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Dow et al.

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(54) **APPLIANCE AND METHOD OF USING SAME HAVING A DELETE CAPABILITY FOR SAVED DATA**

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(51) **Int. Cl.**[7] **H04N 1/024**; H04N 1/40

(52) **U.S. Cl.** **358/473**; 358/444; 358/404

(58) **Field of Search** 358/473, 474, 358/494, 471, 442, 444, 404; 382/313, 189; 345/473, 348, 950, 173, 18.01, 179, 349; 707/539, 541, 530

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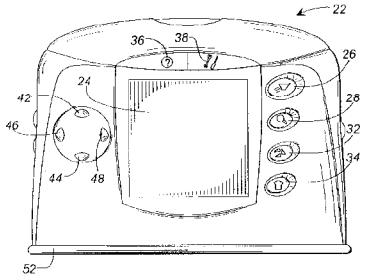
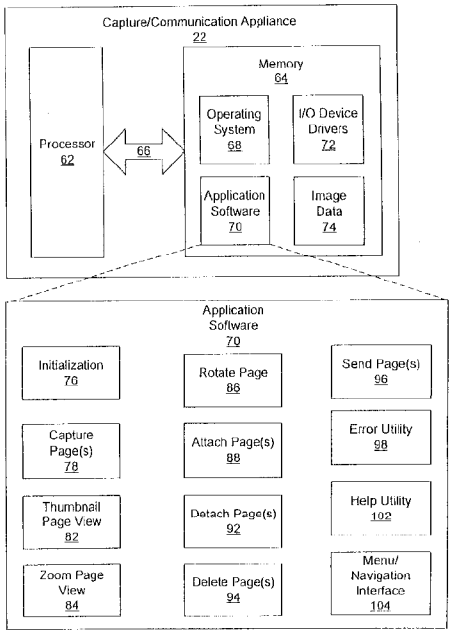
Primary Examiner—Cheukfan Lee

(57) **ABSTRACT**

A hand-held image capture and communication appliance and method of using same are provided wherein images may be captured and saved in an internal memory. The appliance includes a processor for manipulating and exhibiting the images on a built-in display screen. Program code stored in the internal memory and executed by the processor includes a delete page module for purging the memory of captured images when they are no longer needed. The delete page module includes a code segment for displaying an animation, which, in the preferred embodiment, is designed to convey the concept to the user that a delete operation is irreversible. One implementation of the animation shows the deleted page or group of pages turn into ashes, which is a metaphor for the permanence of the delete operation. A confirmation prompt is provided prior to carrying out the delete operation to inform the user how many pages or images will be deleted and what percentage of memory will be freed. In addition, the confirmation prompt allows further consideration by the user before the deleted request is fulfilled.

