Apple Inc. v. Samsung Electronics Co. Ltd. et al Doc. 925 Att. 8

EXHIBIT 3

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US007577460B2

(12) **United States Patent**
Kim et al.

(10) **Patent No.: US 7,577,460 B2**
(45) **Date of Patent: Aug. 18, 2009**

(54) **PORTABLE COMPOSITE COMMUNICATION TERMINAL FOR TRANSMITTING/RECEIVING AND IMAGES, AND OPERATION METHOD AND COMMUNICATION SYSTEM THEREOF**

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(73) Assignee: **Samsung Electronics Co., Ltd** (KR)

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(22) Filed: **Jul. 26, 2006**

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(62) Division of application No. 11/003,222, filed on Dec. 3, 2004, which is a division of application No. 09/540,830, filed on Mar. 31, 2000, now Pat. No. 7,139,014.

(30) **Foreign Application Priority Data**

Mar. 31, 1999 (KR) 1999-11179

(51) **Int. Cl.**
H04M 11/00 (2006.01)
H04N 7/14 (2006.01)

(52) **U.S. Cl.** **455/556.1**; 455/556.2; 455/575.1; 348/14.02

(58) **Field of Classification Search** 455/556.1, 455/556.2, 550.1, 575.1, 575.3, 575.4, 412.1; 348/14.01, 14.02, 14.09, 14.11–14.16; 379/93.24, 379/90.01; 709/204, 206

See application file for complete search history.

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(57) **ABSTRACT**

A method of operating a portable composite communication terminal the functions as both a portable phone and a camera. The method includes: setting a portable phone mode by turning on the portable composite communication terminal, regulating voltage supporting components of the portable phone mode, and performing a general portable phone function; setting a camera mode by turning on the camera in said portable phone mode upon user request for camera operation, said user request being input through a camera mode switch and processed by the controller, regulating voltage supporting components of the camera mode, and performing a camera function; capturing the image of an object upon user request for a photograph in the camera mode; and displaying a captured image stored in a camera memory of the portable composite communication terminal on a display of the portable composite communication terminal upon user request for displaying the image.

1 Claim, 10 Drawing Sheets

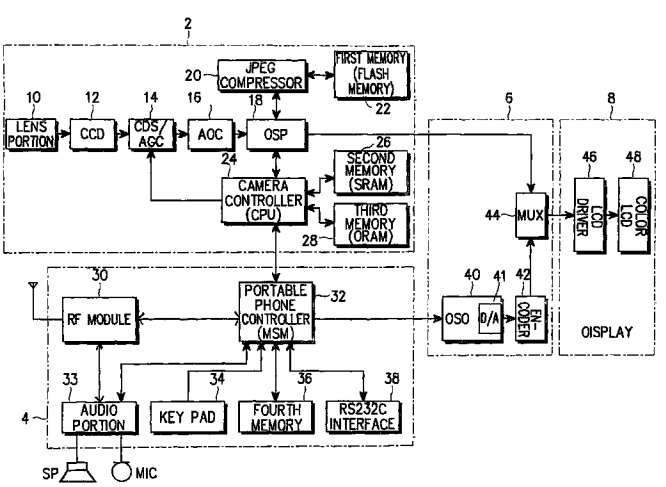

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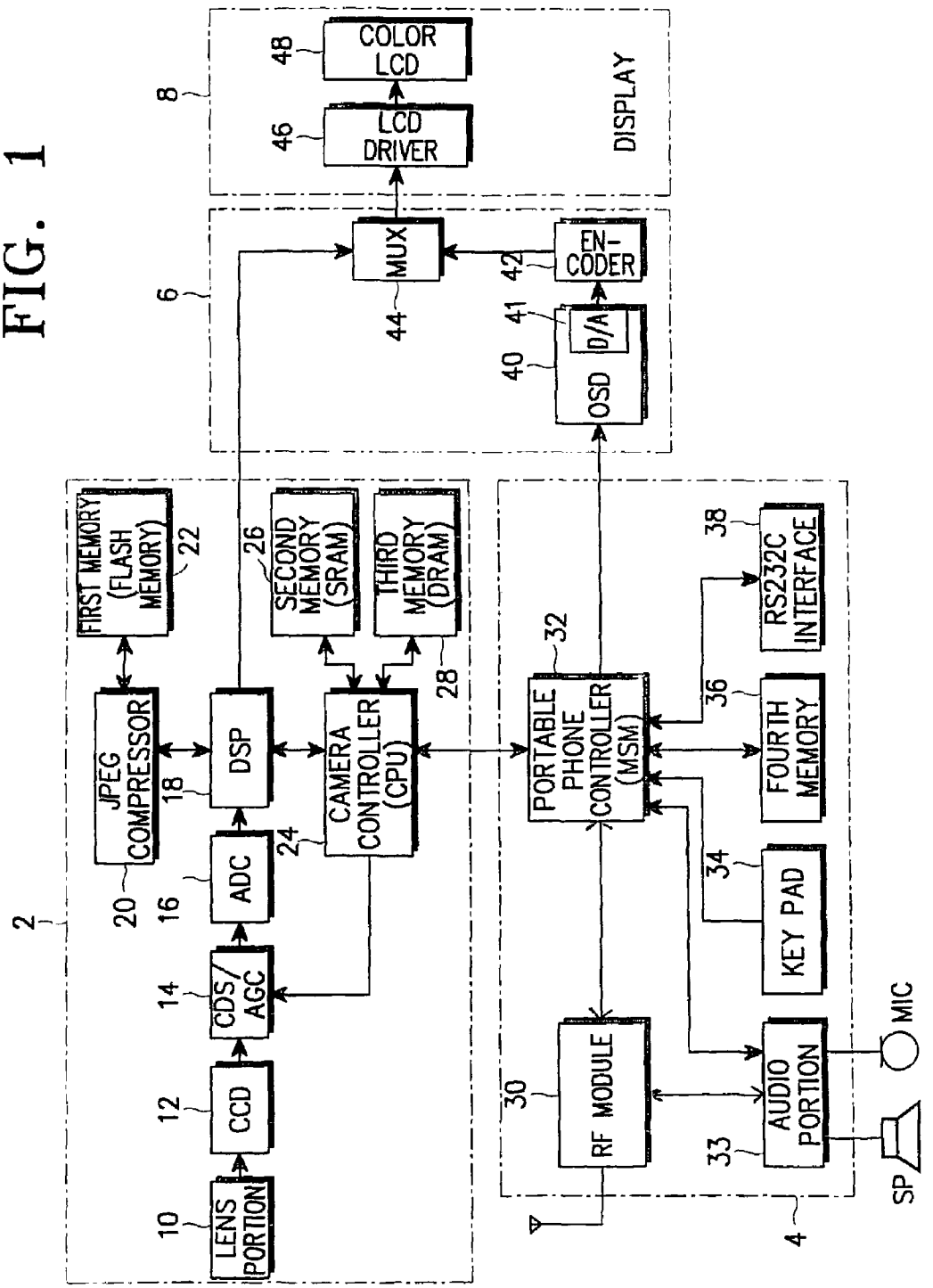
FIG. 1


DISPLAY
COLOR LCD
LCD DRIVER
MUX
EN-CODER
D/A
OSD
FIRST MEMORY (FLASH MEMORY)
SECOND MEMORY (SRAM)
THIRD MEMORY (DRAM)
JPEG COMPRESSOR
DSP
CAMERA CONTROLLER (CPU)
ADC
CDS/AGC
CCD
LENS PORTION
PORTABLE PHONE CONTROLLER (MSM)
RS232C INTERFACE
FOURTH MEMORY
KEY PAD
RF MODULE
AUDIO PORTION
MIC
SP
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
33
34
36
38
40
41
42
44
46
48

