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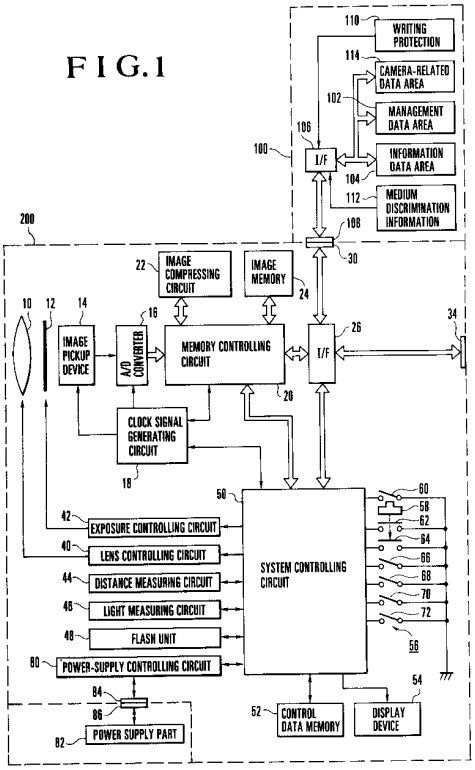
(54) Information signal processing apparatus.

(57) An information signal processing apparatus according to the present invention is arranged to receive, as an input, an information signal to temporarily store therein the input information signal and to temporarily store therein management information prepared during a recording of the information signal in the recording medium, thereby recording the temporarily stored information signal and management information in the recording medium. Accordingly, it is possible to record an information signal having a large amount of information in the recording medium without lowering a recording speed and it is also possible to easily reduce the size, weight and cost of the apparatus.

FIG.1



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Background of the Invention:

Field of the Invention:

The present invention relates to an information signal processing apparatus for processing an information signal and, more particularly, to an information signal processing apparatus for recording an information signal in a recording medium.

Description of the Related Art:

An electronic still video system has heretofore been known as one example of an information signal processing apparatus for processing an information signal. The electronic still video system is arranged to record information signals, such as image signals or sound signals, on a plurality of concentric recording tracks which are formed on a magnetic disk, and to select an arbitrary recording track from among the recording tracks formed on the magnetic disk and reproduce the information signal, such as the image signal or the sound signal, recorded on the selected recording track.

Such an electronic still video system is arranged to record the image signals or the sound signals on the recording tracks formed on the magnetic disk, in the state of analog signals. However, a new system has recently been proposed which is arranged to store digitized image signals or sound signals in a memory card including a plurality of RAMS (random access memories) made from semiconductor memory elements such as D-RAMs, S-RAMs or EEP-ROMs.

However, the storage capacity of the memory card is limited because of the limited storage capacity per chip of the memory device or the limits of the number of chips of a memory element which can be mounted on a single memory card. Further, since the memory element is more expensive than other recording media, it is presently economically difficult to utilize the memory card as a recording medium of large storage capacity.

In contrast, a hard disk unit is known as a recording medium having a larger storage capacity than the memory card, and there has recently been provided a hard disk unit which is removably attachable to an apparatus body similarly to the memory card. If such a hard disk unit is used with an electronic still video camera as a recording medium, it is possible to construct comparatively inexpensively a system having a large storage capacity.

Various kinds of hard disk units are provided for various specifications such as recording capacity, weight, power consumption and recording speed. If the system is constructed so that plural kinds of hard disk units can be attached, it is possible to meet a variety of demands of users.

The aforesaid system is constructed to record a digitized image signal (i.e., image data) or a digitized sound signal (i.e., sound data) in a recording medium such as the memory card or the hard disk unit in the following manner. The recording area of the recording medium is divided into an information data recording area and a management data recording area, and the image data or the sound data is divided into units each corresponding to what is called "cluster", and each of the units is recorded in one cluster in the information data recording area. Information data indicative of the state of use of each cluster is recorded in the management data recording area.

