(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
19 October 2017 (19.10.2017)

WIPO | PCT

(10) International Publication Number
WO 2017/177302 Al

(51) International Patent Classification:
G06F 3/02 (2006.01) *H04N 19/146* (2014.01)
B60W 50/08 (2012.01) *H04W 88/02* (2009.01)
G06F 9/06 (2006.01)

(21) International Application Number:
PCT/CA20 16/050809

(22) International Filing Date:
11 July 2016 (11.07.2016)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/323,03 1 15 April 20 16 (15.04.20 16) US
PCT/CA2016/050710 17 June 2016 (17.06.2016) CA

(71) Applicant: **LIGHT WAVE TECHNOLOGY INC.** [CA/CA]; 400 Wright Street, St-Laurent, Quebec H4N 1M6 (CA).

(72) Inventors: **WISNIA, Jack;** 218 rue Einstein, Dollard-Des Ormeaux, Quebec H9A3H5 (CA). **DU, Feng;** 64 Shediac, Kirkland, Quebec H9J 2J9 (CA).

(74) Agents: **ANGLEHART ET AL.** et al; 1939 de Maisonneuve Ouest, Montreal, Quebec H3H 1K3 (CA).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available):* AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available):* ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17 :

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.1 7(H))*

Published:

— *with international search report (Art. 21(3))*

(54) Title: AUTOMOTIVE REAR-VIEW CAMERA PERIPHERAL

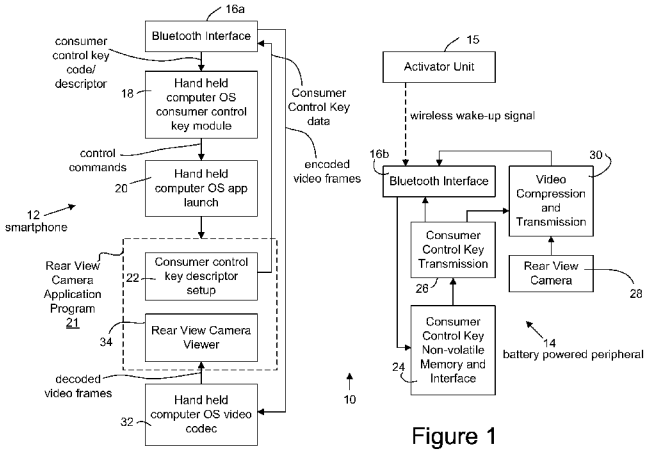

Figure 1

(57) Abstract: An activation device controls a computing device. It has a user input interface, a keyboard interface for connecting to the computing device, a memory for storing at least one sequence of keyboard commands, and a controller configured to store in memory the sequence of keyboard commands and to be responsive to the user input device for transmitting the sequence of keyboard commands stored in memory to the computing device.

WO 2017/177302 A1

AUTOMOTIVE REAR-VIEW CAMERA PERIPHERAL

[001] This application claims priority of US provisional patent application 62/323,031 filed April 15, 2016, and of PCT/CA20 16/0507 10 filed June 17, 2016.

Technical Field

[002] The present application relates to computing device interfaces and also to a battery powered peripheral system, such as a rear view camera for automobiles or entrance cameras.

Background

[003] Smartphones can have excellent computing capabilities and can be useful as a user interface for a variety of peripherals or uses. One example is an automotive rear view camera application. A wireless camera can be mounted at a rear of a vehicle to transmit images to a smartphone having a wireless data interface to provide a display of the images to the driver. Such cameras are useful for guiding a driver to back up a vehicle. Such rear view automotive cameras are typically wired into electrical power of the vehicle, this requires a modification that normally involves a professional installer.

[004] Most smartphones have multiple applications or apps, and the user typically uses a touch screen interface, with or without key presses, to unlock the phone and to run the application. This requires typically a number of strokes and requires attention and dexterity.

Summary

[005] Applicant has discovered that keyboard commands, such as consumer control button (CCB) commands, can be used by a peripheral device to control a computer to rapidly control a state of the computer, for example to bring an application associated with the peripheral device on the computer to be seen and to be run in the foreground for the user, or to change the settings in the operating system of the computer.

[006] The peripheral device that controls the computer in this way can be a dedicated device whose purpose is to send the commands that control the computer, or it can be a device that has a different primary function that cooperates with the computer. In the latter case, the sending of keyboard commands to the computer can help the computer cooperate with the peripheral device to perform the intended function.

[007] In the case of a peripheral device wirelessly connected to the computer via Bluetooth, the same Bluetooth connection can be used for data communication and for a keyboard. However, the keyboard commands can be communicated over a separate link from

other data between the peripheral device and the computer, when applicable. This allows the computer to be used for other applications while also allowing the peripheral device's application to be run in the foreground at the control of peripheral device.

[008] More specifically, Applicant has also discovered that a smartphone can be controlled to unlock and open a desired app using Bluetooth keyboard device commands so as to avoid requiring a user to perform equivalent actions to be ready to use the smartphone in a particular app.

[009] Applicant has also discovered that a battery powered camera can be powered off with only a Bluetooth bridge left active with the viewing device controlling the power state of the camera unit to turn on using user input from a separate battery-powered activation unit. In the case of a vehicle camera, the activation unit is located within the easy control reach of the driver of the vehicle, and allows the driver to control the vehicle camera while driving. In the case of an entrance security camera, the activation unit can be a doorbell button, exterior entrance area motion sensor or a control associated with an interior video display.

[0010] In some embodiments, a separate activator unit is provided that is paired with the smartphone for issuing Bluetooth keyboard commands so as to cause the smartphone to go into a desired state. When this activator unit is used with a Bluetooth peripheral, such as a camera, the activator unit or the smartphone can cause the camera unit to wake up by Bluetooth communication in the case that the camera unit was in a sleep mode. The configuration of the Bluetooth keyboard commands in the peripheral device that sends them to the smartphone to cause the desired app to be called up can be done using a utility that is part of the desired app itself that works with the peripheral or using a separate configuration app on the same smartphone. Alternatively, a separate programming mechanism can be used to set the commands.

[001 1] In some embodiments, the peripheral device can be powered by a controllable power source. In the case of a rear view camera, power can conveniently be taken from the back up lights and controlled by the gear shifter being put into reverse gear. The placing of the gear shift lever into reverse powers up the camera unit, and the camera unit can send Bluetooth HID commands (normally for iOS devices) or other commands such as custom commands (normally for Android devices) to the smartphone to cause the camera app to be called up.

[0012] In accordance with one broad aspect of some embodiments, there is provided an automobile rear view camera device having a wireless module, a consumer control key sequence memory and interface unit connected to said wireless module and configured for store consumer control key codes (or descriptors), a consumer control key transmission module configured for automatically transmitting at least one consumer control key code or descriptor from said consumer control key sequence memory on powering on of said device using said Bluetooth module, a rear view camera, and a video transmission module connected to the camera and the wireless module for transmitting images from the camera.

[0013] In accordance with another broad aspect of some embodiments, there is provided a handheld computer having a wireless data module for communicating with an automobile rear view camera device, an operating system based consumer control key module for interpreting a consumer control key code or descriptor received from the device by the wireless data module to generate operating system control commands, an operating system app launch module responsive to the control commands for launching a rear view camera application program stored in a memory on the handheld computer, a consumer control key descriptor set up module associated with the rear view camera application program for transmitting consumer control key data to the camera device using the wireless module, a camera viewer associated with the rear view camera application program for displaying images received from the camera device through the wireless module.

Brief Description of the Drawings

[0014] The invention will be better understood by way of the following detailed description of embodiments of the invention with reference to the appended drawings, in which:

[0015] Figure 1 is a block diagram illustrating a rear view camera system incorporating both an activator unit for waking up a battery powered camera peripheral and the use of Bluetooth keyboard commands for causing the smartphone to unlock and present the rearview camera app to show video frames from the camera peripheral received over Bluetooth;

[0016] Figure 2 is a flow diagram showing the steps involved in one embodiment of adjusting a video compression rate after an assessment of the available bandwidth of a wireless channel used for the video transmission;

[0017] Figure 3 is a flow diagram showing the steps involved in an embodiment of setting vehicle camera grid lines;

[0018] Figure 4 is a flow diagram showing the steps involved in controlling a computing device using a stored sequence of keyboard commands according to one embodiment;

[0019] Figure 5 is a flow diagram showing the steps involved in controlling a computing device using a stored sequence of keyboard commands according to another embodiment in which a special keyboard app is used to gather user character input while giving the appearance of remaining in another app receiving that character input;

[0020] Figure 6 is a block diagram illustrating a rear view camera system connected to 12V DC from the reverse lamp circuit incorporating the use of Bluetooth keyboard commands for causing the smartphone to unlock and present the rearview camera app to show video frames from the camera peripheral received over Bluetooth;

[0021] Figure 7 is a block diagram illustrating a smartphone app activator unit having four buttons to cause a string of Bluetooth keyboard commands to be issued to the smartphone to unlock the phone and call up a corresponding app;

[0022] Figure 8 is a block diagram illustrating a smartphone activator unit connected to a keyboard and a mouse, where manipulations of the mouse and keyboard cause a string of Bluetooth keyboard commands to be issued to the smartphone to cause the phone to carry out a specific action;

[0023] Figure 9 is a block diagram illustrating a smartphone activator unit for processing voice commands to cause a string of Bluetooth keyboard commands to be issued to the smartphone for carrying out a specific action;

[0024] Figure 10 is a block diagram illustrating a rear view camera peripheral activated by a battery-powered, dashboard mounted activator unit having multiple app launching buttons;

[0025] Figure 11 is a block diagram illustrating a rear view camera peripheral activated by a battery-powered, dashboard mounted activator unit that works with a GPS navigator unit that includes a camera viewer program module;

[0026] Figure 12 is a block diagram of a smartphone coupled with a battery-powered rear-view camera peripheral according to another embodiment;

[0027] Figure 13 is an oblique view of an outer face of vehicle license plate frame having a rear view camera mount;

[0028] Figure 14 is an oblique view of an inward face of the frame of Figure 13 showing a battery compartment, a circuit board compartment, and vehicle mounting bracket;

[0029] Figure 15 is an exploded view of a camera, circuit board with the microprocessor and Bluetooth components corresponding to Figure 1, circuit board compartment cover, battery and battery compartment cover for the embodiment of Figures 13 and 14;

[0030] Figure 16 is an oblique view of a wireless, battery-powered activator unit that can activate a smartphone through Bluetooth keyboard commands and/or a battery-powered peripheral normally in a sleep mode;

[0031] Figure 17A is an oblique view of the rear-view camera and license plate mounting of Figure 13 from the outer or front side;

[0032] Figure 17B is a front plan view of the rear-view camera and license plate mounting of Figure 13;

[0033] Figure 17C is a top plan view of the rear-view camera and license plate mounting of Figure 13;

[0034] Figure 17D is a bottom plan view of the rear-view camera and license plate mounting of Figure 13;

[0035] Figure 17E is a right side plan view of the rear-view camera and license plate mounting of Figure 13; and

[0036] Figure 17F is a left side plan view of the rear-view camera and license plate mounting of Figure 13.

Detailed Description

[0037] In the embodiment of Figure 1, system 10 includes a battery-powered license plate frame mounted camera that can be mounted to the rear license plate mounting of a vehicle. The frame 14 contains a battery (not shown in Figure 1), a rear view camera 28 mounted in the frame, and a circuit board (not shown) that contains a microprocessor (such as a MSP430F5254RGCT) that includes non-volatile memory (including the configuration memory 24). Non-volatile memory can also be provided using a component separate from the microprocessor. Some models of microprocessors may include a Bluetooth wireless transceiver 16b, while a separate component for such a wireless transceiver (Bluetooth or otherwise) can be provided using a separate IC component (for example, a BLE0202C2P chip and/or a CC2564MODN chip).

[0038] In the embodiment of Figure 1, the peripheral unit 14 is woken up from a low-power sleep state using the interface 16b. The wake-up signal is sent by the activator unit 15 in the embodiment of Figure 1. Unit 15 can be a small battery-powered button supported on a key-chain, dashboard of a vehicle, visor, air vent, or any other suitable location that can allow the user to press a button (or otherwise issue a command) to cause the unit 15 to send a wireless signal to the interface 16b to cause the peripheral 14 to wake up. Unit 15 can be a stand-alone device or it can be integrated into a phone holder/case or tablet holder/case.

[0039] While in this description reference is made to Bluetooth wireless transmission, it is to be understood that this is a commonly used wireless transmission protocol. It will be appreciated that any suitable wireless transmission protocol can be applied to variant embodiments herein.

[0040] While in this description reference is made to iPhone, a smartphone designed by Apple Inc. of California, it is intended that the device 12 can be any electronic device, such as a laptop or desktop computer, a smart phone or a tablet computer, such as an iPhone, iPod touch, Android tablet or Android smart phone, GPS unit, display and the like.

[0041] In the embodiment of Figure 1, the peripheral, once woken up, sends Bluetooth keyboard commands to the smartphone 12 to cause the latter to unlock (in the case that it was locked) and to run an app 21 associated with the rear view camera, including a viewer 34. The peripheral 14 has a program module 26 that causes the transmission of wireless keyboard commands previously stored in memory 26 to the Bluetooth interface 16a of the phone 12. Once these commands are sent, module 26 causes another module 30 of the peripheral 14 to encode the video images from camera 28 for transmission to the phone 12. The video encoding module 30 can comprise a hardware chip or software within the microcontroller or computer system.

[0042] Schematically illustrated in Figure 1 are modules 18 and 20 that represent parts of the smartphone 12 operating system that process wireless keyboard commands and allow such commands to launch application programs or apps. In the case of the Apple iPhone®, keyboard commands can be used to perform actions that normally are associated with the device's touch screen actions or buttons, as for example, the swipe action to initiate unlocking a locked phone, the pressing of the home button, volume control, etc. Likewise, running a desired app can be implemented by using a keyboard command to initiate a search or find on

the smartphone, and then sending keystrokes of the name of the app on the smartphone 12 will cause the desired app 21 to be found, with another keystroke, such as ENTER.

[0043] While the video transmission in Figure 1 is done using the same Bluetooth interface 16b as is used for the wireless keyboard interface, a separate wireless transmission link could be used. For example, it is possible to use an IEEE 802.11 (i.e. WiFi) link or a wireless USB or WUSB link to transmit the video data. This would require connecting the smartphone 12 to a corresponding WiFi link bridge of the peripheral 14. Keyboard commands from peripheral 14 can be used to cause the smartphone to establish a WiFi connection to a WiFi module of the peripheral 14. This option can provide greater bandwidth than Bluetooth, however, causing the smartphone 12 to make the new WiFi connection can cause the smartphone 12 to drop an existing WiFi connection and can require a few seconds to establish. Applicant has found the use of WiFi to be acceptable in some circumstances, however, Bluetooth communication has been found to be faster to start and to have sufficient bandwidth for the rear view camera application.

[0044] Furthermore, the bandwidth available over the wireless communications link can be assessed and the video transmission rate can be adjusted according to the assessed bandwidth by setting a compression ratio in module 30, for example a TW9900 chip with an OV780 chip that can provide a variable compression ratio. The available bandwidth can be assessed, for example, by sending a block of data from peripheral 14 to app 21 and measuring the time required for the block of data to be transmitted. The peripheral 14 can then adjust the compression and/or the frame rate accordingly. Applicant has found that the quality of viewing is greatly improved to use a frame rate and/or a compression rate that the channel can handle without dropping frames rather than using a lower compression rate or a frame rate that then involves some frame drops.

[0045] To ensure the Bluetooth streamed video's latency performance, the following can be performed. The Bluetooth radio's usage of the smartphone can be monitored in real-time. This can be done with the help of app 21 in communication with peripheral 14. It is determined if a phone call is in progress at device 12 and if the audio route is to Bluetooth hands-free. If Smartphone's 12 Bluetooth radio is in use, then the H264 video's compression ratio in module 30 is dynamically adjusted to reduce the bit rate of the video so that video's latency performance is assured. Then, app 21 monitors the video streaming bit rate in real-

time, as smartphone 12 knows the video's source bit rate, if the streaming bit rate is lower than the source bit rate (consistently for a predefined period of time), the app 21 can decide that the lower streaming bit rate is due to interference of surrounding environment and increase the H264 video's compression ratio by sending a command to peripheral 14 to reduce video source bit rate in module 30.