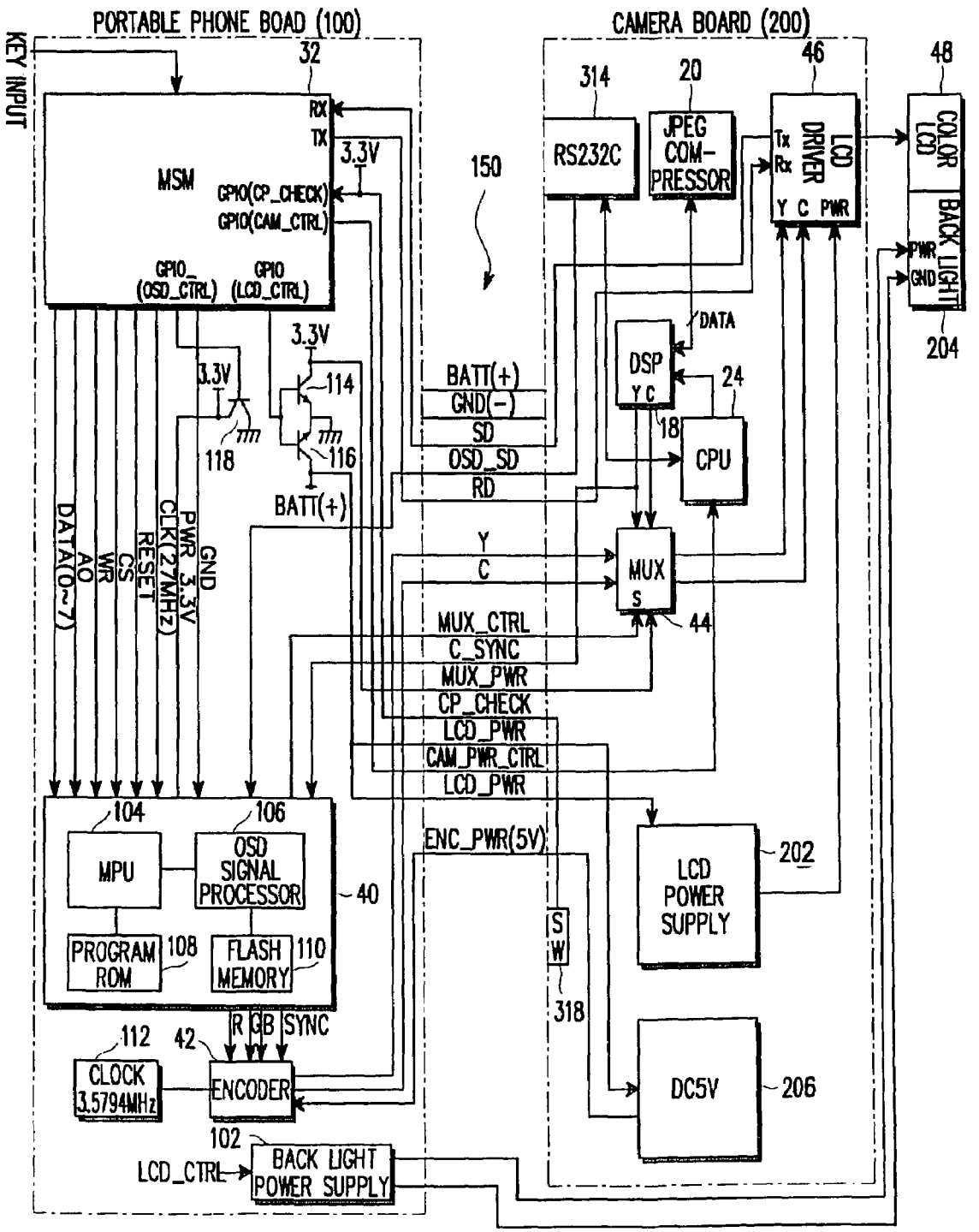
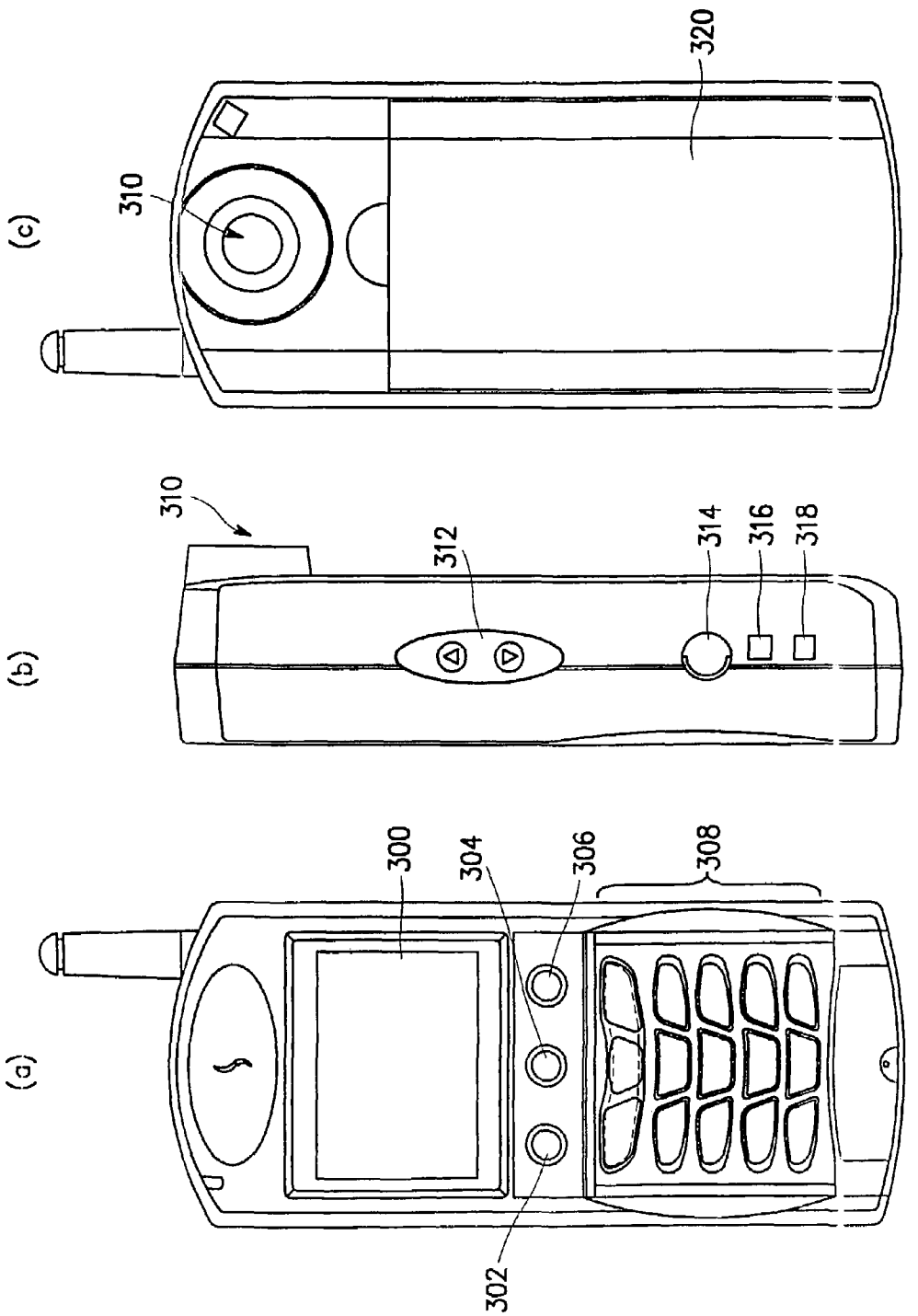

PORTABLE PHONE BOAD (100)
CAMERA BOARD (200)
KEY INPUT
32
MSM
RX
TX
3.3V
GPIO(CP_CHECK)
GPIO(CAM_CTRL)
GPIO_ (OSD_CTRL)
GPIO (LCD_CTRL)
150
314
RS232C
20
JPEG COM-PRESSOR
46
LCD DRIVER
Tx
Rx
Y C PWR
48
COLOR LCD
BACK LIGHT
PWR
GND
204
DATA
DSP
Y C
24
18
CPU
114
116
118
BATT(+)
GND(-)
SD
OSD_SD
RD
Y
C
MUX
S
44
MUX_CTRL
C_SYNC
MUX_PWR
CP_CHECK
LCD_PWR
CAM_PWR_CTRL
LCD_PWR
ENC_PWR(5V)
AO
WR
CS
RESET
CLK(27MHz)
PWR 3.3V
GND
DATA(0~7)
104
106
MPU
OSD SIGNAL PROCESSOR
40
PROGRAM ROM
108
FLASH MEMORY
110
R GB SYNC
112
42
CLOCK 3.5794MHz
ENCODER
102
LCD_CTRL
BACK LIGHT POWER SUPPLY
LCD POWER SUPPLY
202
S W
318
DC5V
206

