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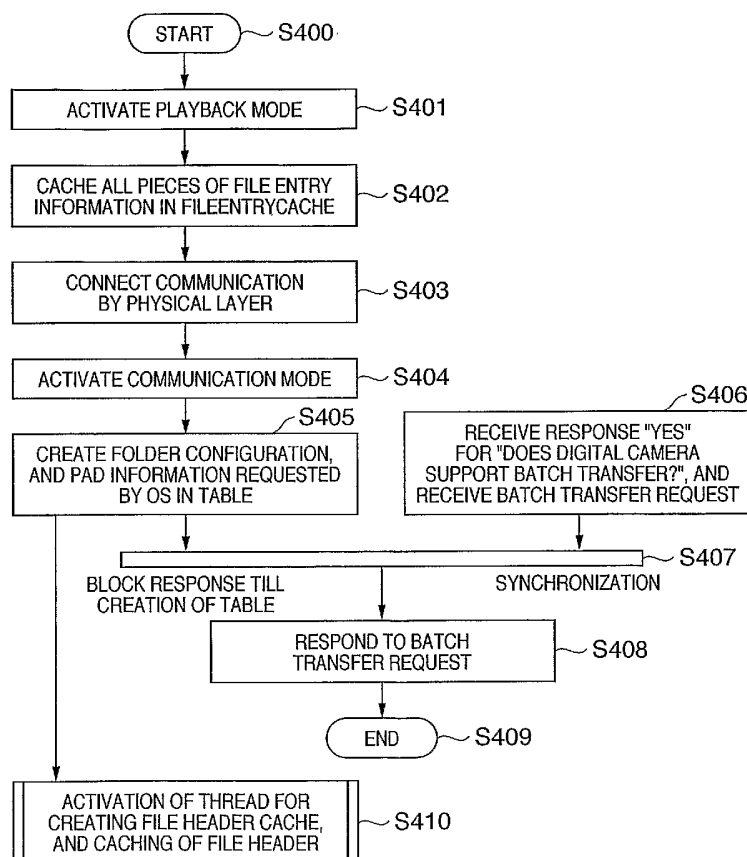
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(54) Title: ELECTRONIC APPARATUS AND CONTROL METHOD



(57) Abstract: An object of this invention is to shorten the response time of an electronic apparatus such as an electronic camera capable of communicating with an information processing apparatus such as a computer, and improve the usability of the information processing apparatus when the information processing apparatus requests data stored in the storage medium of the electronic apparatus. For this purpose, in an electronic apparatus which has a main storage device and an auxiliary storage device, is connected to an external apparatus, and can transmit/receive data to/from the external apparatus, data to be requested by the external apparatus is loaded in advance from the auxiliary storage device to the main storage device before the external apparatus requests the data after connection to the external apparatus is established.



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DESCRIPTION

Electronic apparatus and control method

5 TECHNICAL FIELD

The present invention relates to a technique of shortening the response time of an electronic apparatus such as an electronic camera capable of communicating with an information processing apparatus such as a
10 computer, and improving the usability of the information processing apparatus when the information processing apparatus requests data stored in the storage medium of the electronic apparatus.

15 BACKGROUND ART

An image photographed by a digital camera is generally stored as a file in an auxiliary storage device such as a CF (Compact Flash® memory) mounted in the digital camera. In order to capture the image, the
20 digital camera is generally connected to a computer, a host application is activated in the computer, and the image is transferred.

In general, an application displays reduced images (thumbnail images) as a list of images stored in
25 the auxiliary storage device of the digital camera. The user selects a desired one of the thumbnail images to capture an image file corresponding to the selected

thumbnail image into the computer. The image file is displayed on the display screen of the computer or saved in the auxiliary storage device of the computer.

According to an image file format "Exif-JPEG" which is generally employed in digital cameras, thumbnail images are stored in the same image file as that of main image data. In the above case, when a list is displayed, an area containing thumbnail image data out of the image file is transferred from the digital camera to the computer, and the entire image file need not be transferred to the computer. Hence, the process speed is much higher than that in a case wherein the entire file is transferred to display thumbnail images.

For example, Japanese Patent Laid-Open No. 10-084473 discloses the following technique. That is, the transmitting side creates reduced images by reducing stored original images, and transmits image data of the reduced images to the receiving side. The receiving side displays a list of the received reduced images. Image data of original images corresponding to one or a plurality of reduced images selected from the list are transmitted from the transmitting side to the receiving side.

Recently, as an auxiliary storage device mounted in a digital camera increases in capacity, the number of image files stored in the auxiliary storage device

also increases. Transfer of only reduced images takes a long time when the reduced images of all images stored in the auxiliary storage device are transferred. A long transfer time degrades usability in, e.g.,
5 displaying a list of thumbnail images.

DISCLOSURE OF INVENTION

The present invention has been made to overcome the conventional drawbacks, and has as its object to
10 shorten the response time of an electronic apparatus such as an electronic camera capable of communicating with an information processing apparatus such as a computer, and improve the usability of the information processing apparatus when the information processing
15 apparatus requests data stored in the storage medium of the electronic apparatus.

To solve the above problems and achieve the above object, according to the first aspect of the present invention, there is provided an electronic apparatus
20 which has a main storage device and an auxiliary storage device, is connected to an external apparatus, and can transmit/receive data to/from the external apparatus, wherein data to be requested by the external apparatus is loaded in advance from the auxiliary
25 storage device to the main storage device before the external apparatus requests the data.

According to the second aspect of the present

invention, there is provided a method of controlling an electronic apparatus which has a main storage device and an auxiliary storage device, is connected to an external apparatus, and can transmit/receive data
5 to/from the external apparatus, which controls to load in advance data to be requested by the external apparatus from the auxiliary storage device to the main storage device before the external apparatus requests the data.

10 The electronic apparatus control method according to the present invention is characterized in that after connection to the external apparatus is established, data to be requested by the external apparatus is controlled to be loaded in advance from the auxiliary
15 storage device to the main storage device before the external apparatus requests the data.

According to the third aspect of the present invention, a program causes a computer to execute the control method.

20 According to the fourth aspect of the present invention, a storage medium computer-readably stores the program.

Other objects and advantages besides those discussed above shall be apparent to those skilled in
25 the art from the description of a preferred embodiment of the invention which follows. In the description, reference is made to accompanying drawings, which form

a part hereof, and which illustrate an example of the invention. Such example, however, is not exhaustive of the various embodiments of the invention, and therefore reference is made to the claims which follow the
5 description for determining the scope of the invention.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a block diagram showing a system having a digital camera and computer according to an
10 embodiment of the present invention;

Figs. 2A and 2B are functional block diagrams showing the system having the digital camera and computer according to the embodiment of the present invention;

15 Fig. 3 is a block diagram showing the main module configuration of the system having the digital camera and computer according to the embodiment of the present invention;

Fig. 4 is a flowchart showing operation of the
20 digital camera according to the embodiment of the present invention;

Fig. 5 is a flowchart showing operation of an application according to the embodiment of the present invention;

25 Fig. 6 is a flowchart showing operation of the digital camera according to the embodiment of the present invention;

Figs. 7A and 7B are sequence charts showing operations of the digital camera and computer according to the embodiment of the present invention; and

Fig. 8 is a conceptual view for explaining
5 caching of a file header according to the embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

A preferred embodiment of the present invention
10 will be described below.

A time taken to transfer to a computer the reduced images of images stored in the auxiliary storage device of a digital camera is roughly divided into two:

15 (1) a read time taken to read out a reduced image area in an image file from the auxiliary storage device, and

(2) a data transfer time taken to transfer the reduced image area to the computer.

20 The embodiment of the present invention gives attention to the read time. When a digital camera is connected to a computer, the reduced image area is read out from the auxiliary storage device of the digital camera and stored in a main storage device such as a
25 RAM in advance before an application requests the reduced image area. When the computer requests transfer of the reduced image area, the digital camera

sends back the reduced image data loaded in the main storage device.

A system according to the embodiment is roughly comprised of an electronic apparatus (e.g., a digital camera) having an auxiliary storage means and main storage means for recording photographed image data in a file, an information processing apparatus (e.g., a computer) which can connect the electronic apparatus, and application software which runs in the information processing apparatus.

The embodiment of the present invention will be described in detail.