[0046] It is also possible to cause the smartphone 12 to stop using the wireless channel for the telephone call audio by causing the smartphone to change the audio output of the smartphone from, for example, Bluetooth to the smartphone' s own built-in speaker. The app 21 may or may not be able to issue such a command to the operating system of the smartphone 12, and in the case that it cannot, suitable wireless keyboard commands can be issued from module 26 to cause the audio streaming usage of the wireless channel to be stopped so that more bandwidth is available for the video data. When video transmission is over, the user can restore telephone call streaming over the wireless channel, or the app 21 or module 26 can perform the restoration.

[0047] The steps involved in adjusting the frame rate or compression rate in the video encoding are illustrated in Figure 2.

[0048] In the embodiment of Figure 1, the smartphone 12 has a video codec 32 that is shown as part of the operating system of the hand held computer or smartphone. Alternatively, the video codec 32 could be provided in software within the app 21. Decoded video frames from module 32 are then displayed on the display viewer 34. While it is preferable to transmit encoded and compressed video, uncompressed images can also be transmitted, possibly at a lower resolution or frame rate.

[0049] When a driver is finished using the peripheral 14, the user can switch apps using the interface controls of the smartphone 12 or alternatively the unit 15 can be used to signal closing or stopping of the peripheral 14. Unit 15 can make use of a separate key or an interpretation of a same key (subsequent press, held-down press, or a double tap) to issue shutdown commands to either the peripheral 14 or the smartphone 12, or to both. The shutdown command to the phone 12 can involve Bluetooth keyboard commands to be sent directly or via peripheral 14 to interface 16a to cause the peripheral 14 app 21 to close and then, preferably as configured by the user, the smartphone 12 can turn its screen off, lock, go to a home screen, go to a GPS navigator app, etc. This can save the user from having to

manipulate the smartphone 12, following a backing up action of the vehicle and normally an immediate action of continuing to drive forward.

[0050] Because the camera 28 can be an after-market device, the position of the camera, its tilt angle and the vehicle width are not known until installation. In some embodiments, rear view camera grid lines can be used to estimate the distance and the width of the vehicle when using the camera image for backing up. Such grid lines are known, and in the case of grid lines to guide backing up into a parking space, the lines appear as curved lines that should follow the image of the parking space's parallel lines with transverse curved lines showing distance from the vehicle bumper to the end of the space. Producing an overlay of grid lines using an analog video camera is complicated, and in some embodiments, grid line display is achieved in app 22 rather than in the peripheral 14. The app 22 can be provided with a settings mode that gives the user the ability to adjust the grid lines. Because the smartphone 12 is wirelessly receiving the images, the user can exit the vehicle and stand in the camera's field of view to be on the grid lines seen using app 22. Figure 3 illustrates the step involved in configuring the grid lines. The user can then use the interface of the app to set the position of each of the side or width lines to take into consideration camera position (particularly when the license plate is to one side of the rear of the vehicle) and the vehicle width, and to set the position of the transverse distance line or lines. These calibration settings can be stored in the app 22 or they can be stored in the peripheral 14 so that they can be retrieved and used with the smartphone app 22 of other users.

[0051] Figure 6 illustrates an embodiment similar to that of Figure 1 in which activation of the peripheral comes from a different mechanism than the activation unit 15. In Figure 6, the rear view camera peripheral 14 is turned on by being powered from the 12V DC power taken from the vehicle's reverse indicator lights. An installer finds the power cables connected to the back up or reverse indicator lamps, and splices in a power cable that feeds the peripheral 14. Since power is provided to the reverse indicator lamps by a switch associated with the gear shift mechanism, the peripheral is selectively powered only when the vehicle is in reverse gear.

[0052] When the peripheral 14 is battery-powered, installation in the case of a vehicle can be simplified because a power cable is not required to pass from an inside of the vehicle to an outside. However, on/off control of the peripheral 14 using a vehicle signal, such as the on/off

state of the back-up indicator lights, is convenient because the driver does not need to engage a separate control for the camera. In an alternative embodiment, the activator unit 15 is installed in the vehicle to be controlled by a vehicle signal, such as the on/off state of the back-up indicator lights. For example, an activator unit can be installed in a compartment housing the rear brake/running/back-up indicator lights and powered by the turning on of the back-up lights. In this way, when the driver puts the vehicle into reverse, the activator unit 15 can cause the operation of the rear-view camera to start.

[0053] The wireless keyboard commands for the embodiment of the rear view camera video start sequence can be as follows. The user can approach the vehicle where peripheral 14 is paired with his or her phone 12. The peripheral 14 detects phone 12, making a classic Bluetooth connection, and MFi authentication is done. The phone 12 and peripheral 14 are now connected. The Bluetooth connection between them is maintained with minimum power consumption by maintaining only the Bluetooth component powered while the camera and video compression processor are off. The power requirements for maintaining this Bluetooth connection are so low that conventional batteries can power the unit 14 to remain wirelessly connected for years at a time. Pressing a button on activator unit 15 can cause it to turn on and connect to the peripheral 14. Peripheral 14 responds to the signal from unit 15 to cause the camera 28 and video transmission 30 of peripheral 14 to turn on.

[0054] In some embodiments, peripheral 14 and control unit 15 are paired at the factory. Interface 16b can be configured to be always advertising. Control unit 15 is normally off. When a button is pushed on unit 15, power is supplied from its battery and the Bluetooth connection is made. In peripheral 14, when the interface 16b is connected to the activator unit 15, interface 16b turns on the remainder of the components in peripheral 14. Thus, codec 30 and camera 28 turn on. When the vehicle driver wants to use the rear view camera, the video button on unit 15 is pressed. Unit 15 can be powered by a small button battery, and so can be powered on by pressing its button. In some embodiments, this is the only button. The Bluetooth module 16b of the rear view camera peripheral unit 14 detects the button pressed. The module 16b now powers up the peripheral components. In the case of a microprocessor that can be woken up by an interrupt, module 16b issues the interrupt. As a result, the camera 28 is powered and video compression and transmission 30 are ready to be started. Video

compression can be handled in the microprocessor, or it can be handled by a separate chip, for example a TW9900 chip with an OV780 chip.

[0055] The peripheral 14, particularly in the case of a vehicle rear view camera accessory, can be vulnerable to theft. To reduce the ability for the peripheral 14 to be used by a thief, a master phone 12 is designated. The peripheral 14 can thereafter only be used by a smartphone 12 that is given permission by the master phone 12. This can be done, in the example of an iPhone, by turning on Bluetooth in the setting of the iPhone 12. In the example an Android phone, the app 21 can be started. The peripheral device 14 can be turned on using a switch on the peripheral 14 or by using unit 15. On the iPhone, a Bluetooth pairing request will appear, and the user can complete the pair request. Using an Android device, the pairing can be completed by the app 21. On the iPhone, the app 21 can then be started. Video can then appear on screen. In the app 21, the user provides the input required for the commands to be stored in memory 24. For example, the user provides the unlock code, and this code is send to peripheral 14 to be stored in memory 24. The peripheral 14 is configured to recognize the Bluetooth ID (an equivalent of a MAC address unique to the device) of the phone being first paired and to refuse pairing with another smartphone 12 unless given permission from the first paired smartphone 12. Peripheral 14 stored the Bluetooth ID of the first or master smartphone 12 in non-volatile memory, along with the ID's of all authorized smartphones 12. If the master smartphone is lost, a number of factory set backup single-use master codes are also stored. The owner of the peripheral 14 can contact the manufacturer with the peripheral's serial number to retrieve a back up code that, when sent to the peripheral from app 21, will cause the peripheral 14 to replace the previous master smartphone Bluetooth ID with the new one. The manufacturer can identify the registered owner of the peripheral by the serial number and/or the owner's identification. Once a one-time back up code is used, the used status is recorded in the non volatile memory and is no longer useable.

[0056] In the case that the peripheral 14 transmits the keyboard commands to the smartphone 12, an HID keyboard is started using a classic Bluetooth connection. Module 26 then sends a sequence of keyboard commands stored in memory 24. In the case of an iPhone, this can comprise the following steps:

- send HID keyboard command for unlock swipe
- send passcode 4 digits or long passcode with ENTER

- the Bluetooth keyboard can be stopped so as to be able to use an assistive touch command
- turn on the camera 28 in the peripheral 14
- send iOS launch command to launch app 21
- Start iOS assistive touch
- Start HID point device (Mouse service)
- Move mouse pointer to the "OK" confirm position and press to actually start camera APP
- Once the app is fully launched, the video streaming starts. Disable assistive touch.

[0057] An example of a command that simulates a press on touch screen can be as follows:

```
Enable assistive touch
/* HID map descriptor */
const unsigned char startHidMouseMessage[ ] =
{
  /* param 1 HIDComponentIdentifier*/
  0x00,0x06,   /* length */
  0x00,0x00,  /* ID */
  0x00,0x00,

  /* param 2 vendorIdentifer */
  0x00,0x06,   /* length */
  0x00,0x01,  /* ID */
  0x04,0x61,

  /* param 3 productIdentifier */
  0x00,0x06,   /* length */
  0x00,0x02,  /* ID */
  0x00,0x00,

  /* param 4 HID report descriptor */
  0x00,0x36,   /* length */
  0x00,0x04,  /* ID */

  0x05 ,0x01,
  0x09 ,0x02,
  Oxal ,0x01,
  0x09 ,0x01,
  Oxal ,0x00,
  0x05 ,0x09,
  0x19 ,0x01,
```

```
    0x29 ,0x03,
    0x15 ,0x00,
    0x25 ,0x01,
    0x95 ,0x03,
    0x75 ,0x01,
    0x81 ,0x02,
    0x95 ,0x01,
    0x75 ,0x05,
    0x81 ,0x01,
    0x05 ,0x01,
    0x09 ,0x30,
    0x09 ,0x31,
    0x15 ,0x81,
    0x25 ,0x7f,
    0x75 ,0x08,
    0x95 ,0x02,
    0x81 ,0x06,
    OxcO ,
    OxcO
};

  ISPP_Send_Control_Message(BluetoothStackID,        SerialPortID,0x5400,0,NULL);
//start  assistivetouch

   ISPP_Send_Control_Message(BluetoothStackID,
SerialPortID,0x6800,sizeof(startHidMouseMessage),(unsigned                    char
*)startHidMouseMessage);
To simulate the screen press:
unsigned  char mouseCmd[]  =
{
   /* param  1 HIDComponentIdentifier*/
   0x00,0x06,    /* length  */
   0x00,0x00,   /* ID  */
   0x00,0x00,

   /* param  2 vendorIdentifer    */
   0x00,0x07,    /* length  */
   0x00,0x01,   /* ID  */
   0x01,0x00,0x00
};
ISPP_Send_Control_Message(BluetoothStackID,
SerialPortID,0x6802,sizeof(mouseCmd),mouseCmd);
```

[0058] Stopping of the camera and app can be done either in response to a timer or in response to a subsequent user input, either from the unit 15 or on the smartphone app 21. For

example, the video can stop after a short period, such as 20 seconds, using a timer, or the video can be stopped when the button of unit 15 is pressed and video is being streamed. Peripheral 14 would shut down all components except for the module 16b, so that the Bluetooth connection is maintained between the peripheral and the activator unit. The peripheral can also send a command to the app 21 that streaming will stop, so that the app can manage the end of streaming without an error. Alternatively, the app 21 can be used to send a stop signal to the peripheral 14.

[0059] For security reasons, the HID keyboard interface is started again at the peripheral 14, and a lock key command is sent to lock the phone 12. Then the HID keyboard interface is stopped and the peripheral 14 sleeps with the exception of its Bluetooth interface 16b.

[0060] The steps involved in activating the peripheral 14 and the smartphone 12 to operate are illustrated in Figure 4.

[0061] In the embodiment of Figure 6 where the sleep mode is not managed by interface 16b, the peripheral 14 can follow the above sequence for sending the commands to wake up the phone 12 and to cause the app 21 to open up, however, the commands and/or signals related to waking up and sleeping the peripheral 14 are not required.

[0062] The embodiment of Figure 6 has the advantage over prior art systems that the smartphone 12 can be off and locked, and then the peripheral 14 can cause the smartphone 12 to be unlocked and to open up the app 21 associated with the rear view camera peripheral 14 without the user needing to manipulate the phone 12.

[0063] Figure 7 illustrates an embodiment of how the activator unit 15 can be used to activate directly using wireless keyboard commands the smartphone 12 to unlock, if required, and to launch a desired app 21. The keyboard command transmission modules 24 and 26 provided in the peripheral 14 in the embodiments of Figures 1 and 2 are provided in unit 15 in the embodiment of Figure 7. The Bluetooth interface 16c of unit 15 transmits keyboard commands directly to the wireless interface 16a of the phone 12. Additionally, in the embodiment of Figure 7, there are four app launch buttons 27, each one associated with different apps 21a through 21d (Figure 7 shows only apps 21a and 21d for clarity of illustration). Using a separate app 22, the smartphone is used to configure what keyboard commands are required to launch the individual apps using buttons 27. These keyboard commands are then sent to the unit 15 for storage in memory 24. It will be appreciated that

loading of the commands into memory 24 can be done using a different device than the smartphone 12 using any suitable interface.

[0064] The selector buttons 27 can be of any desired number. While each control can be associated with a different app, it will be appreciated that a control can be associated with a particular function among many functions available within an app or within the operating system controls. For example, a single button 27 can be used to configure the smartphone for use in a given context, such as when driving a car or being used by a customer. For example, the settings can be caused to prevent sleep mode or screen turn-off, setting WiFi to a desired connection or off state and then selecting the desired app to be on the surface for the context. In the case of the Apple iOS, the device can be caused to be in "guided access" mode in which the smartphone is locked into one single app, that is commonly used with customers or guest users. The same button with a second press or a different type of press (or a separate reset button) can cause the module 26 to issue keyboard commands to restore smartphone operation to the original state. For example, the system setting that allows the screen to turn off after a period of non use can be restored, and in the case of guided access mode, that mode can be turned off. As desired, the smartphone 12 can be left on or locked with the commands sent by such restore commands.

[0065] In the context of a store environment in which customers are given tablet computers for a task, such as giving their data to open an account or conclude a purchase, it can be desirable for unit 15 to operate with more than one smartphone 12. In this case, the wireless interface 16c is adapted to be able to link with multiple devices. The app 21 can also be configured to signal to unit 15 when a customer or user of the smartphone 12 (likely a tablet computer) is done entering information or completing a task. This signal can be done using the same wireless channel or a separate channel. It will be appreciated that this ability for one unit 15 to control and in effect monitor the use of a number of smartphones 12 (likely tablet computers) can be applicable to classroom settings and many other contexts.

[0066] Another example of the use of pre-defined operations that can be stored in association with a button 27 relates to the use of the smartphone in a motor vehicle with certain apps that require user input, such as a GPS navigator that may require an address to be input. A button 27 can be used for causing the smartphone 12 to make it easier to input text. For example, there can be a dedicated button 27 to launch a map app 21m (not shown in the

drawings, 'm' is for map), such as Google Maps or Apple Maps, however, instead of the user touching the smartphone's screen to begin entering an address with the standard on-screen keyboard, a dedicated button 27 (or a special press, like a double-tap, of the same button 27 used to launch the map app 21m) is used to cause a special keyboard to be used. Then, a button 27 (or other input from the user) of unit 15 can be used to send keyboard commands to enter settings and cause the smartphone 12 to switch its keyboard to a keyboard that is either larger or more easy to use. For example, in an iOS device, the MyScript Stylus app available at the iStore causes an iOS device to install a third party keyboard called Stylus that allows finger strokes to be recognized for entering characters. Unit 15 can also be used to cause the smartphone 12 to change back the keyboard to a standard keyboard. If the smartphone has an option in settings to cause a standard keyboard to be enlarged or to be otherwise special, commands for engaging such settings can be issued. A custom keyboard can provide a smoother user experience. It can be configured to provide voice feedback, for example to play a recording of "A as in apple" when the character 'A' is entered. It can also provide an enlarged pop up display of the character entered that can then fade after display.