FIG. 2

FIG. 3



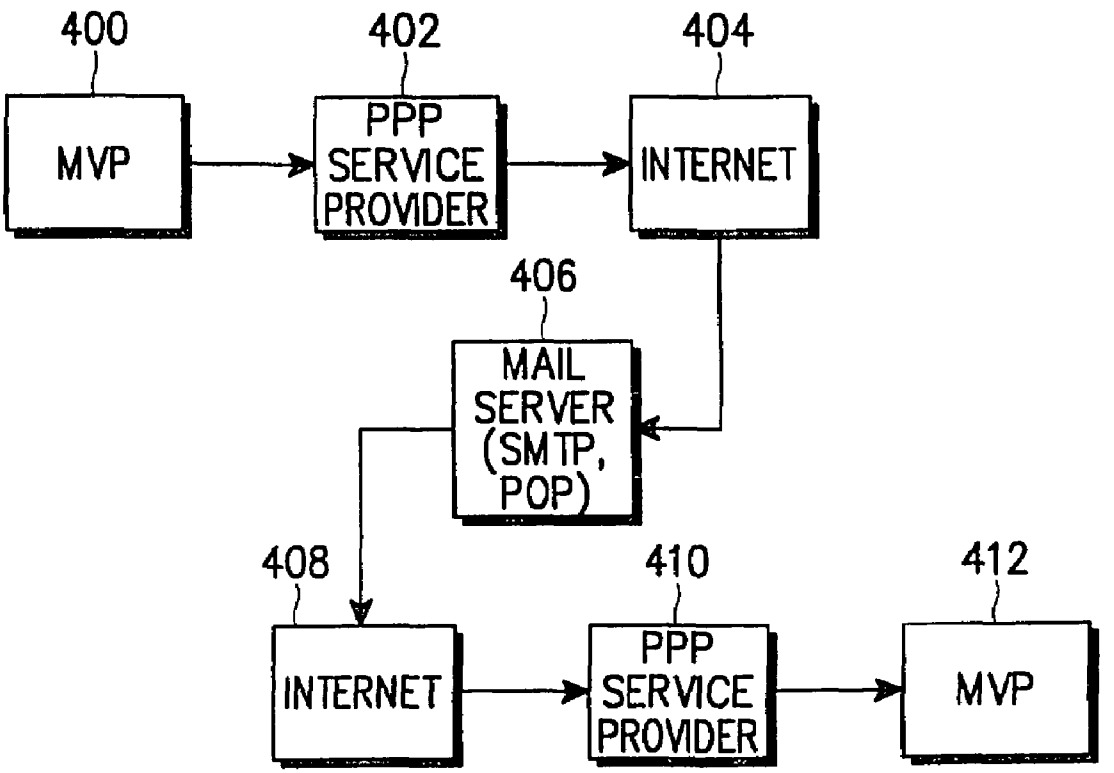

400
MVP
402
PPP SERVICE PROVIDER
404
INTERNET
406
MAIL SERVER (SMTP, POP)
408
INTERNET
410
PPP SERVICE PROVIDER
412
MVP

FIG. 4

FIG. 5

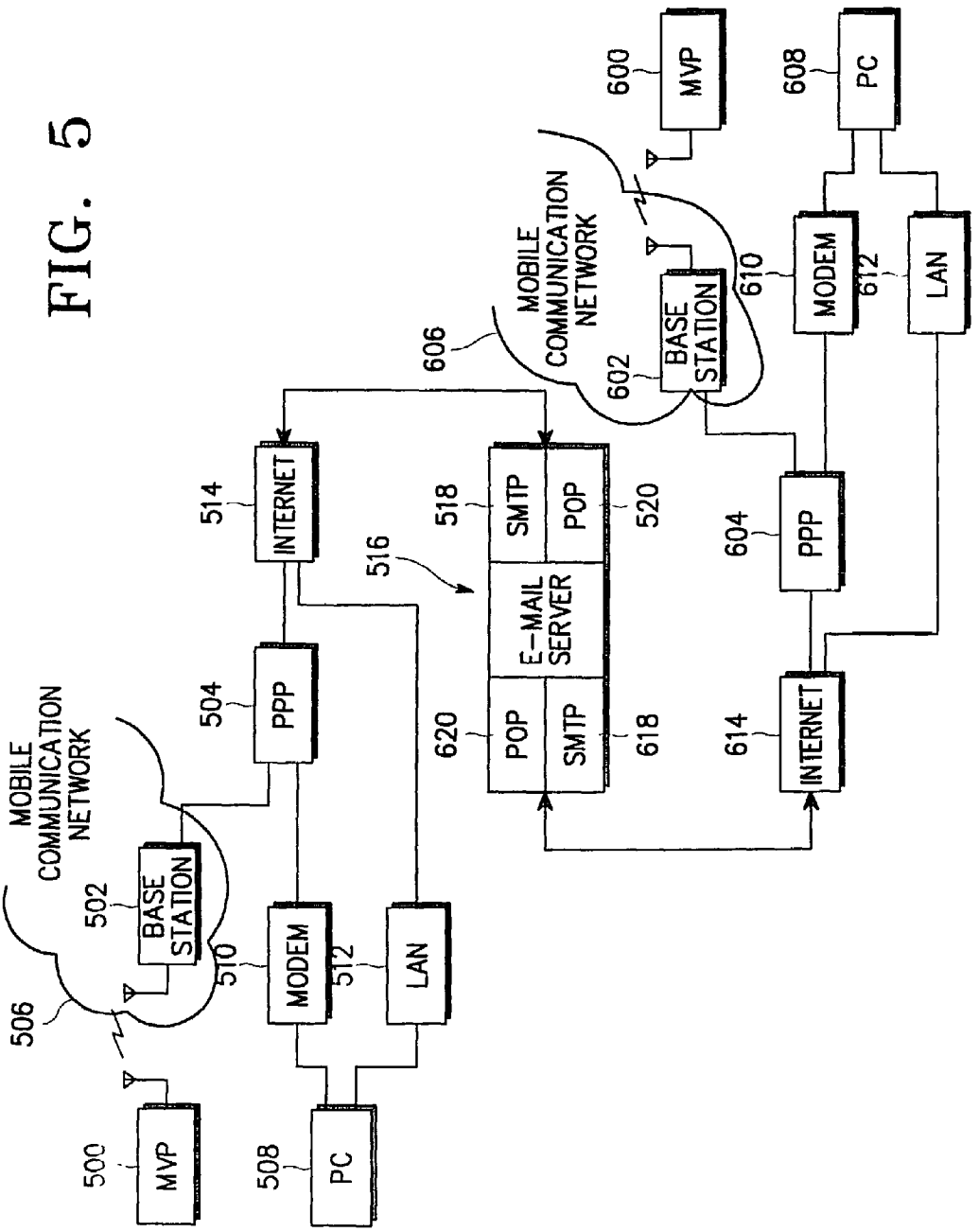
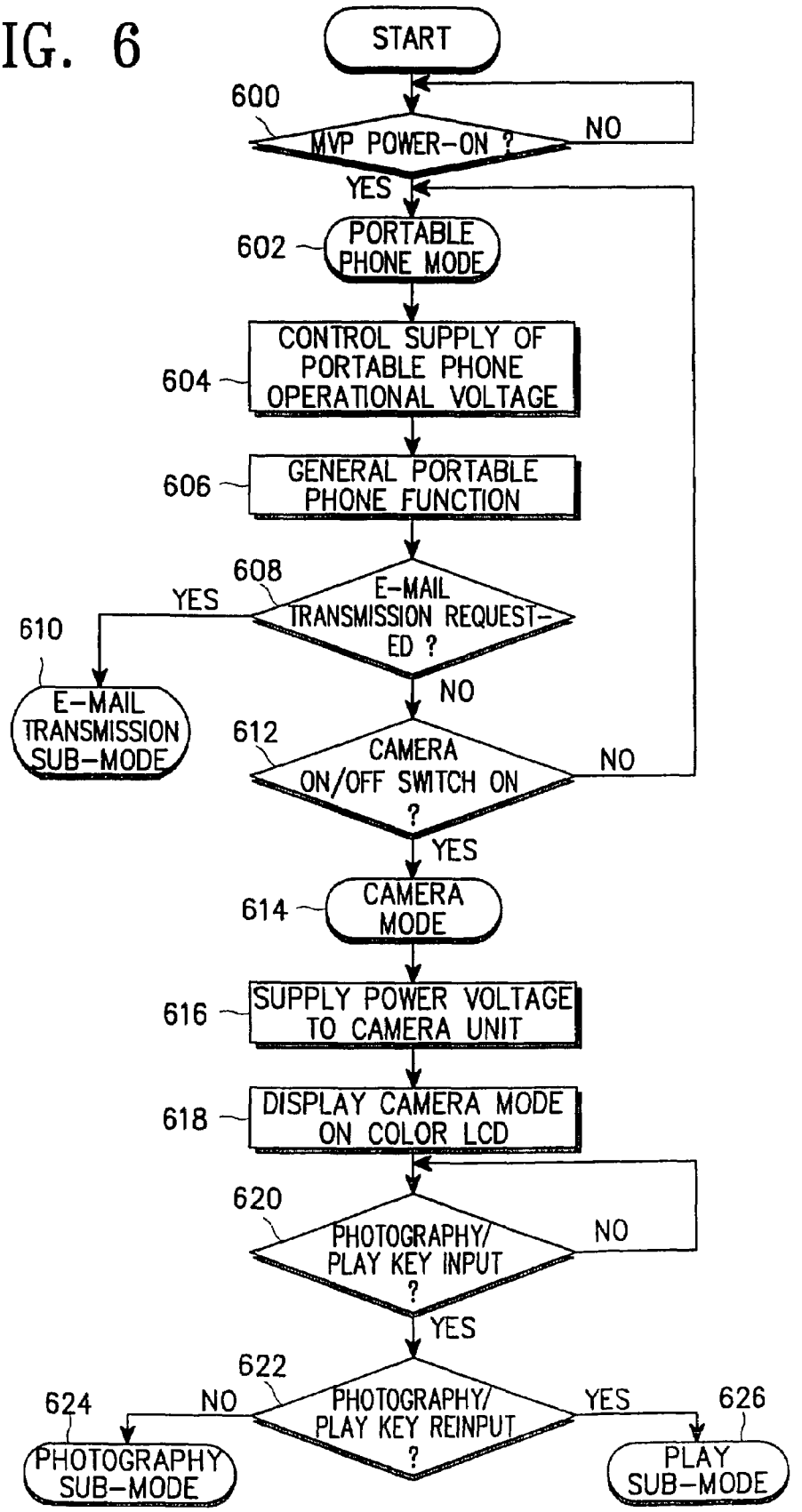

MOBILE COMMUNICATION NETWORK
BASE STATION
MODEM
LAN
MVP
PC
PPP
INTERNET
E-MAIL SERVER
SMTP
POP
500
502
504
506
508
510
512
514
516
518
520
600
602
604
606
608
610
612
614
618
620

FIG. 6


START
600
MVP POWER-ON ?
NO
YES
602
PORTABLE PHONE MODE
604
CONTROL SUPPLY OF PORTABLE PHONE OPERATIONAL VOLTAGE
606
GENERAL PORTABLE PHONE FUNCTION
608
E-MAIL TRANSMISSION REQUEST-ED ?
YES
610
E-MAIL TRANSMISSION SUB-MODE
NO
612
CAMERA ON/OFF SWITCH ON ?
NO
YES
614
CAMERA MODE
616
SUPPLY POWER VOLTAGE TO CAMERA UNIT
618
DISPLAY CAMERA MODE ON COLOR LCD
620
PHOTOGRAPHY/ PLAY KEY INPUT ?
NO
YES
622
PHOTOGRAPHY/ PLAY KEY REINPUT ?
624
NO
PHOTOGRAPHY SUB-MODE
YES
626
PLAY SUB-MODE

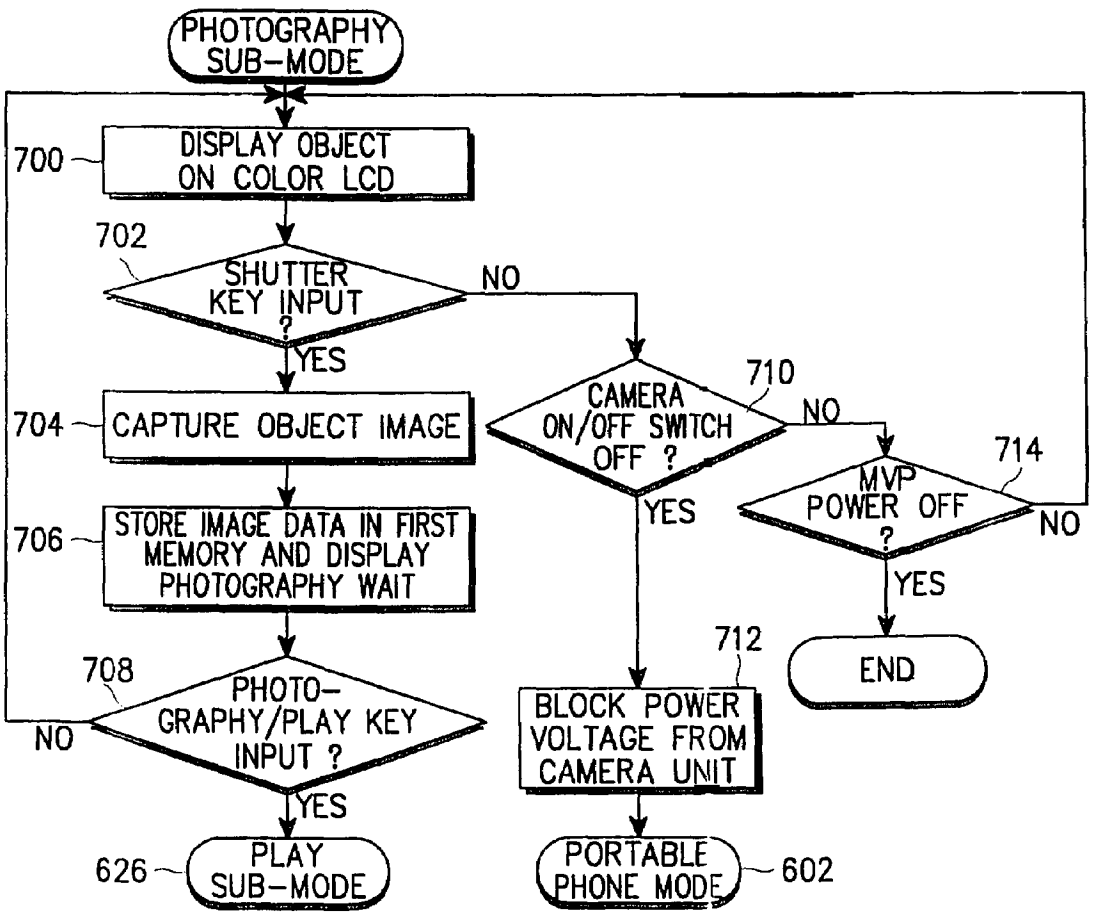

PHOTOGRAPHY SUB-MODE
700
DISPLAY OBJECT ON COLOR LCD
702
SHUTTER KEY INPUT ?
NO
YES
704
CAPTURE OBJECT IMAGE
706
STORE IMAGE DATA IN FIRST MEMORY AND DISPLAY PHOTOGRAPHY WAIT
708
PHOTO-GRAPHY/PLAY KEY INPUT ?
NO
YES
626
PLAY SUB-MODE
710
CAMERA ON/OFF SWITCH OFF ?
NO
YES
714
MVP POWER OFF ?
NO
YES
END
712
BLOCK POWER VOLTAGE FROM CAMERA UNIT
PORTABLE PHONE MODE
602