17 Claims, 9 Drawing Sheets





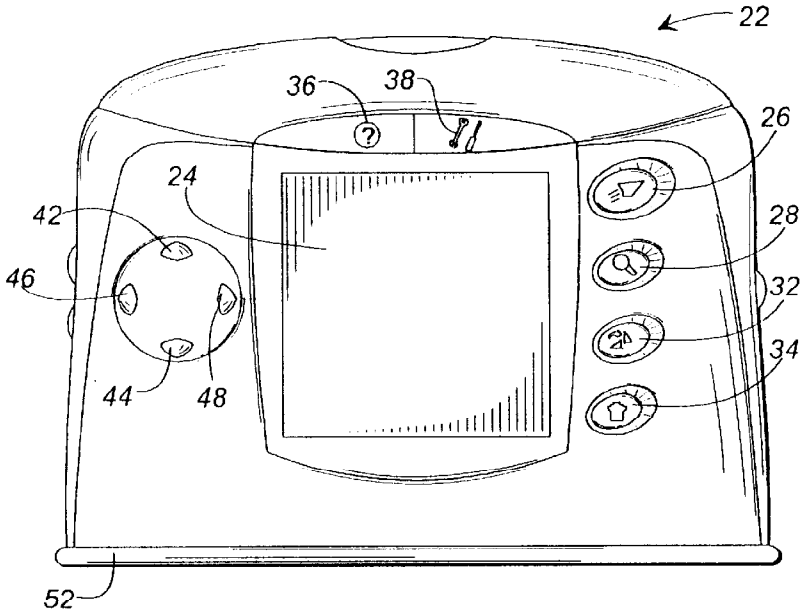


FIG. 1A

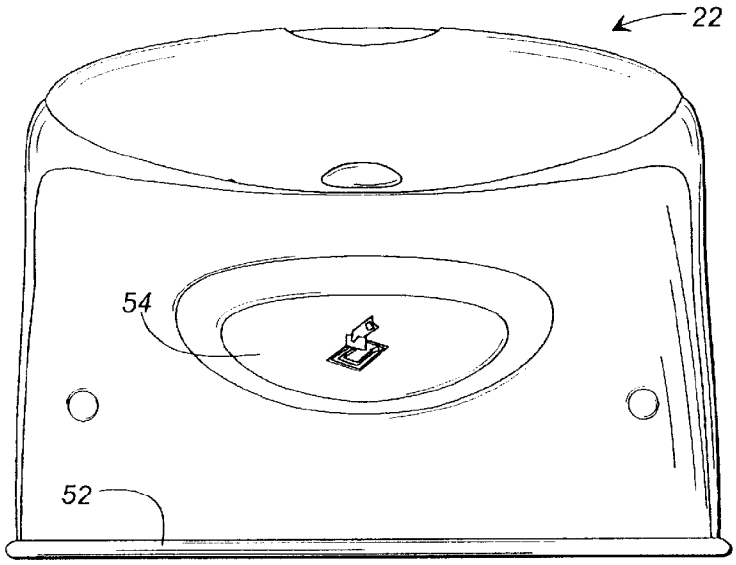


FIG. 1B

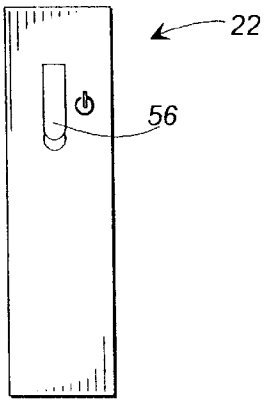


FIG. 1C

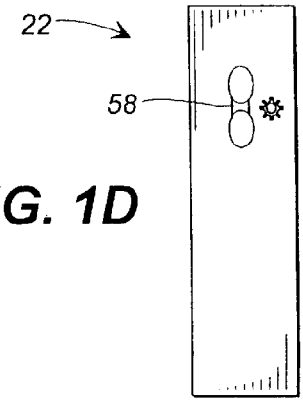


FIG. 1D

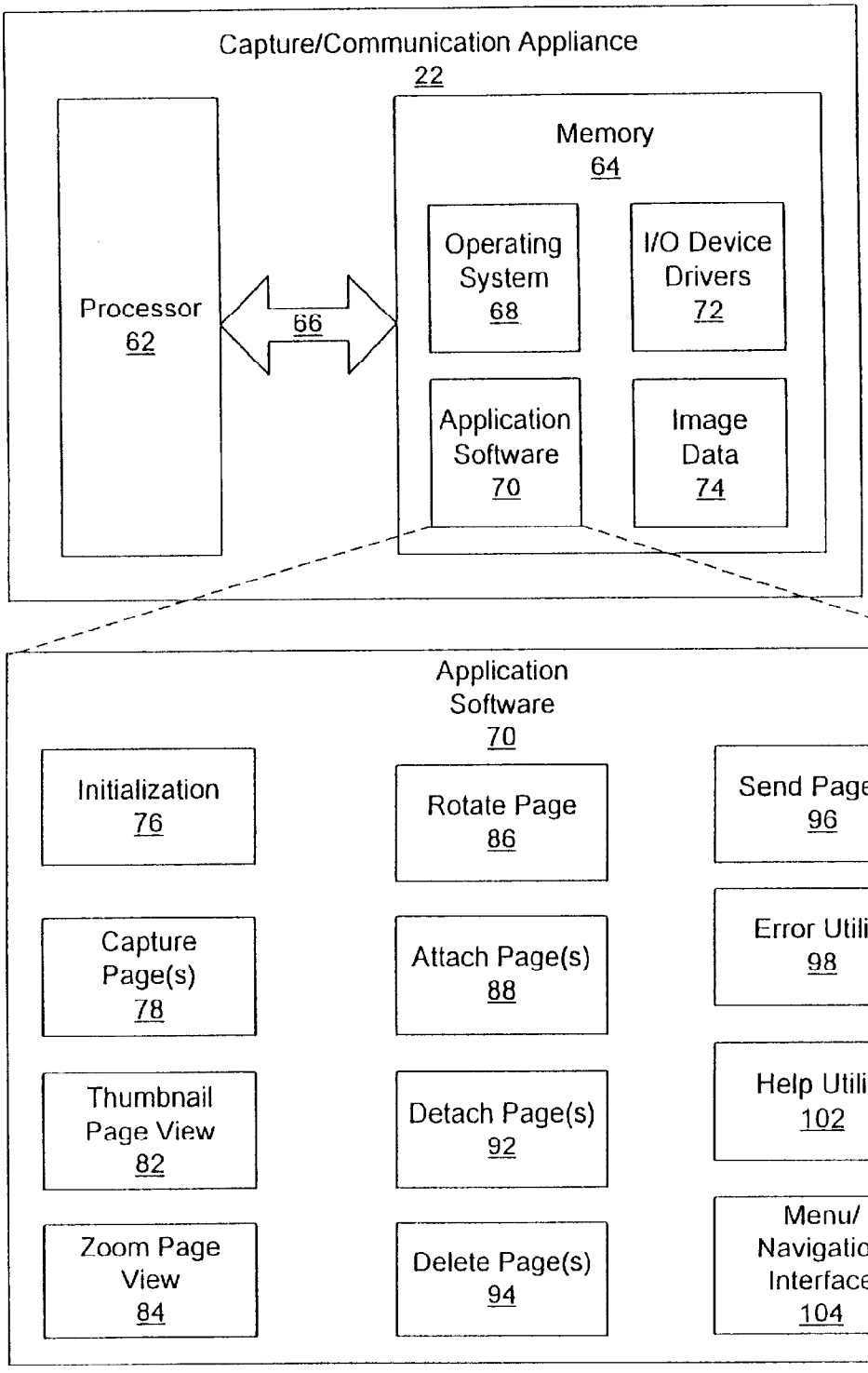

Capture/Communication Appliance
22
Processor
62
66
Memory
64
Operating System
68
I/O Device Drivers
72
Application Software
70
Image Data
74
Application Software
70
Initialization
76
Rotate Page
86
Send Page(s)
96
Capture Page(s)
78
Attach Page(s)
88
Error Utility
98
Thumbnail Page View
82
Detach Page(s)
92
Help Utility
102
Zoom Page View
84
Delete Page(s)
94
Menu/ Navigation Interface
104

FIG. 2

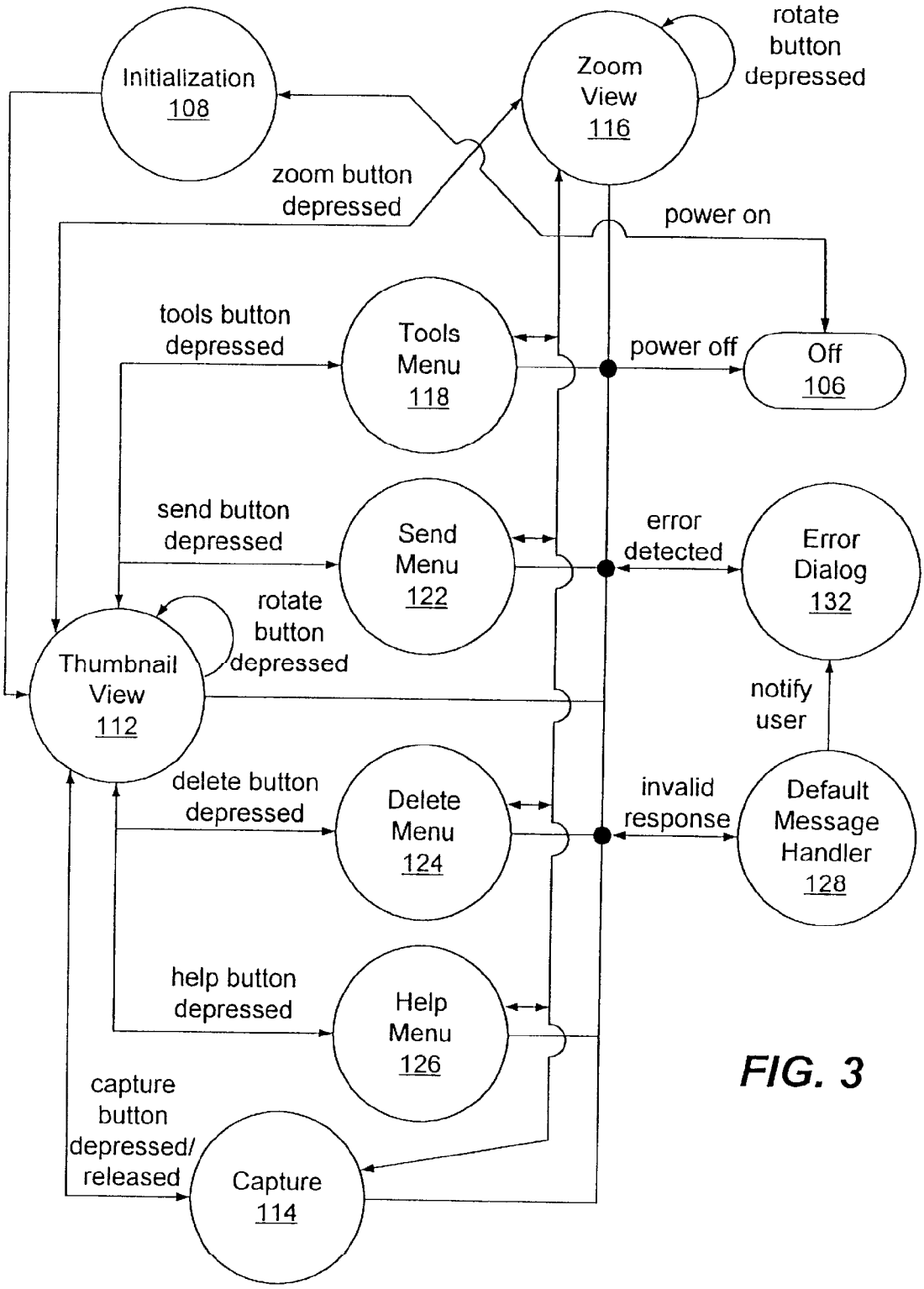

Initialization
108
Zoom
View
116
rotate
button
depressed
zoom button
depressed
power on
tools button
depressed
Tools
Menu
118
power off
Off
106
send button
depressed
Send
Menu
122
error
detected
Error
Dialog
132
rotate
button
depressed
Thumbnail
View
112
notify
user
delete button
depressed
Delete
Menu
124
invalid
response
Default
Message
Handler
128
help button
depressed
Help
Menu
126
capture
button
depressed/
released
Capture
114