[0067] Alternatively, the activator unit 15 can send keyboard commands from memory 24 through transmission module 26 to bring to the surface a special keyboard app 21k (not shown in the drawings, 'k' is for keyboard), and this app 21k can provide a full screen keyboard with keys that are about 4 times larger than usual such that almost the full screen is taken up with the keys, leaving a small portion for the text being typed. The size of the on-screen keyboard can be adjustable. In this embodiment, the return to the map app with the desired text now typed in can be done in a number of ways. In addition to using enlarged keys, finger stroke character recognition can be used to input letters, numbers or symbols instead of keyboard keys. Audio feedback as each character is entered can be provided to help a user enter text. A display of the character entered as a full-screen image and then fading away can also be provided to signal to the user that the character has been entered.

[0068] Firstly, the app 21k can place the desired text in the copy buffer so that the app 21m can access it from the copy buffer, for example by the user issuing a paste command. In this case, the switch from app 21k to app 21m can be done by the user on the smartphone 12, or using the button 27 that calls up app 21m. Secondly, the app 21k can send a command to unit 15 over the same wireless channel used for the keyboard, or using a different channel, to

cause the unit 15 to send keyboard commands to the smartphone 12 to switch to app 21m. In this case, there are two options for transferring the text entered by the user, either by the copy-paste buffer or by sending the text from app 21k to the unit 15 for storing temporarily unit the unit 15 causes the smartphone 12 to switch back to app 21m, and then unit 15 will "type" back the text in app 21m that was entered in app 21k.

[0069] A third option is more complex, however, it can be more seamless for the user provided that the response time of the smartphone 12 is sufficiently fast. Unit 15 and app 21k can work together to provide the appearance of remaining in app 21m while effectively remaining within app 21k for keyboard input, as illustrated in Figure 5. For example, unit 15 can issue keyboard commands to smartphone 12 to call up app 21m, take a screen shot that is placed in the copy buffer, and then unit 15 calls up app 21k. App 21k then reads the copy buffer and displays it in the background with the enlarged keyboard or finger stroke recognition interface in overlay over the background. Each time a character is entered in app 21k, app 21k could signal to unit 15 to send keyboard commands to smartphone 12 to switch over to app 21m, send the character as a keyboard entered character in app 21m, take a screenshot to the copy buffer, and switch back to app 21k. App 21k would then read the copy buffer image and use it for the updated background image, so that the user sees the newly-typed character appear in the image of app 21m. This can give the user the illusion of being in app 21m the whole time, albeit with a modified interface for the enhanced keyboard and/or the stroke recognition.

[0070] While not illustrated in Figure 5, app 21k can include a "hide/stop keyboard" button that the user can use to cancel the operation of app 21k and unit 15 to provide the special keyboard functionality, or a button 27 can be pressed to perform the cancel. While more complex still, app 21k and/or unit 15 can be configured to recognize from the screen image of app 21m (app 21m can be in this context a non-map app as it is the target app that makes use of the special keyboard) the state of app 21m to determine whether app 21k and the coordinated effort of unit 15 for providing keyboard functionality can be terminated. This can allow app 21m to proceed without any interruption from the special keyboard control.

[0071] The embodiment of Figure 8 shows an activator unit 15 wired or wirelessly connected to at least one peripheral device. The activator unit 15 may be used to process input from a peripheral device used by a local user to keyboard commands then processed by the

local user's smartphone 12. In this embodiment, the activator unit 15 is connected to a wired or wireless mouse 27d and a wired or wireless keyboard 27c. The mouse 27d transmits input to a pointer interface 27a of the activator unit 15. Similarly, the keyboard 27c transmits input to a keyboard interface 27b of the activator unit 15. In another example, the keyboard interface 27c and the pointer interface 27a may be the same interface, receiving input from both the mouse 27d and the keyboard 27c.

[0072] Exemplary input from a mouse 27d may be the movement of the pointer, a click of the left button, a click of the right button, a "double-click" of the left button. Exemplary input from a keyboard 27c may be a keystroke or a combination of keystrokes such as "ctrl + c" or "ctrl + z". Such keystrokes may also include, for example, increasing or lowering the volume of the device, or the brightness of a screen.

[0073] The pointer interface 27a and keyboard interface 27b respectively sends the input information from the mouse 27d and keyboard 27c to the consumer control key transmission module 26. To convert this input into keyboard commands, the transmission module 26 may either use information on the layout of the keyboard 27c or the configuration of the mouse 27d, or a set of translation settings for translating the input received from the keyboard 27c and the mouse 27d, this information and/or configurations received by and/or stored in memory in the consumer control key non-volatile memory and interface 24. The keyboard commands are then sent by the transmission module 26, via the Bluetooth interface 16c of the activator unit 15 to the Bluetooth interface 16a of the smartphone 12. Once received, the smartphone 12 carries out the desired action in correspondence with the keyboard commands, these commands processed by modules 18 and 20 of the smartphone's 12 OS.

[0074] The smartphone 12 may also send command settings relating to the keyboard 27c or mouse 27d to the activator unit 15 via, for example, a Bluetooth connection established between the smartphone 12 and activator unit 15. These command settings may then be stored in the consumer control key non-volatile memory and interface 24.

[0075] For example, the peripheral device, such as mouse 27d, and/or the activator unit 15, may establish a Bluetooth connection with the smartphone 12 such as an iOS device (e.g. an iPhone™ or iPad™). In the example of an iOS device, once a Bluetooth connection is established, the activator unit 15 may send keyboard commands to the iOS device, these commands, for example, stored in memory 24. These commands, once received, activate the

application program AssistiveTouch™ on the iOS device. AssistiveTouch™ is an application program for assisting a user in the controlling of the iOS device, such as in the performance of certain gestures (e.g. pinch, multi-finger swipe) and providing a shortcut for accessing certain features of the iOS device (e.g. the Control Center, Siri). Once the AssistiveTouch™ application program is activated, AssistiveTouch™ may be configured in such a way that a cursor appears on the screen of the iOS device. Input from the peripheral device is converted into keyboard commands by the activator unit 15, and these commands are sent to the iOS device by the activator unit 15 and processed into commands of the cursor on the iOS device's screen, such as movements of the cursor, clicking on the screen or swiping across the screen. For example, where the peripheral device is a mouse 27d, the movement of the mouse is converted into keyboard commands, the cursor replicating on the screen the movements of mouse 27d. In another example, when the peripheral device is a trackpad, the trackpad senses the movement and touch of, for example, a user's finger on its surface, and this input is sent to and converted into keyboard commands by the activator unit 15, for operating the cursor appearing on the iOS device's screen, such as by moving, clicking or swiping of the cursor on the screen of the iOS device, these actions equivalent to the input received from the touchpad. The peripheral device, the activator unit 15 and the Bluetooth connection between the peripheral device and the iOS device and/or between the activator unit 15 and the iOS device may be MFi enabled (the MFi program is a licensing program run by Apple where hardware and software peripherals are enabled to run with Apple™ products, such as the iPhone and iPad). Furthermore, the activator unit 15 may be part of the peripheral device. These illustrations are not limitative and are but examples of how AssistiveTouch™ application program may be used in accordance with teachings of the present invention.

[0076] In alternative embodiments of Figure 8, the peripheral device may be another kind of peripheral device aside from a mouse 27d or keyboard 27c. The peripheral device may be, for example, a mic, a joystick, a trackpad, a game controller or a brail keyboard for visually impaired users. The peripheral device may be, for example, any device necessary to assist a user with a disability in using the user's smartphone. Furthermore, there may be, one, two, three or more peripheral devices connected to one activator unit 15.

[0077] In the exemplary embodiment of Figure 8, the activator unit 15 may be, for example, a standalone dongle or hardware integrated into the peripheral (e.g. the keyboard, the

mouse). For example, each peripheral device may have its own activator unit 15 communicating with the smartphone 12 or multiple smartphones 12 (e.g. useful in a class setting).

[0078] The embodiment of Figure 9 shows an activator unit 15 for receiving voice commands and processing these into keyboard commands transmitted to a smartphone 12. A voice processor 27 performs voice recognition, as is known in the art, and issues keyboard command requests to module 26 to control the computing device 12 accordingly. The keyboard commands that correspond to specific actions can be stored in memory 24. The smartphone 12 may be an Apple iPhone® or iPad® operating under the iOS, where the operating system's application programs exist in a sandboxed environment or otherwise prevents an app from controlling settings or other apps to perform actions that normally only a user can do. As described above, the keyboard commands are received by the computer 12 as user commands and are able to perform tasks that an app is not permitted. The activator unit can also have a remote command network interface 27e for receiving voice commands from processor 27 and sending them to a remote server.

[0079] For example, if the processor 27 is part of a device like an Amazon Echo™ device that operates with the Alexa™ app on an iPad or an iPhone device using the iOS operating system, keyboard commands can be issued by processor 27 to cause the iOS computer to launch the Alexa app (or equivalent) using keyboard commands as described above so as to allow the Echo device (or equivalent, such as the Google Home device) to connect to the Internet using the Bluetooth connection (or equivalent) of the Echo device and the Internet connectivity of the iOS device. In addition to the processor commanding the iOS device to run an app for the processor 27, a voice command can be interpreted and used to control the iOS device to do most any operation or function, like command the playing of music with the selection of Bluetooth audio output without requiring the user to manually control the iOS device. Furthermore, when a voice request received by processor 27 can best be answered by the iOS device opening a given app and then functioning with particular parameters, processor 27 can command the iOS device accordingly using keyboard commands. For example, the processor 27 might cause the iOS device to open a map or navigation app and input an address for a destination to be reached in response to a voice command, and then inform the user to look at the iOS device.

[0080] In another example, a voice request received by the processor 27 may be directed to making a phone call. In this instance, once the voice commands to make the call are received by the processor 27, the processor 27 can use keyboard commands to command the iOS device to unlock, to ensure that the audio settings on the device 12 are set to use the Bluetooth device for the conversation (e.g. the one associated with processor 27), to open the application program on the iOS device used to place a call, such as the "Phone" app, and then send a series of keyboard commands to the iOS device to place the call. For instance, the user may make the voice request to "call Dad". If processor 27 does not recognize from the data available to it who "Dad" is, it can issue keyboard commands to the device 12 to open the Phone app, and possibly search through the contacts or the configurations stored in memory on the iOS device for the number associated with "Dad". It can then tell the user to look at the screen of the device 12 to select the number to call if available. Once the call is placed, the Bluetooth connection between the iOS device allows for audio transmission between the handheld speaker, such as the Amazon Echo™, and the device, establishing communication between the parties on the call.

[0081] In another example, the user's voice request received by the handheld speaker's processor 27 may be to add, for instance, a meeting to the user's calendar at a given time and date, the calendar located on the user's iOS device. The processor 27 sends the corresponding keyboard commands to open the "Calendar" app on the iOS device and add the meeting to the calendar in the desired timeslot. In the case where there exists a conflict in the user's schedule on the calendar, the user may, for example, receive the notification of the conflict in the user's schedule via a message appearing on the user's iOS device.

[0082] Alternatively interface 27e can be used to receive control commands from a network service and relay them to module 26 to control the device 12. The remote command network interface 27e may receive said voice commands from, for example, a handheld speaker controlled through voice commands such as the Google Home or Amazon Echo™. For example, when the voice commands received by the handheld speaker are directed at carrying out a desired action on the user's smartphone 12, the handheld speaker will transmit the voice commands to the remote command network interface 27e (which can be, for example, a Bluetooth interface for establishing a Bluetooth connection or a wireless interface for establishing a WiFi connection). The remote command network interface 27e may channel

these commands to the voice command processor 27 which will process the voice commands into keyboard commands recognized by the smartphone, the processing done in function with the processing instructions stored in memory and/or received by the consumer control key non-volatile memory and interface 24. The keyboard commands are then sent by the transmission module 26, using the activator unit's Bluetooth interface 16c, to the smartphone's 12 Bluetooth interface 16a, via an established Bluetooth connection. The keyboard commands are then processed by modules 18 and 20 of the smartphone's 12 OS, resulting in the smartphone 12 carrying out the desired action in accordance with the voice commands.

[0083] In an alternative embodiment of Figure 9, the mic or speaker receiving the voice commands may be integrated into the activator unit 15. The person having ordinary skill in the art will readily recognize that any speaker or device for receiving voice commands may be used without departing from the teachings of the present invention.

[0084] Furthermore, in another alternative embodiment of Figure 9, the remote command network interface 27e may receive instead commands in the form of gestures (these commands sent, for example, by a motion sensor or optical sensor for converting motion information into data), such as hand gestures or body signals, these gestures then processed by the activator unit 15 into keyboard commands in accordance with the teachings of the present invention. In other embodiments of Figure 9, other forms of signals may be processed by the activator unit 15 into keyboard commands, such as heat signals (e.g. by the measurement of infrared radiation), vibrations using, for example, a vibration sensor, humidity (e.g. using a humidity sensor) or light (e.g. using a light sensor) without departing from the teachings of the present invention.

[0085] The embodiment of Figure 10 is similar to that of Figure 7, except that a battery-powered peripheral 14 is included. This peripheral 14 can be woken up using the activation unit 15 directly using Bluetooth communication from interface 16c, or it can be woken up by the app 21a (through interface 16a) that is called up by activation unit 15 in the manner described above. As illustrated, the keypad 27 can have four buttons (any number can be provided as desired), with buttons labeled for specific apps, such as the rear view camera, GPS navigator app, mail app, a "phone home" button that launches the telephone to call a specific number, etc. In Figure 10, the different apps called by the activator unit 15 are not

illustrated as in Figure 7, however, this can be done in a similar manner. Configuration of the commands can be done in module 22 whether in a stand-alone app or as part of the peripheral app 21a.

[0086] In the embodiment of Figure 11, a battery-powered rear view camera peripheral 14 is coupled with an activation unit 15, while the peripheral 14 is coupled with a dedicated GPS navigator unit associated with the vehicle. As in embodiments above, the activation unit 15 can be coupled with the peripheral's Bluetooth interface 16b to cause it to wake up (as illustrated), or it can be coupled with the interface 16a of the display unit 12' which in turn will send the peripheral 14 a wake up command over interface 16b. When a GPS unit is equipped with Bluetooth communications abilities 16a, this embodiment requires additional software to provide the codec 32, the view display and the mode switching between regular navigation mode and camera display mode, but no additional hardware to provide the rear view camera capability.

[0087] Likewise, the embodiment of Figure 11 could exclude the activator 15 as a separate component, and allow controller 25 through user input to cause interface 16a to send a wake-up signal to interface 16b of the peripheral 14.

[0088] In the embodiment of Figure 12, the smartphone 12 is coupled with the peripheral 14 using interfaces 16a and 16b, without involving wireless keyboard commands to control the smartphone 12 to unlock and open up the app 21. In this embodiment, the user unlocks the phone 12 and opens up the app 21. The app 21 then sends the commands to the peripheral 14 that cause it to wake up and to begin sending video.

[0089] Figure 13 shows a frame 40 of a peripheral 14. The frame 40 has a surface for receiving a license plate 46 and includes holes 42 for mounting the plate 46 to the frame 40 using mounting bolts 44. It will be appreciated that any suitable mounting mechanism, whether clips, bolts, transparent retainer cover, or the like can be used. In the embodiment of Figure 13, the camera 28 is mounted in a fixed position, namely in the top left corner using a mounting 48. The camera 28 can be arranged to be located in a variable position or in a different fixed position. In the embodiment of Figure 13, the mounting 48 has a slot into which the plate 46 fits so that the camera 28 fits within the boundaries of the frame 40 of a standard license plate 46. While the plate 46 shown has the dimensions of a North American license plate, it will be appreciated that the frame 40 can be adapted for the plate dimensions

of any jurisdiction or vehicle type. Frame 40 can be relatively thin, and the embodiment of Figure 13 is about 1 cm at the top and expands to about 2 cm at the bottom to have a trapezoidal shape and better accommodate the battery, however, different shapes of battery can fit within a rectangular frame as well.