FIG. 7

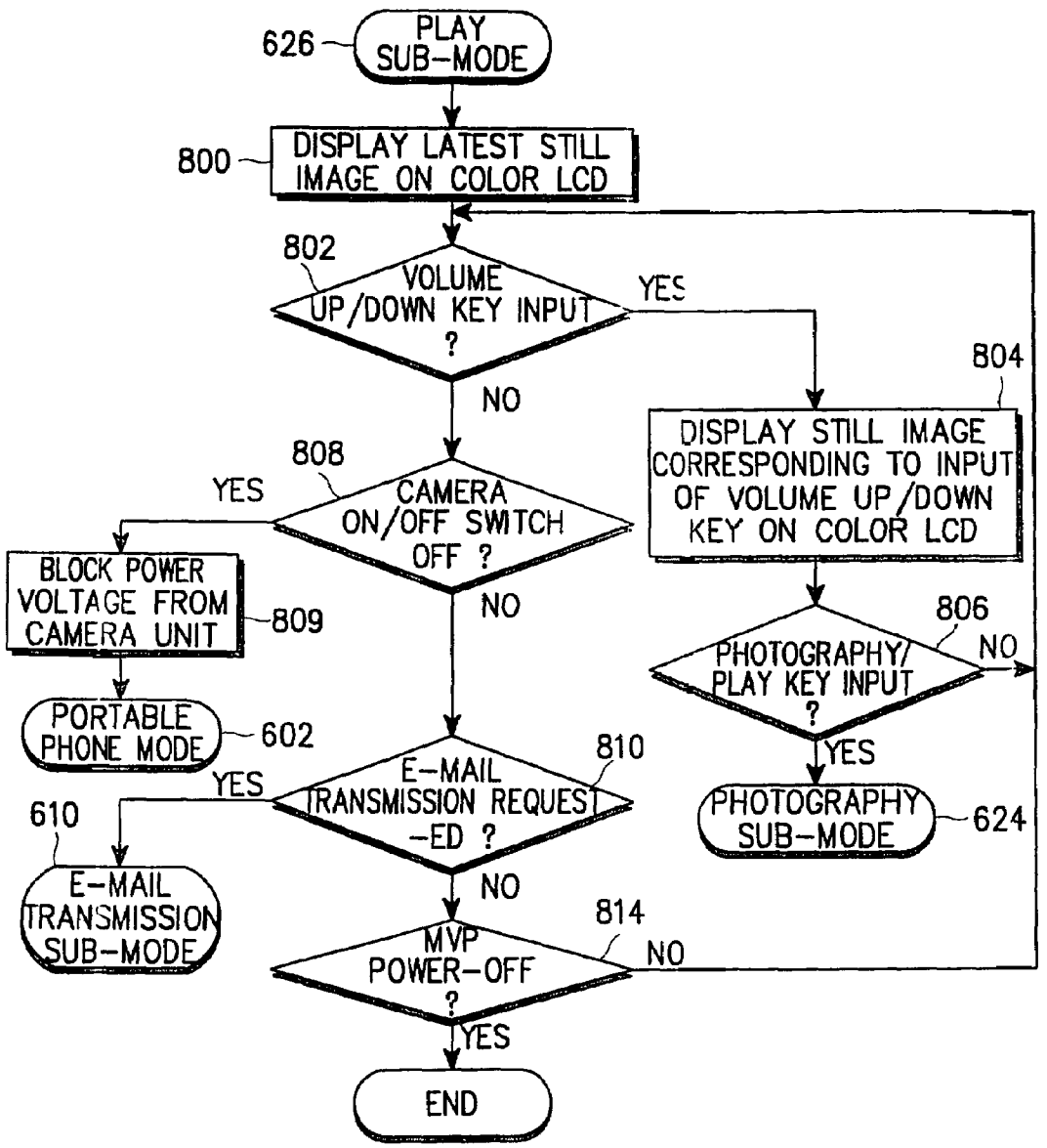

626
PLAY SUB-MODE
800
DISPLAY LATEST STILL IMAGE ON COLOR LCD
802
VOLUME UP/DOWN KEY INPUT ?
YES
NO
804
DISPLAY STILL IMAGE CORRESPONDING TO INPUT OF VOLUME UP/DOWN KEY ON COLOR LCD
808
CAMERA ON/OFF SWITCH OFF ?
YES
NO
BLOCK POWER VOLTAGE FROM CAMERA UNIT
809
806
PHOTOGRAPHY/ PLAY KEY INPUT ?
NO
YES
PORTABLE PHONE MODE
602
810
E-MAIL TRANSMISSION REQUEST -ED ?
YES
NO
610
E-MAIL TRANSMISSION SUB-MODE
PHOTOGRAPHY SUB-MODE
624
814
MVP POWER-OFF ?
NO
YES
END

FIG. 8

FIG. 9

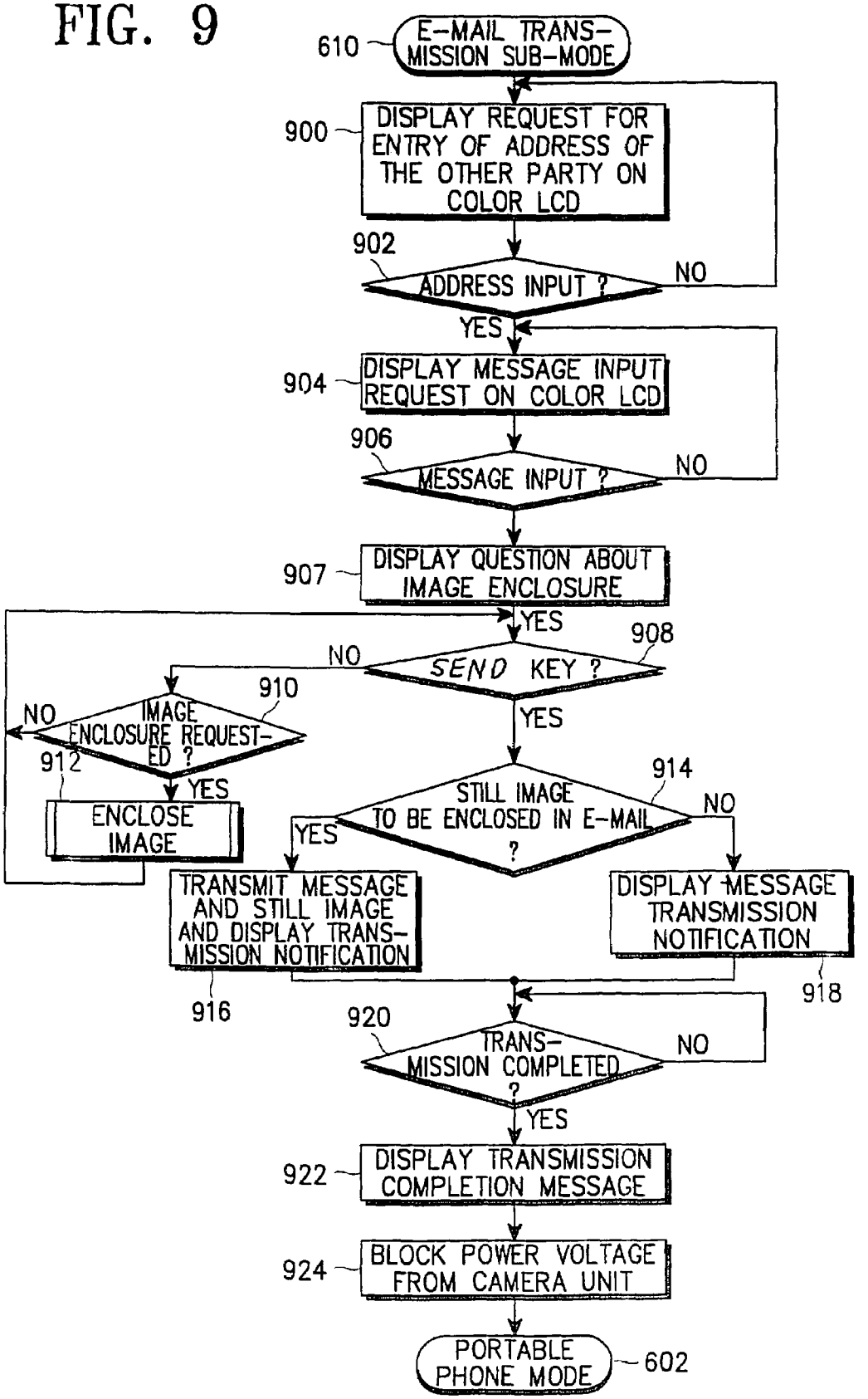
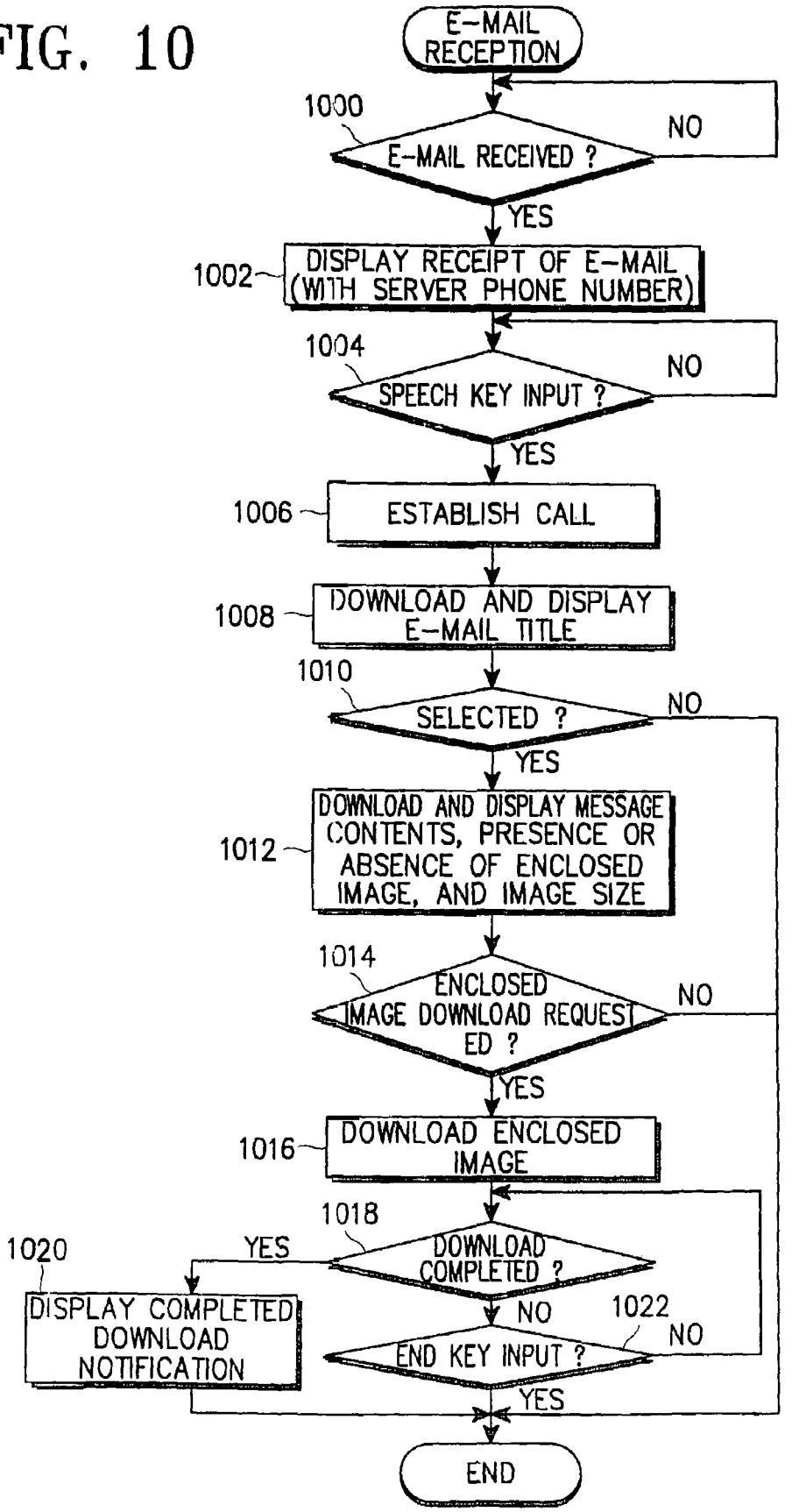