The embodiment implements high-speed list display of reduced images (thumbnail images) in an application by executing loading of thumbnail data to the main storage device until the application requests thumbnail data of the digital camera after the digital camera and computer are connected by PTP (Picture Transfer Protocol) communication.

As shown in Fig. 1, the system according to the embodiment comprises a digital camera 100 having a PTP communication function, and a computer 101 capable of PTP communication. The digital camera 100 and computer 101 can communicate with each other via a communication interface 102 capable of PTP communication. The digital camera 100 detects connection to the computer 101 via the communication interface 102, and changes to

a communication mode. A previous mode is a playback mode. In the computer, an application and driver (including an OS function) capable of PTP communication are installed.

5 Figs. 2A and 2B are block diagrams showing the system having the digital camera 100 and computer 101 in Fig. 1.

Reference numeral 201 denotes an optical system. A beam from an object is formed into an image via the optical system 201, and the image is held as charges by
10 an image sensor 202. Charges stored in the image sensor 202 are converted into an image signal by an image sensing process unit 203. A signal output from the image sensing process unit 203 is converted into a
15 digital signal via an A/D converter 204, and the digital signal is saved in a RAM 210 via a data bus 205.

A central processing unit 213 is roughly made up of six units: an image processing unit 207 (for white
20 balance, sharpness, softening, color balance, level adjustment, and the like), a compression/decompression unit 208 (for JPEG decompression and the like), a display control unit 209 (for rendering of a UI (User Interface) on a display device 217), a
25 recording/playback control unit 211 (for I/O control of a storage medium 218), a communication control unit 212 (for I/O control of data to a communication device

219), and a central control unit 215 (for supervision of these control units).

A system control unit 214 is connected to the data bus 205, and controls operation by the user via an operation device 216. The display device 217 displays a rendering UI requested by the display control unit 209. The storage medium 218 stores via the recording/playback control unit 211 an image (JPEG image or the like) saved in the RAM 210. The storage medium 218 may be a detachable medium or a built-in storage medium of the apparatus, and can hold the storage even when the digital camera is OFF. In the embodiment, a JPEG image file stored in the storage medium complies with the DCF standard, and stores thumbnail data at the header of the file. The communication device 219 may be of a wireless or wired type and of a detachable or undetachable type. The communication control unit 212 can communicate by PTP.

An operation device 221 of the computer 101 includes a keyboard and mouse, and the operation of the operation device 221 is controlled by a system control unit 225. A display device 222 is an output monitor, and outputs a UI rendered by a display control unit 228. A RAM 229 is a nonvolatile memory which stores the OS of the computer and a PTP-compatible application (including an OS). A storage medium 223 inputs/outputs data in accordance with a data request from a storage

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control unit 230, and is a nonvolatile storage device. The storage medium 223 stores applications corresponding to the OS and PTP. A communication device 224 can be connected to the communication interface 102, and inputs/outputs data under the control of a communication control unit 231. The communication device 224 may be of a wireless or wired type and of a detachable or undetachable type. A central processing unit 227 is made up of the display control unit 228, the storage control unit 230, the communication control unit 231, and a central control unit 226 (e.g., for supervision of these control units). A data bus 232 is connected to the system control unit 225, display control unit 228, RAM 229, storage control unit 230, and communication control unit 231.

Fig. 3 is a block diagram showing a main module configuration when the computer 101 and digital camera 100 are connected via the communication interface 102.

An application 301 is a digital camera application which runs in the computer. The application 301 is registered in advance in an OS 302, and may be activated automatically by using connection of the digital camera as a trigger or activated by user operation. The embodiment assumes that the application 301 is mainly activated when the application 301 is notified by the OS 302 that the digital camera 100 has

been connected, and the application 301 displays a list of the reduced images of images stored in the digital camera. For this purpose, the application 301 supports PTP. If the OS 302 establishes connection to the
5 digital camera 100, the application 301 can access the digital camera 100.

The OS 302 is the operating system of the computer 101. The embodiment assumes an OS (e.g., Windows® available from Microsoft) having a function
10 capable of interpreting PTP communication, or an OS capable of PTP communication upon installing a driver. The OS 302 also has a function of recognizing a device capable of PTP communication, and acquiring/managing multimedia information in the digital camera 100.
15 After all pieces of information are acquired, the OS 302 can connect the application and digital camera, and transfer a device handle in response to a request from the application. The embodiment assumes a setting which automatically activates the application 301 upon
20 acquisition of all pieces of information.

A PTPInitiatorDriver 303 is installed in the OS 302, and loaded in response to a request from the OS.

The communication interface 102 can communicate by PTP, and may be of a wireless or wired type and of a
25 detachable or undetachable type as far as PTP communication is possible.

The digital camera 100 can communicate by PTP,

and incorporates a PTPResponderDriver 306,
PTPCacheTable 307, FileEntryCache 308, and
FileHeaderCache 309.

The PTPResponderDriver 306 is assumed to be a PTP
5 responder driver installed in the digital camera 100.

The PTPCacheTable 307 is a cache table for
information requested by PTP. Information which has
been used once can be acquired by referring to the
PTPCacheTable 307 as far as cache matching is
10 guaranteed. The PTPCacheTable 307 is created in the
RAM of the digital camera 100. In general, access to a
RAM is higher in speed than access to a storage medium.
High-speed access can be realized by creating a cache
in the RAM, instead of directly accessing a storage
15 medium and analyzing information. In the embodiment,
the cache structure is arbitrary.

The FileEntryCache 308 caches entry information
of a file, i.e., items written in the file entry (e.g.,
file name, file size, attribute, creation date and
20 time, update date and time, and access date and time).
The FileEntryCache 308 can be referred to as far as
cache matching is guaranteed, similar to the
PTPCacheTable 307, and thus high-speed access can be
realized.

25 The FileHeaderCache 309 caches the header area of
an image file. The digital camera according to the
embodiment generates a DCF-compatible Exif-JPEG file,

and the header area also stores thumbnail data. The FileHeaderCache 309 can be referred to as far as cache matching is guaranteed, similar to the PTPCacheTable 307, and thus high-speed access can be realized.

5 Fig. 4 is a flowchart showing a process performed by the digital camera 100 until the OS 302 notifies the application 301 of activation after detecting connection of the digital camera 100 to the computer 101 via the communication interface 102.

10 At start 400, the digital camera is activated. After start 400, the digital camera 100 is activated in the playback mode (step S401), and caches the file entries of all pieces of medium information in the FileEntryCache 308 (step S402). At this time, the
15 order of media to be cached is arbitrary. The digital camera 100 is connected to the computer via the communication interface 102 (step S403). At this time, the digital camera 100 detects connection of communication by the physical layer, and changes to the
20 communication mode (step S404).

 In the communication mode, the digital camera 100 creates a folder configuration on the basis of data in the FileEntryCache 308, and creates the PTPCacheTable 307 (step S405). At this time, the table is created in
25 consideration of medium information which is to be requested by the OS 302, and a folder configuration which is requested by the OS 302. More specifically,

the PTPCacheTable 307 is created by creating an ObjectHandle and ObjectFormatCode which are necessary as PTP information in addition to information in the FileEntryCache 308 in order to satisfy multimedia
5 information requested by the OS 302. Since no storage medium need be accessed, the process can be completed at a high speed.

Irrespectively of this timing, the computer inquires whether the digital camera 100 supports batch
10 transfer operation as an extended operation of PTP. Since the digital camera 100 according to the embodiment supports batch transfer operation, it sends back a response to this effect. Note that batch transfer is to directly transfer all pieces of
15 multimedia information in the PTPCacheTable. The PTPInitiatorDriver which runs in the computer analyzes the received information of the PTPCacheTable, and executes a process.

If step S405 ends when the computer 101 requests
20 batch transfer (step S406), the digital camera 100 responds to batch transfer (step S408); otherwise, the digital camera 100 blocks the response till the end of step S405 (step S407). In the process of step S408, the digital camera 100 transfers all pieces of
25 multimedia information in the PTPCacheTable. At this time, the PTPCacheTable may be transferred by a fixed size or a variable length size corresponding to the

number of PTP objects. In the process of Fig. 4, the communication count is only one. However, when the data size of an operation performed in batch transfer is a variable length, the computer does not know a size to be ensured and prepared. Thus, redundancy must be given so that an operation of inquiring the size in advance is added, or the version is acquired to change a structure padded in the FileEntryCache 308 in accordance with a change in information requested by the OS 302. Even considering this method, all pieces of multimedia information can be transferred by several communication operations.