[0090] The vehicle side of the frame 40 is shown in Figure 14 with the components removed for clarity. The frame 40 is upside down in the view, and the mounting holes 42 are at the bottom. The battery compartment 50 and the circuit board compartment 52 are shown, along with a inner side of the mounting 48. Cut outs 54 near the mounting holes 42 are used for receiving a bracket 56. While a frame 40 can be mounted to the vehicle using the vehicle's mounting nuts for receiving bolts 44 that are a bit longer than usual (by the added thickness of the frame 40), Applicant has found that some vehicles have a plate mounting area that has obstructions, such as trunk handles, spare tires or lights, and an adjustment in height is useful. Furthermore, it is convenient, although optional, to use the vehicle's original mounting bolts to mount the frame to the vehicle and to use separate bolts to mount the plate to the frame 40. Therefore, bracket 56 is an example of a mechanism that allows a vertical adjustment in position for frame 40. The vehicle's original plate mounting bolts can be affixed through hole 58 with the nut 57 positioned either above or below for a higher or a lower position respectively. The bracket is then clamped to the vehicle and the nut 57 is ready to receive bolt 44 through hole 42. Slots 54 prevents the brackets 56 from turning out of position should the bolts attached to the vehicle become loose. This arrangement has been found to avoid conflicts with the car body components in most cases.

[0091] As shown in Figure 15, the peripheral 14 can comprise a camera 28 held by a bracket 62 that allows for an adjustment of the camera tilt. As illustrated, this can be provided by making screws 63 accessible from the vehicle side of the frame 40 where they can be loosened to allow the camera 28 to be adjusted, and then the screws 63 are tightened so that the camera 28 is fixed in its tilt position. The camera 28 is mounted in the mounting 48 with the circular side members rotatable in sleeves in the mounting 48 and the bracket 62 can have teeth engaging complementary teeth in the side members of the housing of the camera 28 to ensure there is no slippage of the camera in its mounting. Other suitable mechanisms to set the tilt angle are possible, and the example given is but one way of securely setting a tilt angle.

[0092] The camera 28 is connected to a circuit board 64 that contains the hardware and software components of the peripheral 14, and is to be received in compartment 52 (Figure 14) and sealed using cover 65 and gasket 66. Protection against the weather and road contamination is important. A battery 68 is connected to the circuit board 64 for power, and is to be received in compartment 50 and sealed using cover 69 and gasket 70. The battery 68 can provide a service life of about two years. A smaller rechargeable or replaceable battery can also be used.

[0093] While the embodiment of Figure 13 is a frame 40 that essentially matches the dimensions of the license plate 46 with only the camera mount 48 overhanging the plate area, it can be desirable to have either an enlarged frame 40 with a border region along at least one side (for example the two vertical sides) to as to accommodate one or more photovoltaic strips that can be used to recharge the battery 68 using sunlight. Alternatively, solar panel strips can be arranged within the plate area thus covering a border region of the license plate 46.

[0094] While reference is made herein to a rear-view camera system, it will be appreciated that a vehicle camera can be installed at the sides or front of a vehicle. For example, a school bus can use the license plate mount at the front of the bus to monitor an area at the front of the bus without modifying the camera housing. Triggering of the camera operation could be then done from other signal sources, such as the bus stop lights or the door switch. For side mountings of a camera, a different housing would be used.

[0095] Figure 16 shows a view of a stick-on activation unit 15 that includes a single ON button 27 and a single OFF button 27'. Unit 15 can be powered using a standard button battery (e.g. a Lithium CR2032 type battery) or alternatively, it can be powered from the vehicle (or any other external power) using wire port 25. Unit 15 includes the Bluetooth transceiver chip. The Bluetooth transceiver is paired with the peripheral 14 and maintains a low power connection at all times. When the button 27 of unit 15 is pressed, a signal is sent to the peripheral 14 that causes its Bluetooth component 16b to cause the peripheral to wake up and to communicate with the smartphone 12 or the dedicated GPS unit (or any other main computing device) 12'. The unit 15 and the peripheral 14 can remain in this sleep mode with Bluetooth communication established for years without recharging or changing batteries. In the case of button 27', the signal sent to the peripheral indicates that the peripheral 14 is to shut down.

[0096] While in the embodiment described above, the peripheral is a rear view camera peripheral, it will be appreciated that other types of peripherals can make use of the features described herein. For example, a battery-powered camera for building entrances or home security can be coupled with a computer device that can provide a display of the video. The activation unit 15 can be located near a door to cause a smartphone device 12 and camera unit 14 to provide video at the push of the button.

What is claimed is:

1. An activation device for controlling a computing device comprising:

a user input interface; and

a keyboard interface for connecting to said computing device;

a memory for storing at least one sequence of keyboard commands; and

a controller configured to store in said memory said at least one sequence of keyboard commands and to be responsive to said user input device for transmitting one of said at least one sequence of keyboard commands stored in said memory to said computing device.

2. The activation device as defined in claim 1, wherein said keyboard interface is a wireless interface, preferably Bluetooth.

3. The activation device as defined in claim 1 or 2, wherein said computing device is a smartphone.

4. The activation device as defined in claim 3, wherein said at least one sequence of keyboard commands comprise commands for unlocking the smartphone and for causing the smartphone to run a predetermined app.

5. The activation device as defined in any one of claims 1 to 4, further comprising a data link, wherein said activation device comprises a first component and a second component that are interconnected by said data link, preferably a wireless data link, said first component comprising said user input interface, said second component comprises said keyboard interface, said memory and said controller, and said second component is part of a peripheral device connected to said computing device.

6. The activation device as defined in claim 5, wherein said first component is battery-powered, preferably configured to consume power only in response to a user keypress.

7. The activation device as defined in claim 5 or 6, wherein said second component controls at least a turning on of said peripheral device to operate with said computing device, said peripheral device preferably being battery powered.

8. The activation device as defined in claim 5, 6 or 7, wherein said peripheral device is a camera, preferably a rear-view vehicle camera.

9. The activation device as defined in any one of claims 1 to 8, wherein said user input interface comprises a plurality of user keys, each associated with a predetermined sequence of keyboard commands.

10. The activation device as defined in claim 9, wherein one of said plurality of user keys is associated with a predetermined sequence of keyboard commands to cause said computing device to select a predetermined touch-screen keyboard.

11. The activation device as defined in any one of claims 1 to 10, wherein said activation device is adapted to receive and respond to data from the computing device.

12. The activation device as defined in any one of claims 1 to 11, wherein said user input device comprises an external signal input, preferably a power signal taken from an indicator lamp power signal of a back-up lamp of a vehicle.

13. The activation device as defined in any one of claims 1 to 12, wherein said user input device comprises a voice command processor.

14. The activation device as defined in any one of claims 1 to 13, wherein said user input device comprises a pointer interface connectable to a pointer device and configured to cause said keyboard interface to issue pointer control commands in response to pointer device signals.

15. The activation device as defined in any one of claims 1 to 13, wherein said user input device comprises an interface connectable to a keyboard device and configured to cause said keyboard interface to issue keystroke commands in response to keyboard device signals.

16. A computer keyboard comprising the activation device as defined in claim 15.

17. In combination, the activation device as defined in any one of claims 1 to 15, and a computing device having stored in memory a special keyboard app and a target app, wherein said activation device and said special keyboard app are configured to collect character or text input from a user using the special keyboard app and transfer the character or text input to the target app.

18. The combination as defined in claim 17, wherein the activation device comprises at least one user button for launching said target app and for launching said special keyboard app.

19. A vehicle camera peripheral comprising:

a frame having a surface for supporting a license plate;

at least one compartment for containing a battery and a circuit board having a wireless transmitter and video transmission circuitry, said compartment provided in said frame and positioned behind said license plate supporting surface;

a camera mounted to said frame and connected to said circuit board; and

a mounting for connecting said frame to existing license plate fastening devices of a vehicle.

20. The vehicle camera peripheral as defined in claim 19, wherein said mounting is adjustable for connecting said frame at a selected one of a plurality of vertical offset positions.

21. A vehicle camera peripheral comprising:

a mounting for securing the peripheral to a vehicle;

a camera producing a stream of video images;

a wireless transmitter using a wireless channel in communication with a display device which wireless channel can be shared with other peripherals;

video compression and transmission circuitry configured to assess an available bandwidth of said wireless channel and to adapt a video compression rate of said stream of video images in accordance with said available bandwidth.

22. The peripheral as defined in claim 21, wherein said display device can be controlled to stop using said wireless channel with at least one of said other peripherals, and said video compression and transmission circuitry is configured to signal said display device to stop using said wireless channels with said one of said other peripherals.

23. A method of configuring a rear-view camera system comprising:

mounting a rear-view camera module to a vehicle;

providing a wireless battery-powered display device for viewing video from said camera module, said display including video overlay capabilities and a configuration to overlay user-positionable grid or guidelines for parking said vehicle; and

using said display device while dismounted from an interior of said vehicle to view said video while standing in a field of view of said video to adjust said grid or guidelines on said display device.

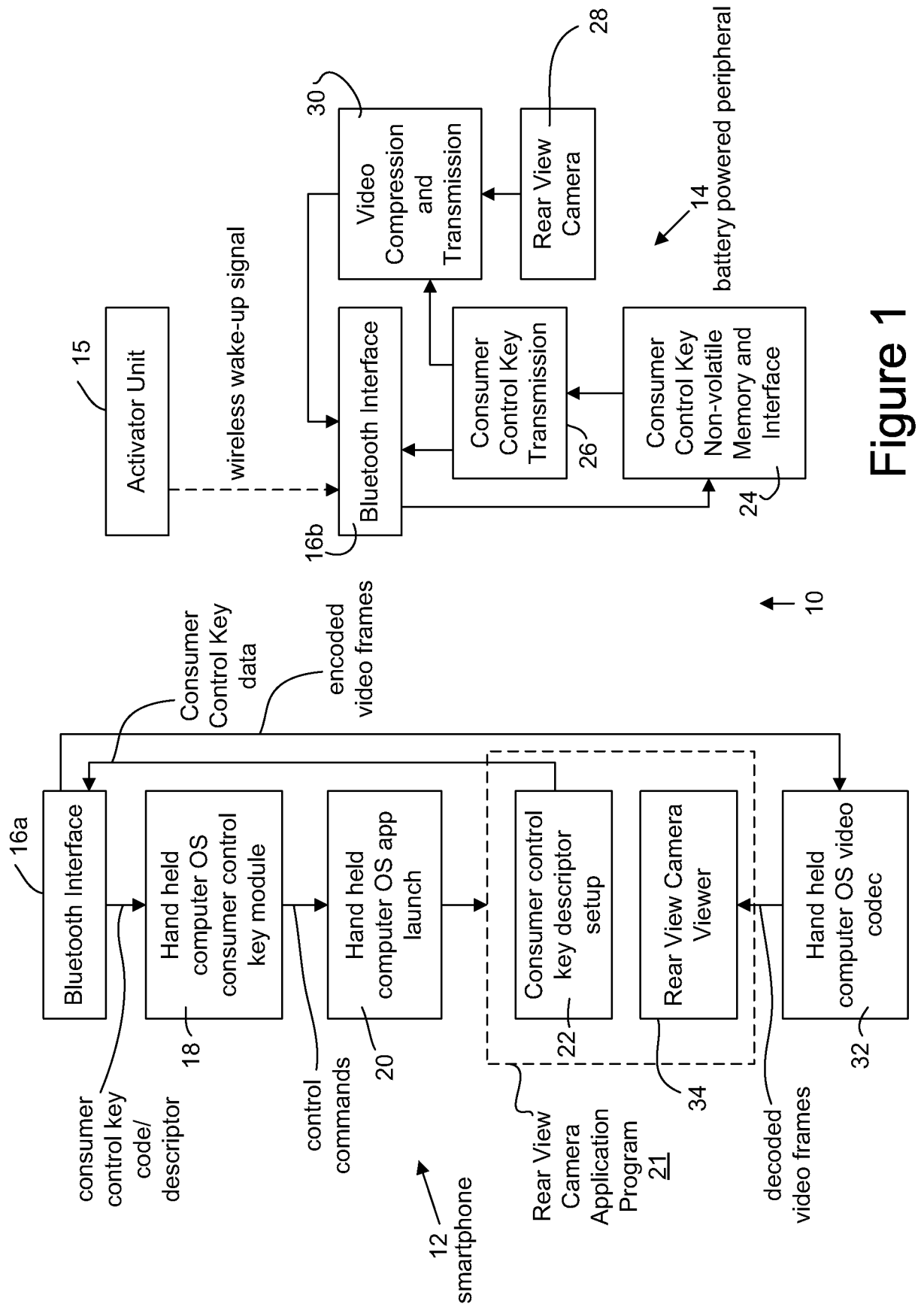
Activator Unit
15
wireless wake-up signal
Bluetooth Interface
16b
Consumer Control Key Transmission
26
Consumer Control Key Non-volatile Memory and Interface
24
Video Compression and Transmission
30
Rear View Camera
28
14
battery powered peripheral
10
Consumer Control Key data
encoded video frames
16a
Bluetooth Interface
Hand held computer OS consumer control key module
18
Hand held computer OS app launch
20
Consumer control key descriptor setup
22
Rear View Camera Viewer
34
Hand held computer OS video codec
32
consumer control key code/ descriptor
control commands
Rear View Camera Application Program
21
decoded video frames
12
smartphone