610
E-MAIL TRANSMISSION SUB-MODE
900
DISPLAY REQUEST FOR ENTRY OF ADDRESS OF THE OTHER PARTY ON COLOR LCD
902
ADDRESS INPUT ?
NO
YES
904
DISPLAY MESSAGE INPUT REQUEST ON COLOR LCD
906
MESSAGE INPUT ?
NO
907
DISPLAY QUESTION ABOUT IMAGE ENCLOSURE
YES
908
SEND KEY ?
NO
910
IMAGE ENCLOSURE REQUESTED ?
NO
912
YES
ENCLOSE IMAGE
YES
914
STILL IMAGE TO BE ENCLOSED IN E-MAIL ?
NO
YES
TRANSMIT MESSAGE AND STILL IMAGE AND DISPLAY TRANSMISSION NOTIFICATION
916
DISPLAY MESSAGE TRANSMISSION NOTIFICATION
918
920
TRANSMISSION COMPLETED ?
NO
YES
922
DISPLAY TRANSMISSION COMPLETION MESSAGE
924
BLOCK POWER VOLTAGE FROM CAMERA UNIT
PORTABLE PHONE MODE
602

FIG. 10


E-MAIL RECEPTION
1000
E-MAIL RECEIVED ?
NO
YES
1002
DISPLAY RECEIPT OF E-MAIL (WITH SERVER PHONE NUMBER)
1004
SPEECH KEY INPUT ?
NO
YES
1006
ESTABLISH CALL
1008
DOWNLOAD AND DISPLAY E-MAIL TITLE
1010
SELECTED ?
NO
YES
1012
DOWNLOAD AND DISPLAY MESSAGE CONTENTS, PRESENCE OR ABSENCE OF ENCLOSED IMAGE, AND IMAGE SIZE
1014
ENCLOSED IMAGE DOWNLOAD REQUESTED ?
NO
YES
1016
DOWNLOAD ENCLOSED IMAGE
1018
DOWNLOAD COMPLETED ?
YES
1020
DISPLAY COMPLETED DOWNLOAD NOTIFICATION
NO
1022
END KEY INPUT ?
NO
YES
END

PORTABLE COMPOSITE COMMUNICATION TERMINAL FOR TRANSMITTING/RECEIVING AND IMAGES, AND OPERATION METHOD AND COMMUNICATION SYSTEM THEREOF

PRIORITY

This application is a Divisional Application of U.S. patent application Ser. No. 11/003,222, filed Dec. 3, 2004 which is a Divisional of U.S. patent application Ser. No. 09/540,830, filed Mar. 31, 2000 now U.S. Pat. No. 7,139,014 which claims priority to an application entitled "Portable Composite Communication Terminal for Transmitting/Receiving Voice and Images, and Operation Method and Communication System Thereof" filed in the Korean Industrial Property Office on Mar. 31, 1999 and assigned Ser. No. 1999-11179, the contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to the field of wireless communications, and in particular, to a portable composite communication terminal for transmitting/receiving voice and images and a communication method and system thereof.

2. Description of the Related Art

With the rapid development of information in society, there is an increasing demand for a composite communication terminal having functions in addition to a communication terminal solely for voice transmission. Currently, mobile phones can transmit voice and text messages between the mobile phone and a base station. In addition, there exist digital cameras, which can take and store images digitally. However, there are no devices, which can take digital images and transmit them to another device. Therefore, there exists a need for a device, which can take digital images and transmit them to another device. A mobile video phone (MVP), according to the present invention, can provide voice and image transmission services that will meet the demands of users in the multimedia era. The MVP is equipped with a digital camera function in addition to the functions of a typical portable communication terminal (e.g., portable phone). A user can therefore photograph an object or images as needed in business and store the photographs in the device. The MVP may also function as a radio transmitter and therefore the user can transmit/receive a desired image without logging into a personal computer (PC).

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a portable composite communication terminal, which can transmit/receive voice and images.

It is another object of the present invention to provide a communication method and system for a portable composite communication terminal, which can transmit/receive voice and images.

These and other objects are achieved by providing a communication system for voice communication and image transmission/reception. The communication system includes a portable composite communication terminal, such as a mobile video phone (MVP), a mobile communication network, and a server. The portable composite communication terminal has a camera unit for digitally capturing the image of an object, constructing the image in a predetermined format, compressing the formatted image, and storing the compressed image in the camera memory under a predetermined camera control, a portable phone unit for providing overall control to the mobile video phone and selectively performing voice communication and image transmission/reception according to a selected transmission mode among predetermined modes, a display for displaying images and characters under the control of the portable phone unit, and an interface unit for interfacing between the portable phone unit and the display to display images and characters on the display under the control of the portable phone unit. The mobile communication network transmits/receives voice and images to/from the portable composite communication terminal. The server is connected to the mobile communication network and provides transmission/reception service of image data over the mobile communication network.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which:

FIG. **1** is a block diagram of a portable composite communication terminal for transmission of voice and images according to an embodiment of the present invention;

FIG. **2** is a schematic diagram of the portable composite communication terminal according to the embodiment of the present invention;

FIGS. **3**A, **3**B, and **3**C illustrate an external view of the portable composite communication terminal according to the embodiment of the present invention;

FIG. **4** is a block diagram of a system for transmission of image data and E-mail data between portable composite communication terminals according to the embodiment of the present invention;

FIG. **5** is a block diagram of a communication system in which the portable composite communication terminal can be used according to the embodiment of the present invention;

FIG. **6** is a flowchart depicting a control operation of the portable composite communication terminal in a portable phone mode and a camera mode according to the embodiment of the present invention;

FIG. **7** is a flowchart depicting a control operation of the portable composite communication terminal in a photography sub-mode of the camera mode according to the embodiment of the present invention;

FIG. **8** is a flowchart depicting an operation of the portable composite communication terminal in a play sub-mode of the camera mode according to the embodiment of the present invention;

FIG. **9** is a flowchart depicting a control operation for transmission of an E-mail message and image data in the portable composite communication terminal according to the embodiment of the present invention; and

FIG. **10** is a flowchart depicting a control operation for receipt of an E-mail message and image data in the portable composite communication terminal according to the embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention will be described hereinbelow with reference to the accompanying drawings. In the following description, well-known functions or constructions are not described in detail since they would obscure the invention in unnecessary detail.

FIG. **1** is a block diagram of a portable composite communication terminal (hereinafter, referred to as mobile video phone: MVP) capable of transmitting voice and images according to an embodiment of the present invention. The MVP includes a camera unit **2** for capturing the image of an object, a portable phone unit **4** for transmitting/receiving voice or images, a display **8** for displaying images and characters, and an interface unit **6** for interfacing between the portable phone unit **4** and the display **8**.

The camera unit **2** can be configured out of a digital still video camera in the MVP of FIG. **1**. The structure and operation of the MVP according to the embodiment of the present invention will be described hereinbelow.

An image captured from an object is applied to a CCD (Charge Coupled Device) **12** through a lens portion **10**. The lens portion **10** may include a zoom lens, a focus lens, and an iris, which are usually used for a digital still video camera. The lens portion **10** is simplified to enable a user to carry the MVP with more convenience in accordance with the embodiment of the present invention. Specifically, mechanical devices and circuits like the zoom lens, a zoom lens driver, and an iris driver are omitted. The iris is used with a iris aperture size fixed to a predetermined degree due to the absence of the iris driver. However, the lens portion **10** can include all or some of the components of a typical lens portion including the zoom lens, the focus lens, the iris, and their drivers, as needed.

The CCD **12** converts an optical signal of the object that passes through the lens portion **10** to an electrical signal (captured image signal) and a CDS/AGC (Correlated Double Sampling/Automatic Gain Control) **14** correlated-double samples the captured image signal and controls the gain of the captured image signal. Noise produced in the CCD **12** is removed from the captured image signal by the correlated double sampling in the CDS/AGC **14**. The CCD **12** and the CDS/AGC **14** can be configured on typical CMOS (Complementary Metal Oxide Semiconductor) sensor chips. An ADC (Analog-to-Digital Converter) **16** converts the gain-controlled image signal of one field received from the CDS/AGC **14** to a digital signal. A DSP (Digital Signal Processor) **18** processes the digital signal received from the ADC **16** into an Y, C image signal of an NTSC (National Television System Committee) or PAL (Phase Alternation by Line) format. The DSP **18** feeds the Y, C image signal to a JPEG (Joint Picture Expert Group) compressor **20** or the display **8** for displaying the Y, C image signal on a color graphic LCD (Liquid Crystal Display) **48** (hereinafter, referred to as a color LCD **48**), under the control of a portable phone controller **32**. Components Y and C of the Y, C image signal are a luminance signal and a chrominance signal, respectively.

For the DSP **18** to store the Y, C image signal in a first memory **22** through the JPEG compressor **20** or feed the Y, C image signal to the display **8**, an object is captured as a still image upon the user pressing a shutter key of the MVP in a camera mode. The DSP **18** applies the captured Y, C image signal to the first memory **22** through the JPEG compressor **20**. On the other hand, if the shutter key is not entered in the camera mode, the DSP **18** temporarily stores the Y, C image signal in a third memory **28** through a camera controller **24** and then the stored Y, C image signal is displayed on the color LCD **48** through the camera controller **24**, the DSP **18**, a selector **44**, and an LCD driver **46**. The user can view the object in the viewfinder of the MVP on the color LCD **48**.