After the end of the process in step S405, another thread is activated in the digital camera 100, and creation of the FileHeaderCache 309 starts (step S418). In this case, the header of an image file stored in the storage medium 218 is loaded by a predetermined size, and padded in the FileHeaderCache 309. Assume that the header size of a file to be loaded and the size of the FileHeaderCache 309 are determined in advance. In the embodiment, the header size of a file to be loaded is 10 kbytes, and the size of the FileHeaderCache 309 is 10,000 kbytes, that is, the file headers of 1,000 image files can be stored in the FileHeaderCache 309. These sizes may be changed in accordance with an image file stored in a storage medium and the number of image files.

If the digital camera 100 receives header information transfer request operation from the computer 101 and the header of a desired file is stored in the FileHeaderCache 309, the digital camera 100 can quickly send back the header information to the computer without accessing the storage medium. As a result, the application 301 can quickly acquire file header information containing thumbnail data, and display a list of thumbnails at a high speed.

10 Note that the FileHeaderCache 309 can hold only 1,000 images. When more than 1,000 images exist, the storage medium must be accessed to acquire the file headers of images which exceed 1,000 images, and the response time becomes as long as a conventional one.

15 However, 1,000 images are sufficient for practical use, and in addition, the FileHeaderCache 309 is created in the RAM of the digital camera 100. For a digital camera having a satisfactory main storage capacity, the FileHeaderCache 309 for a larger number of image files

20 can be prepared. In this case, more than 1,000 images can be acquired at a high speed.

 The FileHeaderCache 309 is not a general FIFO memory and is not deleted from the cache even after it is referred to once. Instead, only a corresponding

25 file is deleted.

 Fig. 5 is a flowchart showing a process performed by the computer until the OS 302 notifies the

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application 301 of activation and the application 301 displays a list of thumbnail images after detecting connection of the computer 101 to the digital camera 100 via the communication interface 102.

5 Start 500 represents a state in which the computer runs.

 In response to connection via the communication interface 102, the computer detects connection of the physical layer (step S501). The OS 302 recognizes a
10 device connected on the basis of data on a device which was connected (step S502). Assume that the PTP-compatible digital camera 100 is connected at least once, and its driver is installed. The OS 302 requests, of the PTPInitiatorDriver 303, all pieces of
15 multimedia information of the digital camera 100 and their folder configurations (step S503). At this time, a file name, file size, file attribute, file creation date and time, PTP ObjectHandle, PTP ObjectFormatCode, and a folder configuration requested by the OS 302 are
20 requested. Upon reception of the request from the OS 302, the PTPInitiatorDriver 303 inquires whether the digital camera 100 supports the batch data transfer function (step S504). In the embodiment, the PTPInitiatorDriver 303 makes an inquiry by using a
25 GetDeviceInfo of PTP operation. If the digital camera 100 supports the batch data transfer function as a result of the inquiry (YES in step S505), the

PTPInitiatorDriver 303 requests batch data transfer (step S507). Upon reception of data, the PTPInitiatorDriver 303 analyzes data in accordance with a configuration requested by the OS 302 on the basis of the received data, and responds to the OS 302 (step S509).

If NO in the process of step S505, the PTPInitiatorDriver 303 acquires all pieces of multimedia information in the digital camera 100 by using, e.g., GetStorageIDs, GetStorageInfo, GetObjectHandles, and GetObjectInfo of PTP operation. After that, the flow shifts to the process of step S508.

Upon reception of a response to the request to the PTPInitiatorDriver 303, the OS 302 activates the application 301 (step S510). The application 301 is activated and requests header data of an image file (step S511). Upon reception of the header data, the application 301 analyzes the data, extracts thumbnail data (step S512), and displays the thumbnail data on the display screen (step S513). This process is repeated by the number of thumbnails to be displayed.

Figs. 7A and 7B are sequence charts until the OS 302 activates the application 301 after the digital camera 100 and computer 101 are connected. This sequence chart corresponds to the module configuration in Fig. 3.

When connection of the physical layer is established via the communication interface 102 (709), the digital camera 100 and computer 101 detect the connection. Before or after connection of the physical layer, the digital camera 100 enters the playback mode once (in the digital camera 100 of the embodiment, the playback mode always precedes the communication mode). In the playback mode, all pieces of file entry information are written and cached in the FileEntryCache 308. Created cache items are a file name, file size, file attribute, and file creation date and time, and the file caching order is not particularly specified.

After the communication mode is activated, another thread is set upon activation of the communication mode, and information requested by the OS 302 is created in the PTPCacheTable 307 in advance. Since the PTPCacheTable 307 is created on the basis of information of the FileEntryCache 308, no access to the storage medium 218 occurs, and the process can be done at a high speed.

While another thread is activated, connection of the physical layer is done in the computer 101 (709), and then the OS 302 detects the connection and starts negotiation with a device (710). At the end of the negotiation, the OS 302 recognizes an imaging device, and requests the device information of the

PTPInitiatorDriver 303. At this time, a file name,
file size, file attribute, file creation date and time,
PTP ObjectHandle, PTP ObjectFormatCode, and folder
configuration are requested. Upon reception of the
5 request from the OS 302, the PTPInitiatorDriver 303
issues a GetDeviceInfo operation command, and sends the
inquiry to the digital camera 100 in order to know
whether the digital camera 100 supports batch data
transfer. Upon reception of the request, the
10 PTPResponderDriver 306 of the digital camera sends back
information representing that the digital camera
supports batch transfer.

Batch transfer means a function of directly
transferring information held in the PTPCacheTable 307
15 to a PC.

The PTPInitiatorDriver 303 of the computer then
executes batch transfer operation GetPTPCacheTable as
an extended operation of PTP.

The digital camera 100 receives the
20 GetPTPCacheTable, and determines whether the
PTPCacheTable 307 can meet the request from the OS 302.
If so, the digital camera 100 instantaneously responds;
otherwise, blocks the response until creation of the
table is completed.

25 Upon the reception of a response to the
GetPTPCacheTable, the PTPInitiatorDriver 303 analyzes
the received table information, analyzes the multimedia

object configuration in the camera, changes it into a configuration requested by the OS 302, and sends back the changed configuration to the OS 302. Upon reception of the information, the OS 302 activates the application 301.

Immediately after the PTPCacheTable is created, the digital camera 100 starts creating the FileHeaderCache 309 (729).

When file header information acquisition operation GetFileHeader is executed upon the completion of creating the FileHeaderCache 309, the digital camera 100 can send back information in the FileHeaderCache 309 as a response. In the embodiment, information requested by GetFileHeader is read out in advance from a storage medium to the RAM (FileHeaderCache 309) by using an interval until GetFileHeader operation is executed upon the completion of creating the PTPCacheTable. With this setting, the digital camera 100 can immediately respond to a GetFileCache because data can be loaded from the RAM more quickly than from the storage medium.

In Figs. 7A and 7B, when many image files exist, header acquisition request GetFileHeader operation from the application may be executed before the FileHeaderCache 309 caches all images. This corresponds to a case wherein a GetFileCache 740 is executed before caching completion 730 in Fig. 7. In

this case, the GetFileCache 740 may be ended with an error or kept waiting till caching completion 730. In this state, however, the application cannot display any thumbnail, resulting in poor usability. In order to

5 avoid this, when the header acquisition request GetFileHeader is executed while the FileHeaderCache 309 is created, i.e., the process in step S410 of Fig. 4 is executed, the digital camera according to the embodiment interrupts a thread which executes caching,

10 suspends the caching process, performs an interrupt process, and preferentially responds to the GetFileHeader.

Fig. 6 is a flowchart showing the interrupt process.

15 Start 800 represents the start of the interrupt process. In step S810, it is determined whether a file header requested by a GetFileHeader has been cached in the FileHeaderCache 309. If the requested file header has already been cached, the data cached in the

20 FileHeaderCache 309 is sent back as a response to the GetFileHeader. If no requested file header has been cached, a desired file header is loaded from a recording medium and cached in the FileHeaderCache 309 in step S820. In step S830, the cached data is sent

25 back as a response to the GetFileHeader.