FIG. 3

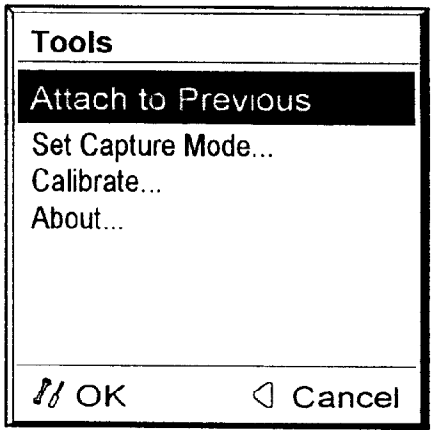


FIG. 4A

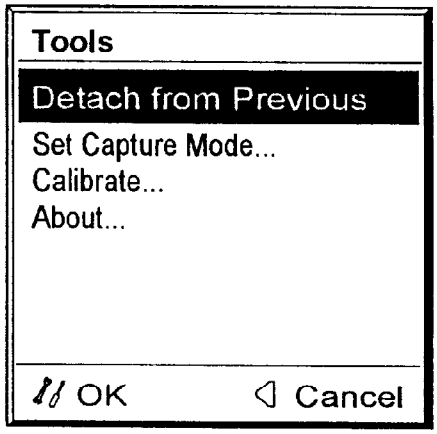


FIG. 4B

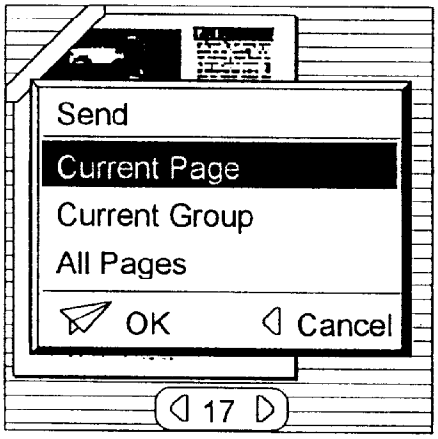


FIG. 5

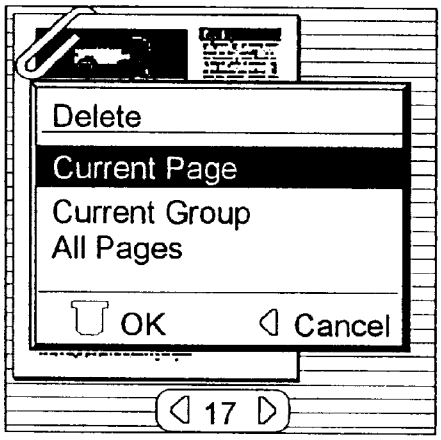


FIG. 6

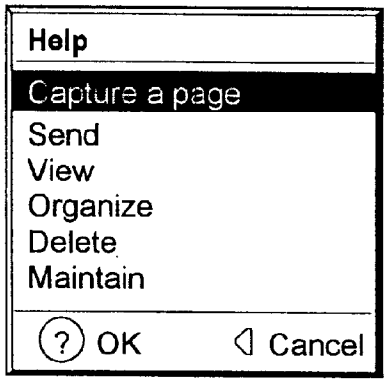


FIG. 7

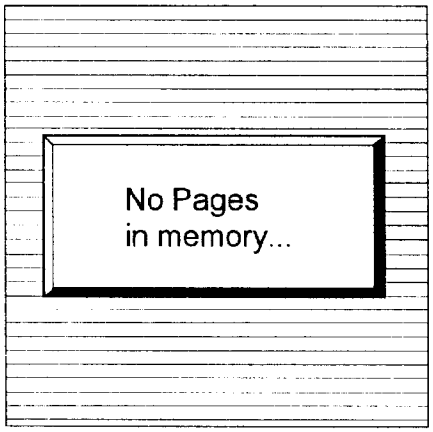


FIG. 8A

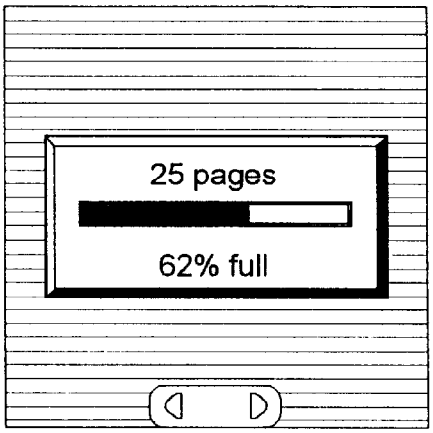


FIG. 8B

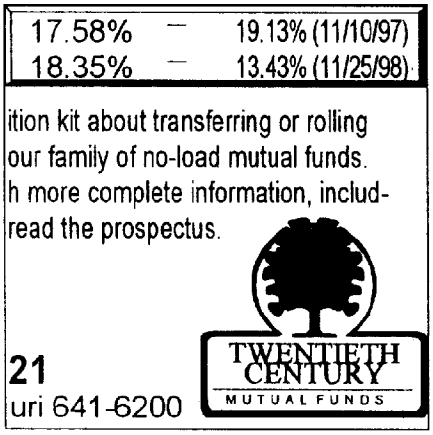


FIG. 8D

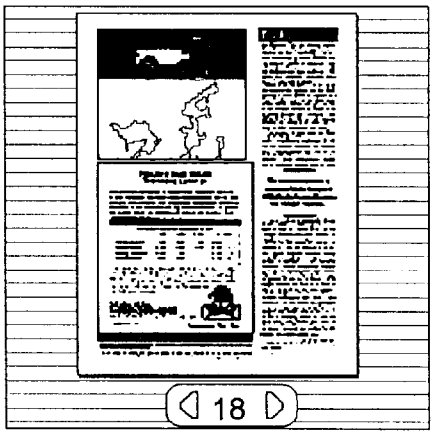


FIG. 8C

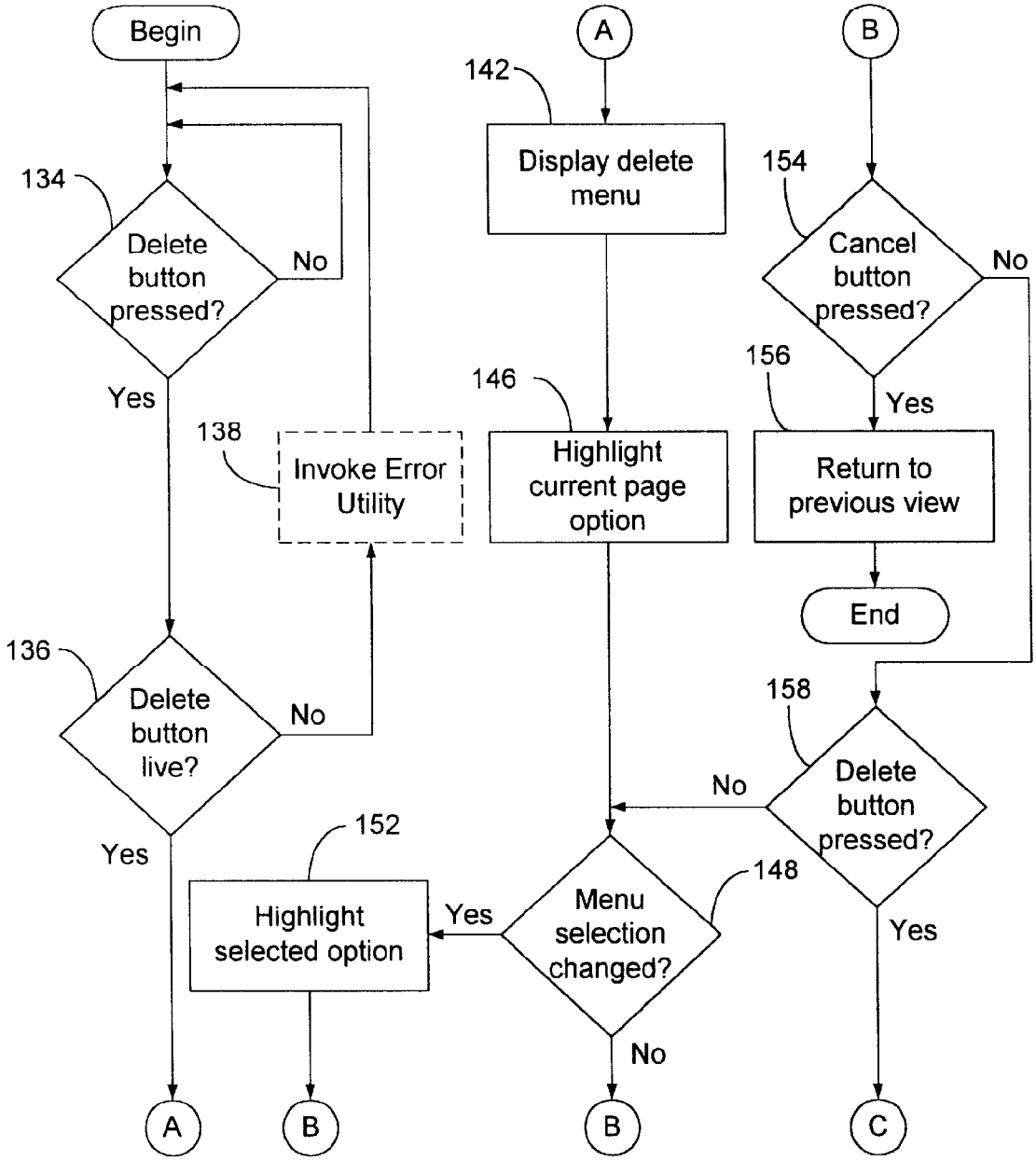

Begin
134
Delete button pressed?
No
Yes
138
Invoke Error Utility
136
Delete button live?
No
Yes
152
Highlight selected option
A
B
142
Display delete menu
146
Highlight current page option
Menu selection changed?
Yes
No
148
A
B
154
Cancel button pressed?
No
156
Yes
Return to previous view
End
158
Delete button pressed?
No
Yes
B
C