Figure 1

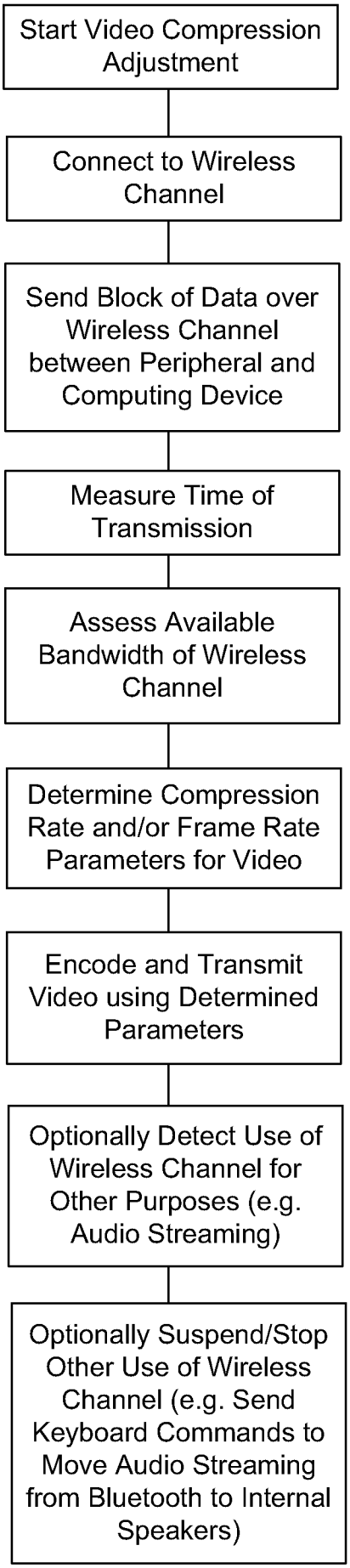

Figure 2

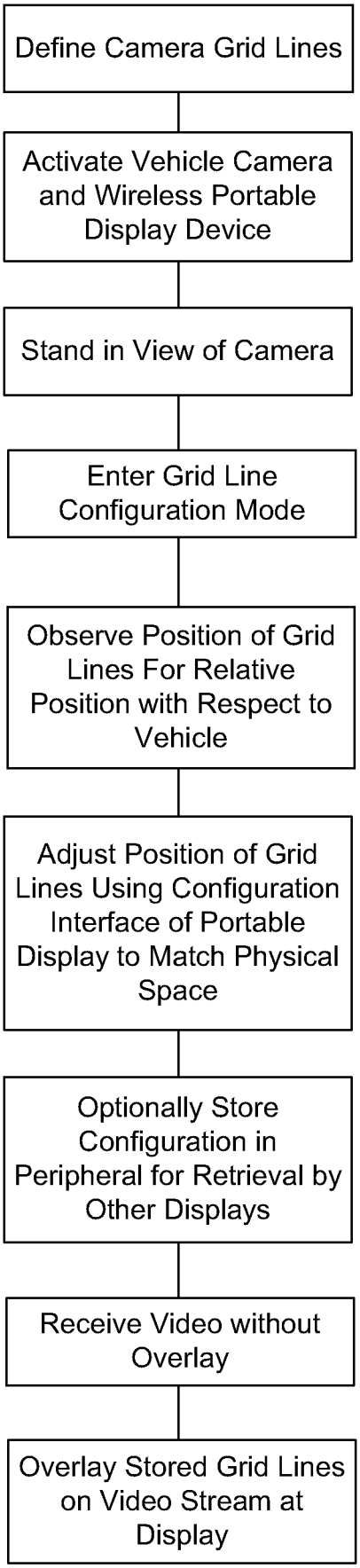

Figure 3

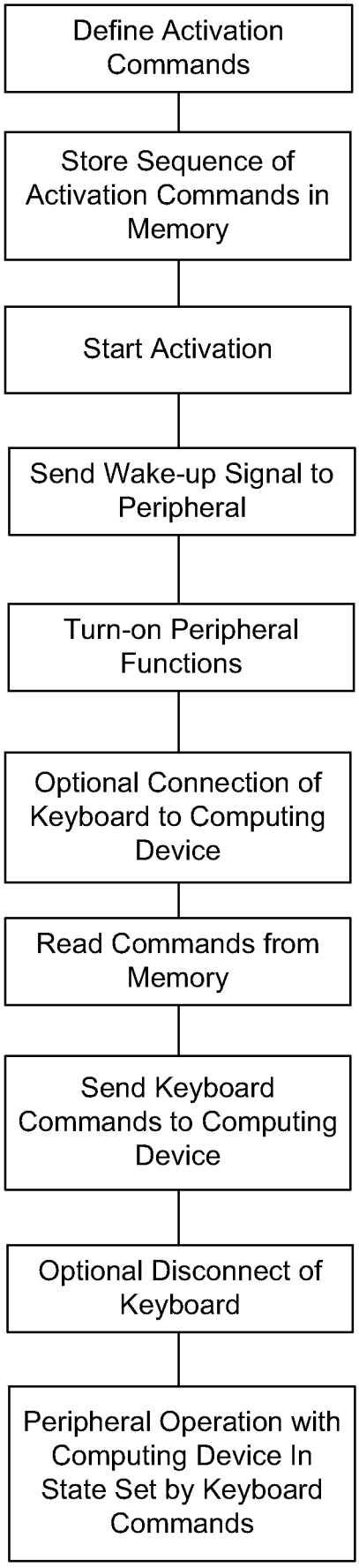

Figure 4

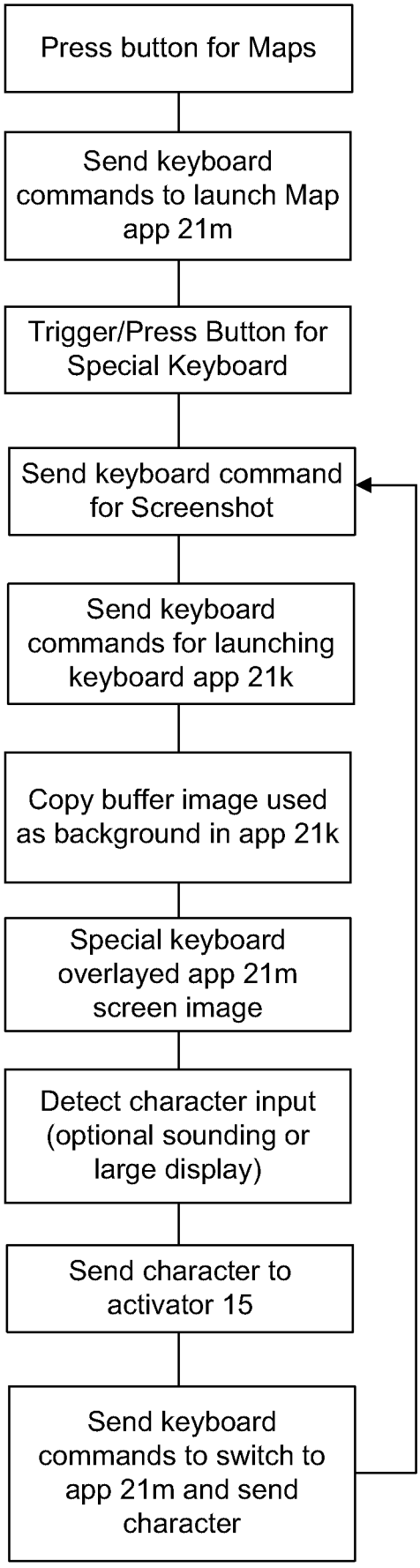

Figure 5

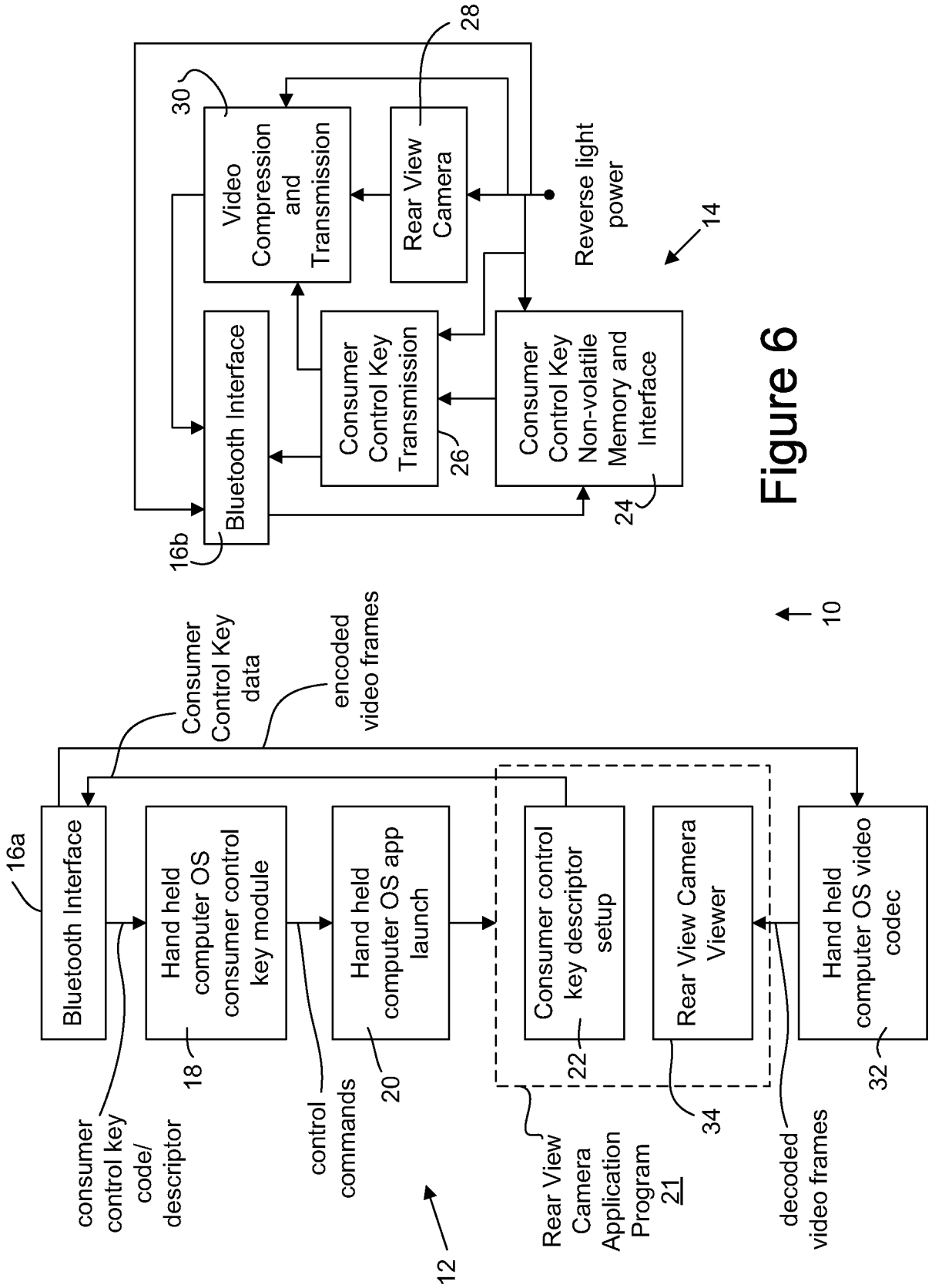
16a
Bluetooth Interface
Hand held computer OS consumer control key module
Hand held computer OS app launch
Consumer control key descriptor setup
Rear View Camera Viewer
Hand held computer OS video codec
Consumer Control Key data
encoded video frames
consumer control key code/ descriptor
control commands
Rear View Camera Application Program 21
decoded video frames
18
20
22
34
32
12
10
16b
Bluetooth Interface
Consumer Control Key Transmission
Consumer Control Key Non-volatile Memory and Interface
Video Compression and Transmission
Rear View Camera
Reverse light power
26
24
30
28
14

Figure 6

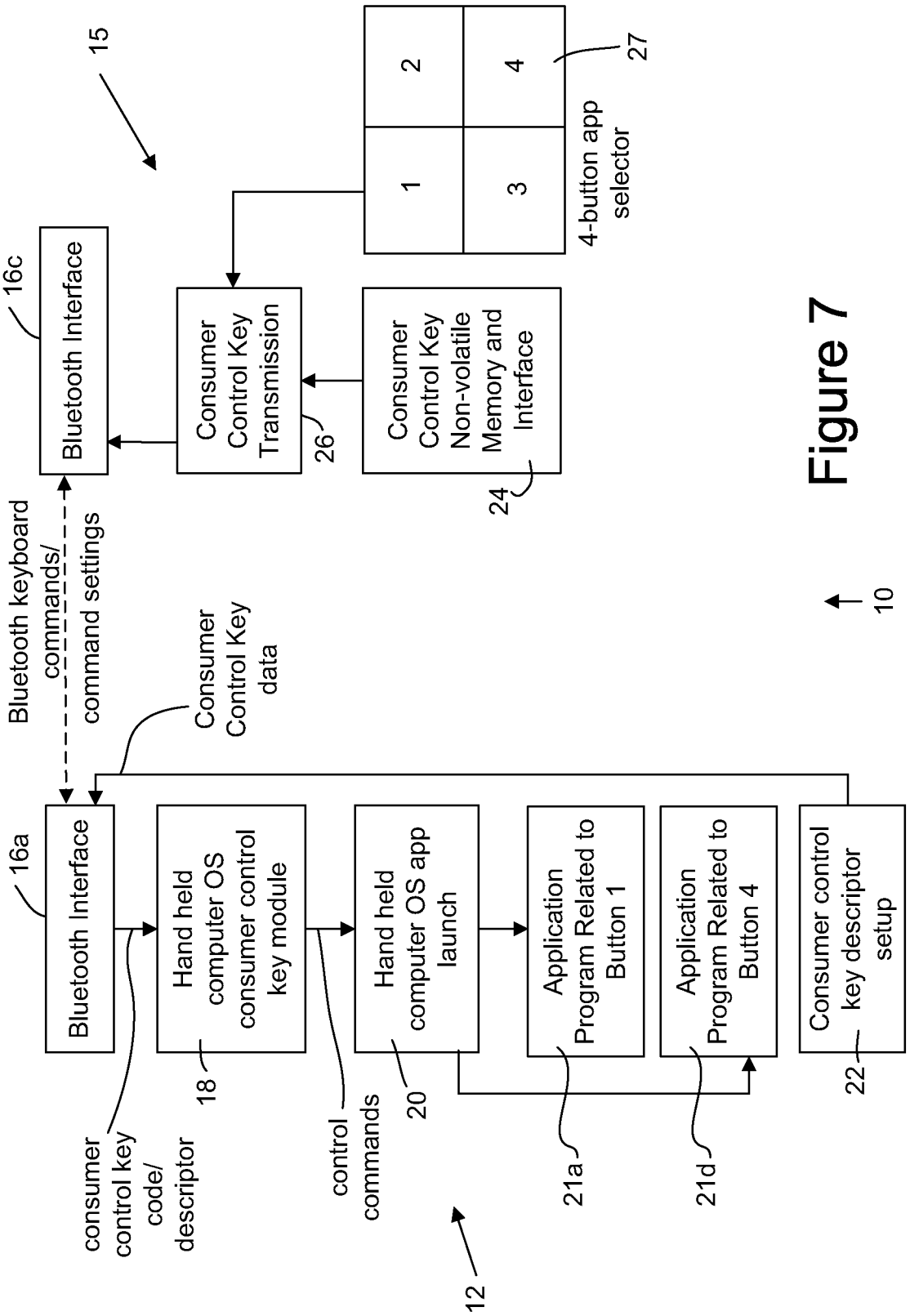
15
16c
Bluetooth Interface
Consumer Control Key Transmission
26
Consumer Control Key Non-volatile Memory and Interface
24
1
2
3
4
4-button app selector
27
Bluetooth keyboard commands/ command settings
Consumer Control Key data
16a
Bluetooth Interface
Hand held computer OS consumer control key module
18
Hand held computer OS app launch
20
Application Program Related to Button 1
Application Program Related to Button 4
Consumer control key descriptor setup
22
consumer control key code/ descriptor
control commands
21a
21d
12
10

Figure 7

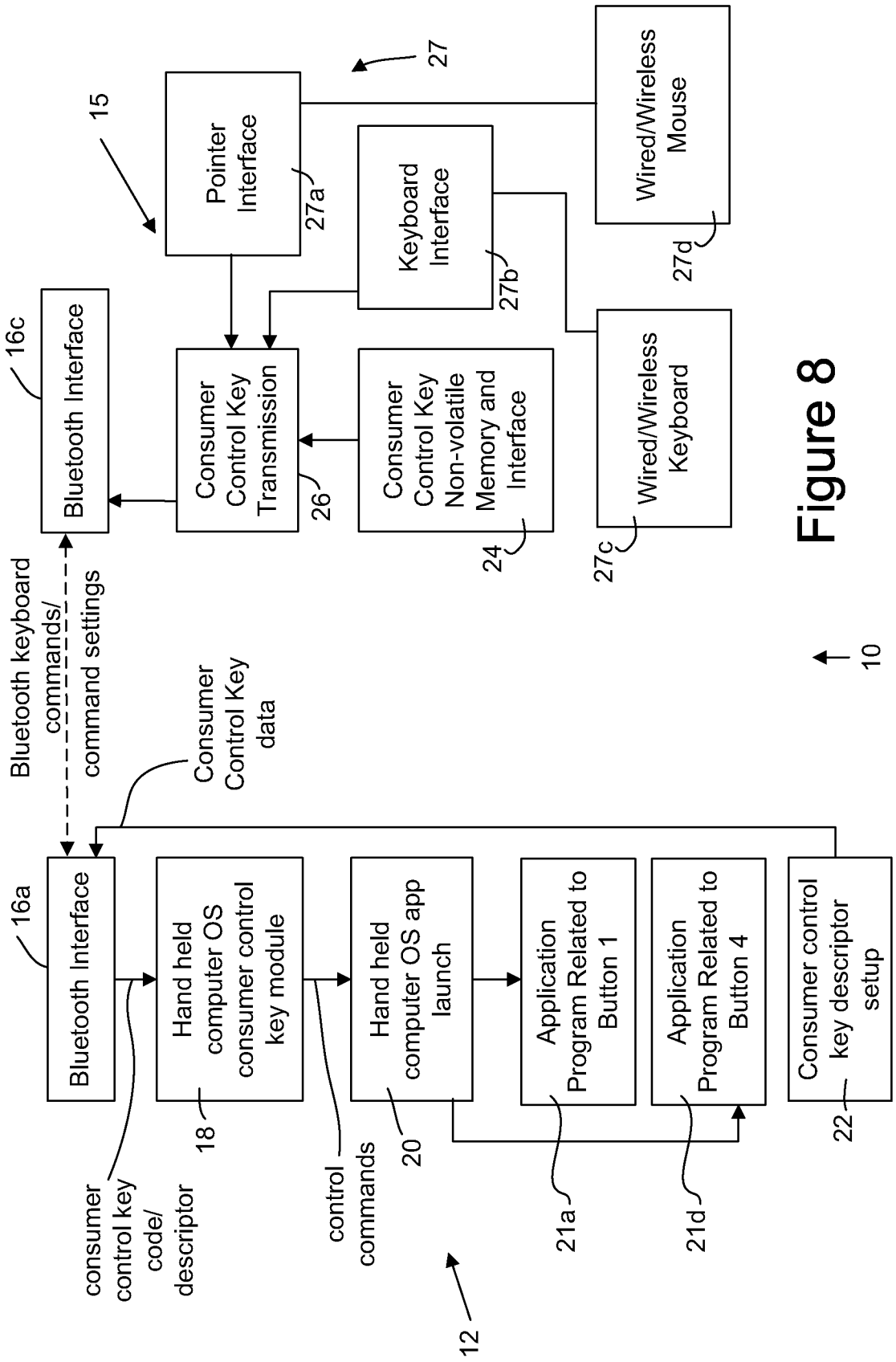
Bluetooth keyboard commands/ command settings
Consumer Control Key data
16a
Bluetooth Interface
16c
Bluetooth Interface
15
Pointer Interface
27a
Keyboard Interface
27b
Wired/Wireless Mouse
27d
27
Consumer Control Key Transmission
26
Consumer Control Key Non-volatile Memory and Interface
24
Wired/Wireless Keyboard
27c
Hand held computer OS consumer control key module
18
Hand held computer OS app launch
20
Application Program Related to Button 1
21a
Application Program Related to Button 4
21d
Consumer control key descriptor setup
22
consumer control key code/ descriptor
control commands
12
10

