utilized with the method.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Preferred and alternative embodiments are described below by way of example with reference to the accompanying drawings, in which:

[0015] FIG. **1**-*a* is a block diagram of an embodiment including a removal storage medium reader wherein the output device is a display device such as a television set.

[0016] FIG. **1**-*b* is a block diagram of an embodiment including a cable-based USB interface to the acquisition device.

[0017] FIG. **1**-*c* is a block diagram of an embodiment wherein the output device is a printer.

[0018] FIG. **1**-*d* is a block diagram of an embodiment wherein the output device is an Internet upload device.

[0019] FIG. **2** is a block diagram of a further embodiment including a remote control signal connecting wirelessly with a digital camera.

[0020] FIG. **3** is a block diagram of a camera adaptor unit.

[0021] FIG. **4** is a perspective view of an embodiment of a remote control handset.

[0022] FIG. **5** is workflow diagram illustrating operation of a system in accordance with a preferred embodiment, including two alternative sources of digital images.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0023] FIG. **1**-*a* is a block diagram of a system in accordance with a preferred embodiment. Referring to FIG. **1**-*a*, the system includes a remote control unit **200**, which may preferably be implemented as a handset, the embodiment illustrated at FIG. **4**, and/or a docking station. The remote control unit **200** of FIG. **1**-*a* is shown communicatively coupled with a wireless receiver **310**. The remote control unit **200** comprises a main processor **220**. The main processor is preferably an embedded processor such as a dedicated system-on-chip integrated circuit, for example, a standard ARM or MIPS based embedded system. The processor **220** shown in FIG. **1**-*a* is interfaced to a number of peripheral subsystems commonly found in consumer remote control units: a user interface console **230** and a wireless communications chip **240**. The user interface console **230** is, for example, a keyboard subsystem allowing the user to select and initiate various control functions by initiating the wireless transfer of control codes to a remote CE appliance such as a TV set or other display unit **300**.

[0024] FIG. **1**-*c* illustrates another embodiment wherein, instead of a display unit **300** such as a television set or other electronic audio and/or visual display device, the display unit **300** of FIGS. **1**-*a* and **1**-*b* is replaced by a hardcopy device such as a color printer **390**. In the embodiment of FIG. **1**-*c*, a printer driver **395** is also used instead of the display driver subsystem **360** shown in FIGS. **1**-*a* and **1**-*b*.

[0025] Another embodiment is illustrated at FIG. **1**-*d*, wherein the data is internet content that may be communicated to an internet upload device **398**, such as a pc or other processor-based device that is connected to a web server. The content may be uploaded to a web page or a database or other construct that is accessible via the internet.

[0026] Many remote control units **200** also feature an optional image display **234**, for example, a LCD display. The display **234** may be an uncomplicated alphanumeric display, or may be a more sophisticated graphical color LCD display or any other display device known to those skilled in the art. A wireless communication chip **240** is preferably employed to communicate control codes (instructions) to the remote CE appliance **300**, **390**. An infrared based means of transmitting control codes may be employed, or alternative communication means such as Bluetooth or WiFi, WUSB or WLAN may be used. Such Radio Frequency communications may use an antenna **248**. These and other subsystems may be used including those that may be common to domestic remote control units for direct control of a CE appliance **300**, e.g., those that bypass wireless receiver **310**.

[0027] The remote control unit **200** preferably also incorporates a removable storage medium reader **210**, for example, a card reader subsystem for accessing data from removable storage media such as compact flash data cards. Alternatively, as illustrated at FIG. **1**-*b*, the remote control unit **200** may have a cable or wireless signal communication interface to an A/V device. As utilized herein, the term "interface" is meant to be any architecture for permitting communication of the A/V data from the A/V device to the remote control unit **200** including a card reader **210**, USB or other cable interface **212**, or wireless interface. A digital camera **100** may communicate A/V data to the remote control unit **200** through a common cable communication system, such as may be installed on many standardized A/V devices. Such communication system may be a USB master **212** which interfaces with the device **100** through a USB slave connector **102**, or a proprietary interface such as ImageLink. Interfacing with such A/V devices may be made using known protocols such as ISO-15740 command language for cameras also known as Picture-transfer-Protocol or PTP. In this scenario, the remote control unit **200** can also act as a docking station for the A/V device **100**.