Fig. 9A

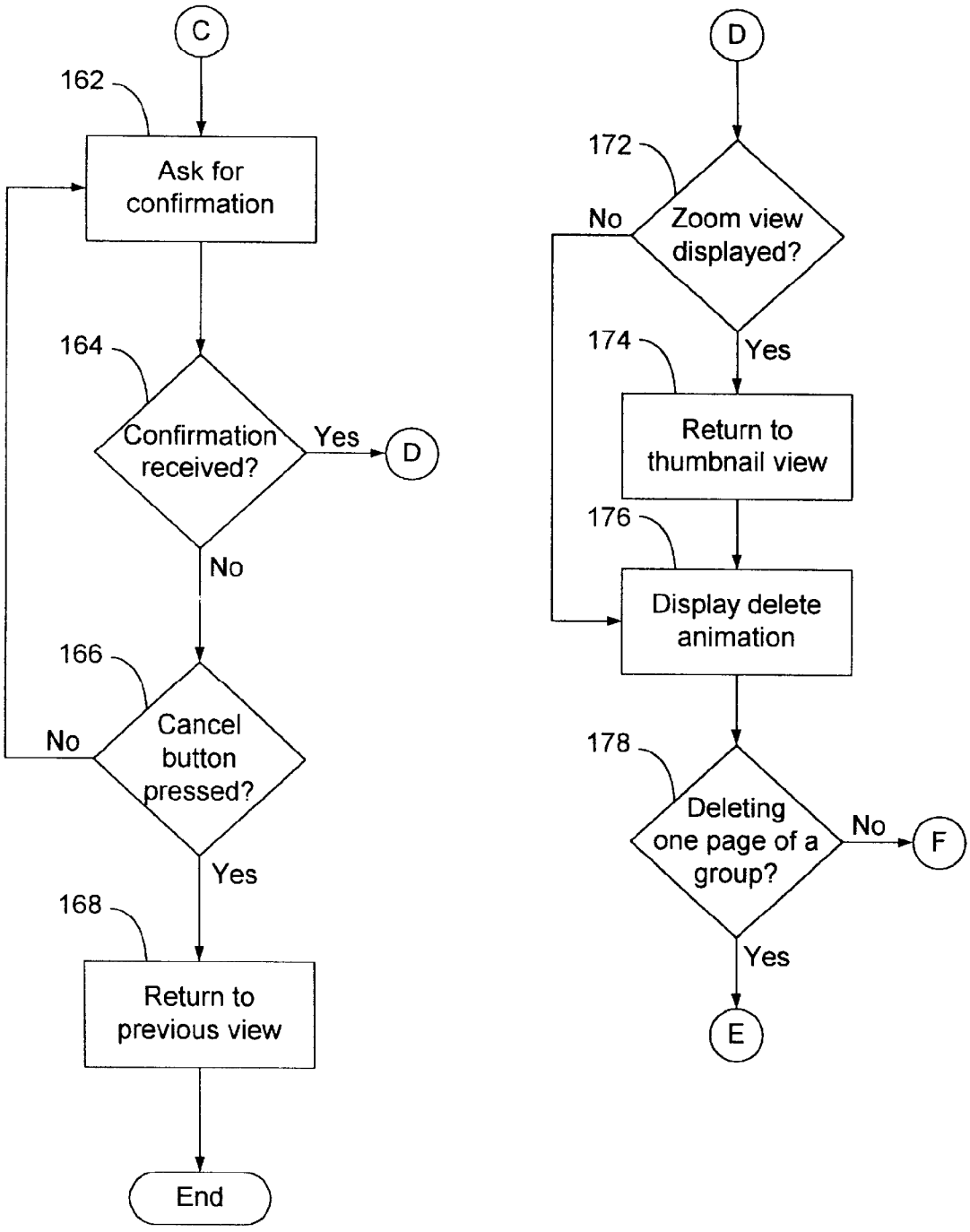

C
162
Ask for confirmation
164
Confirmation received?
Yes
D
No
166
Cancel button pressed?
No
Yes
168
Return to previous view
End
D
172
Zoom view displayed?
No
Yes
174
Return to thumbnail view
176
Display delete animation
178
Deleting one page of a group?
No
F
Yes
E

Fig. 9B

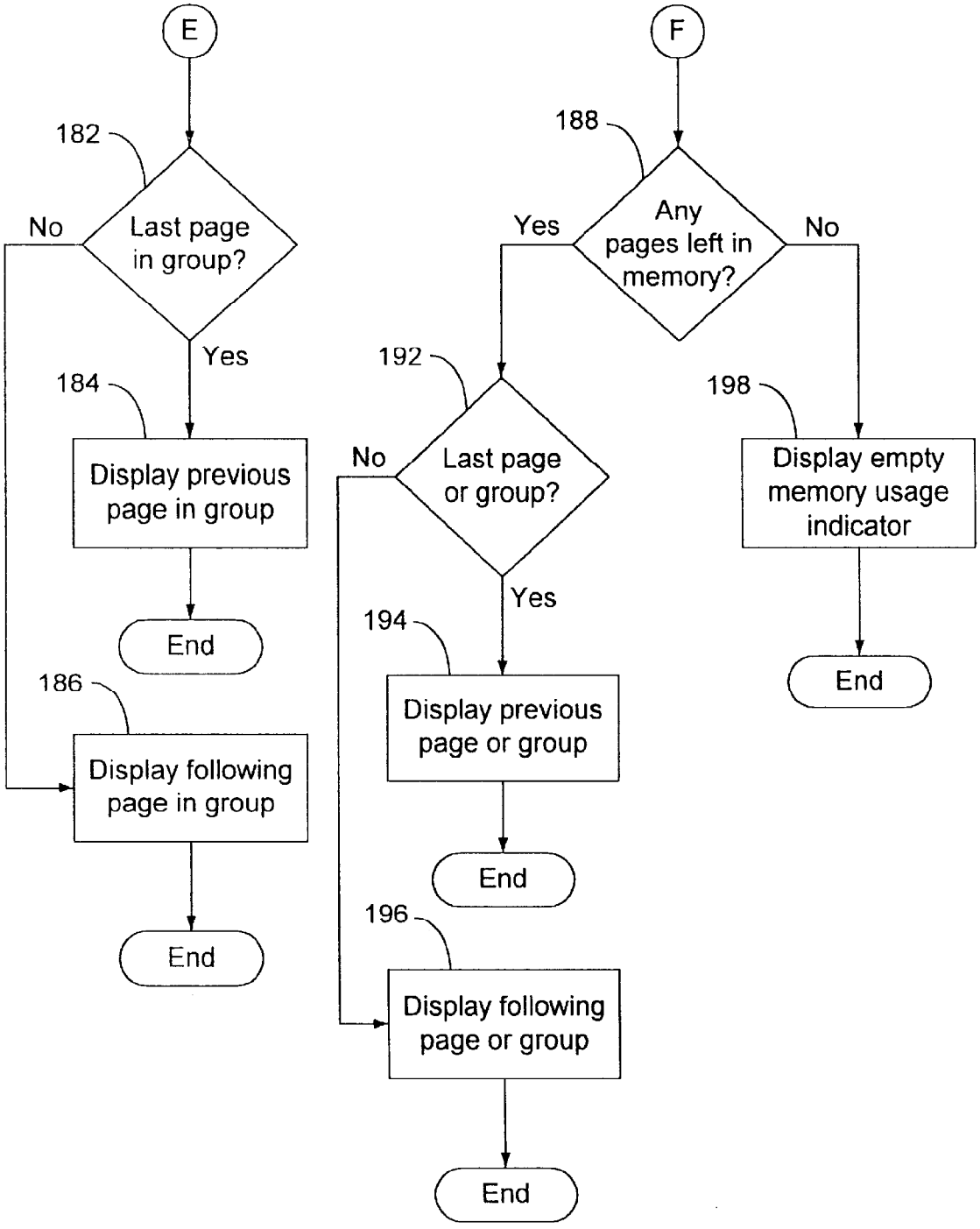

E
182
Last page in group?
No
Yes
184
Display previous page in group
End
186
Display following page in group
End
F
188
Any pages left in memory?
Yes
No
192
Last page or group?
No
Yes
194
Display previous page or group
End
196
Display following page or group
End
198
Display empty memory usage indicator
End