Fig. 8 is a conceptual view for explaining the state of the FileHeaderCache 309 at this time.

When a thread for creating the FileHeaderCache 309 is activated, the headers of image files stored in a storage medium are sequentially stored in the FileHeaderCache 309. In the embodiment, the image files are stored in the order of the file names of files stored in the storage medium. However, the present invention is not limited to this. In 902 of Fig. 8, up to files F1, F2, and F3 have been processed, and the FileHeaderCache 309 stores headers H1, H2, and H3 corresponding to the respective files. In general, a file to be processed next is a file F4, and the FileHeaderCache 309 is to store a header H4 of the file F4. However, when the computer executes a GetFileHeader and a requested file is Fn, a header Hn of the file Fn does not exist in the FileHeaderCache 309. Hence, a process to Fn is executed, the header Hn of the file Fn is stored in the FileHeaderCache 309, and the data is sent back as a response to the GetFileHeader. After the interrupt process ends, the thread for creating the FileHeaderCache 309 continues its process to process the file F4. As a result, the state of the FileHeaderCache 309 changes to a state 903.

As described above, according to the embodiment, immediately after connection between the digital camera and the computer is established, file headers are read out from the storage medium and cached. In many cases,

when the computer recognizes a device such as a digital camera, the OS or driver performs any process. Upon the completion of the process, an application which runs in the computer becomes accessible to the device.

- 5 The embodiment gives attention to the time necessary for the OS or driver. During the time, in the digital camera, an area (file header) which stores thumbnail data expected to be requested by the application is read out from the storage medium and cached in the RAM.
- 10 Generally from a comparison between read speeds from a storage medium and RAM, the read speed from the RAM is much higher. For these reasons, when the application requests thumbnail data of the digital camera, the digital camera can quickly send back data, and the
- 15 application can display a list of thumbnails at a high speed.

- As described in detail above, according to the embodiment, of a file stored in the auxiliary storage device of an electronic apparatus, a data area which is
- 20 to be transferred in accordance with a request from an external apparatus connected to the electronic apparatus is cached in the main storage device in advance, thereby quickly meeting a data request from the external apparatus. Even when data transfer is
- 25 requested during caching, the request can be quickly met by suspending caching by an interrupt process.

In the embodiment, capturing of thumbnail data to

the main storage device is executed until the application requests thumbnail data of the digital camera after connection by PTP communication. However, capturing may be done before connection by PTP communication or during a process for connection as far as it is executed until the application requests thumbnail data of the digital camera.

The embodiment can shorten the response time of an electronic apparatus such as an electronic camera capable of communicating with an information processing apparatus such as a computer, and improve the usability of the information processing apparatus when the information processing apparatus requests data stored in the storage medium of the electronic apparatus.

15 (Other Embodiment)

The object of the embodiment is also achieved when a storage medium (or recording medium) which stores software program codes for realizing the functions of the above-described embodiment is supplied to a system or apparatus, and the computer (or the CPU or MPU) of the system or apparatus reads out and executes the program codes stored in the storage medium. In this case, the program codes read out from the storage medium realize the functions of the above-described embodiment, and the storage medium which stores the program codes constitutes the present invention. The functions of the above-described embodiment are realized when the

computer executes the readout program codes. Also, the present invention includes a case wherein an OS (Operating System) or the like running on the computer performs some or all of actual processes on the basis of the instructions of the program codes and thereby realizes the functions of the above-described embodiment.

Furthermore, the present invention includes a case wherein, after the program codes read out from the storage medium are written in the memory of a function expansion card inserted into the computer or the memory of a function expansion unit connected to the computer, the CPU of the function expansion card or function expansion unit performs some or all of actual processes on the basis of the instructions of the program codes and thereby realizes the functions of the above-described embodiment.

When the present invention is applied to the storage medium, the storage medium stores program codes corresponding to the above-described sequences.

The present invention is not limited to the above embodiments and various changes and modifications can be made within the spirit and scope of the present invention. Therefore, to apprise the public of the scope of the present invention the following claims are made.

CLAIM OF PRIORITY

This application claims priority from Japanese
Patent Application No. 2004-268711 filed on September
15, 2004, the entire contents of which are hereby
5 incorporated by reference herein.

CLAIMS

1. An electronic apparatus which has a main storage device and an auxiliary storage device, is connected to an external apparatus, and can transmit/receive data
5 to/from the external apparatus, wherein
data to be requested by the external apparatus is loaded in advance from the auxiliary storage device to the main storage device before the external apparatus requests the data.
- 10 2. The apparatus according to claim 1, wherein after connection to the external apparatus is established, data to be requested by the external apparatus is loaded in advance from the auxiliary storage device to the main storage device before the external apparatus
15 requests the data.
3. The apparatus according to claim 1, wherein the auxiliary storage device saves data as a file, and the data which is loaded in advance to the main storage device includes part or all of the file stored in the
20 auxiliary storage device.
4. The apparatus according to claim 1, wherein when an area for loading data to the main storage device becomes full, information is directly read out from the auxiliary storage device to meet a request from the
25 external apparatus.
5. The apparatus according to claim 1, wherein when a data request from the external apparatus is received

and no necessary data exists in the main storage device while data to be requested by the external apparatus is loaded in advance to the main storage device, corresponding information is loaded from the auxiliary
5 storage device to the main storage device to send back data to the external apparatus.

6. The apparatus according to claim 1, wherein the electronic apparatus includes a digital camera, and the external apparatus includes a computer.

10 7. A method of controlling an electronic apparatus which has a main storage device and an auxiliary storage device, is connected to an external apparatus, and can transmit/receive data to/from the external apparatus, controlling to load in advance data to be
15 requested by the external apparatus from the auxiliary storage device to the main storage device before the external apparatus requests the data.

8. The method according to claim 7, wherein after connection to the external apparatus is established,
20 data to be requested by the external apparatus is controlled to be loaded in advance from the auxiliary storage device to the main storage device before the external apparatus requests the data.

9. The method according to claim 7, wherein the
25 auxiliary storage device saves data as a file, and the data which is loaded in advance to the main storage device includes part or all of the file stored in the

auxiliary storage device.

10. The method according to claim 7, wherein when an area for loading data to the main storage device becomes full, information is directly read out from the auxiliary storage device to meet a request from the external apparatus.

11. The method according to claim 7, wherein when a data request from the external apparatus is received and no necessary data exists in the main storage device while data to be requested by the external apparatus is loaded in advance to the main storage device, corresponding information is controlled to be loaded from the auxiliary storage device to the main storage device to send back data to the external apparatus.

12. The method according to claim 7, wherein the electronic apparatus includes a digital camera, and the external apparatus includes a computer.