[0028] A system in accordance with a preferred embodiment has the advantage that digital audio and/or visual (A/V) content data may be accessed by the remote control unit **200** from removable storage media in the reader **210** or via a cable or wireless interface from the device **100**. Moreover, such data, stored in internal storage (not shown) in the device **100**, may be further managed, manipulated, combined and otherwise processed by the processor **220** on the remote control unit **200**. After this data has been accessed and suitably prepared, it may be transmitted to the remote wireless receiver **310** along with a sequence of control codes instructing the receiver **310** as to the handling and playing/displaying of the data.

[0029] The wireless receiver **310** of FIGS. **1**-*a* and **1**-*b* includes a main processor **320**, preferably an embedded processor, typically a dedicated system-on-chip integrated circuit. This processor **320** is connected to two main peripheral subsystems: a wireless communication chip **340** with antenna **348** and a display driver subsystem **360**, for example, an RGB/NTSC/PAL/D1/VGA/HDTV/D1-4 interface which is connected, in turn, to a CE display unit such as a conventional TV set **300**. The wireless communication chip **340** is employed to receive, via the wireless connection **250**, control codes transmitted from the remote control unit **200** and, in addition, A/V data which is read from the removable storage medium inserted into the remote control unit **200**.

[0030] The protocol used on the wireless connection **250** may be generic or a specific protocol for the imaging devices used. Examples include using similar protocol between image acquisition devices and hosts such as PTP or in the wireless case PTP-IP or MTP over IP ("MTP-IP"). In the embodiment illustrated at FIG. **1**-*c*, wherein the output device is a printer **390**, such protocols as PictBridge may be used to transfer the data over wireless connection **250**. The CE display unit **300** of the embodiments illustrated at FIGS. **1**-*a* and **1**-*b* is preferably a digital display unit such as an LCD panel or HDTV.

[0031] When A/V content data is received, it will typically be preceded by an identifier indicating the type or format of the content (i.e. audio, visual or both) and may also incorporate additional metadata including recording image processing modifications performed on the remote control unit **200**. Image processing may alternatively or additionally be performed by the processor **320** on the receiver **310**. The receiver-side image processing may be responsive to metadata associated with the A/V content data. As an example, a user may program a slideshow sequence on the remote control unit **200** and then transmit the resulting A/V data to the receiver **310**. Further image processing, including transition effects, redeye removal, blemish removal such as from dust, and/or motion blur compensation can be performed in the receiver **310** prior to the actual rendering of the slideshow image sequence on a TV or other display unit **300**. Such image processing may also be managed directly from the remote control unit **200**. Thus, the receiver **310** may directly control the display unit **300** to play (in the case of audio or movies) and/or display (in the case of still images) the A/V content data.

[0032] Alternatively, remote control unit **200** may control the unit **300** indirectly via the receiver. Such control may include the transition between objects, editing the object, selecting which objects to display, and/or erasing and reordering objects. Editing objects may include operations such as color correction, red eye reduction, rotation, exposure correction, and cropping.

[0033] Another embodiment is illustrated at FIG. **2**. In this embodiment, the remote control unit **200** is preferably the same as or similar to that described in the FIGS. **1**-*a* through **1**-*c*. In this case, however, the wireless receiver **410** is connected to a digital camera **400** or similar imaging appliance. An advantage of this alternative embodiment is that a digital camera will, typically, incorporate a display subsystem **460** which allows it to be connected to a conventional audiovisual CE appliance such as a TV set **300**. Furthermore, the latest digital cameras incorporate WLAN or Bluetooth subsystems. Accordingly, a digital camera with such wireless communications and display subsystems can be modified to take advantage of the remote control unit **200** with removable storage reader **210**. In other words, in this embodiment the receiver **410** controls the display unit **300** to play and/or display the A/V content data via digital camera **400**.