The JPEG compressor **20** converts the captured Y, C image signal received from the DSP **18** to a JEPG formatted image signal and compresses the JEPG-formatted image signal to a predetermined size, under the control of the camera controller **24**. Then, the first memory **22** stores the compressed image signal. The JPEG compressor **20** also decompresses the compressed image stored in the first memory **22** and applies the decompressed image to the DSP **18**, under the control of the camera controller **24**. For example, the JPEG compressor **20** compresses a 640×480 VGA (Video Graphics Array) signal to its ⅛ size. The 640×480 image occupies about 300 Kbytes, one eighth of which is about 40 Kbytes. The first memory **22** is a flash memory, for storing the compressed image received from the JPEG compressor **20**. The capacity of the first memory **22** is adjusted according to the amount of captured image data, preferably to tens of pages (e.g., 50 pages) of captured images.

The camera controller **24** is a CPU (Central Processing Unit) and provides overall control to the camera unit **2**. Upon receipt of a signal corresponding to a key input through a key pad **34** under the control of the portable phone controller **32**, the camera controller **24** performs a corresponding operation. A second memory **26** connected to the camera controller **24** is usually an SRAM (Static Random Access Memory), for storing programs executed in the camera controller **24**. The third memory **28** connected to the camera controller **24** is usually a DRAM (Dynamic Random Access Memory), acting as a buffer for temporarily storing an image received through the camera lens.

Now, the structure and operation of the portable phone unit **4** in the MVP of FIG. **1** will be described. The portable phone controller **32** provides overall control to the portable phone unit **4**. The portable phone controller **32** operates the portable phone unit **4** or the camera unit **2** upon receipt of user key input, or stores an intended image received from the camera unit **2** in a fourth memory **36**. In addition, the portable phone controller **32** controls an OSD (On Screen Display) **40** of the interface unit **6** to display desired characters or a background image on the color LCD **48** of the display **8**. The portable phone controller **32** can be configured on an MSM (Mobile Station MODEM) chip of Qualcomm, for example.

The key pad **34** is provided with digit keys and function keys usually used in a typical portable phone, and keys necessary to photograph and play back images. Key data corresponding to user key input in the key pad **34** is applied to the portable phone controller **32**. The keys for photographing and playing back images include a photography/play key, a mode key for selecting a camera environment, a shutter key, an enter key for setting a camera environment selected by the mode key, and a switch for turning on/off a camera. Some of the keys in the portable phone are used in a camera mode.

FIGS. **3**A, **3**B, and **3**C are a frontal view, left side view, and rear view respectively of the MVP according to the embodiment of the present invention.

Arrangement of the keys in accordance with the embodiment of the present invention will be described referring to FIGS. **3**A and **3**B. Reference numeral **300** denotes a display window being a color LCD. The display window **300** is used as a view finder in a camera mode. Reference numeral **308** denotes the digit keys and the function keys provided to a typical portable phone. Keys **302**, **304**, and **306** above the keys **308** are used as a mode key, a shutter key, and an enter key, respectively, for photography and play. The mode key **302** selects a (partial or whole) delete function mode, a date function mode, a (fine or normal) display function mode, and a sensitivity function mode. The sensitivity of a still image is digitally controlled in the sensitivity function mode.

It is preferable that a flip (not shown in FIG. **3**A) of the MVP according to the embodiment of the present invention covers only the digit and function keys **308**, with the mode key **302**, the shutter key **304**, and the enter key **306** exposed

outward, so that a user can photograph and reproduce an image using the keys **302**, **304**, and **306** without opening the flip of the MVP.

Reference numeral **316** denotes a photography/play key on the left side of the MVP, and reference numeral **314** denotes an RS232C jack above the photography/play **316**, for a user to download a still image from a PC or upload a still image of the MVP to the PC. Reference numeral **312** denotes a volume up/down key for the portable phone. Upon user pressing the volume up/down key **312** in a play sub-mode of the camera mode, an image previous or next to a current image is displayed. Here, the play sub-mode refers to a mode for displaying a still image selected by the user among still images captured and stored on the color LCD **48**. Reference numeral **310** in FIGS. **3**A and **3**B denotes a camera lens. The camera lens **310** is disposed at an upper portion of the rear side of the MVP in accordance with the embodiment of the present invention. Under the camera lens **310** is located a battery **320**.

While the MVP is a flip type in FIGS. **3**A, **3**B, and **3**C, it can be of a folder type or any other type.

Returning to FIG. **1**, the fourth memory **36** connected to the portable phone controller **32** includes an EEPROM (Electrically Erasable and Programmable Read Only Memory), a flash ROM, and a RAM. Variables needed for executing programs are stored in the EEPROM, and data needed for controlling the portable phone is stored in the RAM. Operation programs, application programs, Internet protocols, radio link protocols, and CDMA (Code Division Multiple Access) protocols are mapped in the ROM. The application programs include programs for additional functions such as voice dialing, character recognition, PIM (Personal Information Management), and games, data functions such as browsing, E-mailing, and facsimile, and a user interface function such as GUI (Graphic User interface). The Internet protocols are a protocol for connecting the MVP to a PPP (Point to Point Protocol) server and a protocol used over an Internet. TCP/IP/PPP (Transmission Control Protocol/Internet Protocol/Point to Point Protocol) is an example of the Internet protocols. The radio link protocols include an IS-657 packet data communication protocol and an RLP (Radio Link Protocol). The RLP is a protocol for converting general data for use in a CDMA protocol and recovering the general data. The CDMA protocols are an IS-95A CDMA protocol for 800 MHz, a J-STD-008 CDMA protocol for 1.8 GHz, and an IS-95B protocol at 64-114 Kbps.

An area for storing part of user-intended data or images prior to radio transmission is reserved in the flash ROM, besides the programs and protocols. Though a large capacity buffer is required to store the entire page of images, the flash ROM of the fourth memory **36** assigns a small capacity buffer size, for example, of 600 bytes to store image data received by 512 byte units from the camera controller **24**.

An audio portion **33** converts an analog voice signal received through a microphone (MIC) to a radio signal and feeds the radio signal to an RF (Radio Frequency) module **30**, under the control of the portable phone controller **32**. The audio portion **33** also demodulates a radio signal received from the RF module **30** and outputs a voice signal through a speaker (SP), under the control of the portable phone controller **32**. The RF module **30** downconverts and demodulates an RF signal received through an antenna and outputs the demodulated signal to the audio portion **33**. The RF module **30** also modulates and upconverts a signal received from the audio portion **32** to an RF signal and wireless transmits the modulated signal through the antenna. A signal transmitted/received to/in the RF module **30** can be image and character data as well as a voice signal.

The RS232C interface **38** connected to the portable phone controller **32** is an interface for downloading/uploading a still image from/to a PC.

In FIG. **1**, the interface unit **6** has the OSD (On Screen Display) **40**, an encoder **42**, and the selector **44**.

The OSD **40** performs an OSD control operation for displaying characters or a background image downloaded from a PC on the color LCD **48** of the display **8**, and outputs an R, G, B image signal, for example, an 8-bit digital signal. The DAC (Digital to Analog Converter) **41** converts the digital R, G, B signal received from the OSD **40** to an analog signals, and the encoder **42** encodes the analog R, G, B signal to an NTSC or PAL Y, C signal. The selector **44** is an analog multiplexer (MUX), for selecting the external image Y, C signal received from the DSP **18** of the camera unit **2** or the OSD image Y, C signal received from the encoder **42** and feeding the selected image signals to the display **8**. The display **8** includes the LCD driver **46** and the color LCD and displays characters and images on the color LCD **48**.

FIG. **2** illustrates two boards, namely, a portable phone board **100** and a camera board **200** in which the components shown in FIG. **1** are separately arranged according to the embodiment of the present invention. Referring to FIG. **2**, while the RF module **30**, the audio portion **33**, the key pad **34**, and the fourth memory **36** of the portable phone unit **4** shown in FIG. **1** are not shown in the portable phone board **100** and the CCD **12**, the CDS/AGC **14**, the ADC **16**, the JPEG compressor **20**, and the first, second, and third memories **22**, **26**, and **28** of the camera unit **2** shown in FIG. **1** are not shown in the camera board **200**, it is to be noted that each board is provided with its corresponding components or circuit blocks.

Furthermore, it is also to be appreciated that a battery power voltage BATT(+) is 3.6V and an operational power ranges between 2.8 and 4.3V by way of example in FIG. **2**. A regulator outputs 3.3V or any other voltage for the input of the battery power voltage 3.6V, and a power voltage being tens of volts is supplied through a DC/DC converter.

Both the portable phone board **100** and the camera board **200** shown in FIG. **2** are provided with a DC/DC converter (not shown) so that the two boards can operate together or individually. A connection unit **150** having a plurality of lines connects the two boards **100** and **200**, for implementing a reliable operation and transmitting an operational command and images between boards **100** and **200**.

In accordance with the embodiment of the present invention, a battery power line Batt (+) is connected between a power supply of the portable phone board **100** and a power supply of the camera board **200** to use a battery of a conventional portable phone for both the portable phone board **100** and the camera board **200**. A ground line GND is connected between the boards **100** and **200** for stable operation. Data transmission and reception lines SD and RD are connected between the portable phone controller **32** and the camera controller **24** using UART (Universal Asynchronous Receiver/Transmitter) ports, for communicating commands and data between them. The portable phone controller **32** orders all operations of the camera unit **2**, including photography and reproduction, determines whether the ordered operations are performed reliably, and communicates image data for image transmission, through the data transmission and reception lines SD and RD. Key data related with camera operations received through the key pad **34** of FIG. **1** under the control of the portable phone controller **32** is applied to the camera controller **24** through the data transmission and reception lines SD and RD.

According to the embodiment of the present invention, the camera board **200** of the MVP includes a camera on/off switch **318** and an RS-232C jack **314** for downloading/uploading data from/to a PC. The camera on/off switch **318** has an end grounded and the other end connected to a line CP_CHECK that is in turn connected to a port GPIO (CP_CHECK) of the portable phone controller **24**. A power voltage 3.3V, for example, is connected to the line CP_CHECK through a resistor. A line CAM_PWR_CTRL is connected between a port GPIO(CAM_CTRL) of the portable phone controller **32** and the camera controller **24**, so that the portable phone controller **32** can sense a user pressing the camera on/off switch **318** through the line CP_CHECK, controls the camera controller **24** through the line CAM_PWR_CTRL, and thus turns on/off the camera unit **2**. Only a leakage current of several mili-amperes (mA) is applied to the camera unit **2** to prevent the misoperation of the camera controller **24** when the camera unit **2** turns off. When the user turns off the camera unit **2** with the camera on/off switch **318**, the camera controller **24** terminates the operation of the camera unit **2** by using the leakage current. The operations of circuits and mechanical devices in the camera unit **2** are controlled by the camera controller **24**, which is in turn controlled by the portable phone controller **32**.