13. A program causing a computer to execute a control method defined in claim 7.

14. A storage medium computer-readably storing a program defined in claim 13.

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FIG. 1

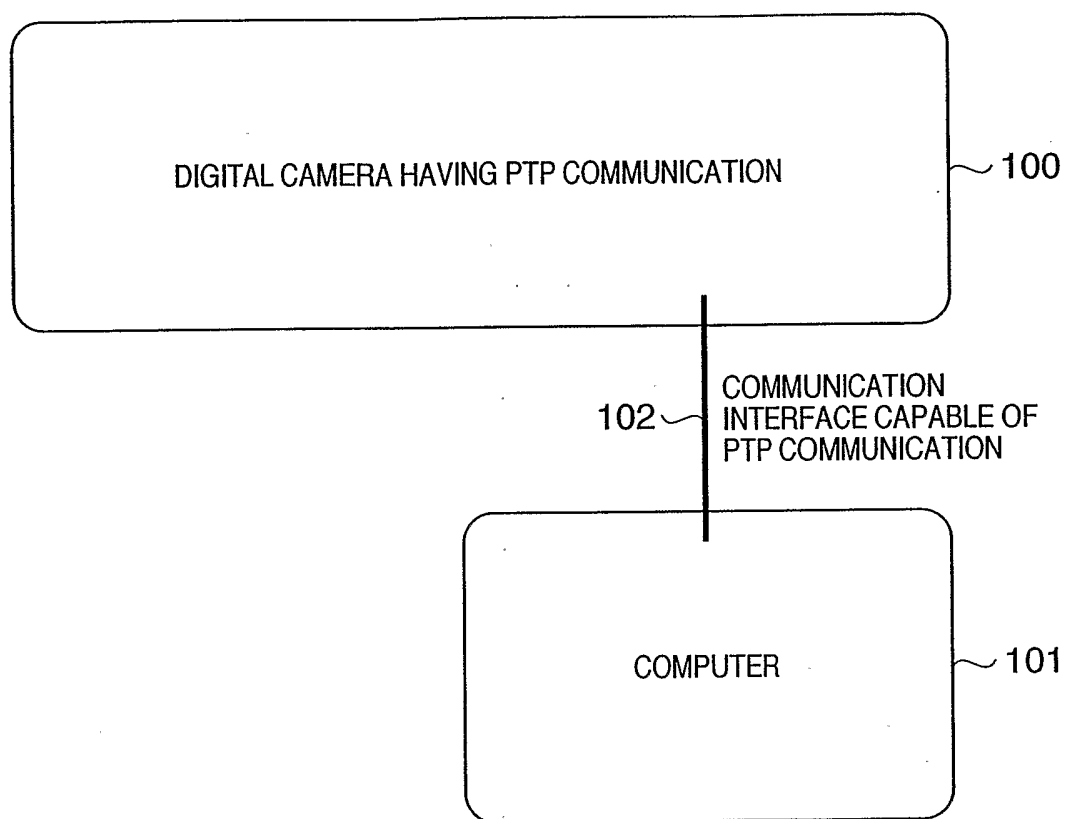
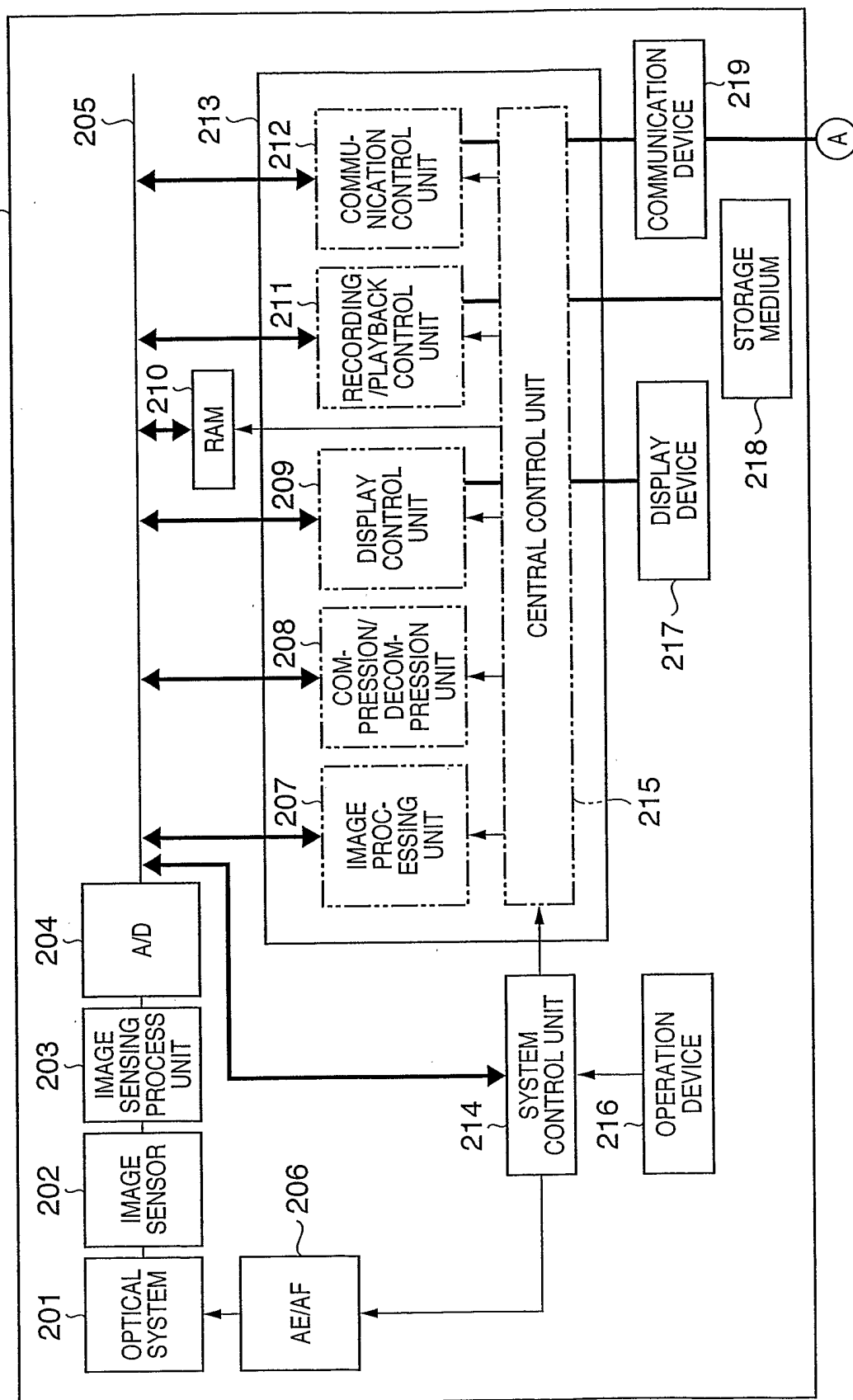