[0034] In a practical exemplary implementation of this alternative embodiment, the camera is a PTP-enabled digital camera, such as may be described at (i) "Digital camera connectivity solutions using the picture transfer protocol (PTP)" to Bigioi, P.; Susanu, G.; Corcoran, P.; Mocanu, I and published in IEEE Transactions on Consumer Electronics, volume 48, issue 3, p 417-427, August 2002; or (ii) PTP/ISO-15740 PTP Specification, available from http://www.i3a.org/downloads_it10.html, which are hereby incorporated by reference. The camera **400** is preferably connected to an adapter unit **370** such as that illustrated in block form at FIG. **3**. The adapter unit **370** of FIG. **3** may correspond generally to wireless communication chip **440** of FIG. **2**. The camera adapter unit **370** incorporates a USB connection **372**, which allows a PTP-enabled digital camera to be connected to the adapter system. It further provides a PTP stack **374**, which provides access to the PTP functionality of the digital camera. The adapter also incorporates a WLAN interface module **380**, which provides connectivity to an external wireless network. This module **370** may be replaced by Infrared, Bluetooth or Powerline communications modules. Implicitly contained within the WLAN communications module is a TCP/IP stack (or a Bluetooth, Infrared or Powerline stacks as appropriate to the physical communication chip be used).

[0035] A PTP/IP stack **378** is also incorporated in the main adapter, thus providing remote access to the PTP functionality of the camera. One further software module is preferably used to fully enable wide-area networking support for remote access to the PTP-enabled digital camera. This is a multiple virtual session emulation module **376**. This moduel **376** is preferably used because the PTP protocol that is designed to support point-to-point communications between a camera and a desktop computer typically does not support the concept of multiple connected devices or multiple concurrent device sessions. Support for these concepts is embodied in the PTP/IP protocol, but this also requires some OS-level support from the device within which the PTP/IP stack is implemented. Thus, as the PTP/IP stack is not directly implemented within the generic PTP camera, it is necessary to provide some emulation support for device and session IDs within the adapter itself. Wireless receivers **310**, **410** have been shown as separate components in the illustrative embodiments. However, they could be incorporated into the display unit **300** or digital camera **400**.

[0036] FIG. **4** illustrates a physical implementation of a remote control unit **700** corresponding to the unit **200** shown in the block diagrams of FIGS. **1**-*a*, **1**-*b*, **1**-*c* and **2**. The remote control unit **700**, which may be similar in form and function to conventional known remote control units, preferably exhibits some additional features designed to accommodate the principle elements of the embodiments described herein.

[0037] First, it may incorporate a slot **780** in the casing of the remote control unit to accommodate the insertion and removal of a removable storage medium into the reader **210** (see FIG. **1**-*a*). Alternatively, slot **780** may be a USB master plug **212** (see, e.g., FIG. **1**-*b*) which will accept a USB cable from the camera **100**. In addition, it may incorporates special function keys **770** to initiate customized image processing algorithms which can enhance or improve the digital content that may be accessed and further managed, manipulated, combined or otherwise processed on the remote control unit **700**.

[0038] In addition to automated image processing functions, the remote control unit **200**, **700** may optionally incorporate a graphical LCD display **710** which can display images loaded from the removable storage medium subsystem **210**. This allows for additional image processing and enhancement functions to be performed on the remote control unit **700** where user input from the remote control keys **762**, **764** may be used to adjust a parametric input to the image processing and functions such as brightness or exposure.

[0039] Further advanced functionality can be achieved using more complex user input such as may be obtained from

an "arrow-key" input button **720** which can allow accurate panning, zooming and scrolling of a selected image. An OK/Enter button is indicated at **728** and an ON/OFF button is indicated at **750** of FIG. **4**.

[0040] An exemplary workflow is illustrated in FIG. **5** for the transmission of, in this example, still images. At block **110**, a memory card is removed from a digital camera or similar imaging device, and then inserted into the card reader of the remote control unit at block **120**. A communications link is then automatically or manually activated between the remote control unit **200**, **700** and the wireless receiver at block **130**. According to this embodiment, the receiver may be an adapter connected to a standard TV set, or alternatively an adapter connected to a digital camera with a display output suitable for providing a signal to a TV set. As stated, these adapter units may be incorporated internally within the TV set or digital camera, rather than being separate appliances. Alternatively, the functions illustrated at block **130** may be operated on an intermediate device such as a centralized remote control box, a digital camera or a home server that will indirectly control the receiver.

[0041] After the communications channel between the remote control unit and the receiver is established, the user may next initiate a sequence of image transfers between the remote control unit and the receiver at block **140**. These transfers may be a sequential display of all the images stored on a memory card, or may alternatively be sequenced by the user, or randomly sequenced. The system may optionally provide support for an interactive user interface (UI) wherein the remote control unit enables a video overlay subsystem within the host device to be activated. The user may then navigate the displayed overlay UI using the remote control keys and thus achieve a more advanced control over the sequencing and transitions for a slide-show display of the images. Finally, at block **180**, the images are displayed on the television set.