Figure 8

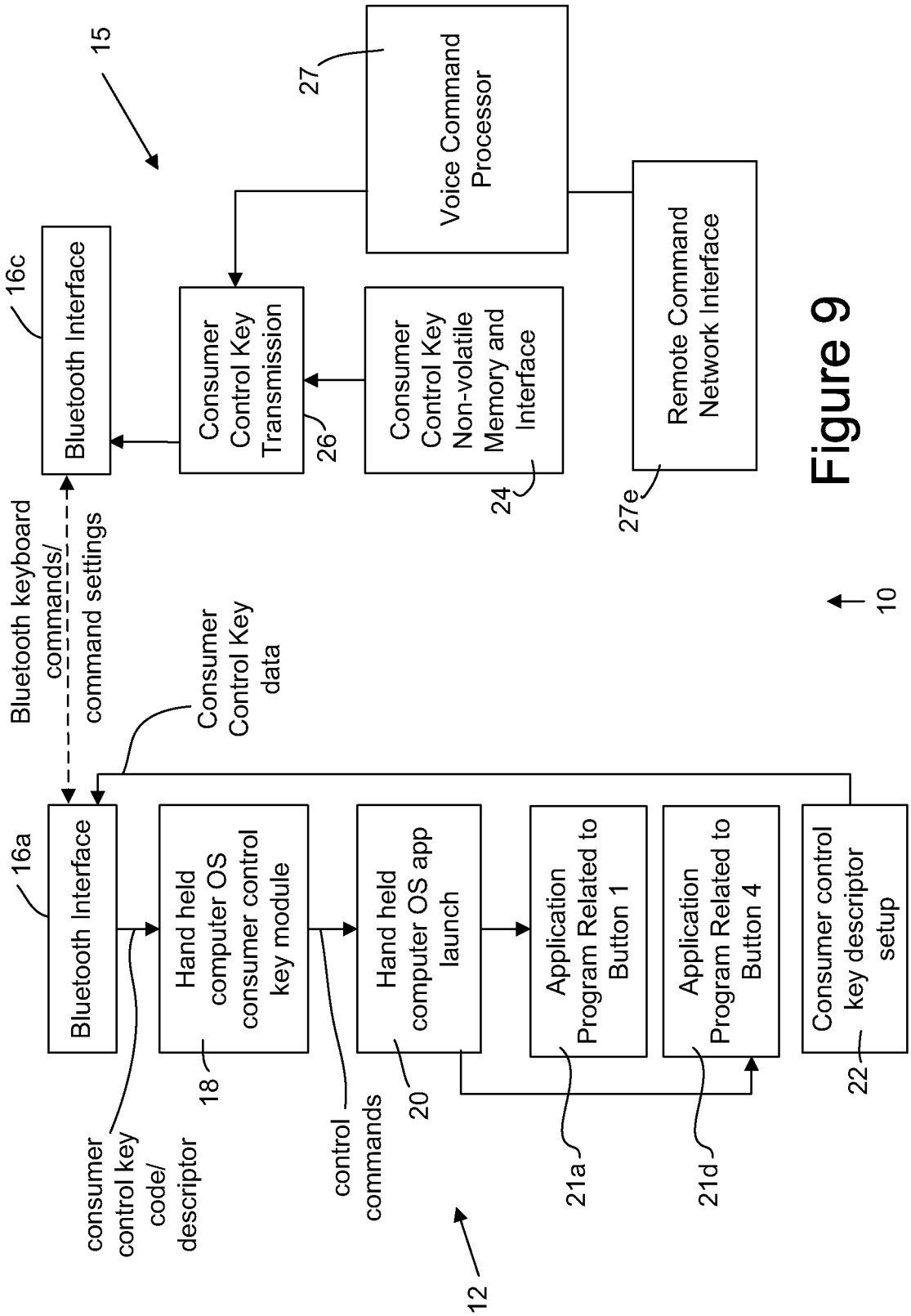
15
27
Voice Command Processor
16c
Bluetooth Interface
Consumer Control Key Transmission
26
Consumer Control Key Non-volatile Memory and Interface
24
Remote Command Network Interface
27e
Bluetooth keyboard commands/ command settings
Consumer Control Key data
16a
Bluetooth Interface
Hand held computer OS consumer control key module
18
Hand held computer OS app launch
20
Application Program Related to Button 1
Application Program Related to Button 4
Consumer control key descriptor setup
22
consumer control key code/ descriptor
control commands
21a
21d
12
10

Figure 9

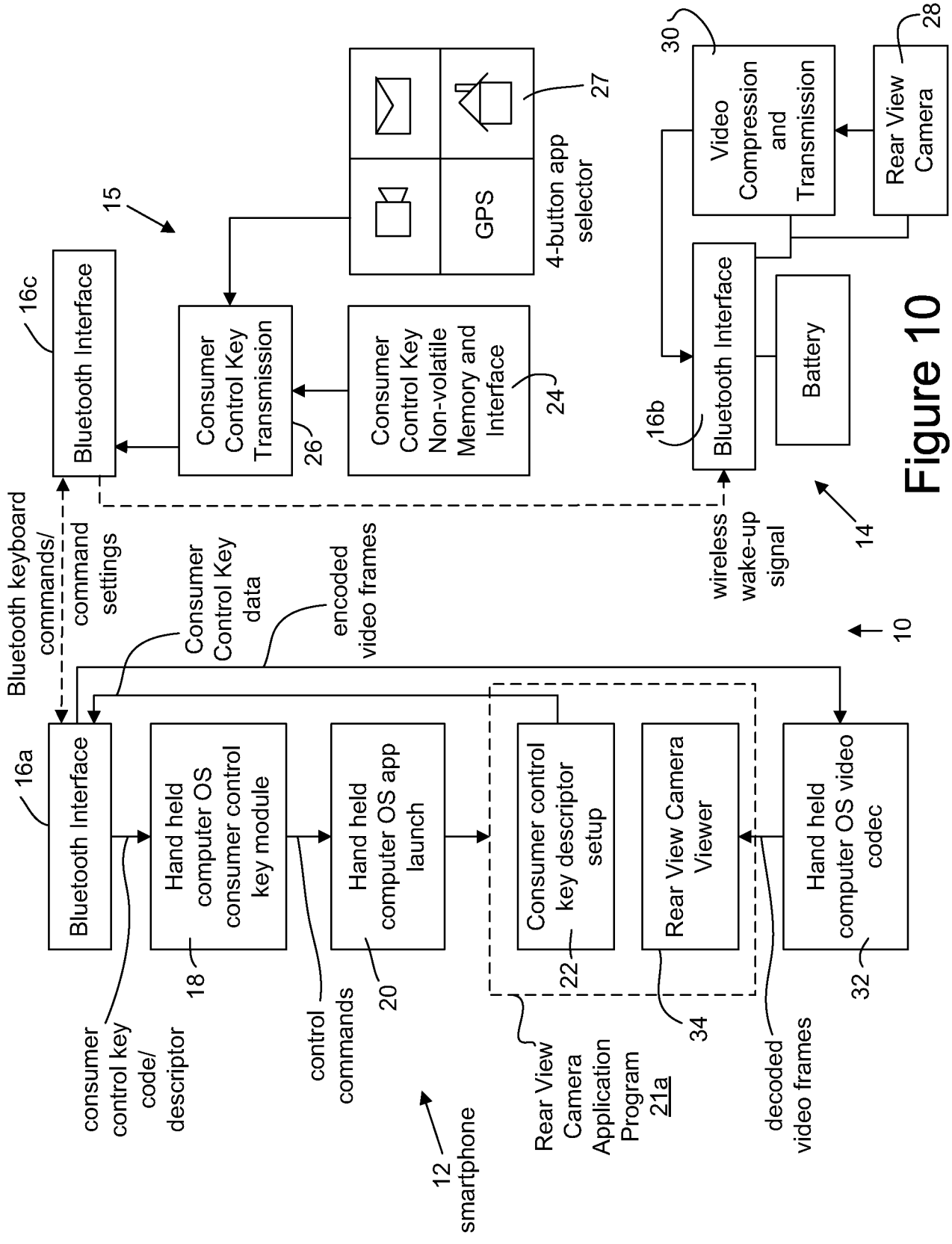
Bluetooth keyboard commands/ command settings
Consumer Control Key data
encoded video frames
wireless wake-up signal
10
14
15
16a
Bluetooth Interface
16b
Bluetooth Interface
16c
Bluetooth Interface
Hand held computer OS consumer control key module
18
Hand held computer OS app launch
20
Consumer control key descriptor setup
22
Rear View Camera Viewer
34
Hand held computer OS video codec
32
Consumer Control Key Transmission
26
Consumer Control Key Non-volatile Memory and Interface
24
GPS
4-button app selector
27
Video Compression and Transmission
30
Rear View Camera
28
Battery
consumer control key code/ descriptor
control commands
12 smartphone
Rear View Camera Application Program 21a
decoded video frames

Figure 10

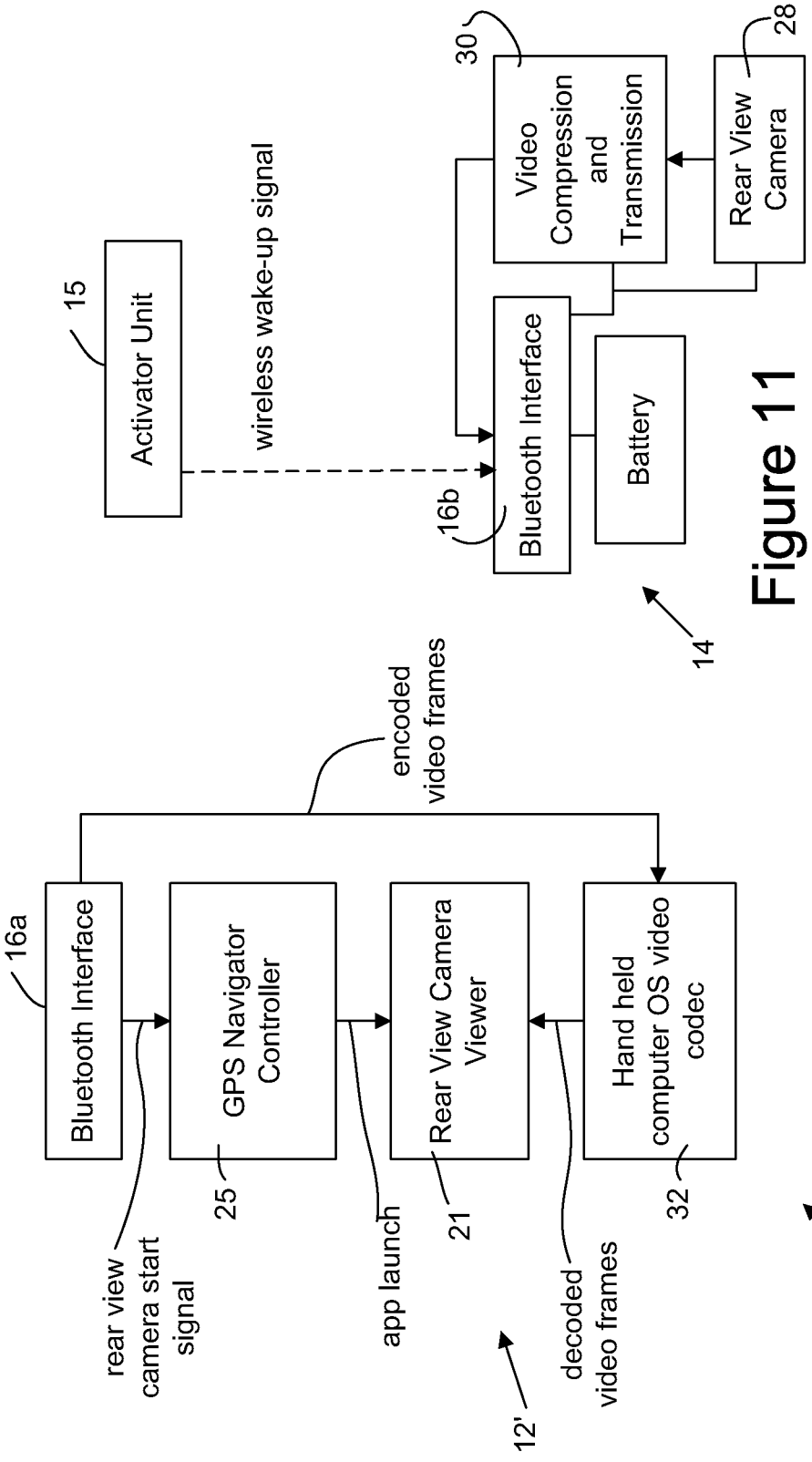
Activator Unit
15
wireless wake-up signal
Video Compression and Transmission
30
Rear View Camera
28
Bluetooth Interface
16b
Battery
14
encoded video frames
Bluetooth Interface
16a
GPS Navigator Controller
25
Rear View Camera Viewer
21
Hand held computer OS video codec
32
rear view camera start signal
app launch
decoded video frames
12'
10