FIG. 2A



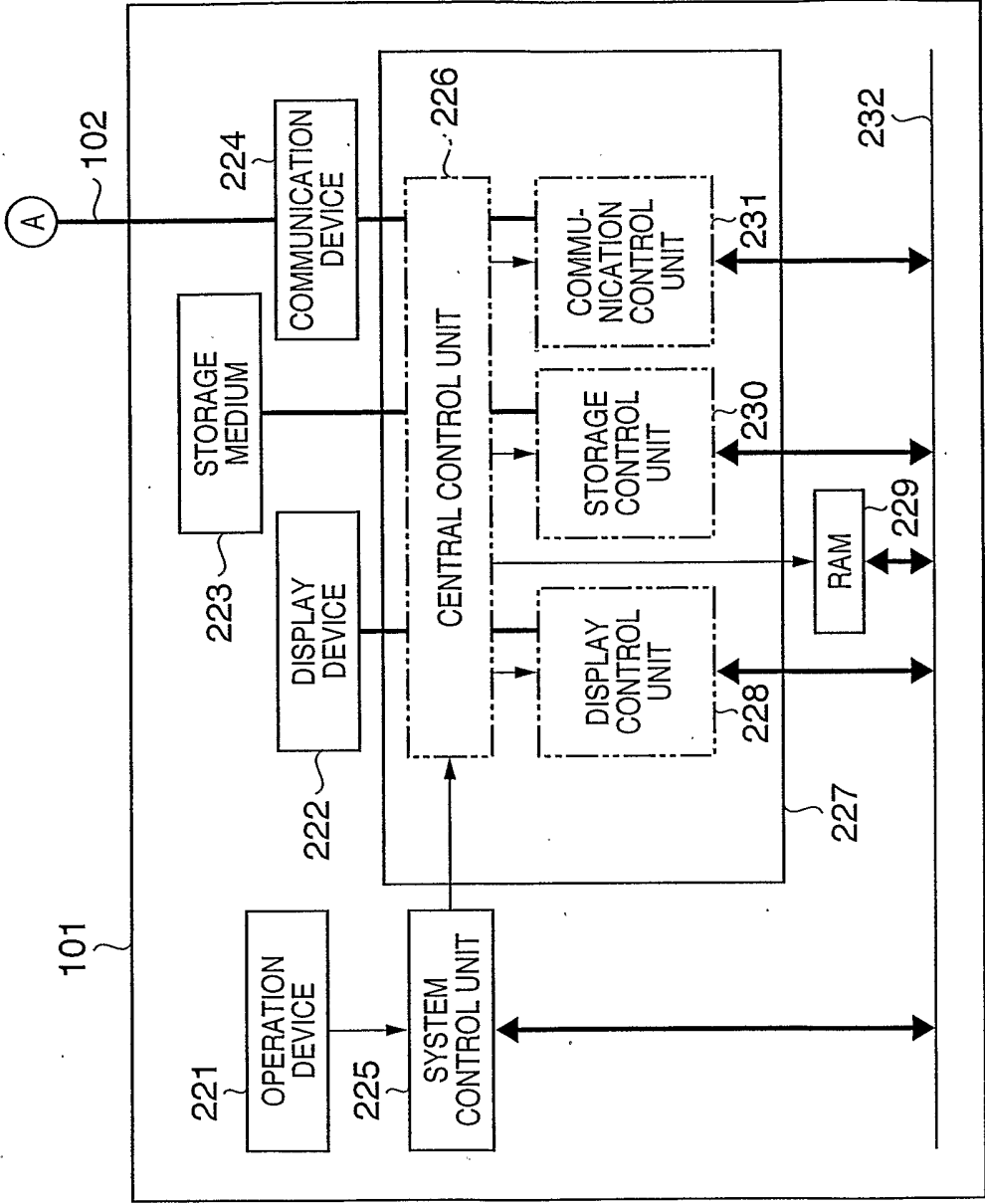
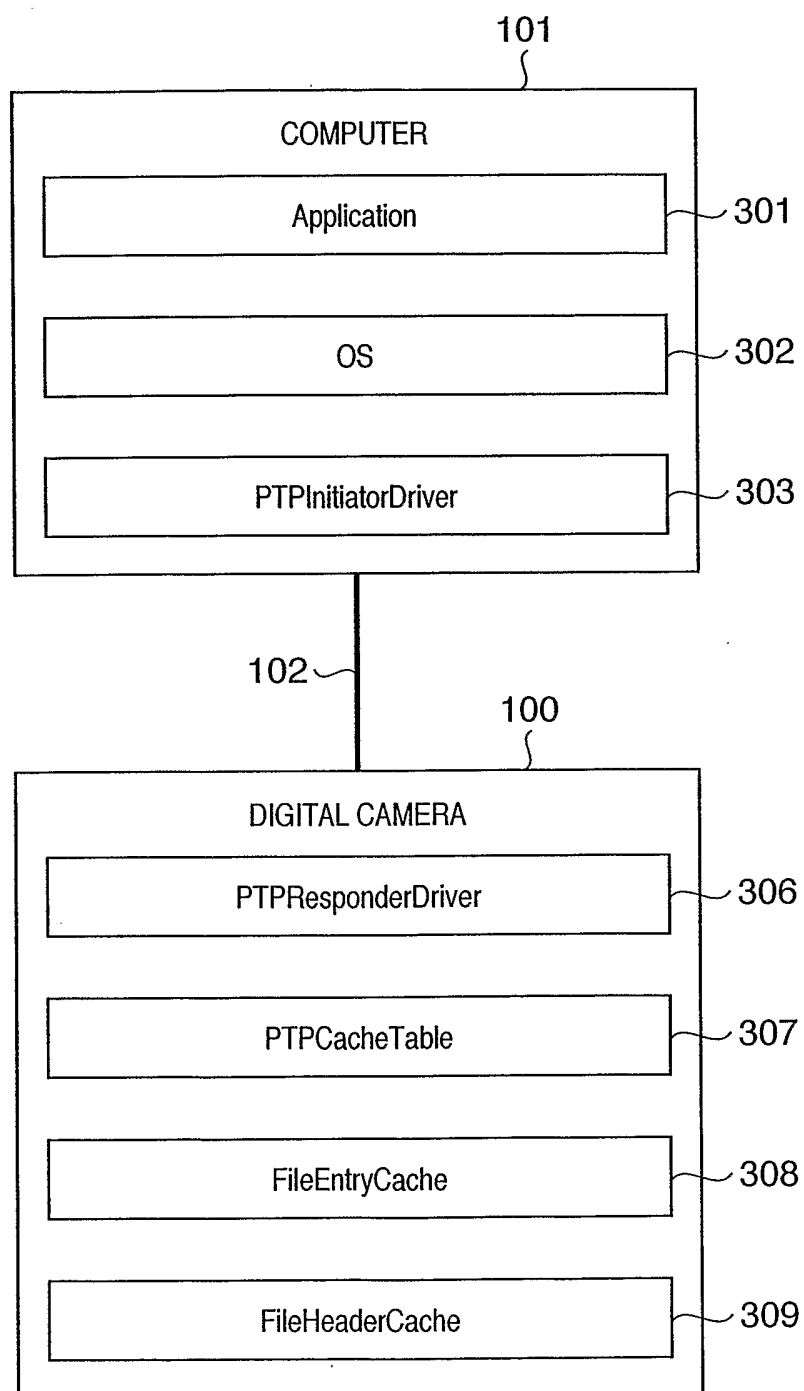
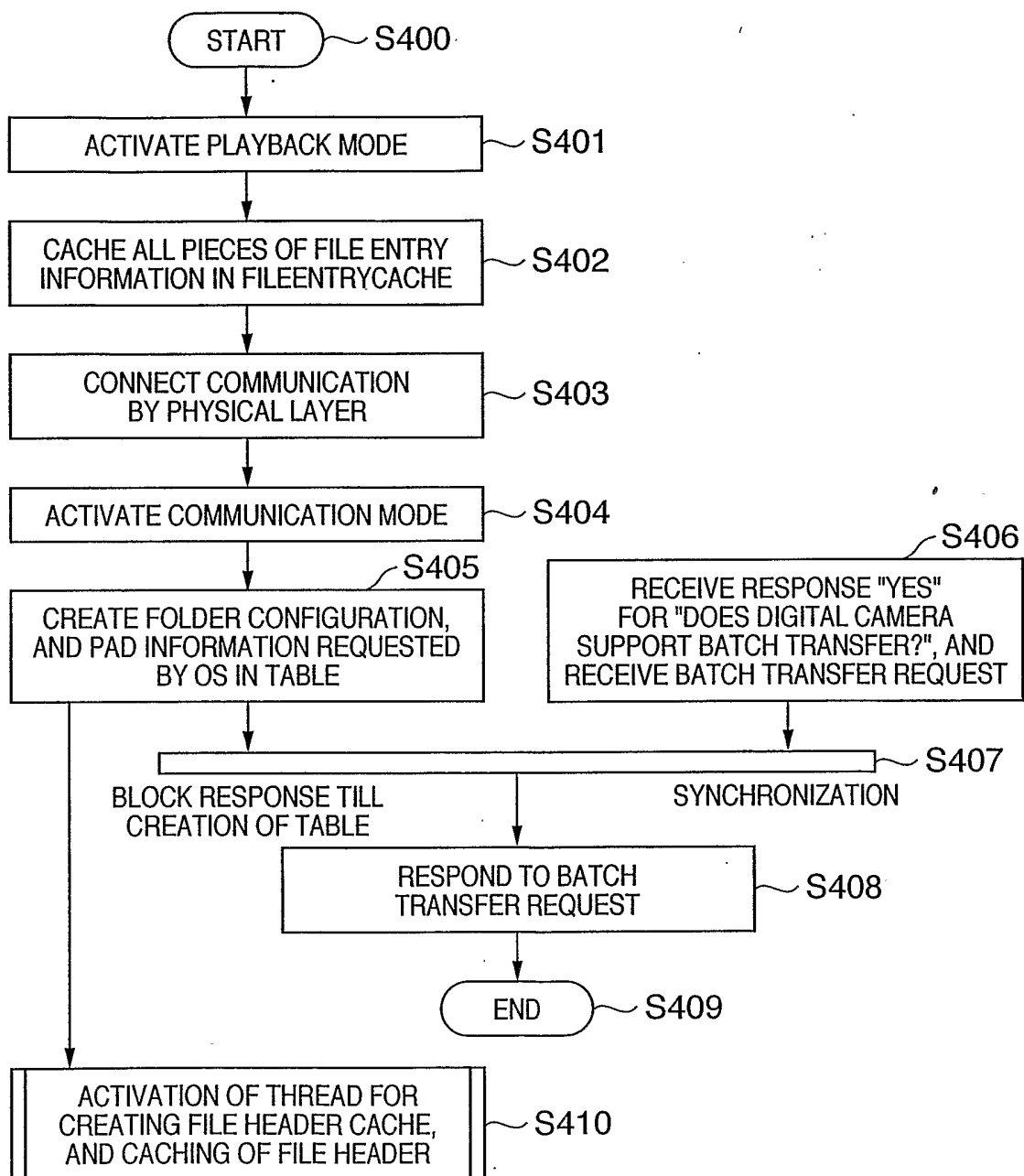