[0042] FIG. **5** also illustrates an alternative embodiment of the system work-flow wherein the images are received wirelessly (not shown) or via a tethered communication (see FIG. **1**-*b*) from a digital camera at block **112**. Image processing (e.g. downsampling) at block **114** and local storage at block **116** functions are performed by the remote control unit prior to initiating the communications link at block **130**, and subsequently transmitting a slideshow of the images at block **140** for display on a user's TV set at block **180**. The example of FIG. **5** may be applied to video and/or audio data, as well, and it may be applied to output at a printer (see FIG. **1**-*c*).

Alternative Embodiments

[0043] The following publications, as well as other publications cited above and below herein, and the background, invention summary, brief description of the drawings and abstract, are hereby incorporated by reference as disclosing alternative embodiments or features not otherwise described in detail above:

[PTP] PTP/ISO-15740, "Picture Transfer Protocol Specification", http://www.i3a.org/downloads_it10.html;

[USB] USB Device Working Group, "USB Still Image Capture Device Definition", http://www.usb.org/developers/devclass_docs/usb_still_img10.pdf;

[CIPA] CIPA, "CIPA DC-001-2003 Digital Photo Solutions for Imaging Devices", http://www.cipa.ip/pictbridge/contents_e/03overview_e.html;

[PB] P. Bigioi, G. Susanu, P. Corcoran and I. Mocanu, "Digital Camera Connectivity Solutions using the Picture Transfer Protocol (PTP)", *ICCE* 2002 and *IEEE Transactions on Consumer Electronics,* vol. 48, number 3, pp. 417-427, August 2002;

[PTP-IP] PTP/IP Draft Specification—for review purposes only www.fotonation.com/products;

[UPNP] UPNP Forum http://ww.upnp.org;

[MTP]; see Media Transfer Protocol Specification msdn.microsoft.com/library/default.asp?url=/library/en-us/dnwmt/html/mtp_spec.asp.;

[0044] The A/V acquisition device **100** that the remote control unit **210** communicates with, in accordance with preferred and alternative embodiments herein, may include an industry accepted (whether as de-facto or de-juro) standard Application Interface Protocol ("API"), or Command Language, that describes the means of retrieving data from the acquisition device. Examples of such interfaces include ISO-15740, aka "Picture-Transfer-Protocol" or "PTP", which describes a command language between digital cameras and receiving devices; see PTP/ISO-15740, "Picture Transfer Protocol Specification", www.i3a.org/downloads_it10.html.

[0045] Such command languages may also have a transport layer component which can be tethered or IP based such as USB Still Image Device Class definition which correlates to the implementation of PTP over USB; see USB Device Working Group, "USB Still Image Capture Device Definition", www.usb.org/developers/devclass_docs/usb_still_img10.pdf or PTP over IP ("PTP-IP") which correlates to the implementation of PTP over Internet Protocols; see PTP/IP Draft Specification—www.fotonation.com/products.

[0046] There may be a specified protocol on top of the PTP for output of images. One example is PictBridge (see , "CIPA DC-001-2003 Digital Photo Solutions for Imaging Devices", http://www.cipa.jp/pictbridge/contents_e/03overview_e.html for specification) which describes such output protocol that may be used in an embodiments for printing purposes.

[0047] Another protocol is the Universal Plug-and-Play Orienting protocol [uPNP]. In generic multi media device cases, such protocol may be Multi Media Transfer Protocol ("MTP").

[0048] The present invention is not limited to the embodiments described above herein, which may be amended or modified without departing from the scope of the present invention as set forth in the appended claims, and structural and functional equivalents thereof. In addition, in methods that may be performed according to preferred embodiments herein and that may have been described above and/or claimed below, the operations have been described in selected typographical sequences. However, the sequences have been selected and so ordered for typographical convenience and are not intended to imply any particular order for performing the operations.

What is claimed is:

1. An apparatus for the remote wireless control of a consumer electronic (CE) appliance, comprising

a remote control unit including an interface for receiving audio or visual data, or both (hereinafter "A/V" data) from an A/V device; and

a wireless receiver coupled to the CE appliance,

wherein the remote control unit is configured to transmit the A/V data and control codes to the receiver, and the receiver is configured to be responsive to the A/V data and control codes from the remote control unit to control the CE appliance to output the A/V data.

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