If image data or sound data is to be recorded over a plurality of clusters, during recording of the image data or the sound data, while the position of a cluster in which the image data or the sound data is recorded is being stored in a management data memory provided in a system control circuit, the image data or the sound data is recorded in the information data recording area. After the completion of the recording of the image data or the sound data, the information data indicative of the state of use of each cluster, which is stored in the management data memory provided in the system control circuit, is recorded in the management data recording area.

However, if the amount of data of the image data or the sound data to be recorded in the recording medium is increased and the number of clusters used for recording the image data or the sound data is increased for the purpose of recording high-quality-image data or high-quality-sound data, it is necessary to provide a management data memory of large storage capacity within the system control circuit so that the positions of clusters used for recording the image data or the sound data can be stored during the recording of the image data or the sound data. With such an arrangement, it is extremely difficult to reduce the size, weight and cost of the apparatus.

On the other hand, if a memory of small storage capacity is used as the management data memory provided within the system control circuit, the size, weight and cost of the system can be reduced. However, the management data memory of small storage capacity does not have a sufficient storage capacity to store the positions of clusters used during recording of the image data or the sound data. Accordingly, the management data memory of small storage capacity needs to repeat the processing of stopping once the operation of recording the image data or the sound data in the information data recording area, reading information data indicative of reading information data, stored in the management data recording area,

indicative of the state of use of each cluster, recording the read information data in the management data recording area, and restarting the operation of recording the image data or the sound data in the information data recording area. As a result, there is the problem that the speed of recording of the image data or the sound data lowers remarkably while image data corresponding to a plurality of images or sound data corresponding to a long-time sound is being continuously recorded.

The data files of the image data or the sound data which are recorded in the recording medium, such as a memory card or a hard disk unit, in the above-described manner, are read from the recording medium in units of one data file and transmitted to an external device, such as an external computer, a printer and a data transmission device. In the external device, various processing such as operational processing, printing processing or data transmission processing is performed. Each of the data files recorded in the recording medium is handled as an independent file.

To prevent a wrong data file from being erroneously read out together with a desired file recorded in the recording medium or to prevent a wrong data file from being erroneously erased during erasure of a desired file recorded in the recording medium, it is necessary to individually add a discrimination number to each data file during recording of the data files in the recording medium so that each of the data files can be identified. For example, a system which records image data files in the recording medium is arranged to count the number of photographic pictures recorded during photographing and recording operations, store the counted number of recorded photographic pictures in a system body, generates a discrimination number corresponding to the stored number or recorded photographic pictures, add the generated discrimination number to an obtained image data file, and record the image data file in the recording medium together with the generated discrimination number.

Since the above-described electronic still video camera is a portable device, a supply of electric power depends on a battery and, if the remaining amount of battery power becomes less during photographing and recording, it will be necessary to replace the battery.

If the remaining amount of power in the battery provided in the system body is insufficient or the battery is removed from the system body for battery replacement, the number of recorded photographic pictures which has been stored in the system body in the above-described manner will be reset. If photographing and recording operations are executed after the battery replacement, a discrimination number identical to a discrimination number which is already added to an image data file recorded in the recording medium is added to a new image data file, and the new image data file is recorded together with the already used discrimination number. When a predetermined image data file recorded in the recording medium is to be read out and transmitted to an external device, such as an external computer, a printer and a data transmission device for the purpose of executing various processing such as operational processing, printing processing or data transmission processing in the external device, there is the problem that a wrong data file is erroneously read out together with the desired file. Otherwise, when a predetermined data file recorded in the recording medium is to be erased, there is the problem that a wrong file is erroneously erased in place of the desired file.

To solve the above-described problems, a nonvolatile memory may be provided in the system body so that the counted number of recorded photographic pictures is stored in the nonvolatile memory during photographing and recording operations. With this arrangement, if the remaining amount of power in the battery provided in the system body becomes insufficient or the battery is removed from the system body for battery replacement, it is possible to prevent resetting of the counted number of recorded photographic pictures which are stored in the nonvolatile memory within the system body in the above-described manner. However, the number of times of data rewriting of the nonvolatile memory is limited, and if the number of times of rewriting of data about the number of recorded photographic pictures exceeds the allowable number of times of data writing of the nonvolatile memory, data about the number of recorded photographic pictures is not correctly updated. As a result, a discrimination number identical to a discrimination number which is already added to an image data file recorded in the recording medium is added to a new image data file, and the new image data file is recorded together with the already used discrimination number.