Fig. 9C

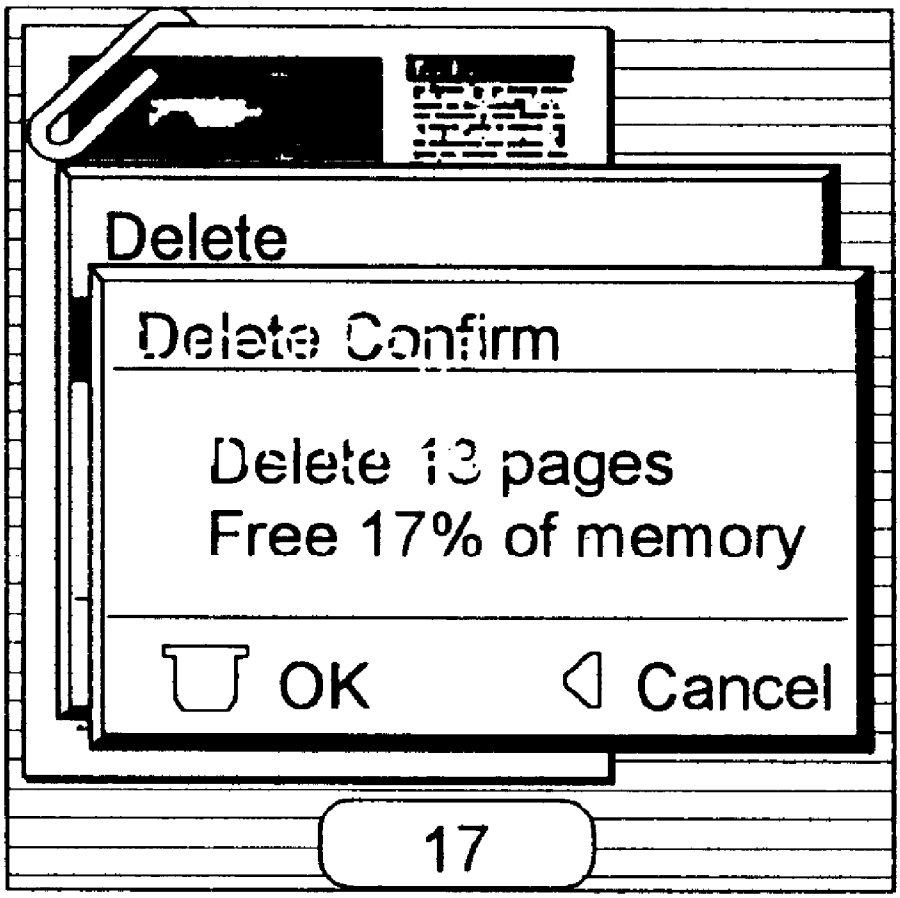

Delete
Delete Confirm
Delete 13 pages
Free 17% of memory
OK
Cancel
17

FIG. 10

APPLIANCE AND METHOD OF USING SAME HAVING A DELETE CAPABILITY FOR SAVED DATA

CROSS REFERENCE TO RELATED APPLICATIONS

This application Ser. No. 09/130,869, is related to U.S. application entitled "APPLIANNCE AND METHOD OF USING SAME HAVING A SEND CAPABILITY FOR STORED DATA", U.S. application Ser. No. 09/130,080, entitled "APPLIANCE AND METHOD OF USING SAME HAVING A USER HELP CAPABILITY" U.S. application Ser. No. 09/130,523, entitled "APPLIANCE AND METHOD OF USING SAME FOR CAPTURING IMAGES", U.S. application Ser. No. 09/180,789, entitled "APPLIANCE AND METHOD OF USING SAME HAVING A CAPABILITY TO GRAPHICALL ASSOCIATE AND DISASSOCIATE DATA WITHAND FROM ONE ANOTHER", U.S. application Ser. No. 09/130,081, entitled "APPLIANCE AND METHOD FOR COMMUNICATING AND VIEWING MULTIPLE CAPTURED IMAGES", U.S. application Ser. No. 09/130,584, entitled "APPLIANCE AND METHOD FOR NAVIGATING AMONG MULTIPLE CAPTURED IMAGES AND FUNCTIONAL MENUS", U.S. application Ser. No. 09/130,572, entitled "APPLIANCE AND METHOD FOR CAPTURING MAGES HAVING A USER ERROR INTERFACE", U.S. application Ser. No. 09/131,258, entitled "APPLIANCE AND METHOD FOR VIEWING CAPTURED IMAGES", and U.S. application Ser. No. 09/130,868, entitled "APPLIANCE AND METHOD FOR MENU NAVIGATION", which are filed contemporaneously herewith and are incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention relates generally to the field of graphical user interfaces, and, more particularly, to a portable hand-held appliance for capturing images through digital scanning that has a graphical user interface for displaying the captured images for user manipulation and processing, and communicating those images to another device or appliance.

Intangible information is a vital business asset that can be exploited for competitive advantage if managed properly. In the past fifteen years, improvements in information processing have been achieved primarily from the widespread use of microcomputers in the workplace and their application in local and wide area networks. Through such applications as electronic mail (email) and networked access to document storage servers, the electronic communications market has exploded. Nevertheless, business is still far from reaching a "paperless" workplace. For example, according to a 1993 report by BIS Strategic Decisions (hereinafter BIS), an information technology consulting firm, more than 90 billion documents were created in 1992 and more than 1 trillion copies of those documents were made. Moreover, BIS estimated that printing and copying expenses average between 6% and 13% of a typical company's revenue. These statistics illustrate the economic savings available for those businesses that are able to merge paper and technology in a unified information processing strategy.

One tool that has proven useful for translating between paper and electronic information is the digital scanner. Scanner-enabled document distribution endows paper-based documents with the speed and convenience of electronic communications. A desktop scanner or network scanner

allows business professionals to scan paperbased documents, manage them effectively and distribute them in a timely fashion. Users can share and distribute information easily by scanning directly to their email or personal computer (PC) fax applications. The growing popularity of fax modems and email is driving the acceptance of scanner-enabled document distribution in offices of all sizes. Fax/modem capabilities, which are available with virtually all modern PCs, enable users to send and receive faxes directly from a computer—at their desk or while traveling—and to check email remotely.

Nevertheless, while scanners are ideal for users who need to disseminate paper-based information to colleagues through PC facsimile and/or email, traditional flatbed scanners lack the convenience and flexibility that users have become accustomed to through such products as notebook computers and cellular phones. Hand-held scanners are an improvement in this regard; however, they are typically dependent on a host computer for displaying the scanned images and for providing power. U. S. Pat. No. 5,550,938 to Hayakawa et al. (hereinafter Hayakawa) discloses a portable image scanner designed to overcome these disadvantages. Specifically, Hayakawa discloses a hand-held cordless image scanner having a display/control screen, a memory for storing scanned images, a self contained power supply and an interface that allows the scanner to be received by a host computer as a memory card for transferring stored images from the scanner to the computer. While Hayakawa's scanner is effective in breaking the dependency on a host computer for image display and power, it still has several drawbacks. For example, Hayakawa's scanner offers no image processing features other than the capabilities of storing or discarding a newly scanned image and reviewing those images that have been stored previously. More advanced image processing would necessarily be done after transfer to a host computer. Moreover, Hayakawa does not offer a graphical user interface (GUI) containing icons and/or animations to assist users in operating their device. Finally, transfer of images is limited to those devices having ports for receiving an external memory card or the capability of reading the scanner memory through a memory card drive.

Accordingly, what is sought is a portable, hand-held image capturing device that allows users to process or manipulate captured images in the device and the ability to communicate the images directly to some other unit such as a computer, printer, or facsimile machine. In addition, the image capturing device should provide cordless operation and use a standard interface for transferring images to other devices. A GUI is preferred to assist users, particularly novices, in operating the device.

SUMMARY OF THE INVENTION

Certain novel features and advantages of the invention will be set forth in the description that follows and will become apparent to those skilled in the art upon examination of the following or may be learned with the practice of the invention.

To achieve the novel features and advantages, the present invention is generally directed to a portable hand-held image capture and communication appliance and method of using same by which images may be captured via capturing means and saved in an internal memory. The appliance includes a processor for manipulating and exhibiting the images on a built-in display screen. Program code stored in the internal memory and executed by the processor includes a delete

page module for purging the memory of captured images when they are no longer needed.

According to an aspect of the invention, the delete page module includes a code segment for displaying an animation. In the preferred embodiment, the animation is designed to convey the concept to the user that a delete operation is irreversible. That is, once an image is deleted from memory, it cannot be recovered. One possible implementation of the animation shows the deleted page or group of pages turn into a pile of burnt ashes, which is a metaphor for the permanence of the delete operation.

According to another aspect of the invention, the delete page module includes a code segment for providing the user with a confirmation prompt prior to carrying out the delete operation. This prompt informs the user how many pages or images will be deleted and what percentage of memory will be freed to allow the user to pause and consider further whether to proceed with the operation.

For convenience, the program code includes a menu/navigation module that provides the user with a list of delete page options through a GUI and processes any user selection thereof In the preferred embodiment, three options are provided: delete the current page or image on display, delete the group of pages of which the current page on display is a member, or delete all pages in memory.

The appliance according to the present invention has many advantages, a few of which are highlighted hereafter, as examples.

One advantage of the invention is that intelligent image processing features, normally reserved for a traditional computer, are provided in a portable, hand-held image capturing appliance.

Another advantage of the invention, is that when a user desires to delete a page or image stored in memory, a confirmation prompt is provided to prevent image data from being deleted inadvertently.

Still another advantage of the invention is that the delete operation is accompanied by an animation, which conveys to the user the permanence or irreversibility of the action taken.