FIG. 2B

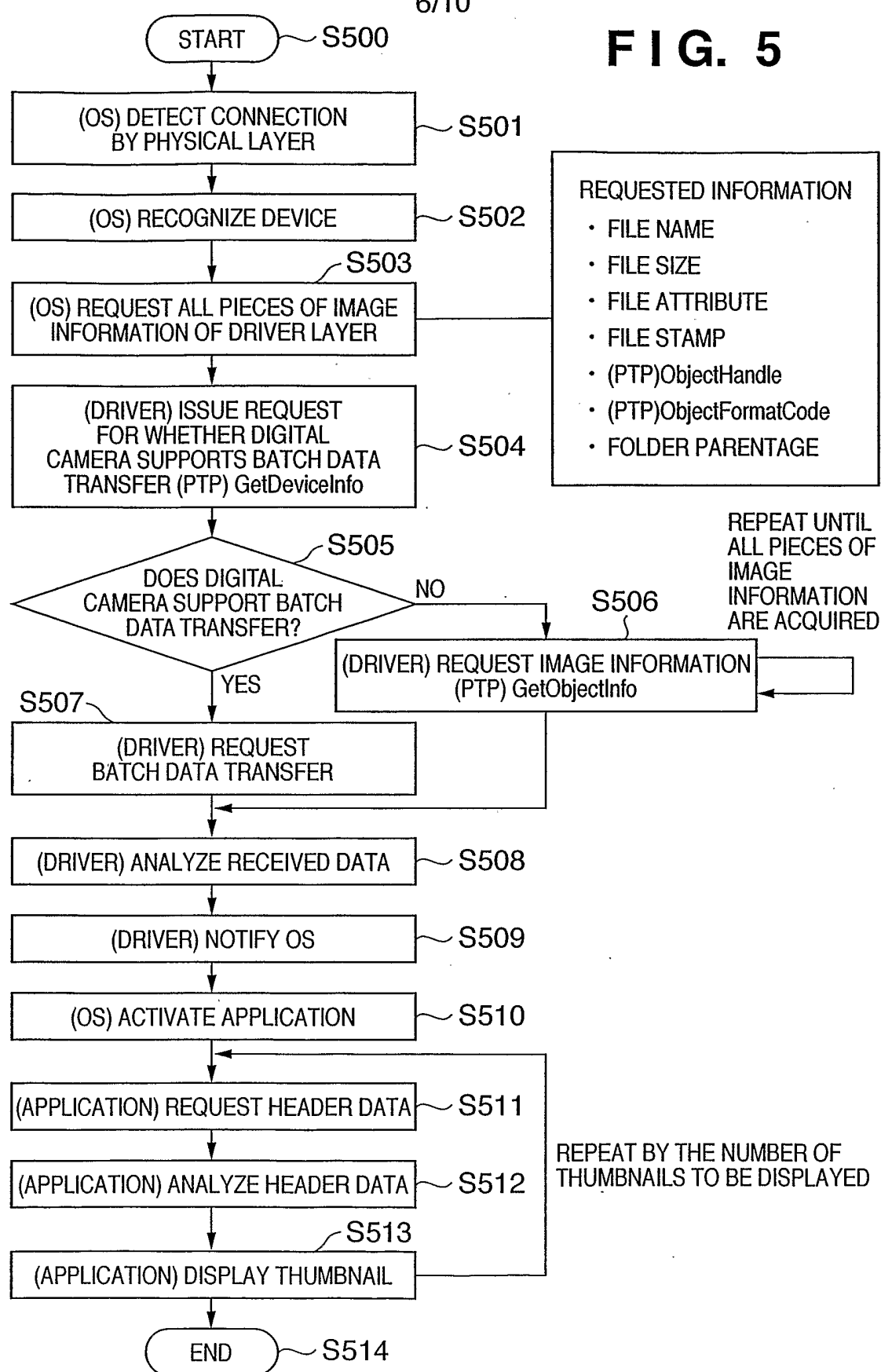
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FIG. 3

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FIG. 4

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FIG. 5

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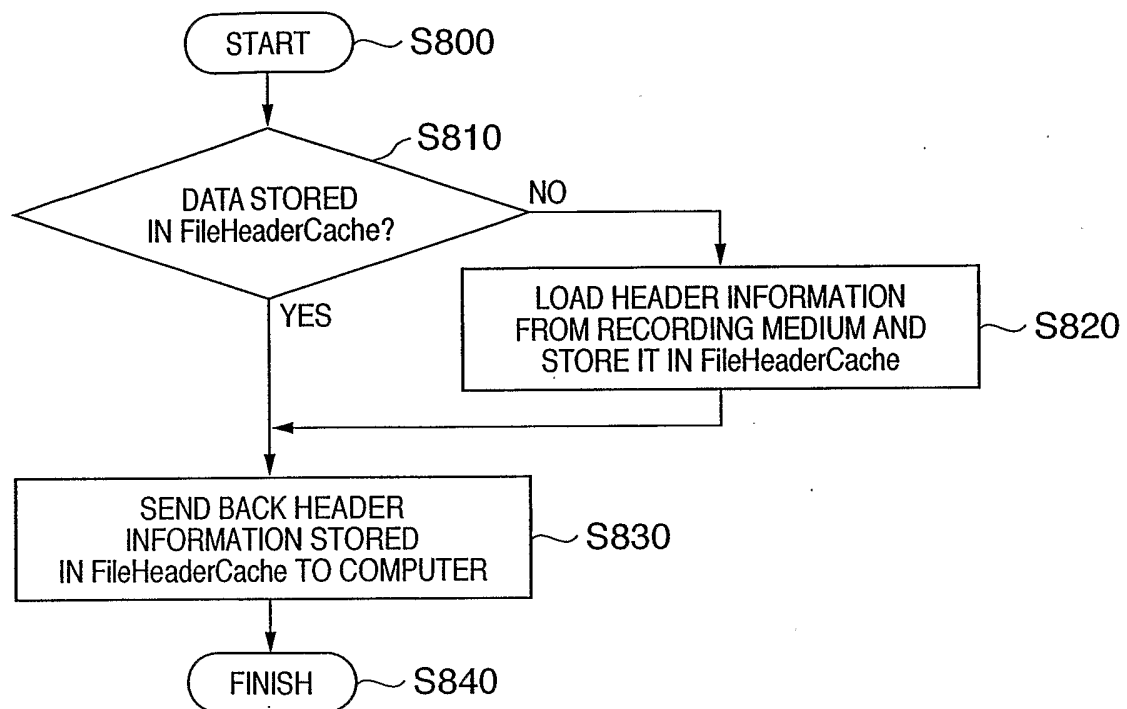
FIG. 6