Meanwhile, an LCD power supply **202** is provided to the camera board **200**, for supplying a power voltage to the LCD driver **46** and the color LCD **48**, and a back light power supply **102** is provided to the portable phone board **100**, for supplying a power voltage to an LCD back light **204**. The portable phone controller **32** controls the on/off state of LCD power supply **202** to reduce the power dissipation associated with the operation of the color LCD **48**. That is, a port GPIO (LCD_CRTL) on the portable phone controller **32** is connected to the bases of a first and a second transistor **114** and **116**. The first transistor **114** has a collector to which 3.3V is applied and an emitter grounded. A line MUX_PWR is connected between the collector of the first transistor **114** and the selector **44**, for supplying 3.3V to selector **44**. The second transistor **116** has a collector connected to the battery power voltage BATT(+) and an emitter connected to ground. A line LCD_PWR is connected between the collector of the second transistor **116** and the LCD power supply **202** and between the collector of the second transistor **116** and a DC (Direct Current) power supply **206**. Hence, the portable phone controller **32** can control the LCD power supply **202** and the DC power supply **206** by use of the port GPIO(LCD_CTRL). A line ENC_PWR connects the DC power supply **206** of the camera board **200** to the encoder **42** of the portable phone board **100**, for supplying a DC power voltage to the encoder **42**.

While the LCD driver **46**, the LCD power supply **202**, the selector **44**, and the DC power supply **206** are located on the camera board **200** in the embodiment of the present invention, they can be on the portable phone board **100** when necessary.

As shown in FIG. **2**, the OSD **40** in the interface unit **6** includes a main processing unit (MPU) **104**, an OSD signal processor **106**, a program ROM **108**, and a flash memory **110**. Each component block can be configured with a chip.

The MPU **104** provides overall control to the OSD **40**. The OSD signal processor **106** displays an intended character at a specific position of a current displayed still image on the color LCD **48** in synchronization with an external color sync signal C_Sync (included in the luminance signal Y) received from the DSP **18**, or displays only characters or a downloaded background image on the color LCD **48** in synchronization with an internal color sync signal C_Sync. Operation programs, fonts, and icons are mapped in the program ROM **108**, and a plurality of pages of background images downloaded from a PC are stored in the flash memory **110**.

The OSD signal processor **106** is preferably configured with an ASIC (Application Specific Integrated Circuit), and its structure and operation will be described in more detail below. Since a conventional method of displaying characters on a black and white character-type LCD does not apply to the color LCD **48** of the present invention, the OSG signal processor **106** converts intended characters and images to a form suitable for the color LCD **48** using data DATA **0-7**, address **A0**, a write signal WR, a chip select signal CS, and a reset signal RESET, for example, from an MSM chip of the conventional portable phone controller **32**. In order to convert the characters and images, the OSD signal processor **106** receives a clock signal CLK (e.g., 27 MHz) used in the MSM chip from the portable phone controller **32**. The portable phone controller **32** can turn on/off 3.3V supplied to the OSD **40** through an internal port GPIO(OSD_CTRL). That is, a third transistor **118** has a base connected the port GPIO(OSD_CTRL) of the MSM chip being the portable phone controller **32**, an emitter grounded, and a collector connected to the OSD signal processor **106** through a PWR 3.3V line. A power voltage 3.3V is applied to the collector of the third transistor **118**. Thus, the portable phone controller **32** can turn on/off 3.3V to/from the OSD **40** through the port**6** GPIO(OSD_CRL).

A line OSD_SD connects the RS232C jack **314** of the camera board **200** to the OSD signal processor, so that the user can download a desired still image from the PC utilizing the RSC232C jack **314** for use as a background on the color LCD **48**.

The OSD signal processor **106** operates under the control of the MPU **104** of the OSD **40** and outputs an R, G, B signal and a color sync signal C_Sync. The R, G, B signal is an 8-bit digital signal for representing 256 colors (R: 3 bits, G: 3 bits, and B: 2 bits).

Synchronization should be provided to the camera of the MVP in order to represent desired characters in an image, which is being photographed or played back. For this purpose, a line C_Sync is connected between the DSP **18** and the OSD signal processor **106**, so that the DSP **18** applies the external color sync signal C_Sync to the OSD signal processor **106** as a color sync signal for the current photographed or retrieved image data. The OSD signal processor **106**, synchronized to the external color sync signal C_Sync, controls a specific character in a predetermined area of an image displayed on the color LCD **48**.

The OSD signal processor **106** includes an internal sync signal generator (not shown). The internal sync signal generator generates the internal sync signal C_Sync for displaying a background image or characters on the color LCD **48** in a portable phone mode because the DSP **18** does not output the external sync signal C_Sync in the portable phone mode.

The D/A converter **41** of FIG. **1** converts the 8-bit digital R,G,B signal received from the OSD signal processor **106** to an analog signal. For the input of the analog R,G,B signal from DAC **41** and the color sync signal C_Sync from the OSD signal processor **106**, the encoder **42** outputs an OSD image Y,C signal in response to a clock signal at 3.5794 MHz received from the clock signal generator **112**.

3.3V are applied to the selector **44** through a line MUX_PWR. The line MUX_PWR is connected to the collector of the first transistor **114**, to which 3.3V is applied. The first transistor **114** has an emitter grounded and a base connected to a port GPIO(LCD_CRTL) of the portable phone controller

32. The portable phone controller **32** controls 3.3V to selectively be applied to the selector **44** through the port GPIO (LCD_CTRL).

The image Y, C signal output from the DSP **18** of the camera unit **2** or the image Y, C signal output from the encoder **42** is selectively fed to the display **8**. The OSD signal processor **106** controls the selection in the selector **44** through a line MUX_CTRL connected between the OSD signal processor **106** and the selector **44**. The OSD signal processor **106** controls the selector **44** to select the OSD image Y, C signal received from the encoder **42** through the line MUX_CTRL at the time when characters or a background image needs to be output.

A detailed description of a control operation in the MVP according to the embodiment of the present invention will be given in connection to FIGS. **1** to **6**. Referring now to FIG. **6**, there is shown a flowchart illustrating an operation control procedure in the MVP according to the embodiment of the present invention. When a user turns on the MVP in step **600**, the portable phone controller **32** enters a portable phone mode in step **602**. Then, the portable phone controller **32** controls a portable phone operational power voltage to be supplied in step **604**. That is, the power voltage is supplied to the portable phone unit **4**, the selector **44** of the interface unit **6**, and the display **8**. In step **606**, the portable phone controller **32** performs a function related with a typical portable phone. A power voltage is not supplied to the other circuits and device drivers of the camera unit **2** except for the camera controller **24** in the portable phone mode.

Referring back to FIG. **2**, for supply of the power voltage in the portable phone mode, the portable phone controller **32** controls the power voltage to be supplied to the LCD power supply **202**, the DC power supply **206**, the back light power supply **102**, and the selector **44** through the port GPIO(LCD_CTRL). Therefore, the power voltage is applied to the selector **44**, the LCD power supply **202** applies the power voltage to the LCD driver **46** and the color LCD **48**, the DC power supply **206** applies the power voltage to the encoder **42**, and the back light power supply **102** applies the power voltage to a back light **204**. The power voltage is also supplied (not shown) to the camera controller **24** of the camera unit **2**.

Upon request for E-mail transmission in the portable phone mode in step **608**, the portable phone controller **32** enters an E-mail transmission sub-mode in step **610**.

Meanwhile, when the camera function in the MVP is used, the user turns on the camera on/off switch **318** on the left side of the MVP. The portable phone controller **32** senses the on-state of the camera on/off switch **318** in step **612** and enters a camera mode in step **614**. Then, the portable phone controller **32** controls the camera controller **24** in order to supply a power voltage to the camera unit **2** in step **616** and controls the OSD **40** to display a message indicating the camera mode in graphics or characters on the color LCD **48** in step **618**.

If the user presses the photography/play key **316** on the left side of the MVP in the camera mode in step **620**, the portable phone controller **32** checks whether user presses the photography/play key **316** again in step **622**, if not, the controller **32** enters a photography sub-mode in step **624**. If the photography/play key **316** is entered for the second time, the portable phone controller **32** enters a play sub-mode in step **626**. Every time the user presses the photography/play key **316**, the photography sub-mode and the play sub-mode are toggled.

Referring to FIG. **7**, there is shown a flowchart illustrating a control operation in the MVP in a photography sub-mode of a camera mode. When the photography sub-mode is set in step **624** of FIG. **6**, the camera controller **24** controls an object in sight of the camera lens to be displayed on the color LCD **48** in step **700**. The object is temporarily stored in the third memory **28** through the lens portion **10**, the CCD **12**, the CDS/AGC **14**, the ADC **16**, the DSP **18**, and the camera controller **24** and then displayed on the color LCD **48** through the camera controller **24**, the DSP **18**, the selector **44**, and the LCD driver **46**.

The user views the intended object on the color LCD **48** acting as a view finder and presses the shutter key **306** on the frontal side of the MVP as shown in FIG. **3**A to capture the image of the object in step **702**. The portable phone controller **32** controls the camera controller **24** to photograph the object at the time point when the user presses the shutter key **306** in step **704**. Then, the portable phone controller **32** controls the camera controller **24** to store the captured image data in the first memory of the camera unit **2**, while controlling the OSD **40** to display a photography wait message on the color LCD **48**, in step **706**. Text characters "WAIT" can be an example of the photography wait message.

In step **708**, it is determined whether the photography/play key **316** is entered in the current photography sub-mode. In the absence of the input of the photography/play key **316**, the procedure returns to step **700**. Upon input of the photography/play key **316**, the photography sub-mode is toggled to the play sub-mode in step **626** of FIG. **6**.

Meanwhile, if the shutter key **316** is not entered in the photography sub-mode in step **702**, the portable phone controller **32** determines whether the camera on/off switch **318** is off in step **710**. In the off-state of the camera on/off switch **318**, the portable phone controller **32** controls the camera controller **24** to block a power voltage from the camera unit **2** in step **712** and returns to the portable phone mode in step **602** of FIG. **6**. On the contrary, in the on-state of the camera on/off switch **318**, the portable phone controller **32** determines in step **714** whether the MVP is powered-off. If the MVP is powered-off, the portable phone controller **32** ends the procedure, and otherwise, it returns to step **700** of FIG. **7**.

The control operation of the MVP in the play sub-mode of step **614** will be described in more detail referring to FIG. **8**. Referring to FIG. **8**, there is shown a flowchart illustrating a control operation in the MVP in a play sub-mode of the camera mode. The play sub-mode allows the user to view a captured image on the color LCD **48** and can be performed in the camera mode.