Yet another advantage of the invention is that a GUI is provided, which allows new users to operate the appliance with minimal training or assistance.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

Other features of the present invention will be more readily understood from the following detailed description of specific embodiments thereof when read in conjunction with the accompanying drawings, in which:

FIG. **1A** is an elevation view of the hand-held image capture and communication appliance according to the present invention, which depicts a side of the unit containing the display screen, operation buttons, and navigation buttons;

FIG. **1B** is an elevation view of the appliance of FIG. **1A** depicting the opposing side to that illustrated in FIG. **1A**, which contains the capture button for performing an image capture;

FIG. **1C** is an elevation view of the appliance of FIGS. **1A** and **1B** depicting an end of the unit, which contains the power switch;

FIG. **1D** is an elevation view of the appliance of FIGS. **1A**, **1B**, and **1C** depicting the opposing end to that illustrated in FIG. **1C**, which contains a brightness button for adjusting the visual clarity of the display screen;

FIG. **2** is a high-level block diagram of the internal hardware and software architecture of the appliance illustrated in FIGS. **1A–1D**;

FIG. **3** is a high-level state diagram of the application software of FIG. **2**;

FIGS. **4A** and **4B** illustrate the tools menus displayed on the display screen of FIG. **1A**;

FIG. **5** illustrates the send menu displayed on the display screen of FIG. **1A**;

FIG. **6** illustrates the delete menu displayed on the display screen of FIG. **1A**;

FIG. **7** illustrates the help menu displayed on the display screen of FIG. **1A**;

FIGS. **8A** and **8B** depict memory usage indicator icons on the display screen of FIG. **1A** that provide a memory utilization report for the appliance;

FIG. **8C** illustrates a thumbnail view of a captured image on the display screen of FIG. **1A**;

FIG. **8D** illustrates a zoom view of a captured image on the display screen of FIG. **1A**;

FIGS. **9A**, **9B**, and **9C** are a flow chart describing the operation of the delete page module of FIG. **2**; and

FIG. **10** illustrates a delete confirmation prompt displayed on the display screen of FIG. **1A**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

While the invention is susceptible to various modifications and alternative forms, a specific embodiment thereof is shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit the invention to the particular form disclosed, but on the contrary, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the claims.

Architecture of the Image Capture and Communication Appliance

A portable, hand-held, image capture and communication appliance **22** embodying the principles of the present invention is shown in FIGS. **1A** through **1D**. Specifically, FIG. **1A** depicts one side (i.e., front) of appliance **22** where a flat-panel display **24** along with user operation buttons **26**, **28**, **32**, **34**, **36**, **38** and user navigation buttons **42**, **44**, **46**, **48** are located. Display **24** is preferably of the flat-panel variety to accommodate the hand size dimensions of appliance **22**. Common types of flat-panel displays suitable for use in the present invention include electroluminescent displays, gas plasma discharge displays, and liquid crystal displays (LCDs). Display **24** is the means by which information, including captured images, text, icons, and animations, is communicated to the user. As used herein, the term "image" encompasses both text (binary) and color, graphic, or gray-scale visuals. The user operation buttons comprise an image send or transmit button **26**, an image zoom button **28**, an image rotate button **32**, an image delete button **34**, a help utility button **36** and a tools menu button **38**. Send, zoom, rotate, and delete buttons **26**, **28**, **32** and **34** allow the user to electronically manipulate an image or page that has been captured into memory through photoelement array **52**. Note that an image captured in memory is interchangeably referred to herein as a "page" because the image is portrayed in appliance **22** as a physical page of text and/or imagery. Activation of tools button **38** presents the user with a menu

that includes possible image operations (e.g., image attachment/grouping, image detachment/ungrouping), changing the mode of appliance **22** (i.e., toggling between text (binary) capture and color, graphic, or grayscale capture modes), calibrating appliance **22**, displaying a screen identifying important specifications such as a model number, hardware or software release number, memory equipage, etc., or other user utilities not deserving of a dedicated external button for activation. Help button **36** provides the user with access to general tutorials, process animations, how-to instructions on the operation of appliance **22**, and context sensitive instruction when help is requested while another operation or menu is active. The navigation buttons include an up button **42**, a down button **44**, a left button **46**, and a right button **48** and are controlled by the user to steer a course through menu items and to view images or pages that have been captured in memory.

FIG. **1**B shows the side of appliance **22** opposite that illustrated in FIG. **1**A (i.e., back). The back side of appliance **22** includes image capture button **54**, which is depressed by a user to capture an image through photoelement array **52** and is released once the image is captured. A power switch **56** is included at one end of appliance **22** as shown in FIG. **1**C and a brightness control **58** for display **24** is located at the other end of appliance **22** as shown in FIG. **1**D. The positioning of the various buttons, power switch **56**, and brightness control **58** on appliance **22** as shown in FIGS. **1**A through **1**D is merely exemplary and can be modified as needed to satisfy the ergonomic requirements of the targeted user community.

Referring now to FIG. **2**, the internal architecture of appliance **22** will be described hereafter. Appliance **22** includes a processor **62**, which communicates with a memory **64** via address/data bus **66**. Processor **62** can be any commercially available or custom microprocessor suitable for an embedded application. Memory **64** is representative of the overall hierarchy of memory devices containing the software and data used to implement the finctionality of appliance **22**. Memory **64** can include, but is not limited to, the following types of devices: cache, ROM, PROM, EPROM, EEPROM, flash, SRAM, and DRAM. As shown in FIG. **2**, memory **64** holds four major categories of software and data used in appliance **22**: the operating system **68**; the application software **70**; the I/O device drivers **72**; and the image data **74** generated for each capture. Operating system **68** should be designed for real time embedded applications and, preferably, is relatively compact to make the most efficient use of memory **64**. One such example of a real time operating system meeting these criteria is the PSOSYSTEM operating system (pSOSystem® or pSOS®) sold by Integrated Systems, Inc., 3260 Jay Street, Santa Clara, Calif. 95054-3309, which is used in the preferred embodiment of the present invention. I/O device drivers **72** include software routines accessed through operating system **66** by application software **70** to communicate with devices such as display **24**, certain memory components **64** and I/O ports such as a serial port or infra red (IR) port for transferring data to another appliance, device or system. The digital representations of the images captured by appliance **22** is denoted by image data **74**. The format used for storing the images should be compatible with application software **70**. One common format used for encoding images is the CCITT standard, which is used in the preferred embodiment of the present invention; however, other public or proprietary standards can be used with equal success. For example, JPEG is a common standard used to encode graphic or color images. Finally, application software **70** comprises the control programs that implement the various features of appliance **22**. Application software **70** and devices drivers **72** are typically written in a high-level programming language such as C or C++ for development convenience. Nevertheless, some drivers or application modules are sometimes written in assembly or machine language to optimize speed, memory usage or layout of the software in memory. In the preferred embodiment, the present invention uses C language to implement most application software **70** and device drivers **72**. Assembly language is used to implement time-critical code segments.

Application software **70** can be broken into several modules corresponding to the various features of appliance **22**, as shown in FIG. **2**. These software modules include an initialization module **76**, a capture page module **78**, a thumbnail view module **82**, a zoom view module **84**, a page rotation module **86**, an attach page module **88**, a detach page module **92**, a delete page module **94**, a send page module **96**, an error utility module **98**, a help utility module **102** and a menu/navigation interface module **104**. A brief overview of each of the aforementioned modules follows hereafter.

Initialization module **76** contains the boot software that is invoked when appliance **22** powers up. This module works closely with operating system **68** and device drivers **72** to perform any hardware initialization for processor **62**, memory devices **64**, display **24**, and software initialization for global resources, such as message queues and buffers, system tasks, and memory partitions. Capture page module **78** controls the acquisition of images through photoelement array **52** and their conversion into a suitable format for storage in memory **64**. Thumbnail view module **82** provides the default visual for pages and icons shown on display **24**. For example, FIGS. **8**A and **8**B show a memory usage indicator icon for the cases where memory **64** is empty (i.e., no captured pages in memory) and where memory **64** holds **25** captured pages.