Figure 11

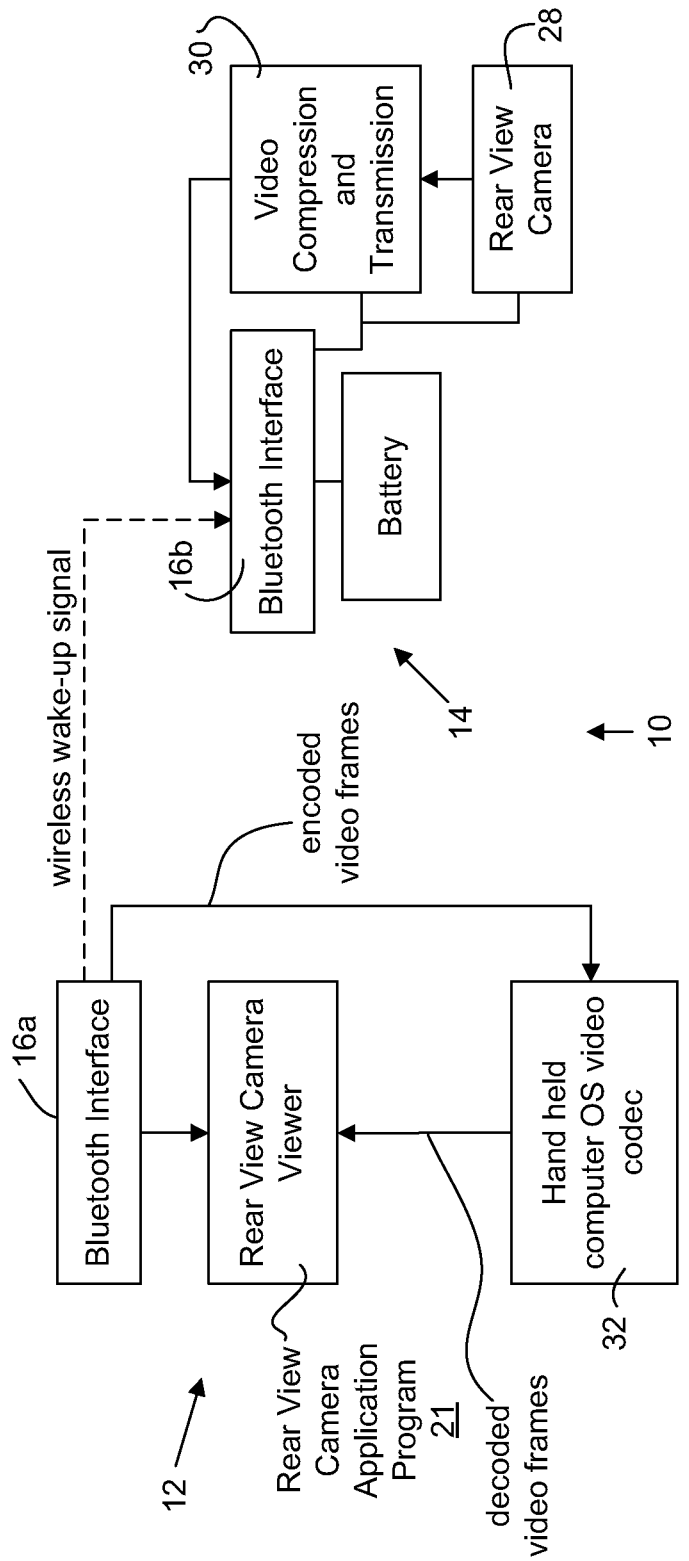
30
Video Compression and Transmission
28
Rear View Camera
Bluetooth Interface
Battery
16b
wireless wake-up signal
encoded video frames
14
10
16a
Bluetooth Interface
Rear View Camera Viewer
Hand held computer OS video codec
12
Rear View Camera Application Program 21
decoded video frames
32

Figure 12

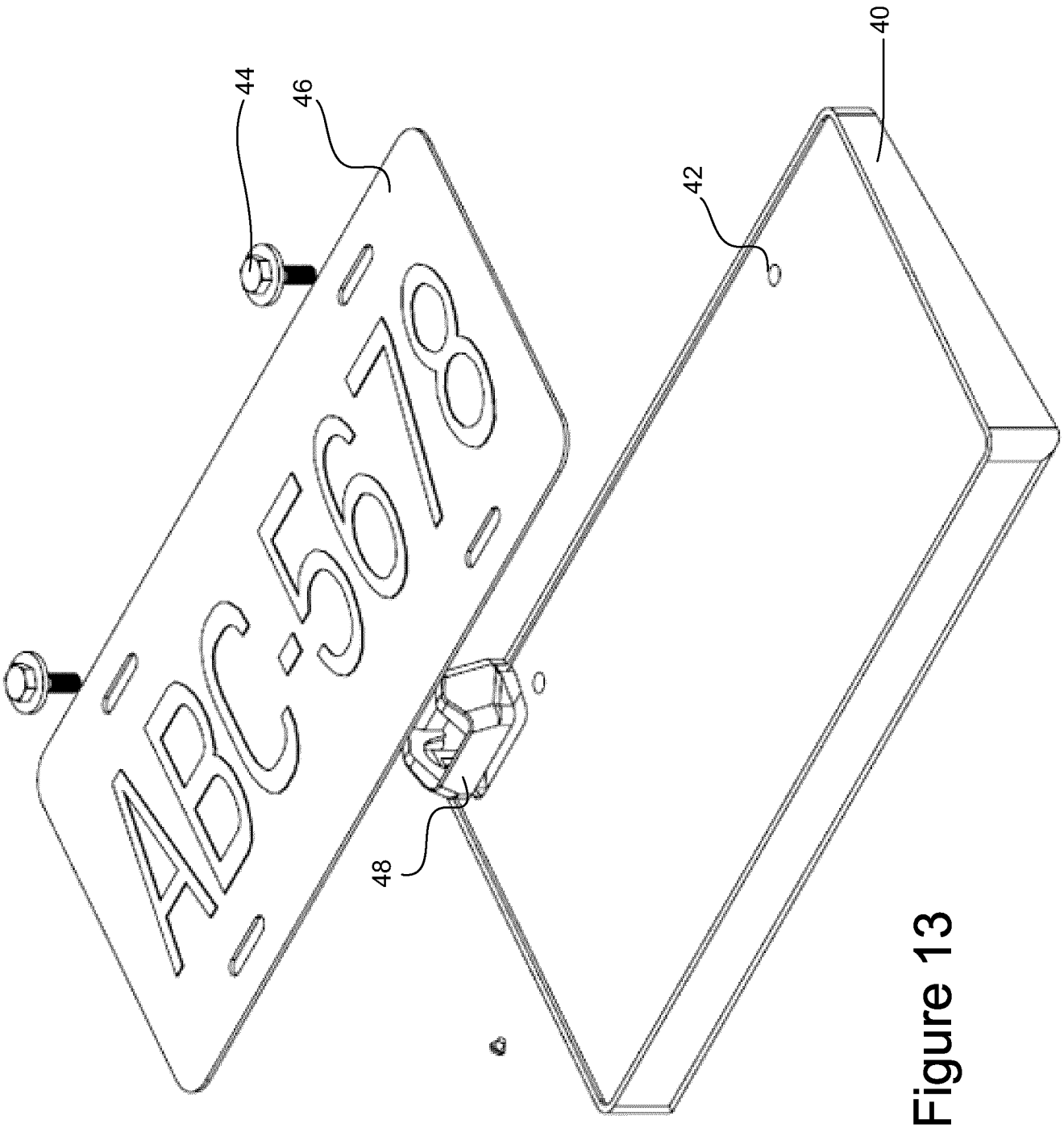

Figure 13

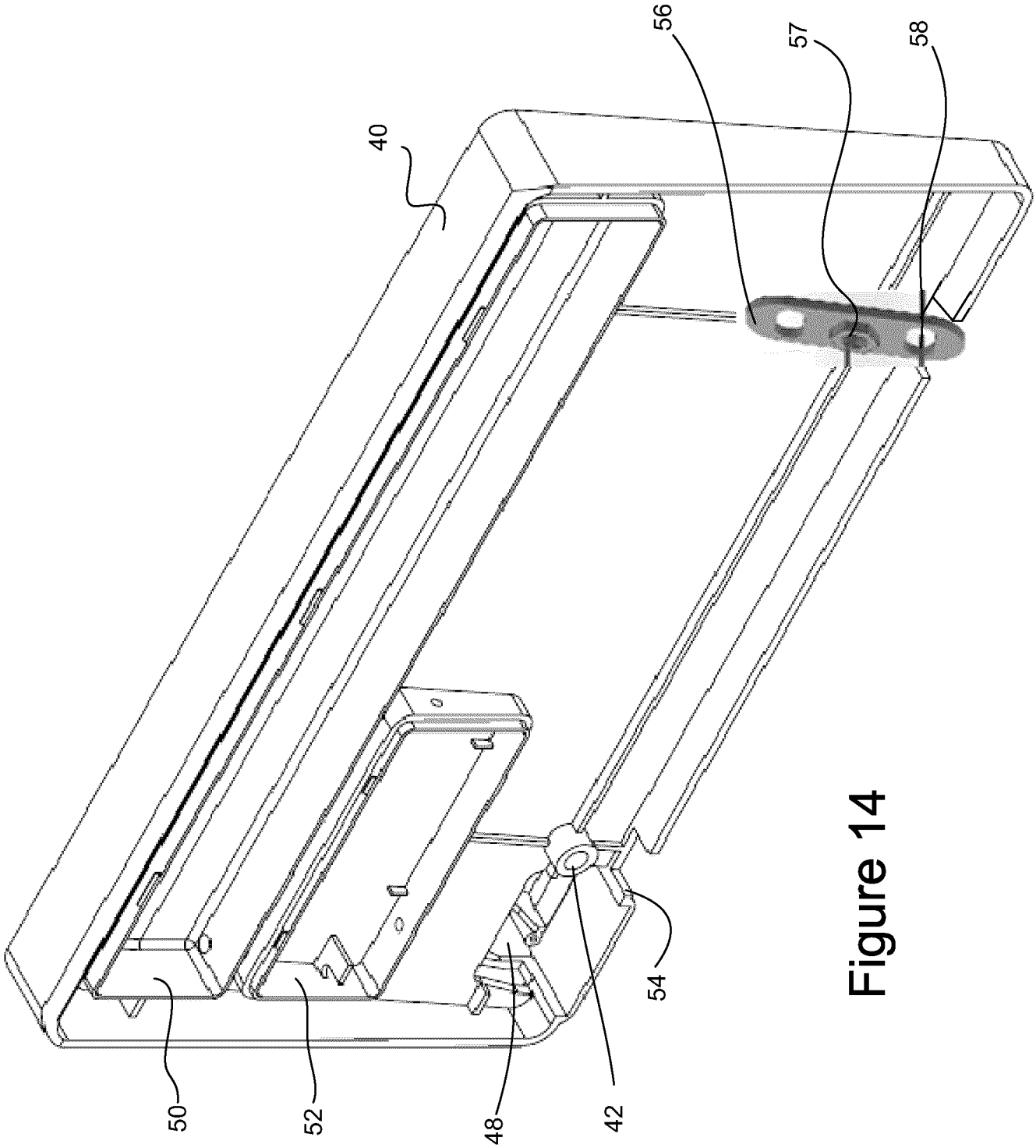

Figure 14

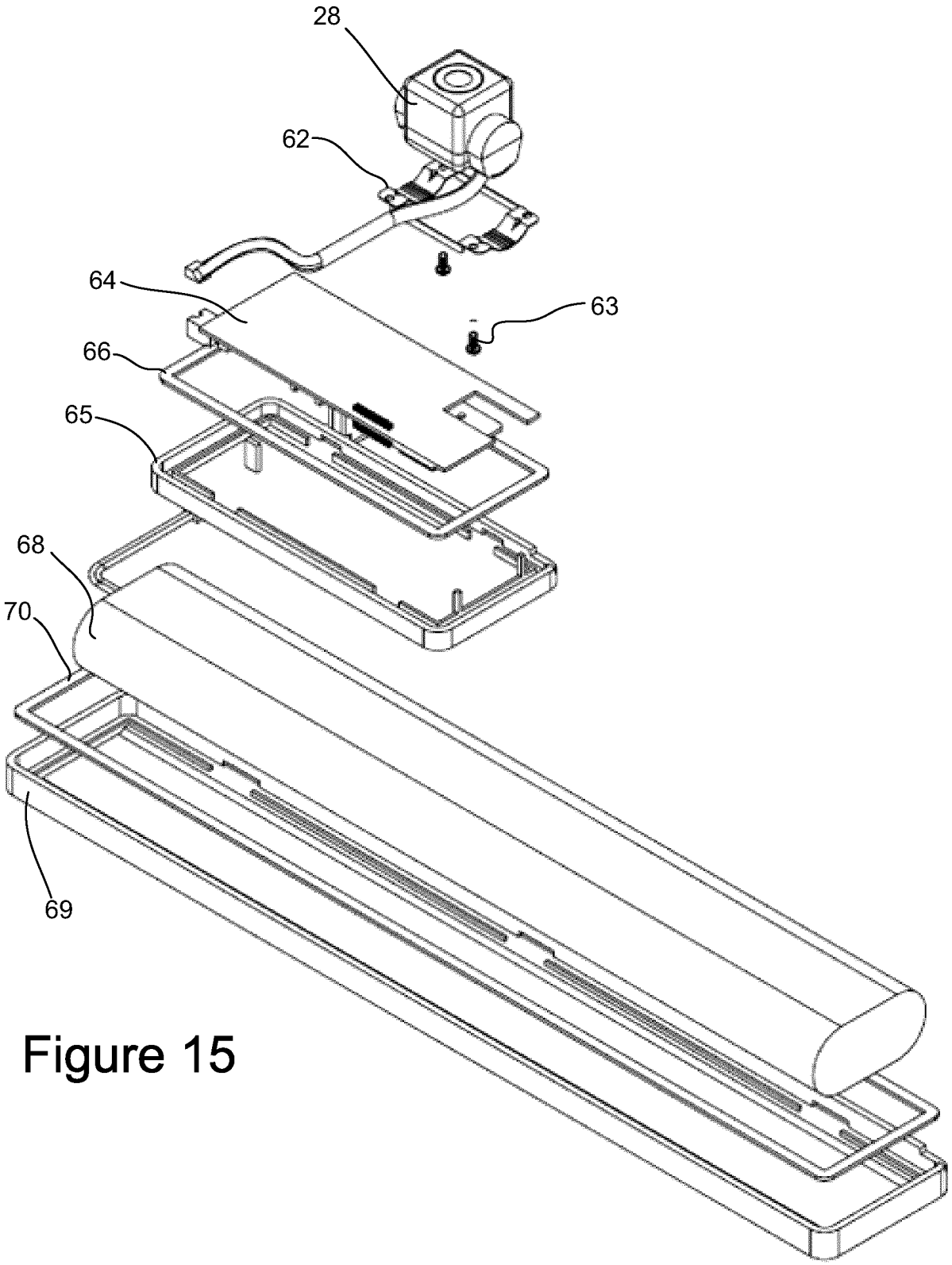

Figure 15

Figure 16

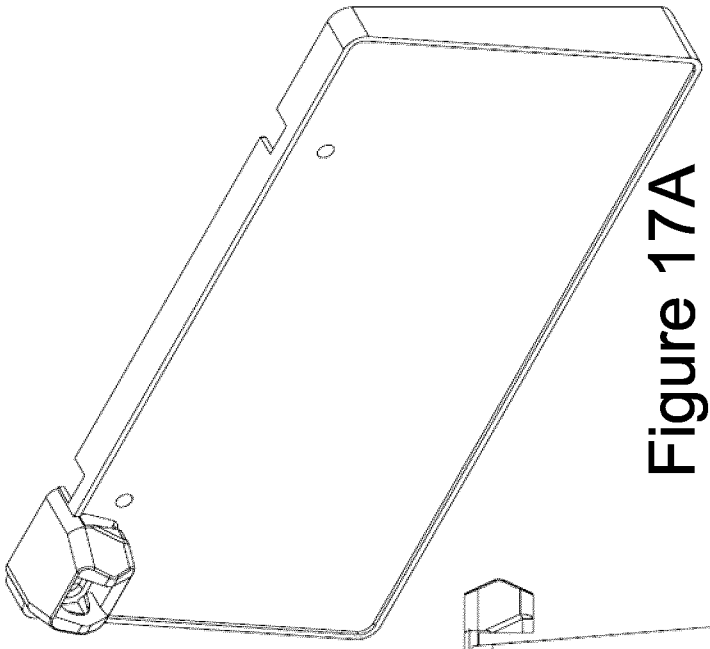

Figure 17A

Figure 17F

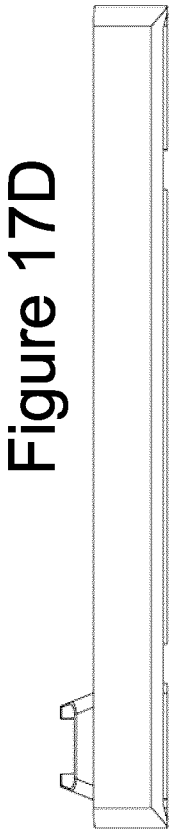

Figure 17D

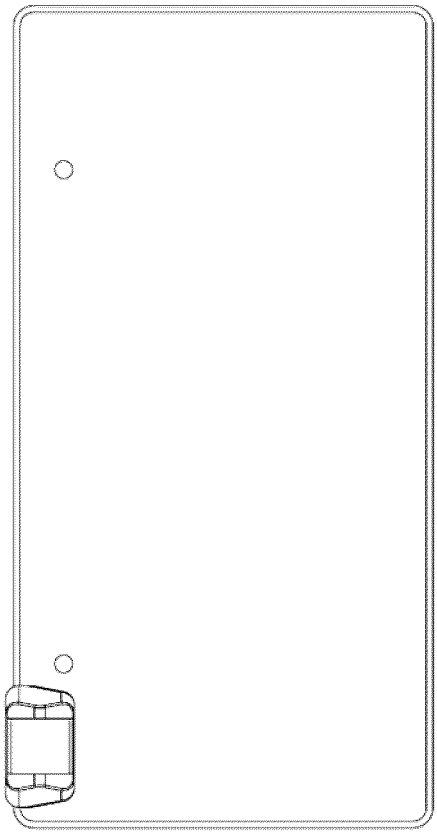

Figure 17B

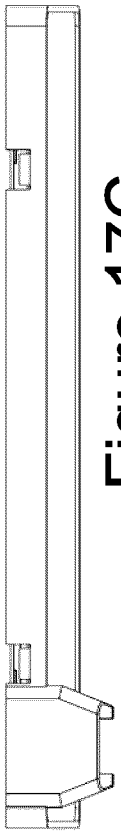

Figure 17C

Figure 17E

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2016/050809

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***G06F 3/02*** (2006.01) , ***B60W 50/08*** (2012.01) , ***G06F 9/06*** (2006.01) , ***H04N 19/146*** (2014.01) , ***H04W 88/02*** (2009.01)