The above-described system is also arranged in the following manner. If a digitized image signal (i.e., image data) or a digitized sound signal (i.e., sound data) are to be recorded in a recording medium such as a memory card or a hard disk unit, after the image data or the sound data is stored in an image memory once, the image data or the sound data stored in the image memory is read out and recorded in the recording medium. During photographing and recording operations, if the storage capacity of the image memory is filled with the image data or the sound data stored in the image memory once, the photographing and recording operations are interrupted once and the image data or the sound data stored in the image

memory is transmitted to and recorded in the recording medium. Thus, if a storage capacity capable of storing the image data or the sound data occurs in the storage capacity of the image memory, the system is placed in the state of being able to restart the photographing and recording operations.

However, in the case of the electronic still camera having the above-described arrangement, an operator cannot make a judgement as to whether the photographing and recording operations are interrupted because the storage capacity of the image memory is full or the photographing and recording operations can be performed because the storage capacity of the image memory contains a data storable portion. Such an electronic still camera, therefore, involves the following operational disadvantages. For example, if the operator operates a recording start instructing switch to continue the photographing and recording operations, it may be impossible to start the photographing and recording operations. If the operator operates the recording start instructing switch during an interruption of the photographing and recording operations and the recording start instructing switch remains operated, the photographing and recording operations are restarted at an unintended timing for the operator, so that unintended image data or sound data will be recorded in the recording medium. It is particularly difficult for the operator to make a judgement as to the timings of starting, resuming and ending of the photographing and recording operations during a continuous-shooting recording mode.

Such an electronic still camera has also conventionally been realized as an apparatus capable of recording and reproducing still image data and sound data in a recording medium using a magnetic disk called a still video floppy disk. An electronic still camera is also proposed which uses a memory card including a solid-state memory element, such as a DRAM, an SRAM or an EEPROM, which is packaged in card form.

If the still image data and the sound data are to be recorded in the recording medium described above, the still image data and the sound data are recorded in file form on picture-by-picture basis, and combination information indicative of a correspondence between each image file and each sound file is also recorded as a control file. On the basis of the combination information in the control file, the image files and the sound files are combined so that reproduction or transmission can be performed.

However, in the case of the conventional electronic still camera, if the control file is erased, the correspondence between the image files and the sound files is lost, so that it is impossible to optimumly combine the image files with the sound files so that reproduction or transmission can be performed.

Summary of the Invention:

It is, therefore, an object of the present invention to an information signal processing apparatus capable of solving the above-described problems.

Another object of the present invention is to provide an information signal processing apparatus which is capable of recording an information signal having a large amount of information in a recording medium without lowering a recording speed and the size, weight and cost of which can be easily reduced.

To achieve the above-described objects, according to one aspect of the present invention, there is provided an information signal processing apparatus which is arranged to record an information signal in a recording medium and which comprises recording means for recording the information in the recording medium, and temporarily storing means for receiving, as its input, an information signal, temporarily storing therein the input information signal and storing therein management information prepared during a recording of the information signal in the recording medium.

Another object of the present invention is to provide an information signal processing apparatus of good operability which is capable of preventing erroneous discrimination information from being added to an information signal when discrimination information which serves to discriminate among information signals to be recorded in a recording medium in predetermined units is to be added to the information signal, so that the information signal can be recorded in the recording medium with correct discrimination information added to the information signal. In such an information signal processing apparatus, it is possible to accurately read out the information signal recorded in the recording medium in the predetermined units so that the read information signal can be erased or subjected to various processings in the external device.