In FIG. **8**C, thumbnail view module **82** presents an entire page on display **24** as illustrated in FIG. **8**C. Zoom view module **84** allows the user to magnify a portion of a page as illustrated in FIG. **8**D. Page rotation module **86** allows the user to rotate a page either in thumbnail or zoom view in 90° increments. Attach page module **88** allows the user to logically join pages together to form a group of pages that can be manipulated as an individual unit. Conversely, detach page module **92** allows the user to separate a page or pages from a previously formed group. Delete page module **94** allows the user to purge a page or group of pages from memory **64**. The operation of delete page module **94** will be discussed in detail hereinafter. Send page module **96** allows the user to transfer a page or group of pages to another appliance, device or system through the serial or IR communication ports of appliance **22**. Error utility module **98** provides notification to the user when the user attempts an invalid operation. Help utility module **102** provides the user, in real time, with general instructions through text and animation for operating appliance **22** and context sensitive instructions for performing a specific operation. Lastly, menu/navigation interface module **104** provides the user with graphical menus for performing various operations and processes the user's response thereto. Moreover, menu/navigation interface module **104** responds to navigation buttons **42**, **44**, **46**, and **48** that allow the user to steer a course through the graphical menus and view the stored pages.

A high level state diagram for application software **70** is shown in FIG. **3**. This state diagram is useful for gaining a broad understanding of the operation of application software

70 and its associated software modules. These states are representative of tasks or processes in application software 70 that act on messages from a message queue, which are generated as a result of user interaction with appliance 22 (i.e., activation of buttons). Appliance 22 and application software 70 begin and terminate from the off state 106, which is controlled by the user through operation of power switch 56. Off state 106 can clearly be entered from any other state in response to a user turning appliance 22 off through switch 56. When a user turns switch 56 to the on position, the system will pass through a transient initialization state 108 during which time initialization module 76 is invoked to perform its functions. Once system initialization is complete, the system enters the thumbnail view state 112, which is the default state for viewing any captured images. From thumbnail view state 112, the system can transition to any one of several possible states depending on the action by the user. For example, the capture button can be pressed to enter capture state 114 to perform an image capture. After the image is captured, the button is released to return to thumbnail view state 112. If the user wishes to change the orientation of the captured image, then activation of rotation button 32 will rotate the captured image 90° with each invocation. Moreover, now that an image is captured in memory 64, a user can obtain a magnified view of a portion of the image or page by pressing zoom button 28 to enter zoom view state 116. Similar to thumbnail view state 112, the magnified image can also be rotated through application of rotation button 32. The system will return to thumbnail view state 112 through operation of zoom button 28.

From thumbnail view state 112 or zoom view state 116, one of four menu states can be entered depending on the choice made by the user. First, activation of tools button 38 will transition the system into tools menu state 118 where a menu of possible page operations and/or features is exhibited on display 24 as illustrated in FIGS. 4A and 4B. Second, activation of send button 26 will transition the system into send menu state 122 where a menu of options for transferring a page or group of pages to another appliance, device or system is exhibited on display 24 as illustrated in FIG. 5. Third, activation of delete button 34 will transition the system into delete menu state 124 where a menu of options for deleting a page or group of pages from memory 64 is exhibited on display 24 as illustrated in FIG. 6. Lastly, activation of help button 36 will transition the system into help menu state 126 where a menu of help topics is exhibited on display 24 as illustrated in FIG. 7. Once any of the aforementioned menu states is reached, the user can choose a desired menu option by using navigation buttons 42 and 44 and then validating the choice by pressing a confirmation button. In the preferred embodiment of the present invention, the confirmation button is simply the button by which the present menu on display is accessed. An icon indicating the appropriate confirmation button is displayed in the lower left hand side of the menus as illustrated in FIGS. 4 through 7. Menu states may be exited by simply invoking navigation button 46 to transition to a previous state.

An invalid response by the user (i.e., user presses an inactive button) will result in a transition to the default message handler state 128 where the user response is interpreted through the message that was generated internally. Frequently, the invalid response by the user will simply be ignored. Nevertheless, depending on the button that was invoked and the current state of application software 70, a transition is sometimes made to the error dialog state 132 to notify the user of their error via a message or graphic (e.g., a blinking icon) on display 24. Alternatively, error dialog state 132 can be entered directly if application software 70 detects an error in the execution of a valid operation. The most common example of this is when the user follows an improper capture path with appliance 22 during the image capture process.

The features provided by the delete page software module 94 will be described hereafter with frequent reference to (a) the architecture and operation of the application software 70 of FIG. 2; (b) the delete menu and confirmation prompt of FIGS. 6 and 10; and (c) the flow charts of FIGS. 9A, 9B, and 9C.

Operation of the Delete Page Feature

The delete page feature of appliance 22 is exercised through delete button 34, which displays the delete menu illustrated in FIG. 6. Thus, as represented by decision diamond 134 in FIG. 9A, the process begins with menu/navigation interface module 104 (see FIG. 2) processing a message indicating that delete button 34 has been activated. Depending on the current state of application software 70, this response may not be valid as indicated by decision diamond 136. If delete button 34 is not currently active or live, error utility software module 98 may optionally be invoked to notify the user that delete button 34 is presently inactive in step 138. If, however, delete button 34 is active, the process continues by following termination A where the delete page menu is exhibited on display 24 (see FIG. 1A) in step 142 as shown in FIG. 6. The current page option is highlighted as the default action in step 146 as depicted in FIG. 6.

Referring now to FIG. 6, three delete page options are offered to the user: delete the current page, delete the current group, or delete all pages stored in memory 64 (see FIG. 2). The first option of deleting the current page, which is chosen as the default in the preferred embodiment, allows the user to delete whatever page is currently displayed on display 24 (see FIG. 1A). Thus, whether the current page is displayed in thumbnail view (e.g., FIG. 8C), is displayed in zoom view (e.g., FIG. 8D), is the inner page of a group of pages (e.g., FIG. 5) that have been logically joined through attach page module 88 (see FIG. 2), or is the first page of a group of pages, that page will be selected for deletion. The second option allows the user to delete the group of pages of which the current page displayed on display 24 is a member. The entire group will be deleted irrespective of whether the current page on display is the first or an inner page of the group. Finally, the third option allows the user to delete all pages stored in memory. This option can be used even if no page is currently on display, such as the example shown in FIG. 8B where the memory usage indicator icon is displayed

The delete menu options discussed in the foregoing are used in the preferred embodiment of the present invention. Nevertheless, alternative delete options can be used to adapt to changing or differing user preferences. For example, a skilled programmer may wish to design application software 70 such that a user could electronically tag or mark pages stored in memory 64 by pressing a button when they are displayed. A fourth option could then be added to the delete menu of FIG. 6 allowing the user to delete those tagged or marked pages when delete page module 94 (see FIG. 2) is invoked through delete button 34.

Returning now to FIG. 9A, the user can choose between the aforementioned delete options using navigation buttons 42 and 44 (see FIG. 1A) as indicated by decision diamond 148. As the user moves between options, the currently

selected option will be highlighted in step **152**. Once a selection is made, the delete process continues at termination B. As shown in FIG. **6**, options from the delete menu can be confirmed using delete button **34** or the menu can be exited through activation of navigation button **46**. Thus, at decision diamond **154**, if the delete menu is exited, the delete process ends at step **156** by removing the menu from display **24** and returning the display to the previous view (ie., the view on display prior to invocation of delete button **34**). Otherwise, if an option is confirmed through invocation of delete button **34**, control will be transferred to delete page module **94** at decision diamond **158**.

Following termination C in FIG. **9**B, delete page module **94** in step **162** displays a delete confirmation prompt on display **24** as shown in FIG. **10**, which provides the user with a second opportunity to abort the delete operation. The delete confirmation prompt depicted in FIG. **10** is in response to a delete selection (see FIG. **6**) and informs the user how many pages will be deleted and the percentage of memory that will be freed once the deletion is completed. While use of the confirmation prompt is not required, it is recommended because of the design paradigm followed in the preferred embodiment. To preserve memory resources in appliance **22**, once an image or page has been deleted it is permanently erased from memory and cannot be retrieved later. Alternative designs can be implemented by the skilled programmer, however, that provide additional protection from an inadvertent page deletion. For example, delete page module **94** could be designed to store deleted pages in memory **64** (see FIG. **2**) in a deleted page list or other suitable data structure. Once a page is deleted, this would be represented by a metaphor of placing the page in a garbage or trash can. Nevertheless, deleted pages that have been symbolically placed in the trash can could still be recovered through an option provided on the delete menu of FIG. **6**. To permanently delete a page, another option could be provided on the delete menu of FIG. **6** to, in effect, empty the trash can. Emptying the can causes the pages that are held on the deleted page list or data structure to be permanently erased from memory **64**. A drawback to this design, however, is that users may fail to empty the trash can to purge deleted pages from memory with sufficient frequency. As a result, memory resources may rapidly be exhausted. Because memory is a valuable commodity in the small embedded system used to control appliance **22**, the selected page or pages will be permanently deleted from memory provided a positive confirmation is received through a third invocation of delete button **34** at decision diamond **164**.