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)

I***PC:ALL***

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

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

QUESTEL-ORBIT ***&*** keywords:
smartphone/iphone/blackberry/ipad/"tablet computer'Vandroid phone"/"hand-held phone'Vandroid tablet"; rear-view/back-up/"licence plate'Vautomotive/automobile/vehicle/wireless camera; "remote control";
Continued on ***Supplemental Page ...***

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 8,855,719 B2 *(Jacobsen et al.)* - 7 October 2014 (07-10-2014) * col. 2, l. 33; col. 3, ll. 16, 37-38; col. 5, ll. 11-12, 28-34; col. 6, ll. 23-31; col. 7, l. 25; col. 11, l. 28; col. 14, ll. 13-27; col. 15, 47-55; Figs. 1, 2, 10, 15 *	1-8, 11, 13-17 9, 10, 12, 18
X Y	US 7,629,963 B1 *(Wright)* - 8 December 2009 (08-12-2009) * Abstract *	1, 15 9, 10, 18
Y	US 2003/0133014 A1 *(Mendozd)* - 17 July 2003 (17-07-2003) * [0023]; claim 10 *	12
X	US 2012/0256541 *M(Dandrow)* - 11 October 2012 (11-10-2012) * [0017]-[0020]; Figs. 1, 2 *	19, 20

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

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier application or patent but published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 26 October 2016 (26-10-2016)	Date of mailing of the international search report 26 October 2016 (26-10-2016)
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 819-953-2476	Authorized officer Cristian S. Popa (819) 639-8274

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009/0244282 A1 *(Eguiguren)* - 1 October 2009 (01-10-2009) * [0031]; [0034] *	19, 20, 23
A	US 8,194,132 B2 *{Dayan et al.)* - 5 June 2012 (05-06-2012) * Abstract; col. 13, l. 59 *	19, 20, 23
A	US 2006/0098094 A1 *(Lott)* - 11 May 2006 (11-09-2006) * Abstract; [0036] *	19, 20, 23
X	US 2012/0109406 A1 *(Yousefi et al.)* - 3 May 2012 (03-05-2012) * [0093]; [0146]; [0292]; [0259]; [0581]-[0582]; [0591]; [0593]; Fig. 100 *	21, 22
A	US 2015/0312572 A1 *(Owen)* - 29 October 2015 (29-10-2015) * Abstract; [0003]-[0004]; [0020]; [0022]; [0042]; [0065] *	21, 22
A	US 2007/0219686 A1 *(Plante)* - 20 September 2007 (20-09-2007) * [0032]-[0033]; [0057] *	21, 22
A	US 2013/0321629 A1 *(Zhang et al.)* - 5 December 2013 (05-12-2013) * Abstract; [0003]; [0004]; [0019]; [0021]; Fig. 1 *	23

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2016/050809

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of the first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. Ill Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Claims 1-18: *An activation device having a key board interface for controlling a computing device by way of a sequence of memorized keyboard commands*
Claims 19-20: *A vehicle camera peripheral mounted on a frame for supporting a license plate*
Claims 21-22: *Adaptive video compression and wireless transmission in a vehicle camera peripheral*
Claim 23: *Configuring a vehicle rear-view camera by using a grid or guidelines for parking the vehicle*

1. ☑ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claim Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Supplemental Page

Keywords (continued):

simulate/emulate/translate/convert keyboard/keystrokes sequence/macro; wireless keyboard; power taken/derived/from back-up indicator/lamp/light;
back-up/rear-view/"license plate'V'licence plate"/veliicle/automotive/veliicle-mounted/on-vehicle camera; integrated/incorporated/ built-in/embedded battery; wireless; frame compartment/cavity;
"available bandwidth";
calibrate, adjust, position, configure; grid, "grid line", guide, "guide line", overlay, grill; parking;
user/driver "in view"/outside/dismounted/off-veliicle/off-car/ off-automobile/"in picture'V'in view'V'in field of view"/standing/"in front of camera"

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US8855719B2	07 October 2014 (07-10-2014)	US2011187640A1	04 August 2011 (04-08-2011)
		CA2685947A1	27 November 2008 (27-11-2008)
		CN101632033A	20 January 2010 (20-01-2010)
		CN101632033B	31 July 2013 (31-07-2013)
		CN101755299A	23 June 2010 (23-06-2010)
		CN101809651A	18 August 2010 (18-08-2010)
		CN101809651 B	07 November 2012 (07-11-2012)
		CN102460349A	16 May 2012 (16-05-2012)
		CN102812417A	05 December 2012 (05-12-2012)
		CN102812417B	02 March 2016 (02-03-2016)
		DE112008003468T5	03 December 2009 (03-12-2009)
		EP2150950A1	10 February 2010 (10-02-2010)
		EP2183742A2	12 May 2010 (12-05-2010)
		EP2207164A2	14 July 2010 (14-07-2010)
		EP2207164A3	08 December 2010 (08-12-2010)
		EP2427812A1	14 March 2012 (14-03-2012)
		EP2427812A4	08 June 2016 (08-06-2016)
		GB0913858D0	16 September 2009 (16-09-2009)
		GB2459220A	21 October 2009 (21-10-2009)
		GB2459220B	05 September 2012 (05-09-2012)
		JP2010516186A	13 May 2010 (13-05-2010)
		JP5190070B2	24 April 2013 (24-04-2013)
		JP2010527557A	12 August 2010 (12-08-2010)
		KR20090101378A	25 September 2009 (25-09-2009)
		KR101441873B1	04 November 2014 (04-11-2014)
		US2009209205A1	20 August 2009 (20-08-2009)
		US8355671 B2	15 January 2013 (15-01-2013)
		US2008291277A1	27 November 2008 (27-11-2008)
		US8378924B2	19 February 2013 (19-02-2013)
		US2008288408A1	20 November 2008 (20-11-2008)
		US8812399B2	19 August 2014 (19-08-2014)
		US2009099836A1	16 April 2009 (16-04-2009)
		US8825468B2	02 September 2014 (02-09-2014)
		US2009251409A1	08 October 2009 (08-10-2009)
		US8909296B2	09 December 2014 (09-12-2014)
		US2009117890A1	07 May 2009 (07-05-2009)
		US9116340B2	25 August 2015 (25-08-2015)
		US2008169998A1	17 July 2008 (17-07-2008)
		US9217868B2	22 December 2015 (22-12-2015)
		US2011001699A1	06 January 2011 (06-01-2011)
		US9235262B2	12 January 2016 (12-01-2016)
		US2015334218A1	19 November 2015 (19-11-2015)
		US9310613B2	12 April 2016 (12-04-2016)
		US2014368436A1	18 December 2014 (18-12-2014)
		WO2008088691A2	24 July 2008 (24-07-2008)
		WO2008088691A3	02 October 2008 (02-10-2008)
		WO2008140630A2	20 November 2008 (20-11-2008)
		WO2008140630A3	26 March 2009 (26-03-2009)
		WO2008140630A8	25 June 2009 (25-06-2009)
		WO2008143870A1	27 November 2008 (27-11-2008)
		WO2009017797A2	05 February 2009 (05-02-2009)
		WO2009017797A3	26 March 2009 (26-03-2009)
		WO2010129679A1	11 November 2010 (11-11-2010)
		WO2010129679A9	24 February 2011 (24-02-2011)
		WO2011097226A1	11 August 2011 (11-08-2011)
US7629963B1	08 December 2009 (08-12-2009)	US7629963B1	08 December 2009 (08-12-2009)
		US8384670B1	26 February 2013 (26-02-2013)
US2003133014A1	17 July 2003 (17-07-2003)	None	

US2012256541A1	11 October 2012 (11-10-2012)	US2012256541A1	11 October 2012 (11-10-2012)
		US9270407B2	23 February 2016 (23-02-2016)
		US2016152177A1	02 June 2016 (02-06-2016)
US2009244262A1	01 October 2009 (01-10-2009)	None	
US8194132B2	05 June 2012 (05-06-2012)	US2008030311A1	07 February 2008 (07-02-2008)
		CA116699S	28 November 2007 (28-11-2007)
		CA117957S	26 March 2008 (26-03-2008)
		CA2609338A1	26 July 2007 (26-07-2007)
		USD535676S1	23 January 2007 (23-01-2007)
		USD536011S1	30 January 2007 (30-01-2007)
		USD536012S1	30 January 2007 (30-01-2007)
		USD536016S1	30 January 2007 (30-01-2007)
		USD536360S1	06 February 2007 (06-02-2007)
		USD545784S1	03 July 2007 (03-07-2007)
		USD577050S1	16 September 2008 (16-09-2008)
		US7245207B1	17 July 2007 (17-07-2007)
		US2007171032A1	26 July 2007 (26-07-2007)
		US2013033599A1	07 February 2013 (07-02-2013)
		US2015353026A1	10 December 2015 (10-12-2015)
		WO2007084990A2	26 July 2007 (26-07-2007)
		WO2007084990A3	22 May 2008 (22-05-2008)
		WO2008036965A2	27 March 2008 (27-03-2008)
		WO2008036965A3	03 July 2008 (03-07-2008)
US2006098094A1	11 May 2006 (11-05-2006)	None	
US2012109406A1	03 May 2012 (03-05-2012)	US2012109406A1	03 May 2012 (03-05-2012)
		US9215124B2	15 December 2015 (15-12-2015)
		CN103354991A	16 October 2013 (16-10-2013)
		CN103354991B	10 February 2016 (10-02-2016)
		CN105635981A	01 June 2016 (01-06-2016)
		EP2636204A2	11 September 2013 (11-09-2013)
		KR20130086363A	01 August 2013 (01-08-2013)
		KR101462551B1	18 November 2014 (18-11-2014)
		US2012106446A1	03 May 2012 (03-05-2012)
		US8467324B2	18 June 2013 (18-06-2013)
		US2012106526A1	03 May 2012 (03-05-2012)
		US8493981B2	23 July 2013 (23-07-2013)
		US2012106447A1	03 May 2012 (03-05-2012)
		US8582579B2	12 November 2013 (12-11-2013)
		US2012106350A1	03 May 2012 (03-05-2012)
		US8718054B2	06 May 2014 (06-05-2014)
		US2012109407A1	03 May 2012 (03-05-2012)
		US8731773B2	20 May 2014 (20-05-2014)
		US2012106549A1	03 May 2012 (03-05-2012)
		US8750306B2	10 June 2014 (10-06-2014)
		US2012106565A1	03 May 2012 (03-05-2012)
		US8750319B2	10 June 2014 (10-06-2014)
		US2012106448A1	03 May 2012 (03-05-2012)
		US8804734B2	12 August 2014 (12-08-2014)
		US2012110356A1	03 May 2012 (03-05-2012)
		US8806242B2	12 August 2014 (12-08-2014)
		US2012106544A1	03 May 2012 (03-05-2012)
		US8929198B2	06 January 2015 (06-01-2015)
		US2012106469A1	03 May 2012 (03-05-2012)
		US8976744B2	10 March 2015 (10-03-2015)
		US2012106551A1	03 May 2012 (03-05-2012)
		US9031073B2	12 May 2015 (12-05-2015)
		US2012109446A1	03 May 2012 (03-05-2012)
		US9077586B2	07 July 2015 (07-07-2015)

		US20121 09446A1	03 May 2012 (03-05-2012)
		US9077586B2	07 July 201 5 (07-07-201 5)
		US201 2 106537A1	03 May 2012 (03-05-2012)
		US9088454B2	21 July 201 5 (21-07-201 5)
		US201 2 106550A1	03 May 2012 (03-05-2012)
		US9143384B2	22 September 201 5 (22-09-201 5)
		US201 4036922A1	06 February 201 4 (06-02-2014)
		US9225581 B2	9 December 201 5 (29-1 2-2015)
		US201 516381 9A1	11 June 201 5 (11-06-201 5)
		US92581 73B2	09 February 201 6 (09-02-2016)
		US201 3279500A1	24 October 201 3 (24-1 0-201 3)
		US9276801 B2	01 March 2016 (01-03-201 6)
		US201 4226589A1	14 August 2014 (14-08-2014)
		US9332261 B2	03 May 2016 (03-05-2016)
		US201 421 1803A1	31 July 201 4 (31-07-201 4)
		US941 4070B2	09 August 2016 (09-08-2016)
		US201 2 105637A1	03 May 2012 (03-05-2012)
		US201 2 106653A1	03 May 2012 (03-05-2012)
		US201 2 109447A1	03 May 2012 (03-05-2012)
		US201 2 173900A1	05 July 201 2 (05-07-201 2)
		US201 2 173905A1	05 July 201 2 (05-07-201 2)
		US201 3250933A1	26 September 201 3 (26-09-201 3)
		US201 5326488A1	12 November 201 5 (12-1 1-201 5)
		US201 5365664A1	17 December 201 5 (17-12-201 5)
		US201 5373583A1	24 December 201 5 (24-12-201 5)
		US201 601 6523A1	21 January 201 6 (21-01-2016)
		US201 6 134562A1	12 May 2016 (12-05-2016)
		US201 6198485A1	07 July 201 6 (07-07-201 6)
		WO2012061625A2	10 May 2012 (10-05-2012)
		WO2012061625A3	26 July 201 2 (26-07-201 2)
US201 5312572A1	29 October 201 5 (29-1 0-201 5)	US201 5312572A1	29 October 201 5 (29-1 0-201 5)
		US91 06887B1	11 August 2015 (11-08-201 5)
US2007219686A1	20 September 2007 (20-09-2007)	US2007219686A1	20 September 2007 (20-09-2007)
		US9201 842B2	01 December 201 5 (01-12-201 5)
		EP2002329A2	17 December 2008 (17-12-2008)
		EP2002329A4	20 January 201 0 (20-01-201 0)
		US201 331 771 1A1	28 November 201 3 (28-11-201 3)
		US9208129B2	08 December 201 5 (08-12-201 5)
		US201 531 7846A1	05 November 201 5 (05-11-201 5)
		US201 6057342A1	25 February 201 6 (25-02-2016)
		US201 60681 05A1	10 March 2016 (10-03-201 6)
		WO20071 0901 0A2	27 September 2007 (27-09-2007)
		WO20071 0901 0A3	25 September 2008 (25-09-2008)
US201 3321629A1	05 December 201 3 (05-12-201 3)	US201 3321629A1	05 December 201 3 (05-12-201 3)
		CN103448634A	18 December 201 3 (18-12-201 3)
		CN103448634B	28 October 201 5 (28-1 0-201 5)
		DE1 0201 320941 5A1	05 December 201 3 (05-12-201 3)