To achieve the above-described object, according to another aspect of the present invention, there is provided an information signal processing apparatus which is arranged to record an information signal in a recording medium and which comprises management information adding means for receiving, as an input, an information signal and adding management information corresponding to an order of recording of the information signal in the recording medium to the information signal during a recording of the input information signal in the recording medium, and recording means for recording in the recording medium the information

signal to which the management information is added by the management information adding means.

Another object of the present invention is to provide an information signal processing apparatus of good operability which is arranged so that when an image signal is to be continuously recorded in a recording medium, an operator can easily make a judgement as to the recording timing of the image signal to record the necessary information in a recording medium at the desired timing, whereby it is possible to prevent erroneous recording of an unnecessary information signal.

To achieve the above object, in accordance with another aspect of the present invention, there is provided an information signal processing apparatus which is arranged to record an information signal in a recording medium and which comprises temporarily storing means for receiving, as an input, an information signal and temporarily storing the input information signal, display means for displaying a state of a recording capacity of the information signal in the temporarily storing means, recording means for reading the information signal temporarily stored in the temporarily storing means and recording the read information signal in the recording medium, and controlling means for controlling the temporarily storing means and the recording means so that the information signal temporarily stored in the temporarily storing means is recorded in the recording medium by the recording means and for causing the display means to display the state of the recording capacity of the information signal in the temporarily storing means.

Another object of the present invention is to provide an information signal processing apparatus capable of optimumly combining still image data with sound data for the purpose of reproduction or transmission even if there is no information indicative of a correspondence relation between the still image data and the sound data.

To achieve the above object, in accordance with another aspect of the present invention, there is provided an information signal processing apparatus which is arranged to record still image data and sound data in a recording medium and which comprises decision means for determining whether a combination of the still image data and the sound data recorded in the recording medium is appropriate, on the basis of a recording time of each of the still image data and the sound data, and processing means for combining, if the decision means determines that the combination of the still image data and the sound data is appropriate, the still image data with the sound data and executing predetermined processing.

The above and other objects, features and advantages of the present invention will become apparent from the following detailed description of preferred embodiments of the present invention, taken in conjunction with the accompanying drawings.

Brief Description of the Drawings:

Fig. 1 is a block diagram schematically showing the arrangement of an electronic still video system to which the present invention is applied as a first embodiment thereof;

Fig. 2 is part of a flowchart showing the operating routine of the electronic still video system shown in Fig. 1;

Fig. 3 is part of the flowchart showing the operating routine of the electronic still video system shown in Fig. 1;

Fig. 4 is a flowchart which serves to explain in detail the retrieval operation routine executed in each of Step 5 of Fig. 2 and Step S5 of Fig. 11;

Fig. 5 is a flowchart which serves to explain in detail the distance•light measuring operation routine executed in each of Step S22 of Fig. 3 and Step S22 of Fig. 12;

Fig. 6 is a flowchart which serves to explain in detail the photographic operation routine executed in each of Step S24 of Fig. 3 and Step S24 of Fig. 12;

Fig. 7 is a flowchart which serves to explain in detail the drive-parameter initializing operation routine executed in Step S41 of Fig. 4;

Fig. 8 is a flowchart which serves to explain in detail the directory entry retrieval operation routine executed in Step S43 of Fig. 4;

Fig. 9 is a flowchart which serves to explain in detail the file allocation table retrieval operation routine executed in Step S45 of Fig. 4;

Fig. 10 is a flowchart which serves to explain in detail the recording operation routine executed in each of Step S25 of Fig. 3 and Step S25 of Fig. 12;

Fig. 11 is part of a flowchart showing the main operating routine of an electronic still video system according to a second embodiment of the present invention;

Fig. 12 is part of the flowchart showing the main operating routine of the electronic still video system according to the second embodiment of the present invention;

Fig. 13 is a block diagram schematically showing the arrangement of an electronic still video system to which the present invention is applied as a third embodiment thereof;

Fig. 14 is part of a flowchart showing the main operation routine of the electronic still video system shown in Fig. 13;

Fig. 15 is part of the flowchart showing the main operation routine of the electronic still video

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