FIG. 7B

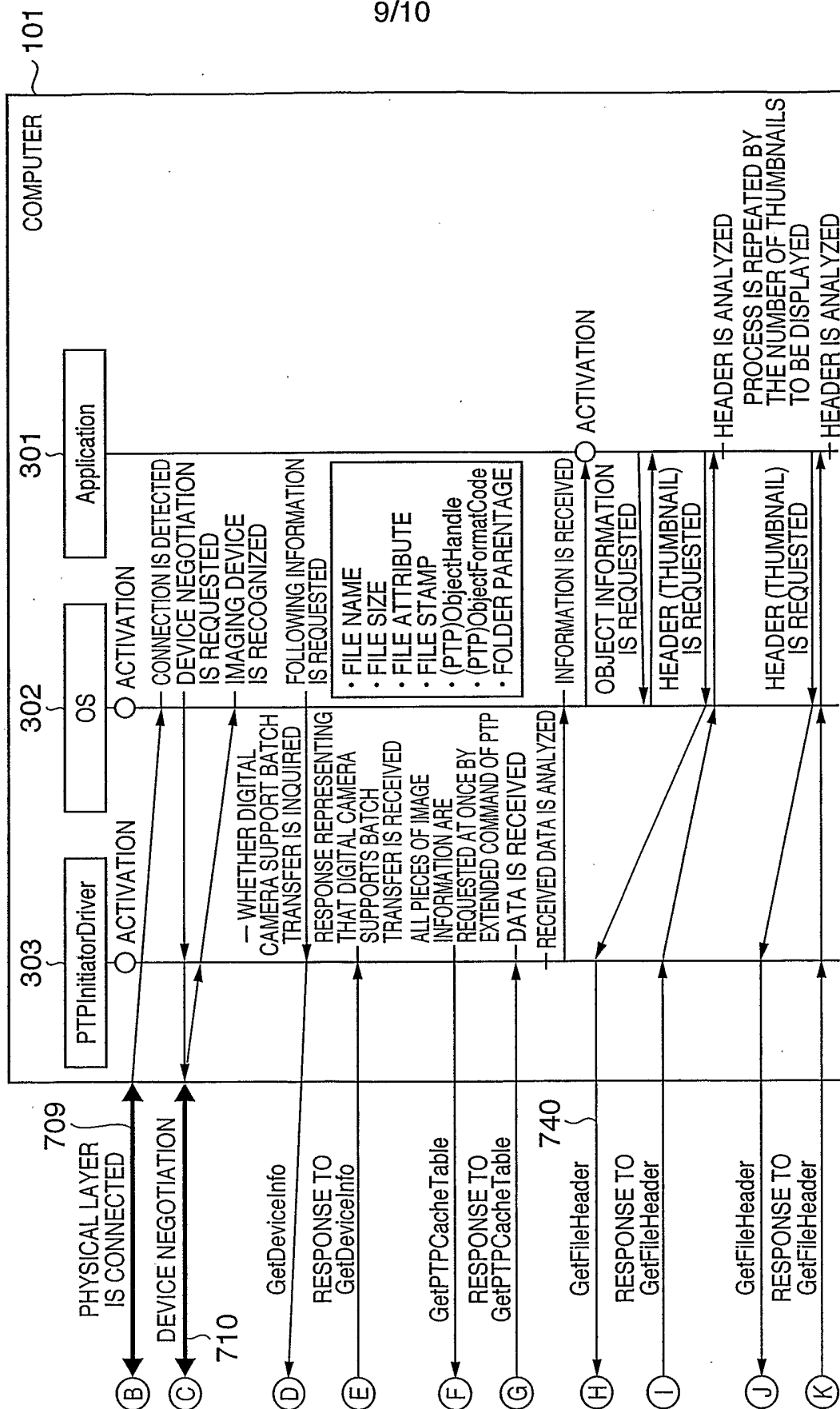
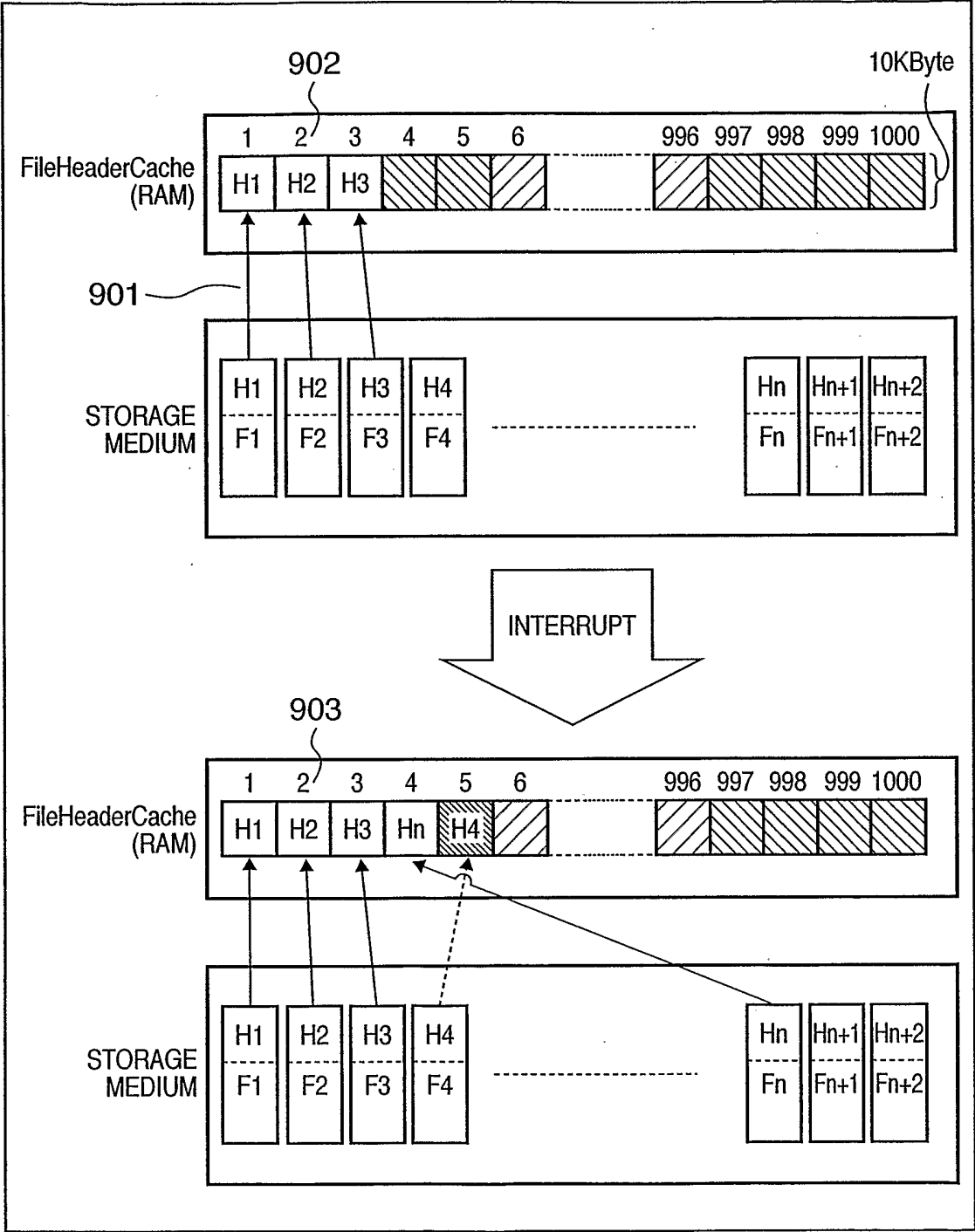


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/017329

A. CLASSIFICATION OF SUBJECT MATTER			
Int.Cl. G06F12/00 (2006.01), G06F3/06 (2006.01), H04N5/907 (2006.01), H04N5/91 (2006.01)			
According to International Patent Classification (IPC) or to both national classification and IPC			
B. FIELDS SEARCHED			
Minimum documentation searched (classification system followed by classification symbols)			
Int.Cl. G06F12/00 (2006.01), G06F3/06 (2006.01), H04N5/907 (2006.01), H04N5/91 (2006.01)			
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2005 Registered utility model specifications of Japan 1996-2005 Published registered utility model applications of Japan 1994-2005			
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)			
C. DOCUMENTS CONSIDERED TO BE RELEVANT			
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	
X	JP 9-305473 A (Fuji Xerox Co., Ltd.) 1997.11.28, paragraph 0012-0032, figure 1, 2, 8, 9	1-3, 6-9,	12-14
Y	(Family : none)	4-5, 10-11	
Y	JP 9-330257 A (NEC Corporation) 1997.12.22, [0010] -[0013] (Family : none)	4, 10	
Y	JP 11-219313 A (Mitsubishi Electric Corporation) 1999.08.10, [0112] -[0115], fig.7 (Family : none)	5, 11	
A	JP 2003-125190 A (Ricoh Co., Ltd.) 2003.04.25, whole document (Family : none)	1-14	
A	JP 11-355706 A (Canon Inc.) 1999.12.24, whole document & US 6784925 B1	1-14	
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.			
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family			
Date of the actual completion of the international search		Date of mailing of the international search report	
13.12.2005		27.12.2005	
Name and mailing address of the ISA/JP		Authorized officer	5M 9290
Japan Patent Office		AIZAKI, Hirotsune	
3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan		Telephone No. +81-3-3581-1101 Ext. 3599	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/017329

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

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

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

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

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

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

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

The groups of invention (claims 1, 2, 7, 8, 13, 14 claims 3, 9 claims 4, 10 claims 5, 11 and claims 6, 12) are not so linked as to form a single general inventive concept for the following reasons:

The technical features of claim 1 and 7, which is the common technical features of the groups of invention, had been disclosed in the document JP9-305473 A (Fuji Xerox Co., Ltd.) and they don't have novelty.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

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

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.