The user can abort the delete operation by activating navigation button **46** at decision diamond **166**. If the delete menu is exited, the delete process ends at step **168** by removing the confirmation prompt of FIG. **10** and the underlying delete menu of FIG. **6** from display **24** and returning the display to the previous view (i.e., the view on display prior to invocation of delete button **34**). Otherwise, if the delete operation is confirmed at decision diamond **164**, the delete process continues at termination D.

If a page or group of pages to be deleted are currently displayed in zoom view on display **24** as shown in FIG. **8**D, delete page module **94** determines this at decision diamond **172** and returns the display to the thumbnail view depicted in FIG. **8**C in step **174**. With the page or group of pages in thumbnail view, delete page module **94** permanently deletes the selected page or group of pages in step **176** and conveys this operation to the user through the use of an animation. According to the preferred embodiment, the delete animation shows the selected page or pages to be deleted turning to ash starting from the bottom of the page or pages and continuing to the top. The ashes are then shown to fall to the bottom of display **24** where they disappear from the display. Ashes are chosen as a metaphor for the delete operation in the preferred embodiment because they convey to the user the notion that the page or group of pages are permanently deleted. That is, it would be impossible to reconstruct a page burned to the point that only ashes remain. Similarly, it is impossible to recover a page or group of pages that have been purged from memory **64** through the delete feature of the present invention. Alternative animation scenes or even textual dialogs can be used to communicate the concept to the user that the delete operation is permanent without departing from the scope of the present invention. In choosing an alternative animation, emphasis should be placed on selecting a metaphor that conveys the irreversibility of the delete feature.

After the animation completes, display **24** is updated according to the particular page or group of pages that was deleted. For example, if a single page in a group of pages was deleted as represented by decision diamond **178**, the delete process continues at termination E of FIG. **9**C. If the deleted page happened to be the last page in the group as represented by decision diamond **182**, the new last page becomes the current page displayed on display **24** in step **184**. Otherwise, the following or subsequent page in the group becomes the current page on display in step **186**.

If the delete operation was not performed on a single page of a group, the delete process continues at termination F of FIG. **9**C. A determination is made by delete page module **94** at decision diamond **188** whether the delete operation purged memory **64** of all pages. This would occur if the all pages option was chosen from the delete menu of FIG. **6** or if the single page or group of pages deleted were the only remaining pages. If pages remain in memory **64** after the delete operation is performed, the delete process follows a similar sequence to that described hereinbefore following termination E. If the deleted, page or pages happened to be the last logical page or group as represented by decision diamond **192**, the new last page or group (i.e., page or group logically preceding the deleted page or group) is displayed on display **24** in step **194**. Otherwise, the following or subsequent page or group is displayed in step **196**.

Finally, if it is determined at decision diamond **188** that all images have been purged from memory **64**, then the empty memory usage indicator of FIG. **8**A will be displayed on display **24** in step **198** to inform the user that appliance **22** no longer contains any captured images.

It is important to emphasize that while the present invention has been illustrated herein with reference to an image capture and communication appliance, the GUI and human-machine interface features of the present invention are applicable to any device or appliance that stores information as data entitieg or fileg. Examples of such devices include digital cameras, video recording devices (e.g., video stored in digital form), audio recording devices (e.g., audio stored in digital form), portable fax machines, desktop, laptop, and hand-held computing devices. Furthermore, it is envisioned that the methods disclosed herein for deleting image data can likewise be used in any device or appliance that stores data as logical entities.

Application software **70**, which comprises an ordered listing of executable instructions for implementing logical functions, can be embodied in any computerreadable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-

based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In the context of this document, a "computer-readable medium" can be any means that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device. The computer readable medium can be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of the computer-readable medium would include the following: an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (magnetic), a read-only memory (ROM) (magnetic), an erasable programmable read-only memory (EPROM or Flash memory) (magnetic), an optical fiber (optical), and a portable compact disc read-only memory (CDROM) (optical). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via for instance optical scanning of the paper or other medium, then compiled, interpreted or otherwise processed in a suitable manner if necessary, and then stored in a computer memory.

The principles of the present invention have been disclosed herein as embodied in a portable, hand-held image capture and communication appliance that provides the flexibility of traditional hand-held scanners yet offers an array of intelligent features not heretofore known in the art. For example, the capture and communication appliance includes a delete page or image feature that is accompanied by an animation to convey to the user that once a page is deleted, it cannot be recovered. For protection against inadvertent image deletion, the user is provided with a confirmation prompt before a delete request is carried out. In addition, a GUI is provided that allows even a novice user to successfully operate the appliance with minimal or no outside instruction. It is these intelligent features that place the present invention in a new class of products known as electronic information appliances that merge the functionality of electronic peripheral devices, such as image scanners, with the processing capabilities and graphical interface used in computers.

In concluding the detailed description, it should be noted that it will be obvious to those skilled in the art that many variations and modifications can be made to the preferred embodiment without substantially departing from the principles of the present invention. All such variations and modifications are intended to be included herein within the scope of the present invention, as set forth in the following claims.

We claim:

1. A hand-held image capture and communication appliance, comprising:

a photoelement array for capturing image data;

a memory for saving said image data;

a processor in communication with said memory;

a display in communication with said processor for exhibiting said image data; and

program code stored in said memory and executed by said processor, said program code comprising a delete page module for purging said image data from said memory.

2. The appliance of claim **1**, wherein said program code further comprises:

a first code segment for displaying an animation on said display.

3. The appliance of claim **2**, wherein said program code further comprises:

a second code segment for displaying a delete confirmation prompt on said display.

4. The appliance of claim **1**, wherein said program code further comprises:

a third code segment for displaying valid appliance operations on said display based on a current state and processing any response thereto.

5. The appliance of claim **1**, wherein said delete page module comprises:

a first code segment for displaying a delete confirmation prompt on said display; and

a second code segment for displaying an animation on said display.

6. The appliance of claim **5**, wherein said animation is a metaphor for an irreversible deletion of said image data from said memory.

7. The appliance of claim **6**, wherein said metaphor is a page of said image data turning into ash.

8. The appliance of claim **5**, wherein said first code segment further comprises:

a fourth code segment for displaying a number of pages of said image data to be purged from said memory on said display.

9. The appliance of claim **5**, wherein said first code segment further comprises:

a fifth code segment for displaying a percentage of said memory to be made available on said display when said image data is purged from said memory.

10. A hand-held image capture and communication appliance, comprising:

capturing means for acquiring image data;

storage means for saving said image data;

processing means in communication with said storage means;

display means in communication with said processing means for exhibiting said image data; and

program code stored in said storage means and executed by said processing means, said program code comprising a delete page module for purging said image data from said storage means.

11. The appliance of claim **10**, wherein said program code further comprises:

a menu module for displaying valid appliance operations on said display based on a current state and processing any response thereto.

12. The appliance of claim **10**, wherein said delete page module comprises:

a first code segment for displaying a delete confirmation prompt on said display.

13. The appliance of claim **10**, wherein said delete page module comprises:

a first code segment for displaying an animation on said display.

14. The appliance of claim **10**, wherein said delete page module comprises:

a first code segment for displaying a delete confirmation prompt on said display; and

a second code segment for displaying an animation on said display means.

15. The appliance of claim **14**, wherein said first code segment further comprises:

a third code segment for displaying a number of pages of said image data to be purged from said storage means on said display means; and

a fourth code segment for displaying a percentage of said storage means to be made available on said display means when said image data is purged from said storage means.

16. The appliance of claim **14**, wherein said animation is a metaphor for an irreversible deletion of said image data from said storage means.

17. The appliance of claim **16**, wherein said metaphor is a page of said. image data turning into ash.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,292,273 B1
DATED : September 18, 2001
INVENTOR(S) : Dow et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

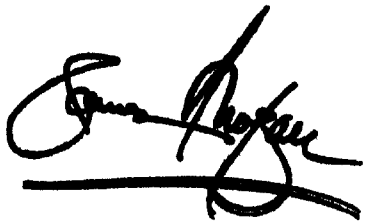
Column 1,
Line 8, delete "APPLIANNCE" and insert therefor -- APPLIANCE --
Line 13, delete "09/130,523" and insert therefor -- 09/130,573 --
Line 15, delete "09/180,789" and insert therefor -- 09/130,789 --
Line 17, delete "GRAPHICALL" and insert therefor -- GRAPHICALLY --
Line 18, delete "WITHAND" and insert therefor -- WITH AND --

Column 6,
Line 36, after "captured pages." do not begin a new paragraph

Column 10,
Line 55, delete "entitieg or fileg" and insert therefor -- entities or files --

Signed and Sealed this

Fourth Day of November, 2003



JAMES E. ROGAN
Director of the United States Patent and Trademark Office