Upon selection of the play sub-mode, the portable phone controller **32** controls the camera controller **24** to display the latest captured still image on the color LCD **48** in step **800**. That is, the camera controller **24** reads out the last stored still image from the first memory and displays it on the color LCD under the control of the portable phone controller **32**.

Upon the pressing of the volume up/down key **312** in this situation, the portable phone controller **32** controls the camera controller **24** to display a captured still image on the color LCD **48** depending on the volume up/down input. For example, the next still image is displayed on the color LCD for the input of the volume-up key data and the previous still image is displayed on the color LCD **48** for the input of the volume-down key data.

The portable phone controller **32** determines whether the photography/play key has been entered in step **806**. Upon entry of the photography/play key **316**, the play sub-mode is toggled to the photography sub-mode in step **624** of FIG. **6** and otherwise, the portable phone controller **32** returns to step **802**.

If the volume up/down key **312** is not entered in step **802**, the portable phone controller **32** determines whether the camera on/off switch **318** is off in step **808**. In the off-state of the

camera on/off switch **318**, the portable phone controller **32** controls the camera controller **24** to block the power voltage from the camera unit **2** in step **809** and then returns to the portable phone mode in step **602**. In the on-state of the camera on/off switch **318**, the portable phone controller **32** determines whether an E-mail transmission has been requested from the user in step **810**. Upon user request for the E-mail transmission, the portable phone controller **32** returns to the E-mail transmission sub-mode in step **610**. By selecting the E-mail transmission sub-mode in the play sub-mode, the user can transmit an E-mail with a still image enclosed therein.

If the E-mail transmission sub-mode is not set in step **810**, the portable phone controller **32** determines whether the MVP is powered-off in step **814**. If the MVP is powered-off, the portable phone controller **32** ends the procedure, and otherwise, the portable phone controller **32** returns to step **802**.

In the E-mail transmission sub-mode, an E-mail is transmitted in accordance with the embodiment of the present invention. Before describing the transmission/reception of an E-mail message and image data in detail, a description of a communication system and network for transmission/reception of an E-mail message and image data will be presented referring to FIGS. **4** and **5**.

Referring to FIG. **4**, there is shown a concept view of the inter-MVP image data or E-mail transmitting system according to the embodiment of the present invention. An MVP **400** transmits an E-mail or image data to an E-mail server **406** through a PPP service provider **402** and an Internet **404**. The E-mail server **406** in turn transmits the received E-mail or image data to another MVP **412** through an Internet **408** and a PPP service provider **410**. The E-mail server **406** includes an SMTP (Sending Mail Transfer Protocol) server and a POP (Post Office Protocol) server for transmitting the E-mail and image data from the E-mail server **406**.

Referring now to FIG. **5**, there is shown a block diagram of a communication system for transmitting/receiving voice and image data using the MVP of the present invention. The communication system includes MVPs **500** and **600**, base stations **502** and **602** communicating with the MVPs **500** and **600**, PPP servers **504** and **604**, Internets **514** and **614** connected to the PPP servers **504** and **604**, an E-mail server **516** connected to the Internets **514** and **614**, PCs **508** and **608**, MODEMS **508** and **608** connected between the PCs **508** and **608** and the PPP servers **504** and **604**, and LANs (Local Area Networks) **512** and **612** connected between the PCs **508** and **608** and the Internets **514** and **614**. The base stations **502** and **602** belong to mobile communication networks **506** and **606**, and the E-mail server **516** includes SMTP servers **518** and **618** for receiving an E-mail and image data and POP servers **520** and **620** for transmitting an E-mail and image data.

An application program for E-mail is stored in the fourth memory **36** of the portable phone unit **4**, therefore, the MVP can perform an E-mail function without an extra connection to a computer. In accordance with the embodiment of the present invention, the data packet communication standard, IS-657 is applied for implementation of an E-mail function, and images are appended to the contents of an E-mail by a compression method as provided by the international still image compression standard, JPEG.

Transmission of image data and an E-mail will be described in detail with reference to FIGS. **1** to **5** and FIG. **9**. An MVP user can select an E-mail transmission sub-mode in a portable phone mode or in a play sub-mode of a camera mode. Referring to FIG. **9**, there is shown a flowchart illustrating a control operation for transmitting E-mail and image data in the MVP according to the embodiment of the present invention.

Upon selection of the E-mail transmission sub-mode, the portable phone controller **32** controls the OSD **40** to display a message requesting entry of the address of the other party on the color LCD **48** in step **900** of FIG. **9**. When the user enters the address of the other party through the key pad **34** in step **902**, the portable phone controller **32** requests entry of a message (title and contents) to the user through the color LCD **48** in step **904**. Upon user entry of the message in step **906**, the portable phone controller **32** displays a message asking whether an image is to be enclosed on the color LCD **48** in step **907**.

The user presses a key corresponding to image enclosure if he wants to enclose an image in the E-mail transmission sub-mode. Therefore, if the user directly presses a send key, this implies that no image is enclosed in the E-mail transmission sub-mode. In step **908**, the portable phone controller **32** determines whether the send key has been entered. Upon entry of the send key, the portable phone controller **32** proceeds to step **914**, and otherwise, the portable phone controller **32** determines whether the image enclosure key has been entered in step **910**. Upon user request for image enclosure in step **910**, the portable phone controller **32** performs a control operation to enclose an image in the E-mail in step **912**. The image enclosure operation is performed in steps **626**, **800**, **802**, and **804**. After step **912**, the portable phone controller **32** returns to step **908**.

Meanwhile, upon entry of the send key in step **908**, the portable phone controller **32** determines whether there is any still image to be enclosed in the E-mail. If the E-mail transmission sub-mode is selected in the play sub-mode of the camera mode, this implies that image data to be enclosed in the E-mail exists. If the image enclosure operation is implemented in the E-mail transmission sub-mode selected in the portable phone mode, as in step **912**, this implies that image data to be enclosed in the E-mail exists. However, if only the E-mail transmission sub-mode is selected in the portable phone mode, this implies that no image data enclosed in the E-mail exists.

In the presence of a still image to be enclosed in the E-mail in step **914**, the portable phone controller **32** transmits the received message (title and contents) and the enclosed still image to the E-mail server **510** in packets, while displaying a message indicating E-mail transmission on the color LCD **48**, in step **916**. In the absence of a still image to be enclosed in the E-mail in step **914**, the portable phone controller **32** transmits the received message (title and contents) to the E-mail server **510** in packets, while displaying the message indicating E-mail transmission on the color LCD **48** in step **918**.

Upon completion of the E-mail transmission in step **920**, the portable phone controller **32** displays a message indicating completed transmission on the color LCD **48** in step **922** and blocks a power voltage from the camera unit **2** in step **924**. Thus, the portable phone controller **32** enters the portable phone mode **602**.

Packet transmission of an E-mail with a still image enclosed therein in step **916** of FIG. **9** will be described in more detail. Still image data is transmitted by the data block size of a typical digital still video camera, for example, by 512 byte units, between the camera unit **2** and the portable phone unit **4** in the MVP, and the MVP transmits data in packets to the E-mail server **516**. A packet is of length 584 bytes, including a 536-byte data block, an 8-byte header, a 20-byte TCP (Transmission Control Protocol), and a 20-byte IP (Internet Protocol).

For packet transmission, the portable phone controller **32** reads still image data of about 40 Kbytes in 512 byte units from the first memory **22** of the camera unit **2** and temporarily stores the read data in the fourth memory **36** of the portable phone unit **4**. Then, the 512-byte long image data is appended to the message (tile and contents) of an E-mail and the resulting message is loaded in the data block of 536 bytes. In this manner, the image data is transmitted in packets.

Assuming that the still image of about **40** Kbytes and the contents of the E-mail message are about 60 Kbytes, the MVP can transmit data of about 70 Kbytes including data and a header of a packet for about 60 seconds at 9600 bps (=70 Kbytes×8). Here, 9600 bps is a data transmission rate in a CDMA system.

Referring back to FIG. **5**, the MVP **500** connects to the PPP server **504** through the base station **502** and a PPP service provider **504** and then to the E-mail server **516** using the TCP/IP protocol. The MVP **500** can upload an E-mail having image data enclosed therein to the E-mail server **516** using the POP server **520** of the E-mail server, or download an E-mail or an E-mail having image data enclosed therein from the E-mail server **516** using the SMTP server **518** of the E-mail server **516**.

Upon receipt of an E-mail, the E-mail server **516** notifies a terminal of the other party, for example, the PC **608** or the MVP **600** of the arrival of the E-mail.

Referring to FIG. **10**, there is shown a flowchart illustrating a control operation for reception of an E-mail and image data in the MVP according to the embodiment of the present invention. Upon receipt of an E-mail in step **1000**, the portable phone controller **32** of the MVP displays a message notifying receipt of the E-mail and a server phone number on the color LCD **48** in step **1002**. If the user enters the send key in the key pad **34** to check an E-mail message, the portable phone controller **32** establishes a call with the E-mail server in step **1006**. In step **1008**, the portable phone controller **32** downloads the tile of the E-mail and displays it on the color LCD **48** in step **1008**. When the user presses a specific key to read the E-mail message in step **1010**, the portable phone controller **32** downloads message contents, information about the presence or absence of enclosed image data, and the file size of the enclosed image, and displays the downloaded information on the color LCD **48** in step **1012**.

Then, when the user requests downloading the enclosed image in step **1014**, the portable phone controller **32** downloads the enclosed image in step **1016**. In step **1018**, the portable phone controller **32** determines whether the download is completed. Upon completion of the download, the portable phone controller **32** displays a message indicating completed downloading on the color LCD **48** in step **1020**. On the other hand, if the download is not completed, the portable phone controller **32** determines whether a an end key has been entered in step **1022**. To suspend the download for such a reason as a long download time, the user just presses the end key. The portable phone controller **32** determines whether the end key has been entered in step **1022**. Upon input of the end key, the portable phone controller **32** ends the procedure.

As described above, the MVP of the present invention acts as both a general portable communication terminal and a digital camera. Accordingly, it can play back photographed images, transmit/receive images, and perform voice communication.

While the invention has been shown and described with reference to a certain preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A data transmitting method for a portable composite communication terminal which functions as both a portable phone and a camera, comprising the steps of:

entering a first E-mail transmission sub-mode upon user request for E-mail transmission while operating in a portable phone mode, the first e-mail transmission sub-mode performing a portable phone function;

entering a second E-mail transmission sub-mode upon user request for E-mail transmission while operating in a display sub-mode, the second e-mail transmission sub-mode displaying an image most recently captured in a camera mode;

sequentially displaying other images stored in a memory through the use of scroll keys;

transmitting the address of the other party and a message received through a user interface in the first E-mail transmission sub-mode; and

transmitting the address of the other party and the message received through the user interface and the image displayed on the display as an E-mail in the second E-mail transmission sub-mode.

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