PROGRAMMABLE SUPERIMPOSER

The present invention relates to a superimposer, for example, one which is used in a camcorder.

Generally speaking, a conventional camcorder refers to a video camera combined with a video tape recorder, and a conventional superimposer function is a function of the camcorder.

In general, typical examples of superimposer functions may include; a record function for recording a first and a second image in a memory, a read-out function for calling out recorded superimposed dialogue, a toggle function for reversing or obtaining the obverse of images, a scroll function for scrolling an image in one or more directions, and a curtain function for blanking out pictures or parts of pictures by covering them with an image of a single colour. In the conventional camcorder, each function is controlled by a corresponding superimposer function key which performs or suspends a corresponding superimposer function, and which must be pressed by the user when the corresponding superimposer function is required.

In order to edit diversified pictures, for example where two separate images are recorded page by page, if a user wants to keep on performing a series of superimposer functions, or wishes to call out a desired image with a scroll function after a certain time has lapsed, the user must manually press a key every time a superimposer function is to be changed.

Thus, the conventional camcorder heretofore described is inconvenient to use because, when simultaneously using

superimposer functions, video recording is accomplished intermittently, due in part, to the manual operation of the superimposer function keys.

Accordingly, one object of a preferred embodiment of the present invention may be to provide a method for processing and setting up a superimposer function key so that pictures can be edited continuously during video recording through a single input of that key.

According to a first aspect of the present invention, there is provided a method of operating a programmable superimposer of a camcorder, the camcorder including a micro-computer, a key matrix, a superimposer controller and a memory device, said method comprising the steps of:

(a) in a storage mode, entering a succession of superimposer functions for subsequent single-key execution, by storing a succession of mode flags, each of said mode flags corresponding to a given program mode, and storing a plurality of time flags, each of said time flags corresponding to a desired operating period of the given program modes; and

(b) in a reproduction mode, subsequent to activation of said single-key, executing said succession of superimposer functions by executing the program modes in accordance with the stored mode and time flags.

Preferably said method further comprises the steps of:

checking whether an input key indicates a program mode or not;

if said input key does not indicate a program mode, checking whether said input key indicates a reproduction mode or not;

if said input key indicates the selection of a program mode, setting a program mode flag, a mode 1 flag and a time 1 flag or, if said input key is a reproduction key, setting a reproduction mode flag and a reproduction 1 flag;

if there is a mode key input and a mode flag is set, storing said mode flag, resetting said mode flag, and setting a next mode flag; and

if there is a said mode key input and a time flag is set, storing a time value, resetting a time flag, and setting a next time flag.

Preferably the method further comprises the steps of:

if said input key indicates a reproduction mode, checking a reproduction mode flag and performing a corresponding reproduction mode; and

counting a respective mode performance time for an execution of said step, and performing a next mode if said time equals or exceeds a predetermined value.

Preferably said counting step comprises the steps of:

checking whether a timer is set to a set time or not; and

if said timer is set to a set time, checking whether said set time is a time of a predetermined value;

if said set time is of said predetermined value, setting a corresponding mode completion flag, resetting a present time flag, and setting a next mode time flag.

Said modes may include one or more of the following; a Read mode, a Toggle mode, a Curtain mode, a Record mode, a Scroll mode.

Preferably said modes have respective corresponding superimposer functions of; a Read function, a Toggle function, a Curtain function, a Record function, a Scroll function.

Said programmable superimposer system may be arranged for continous editing of a video picture simultaneously with recording thereof.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings, in which:

Figures 1A and 1B are illustrations of one example of a 5-step function as may be required for a superimposer to perform;

Figure 2 is a block diagram of a programmable superimposer system according to a preferred embodiment of the present invention;

Figure 3 shows a flow chart of a routine according to a preferred method of the present invention for operating a camcorder, including control of a programmable superimposer system;

Figure 4 is key function performance routine according to a preferred method of the present invention;

Figure 5 is a routine for implementing a mode and for establishing an execution time for performing a mode, according to a preferred method of the present invention; and

Figure 6 is a routine according to a preferred method of the present invention for interruption of a timer when a mode is performed.

Referring to figure 2 of the accompanying drawings, a programmable superimposer system, for example as may be used in a camcorder or video recorder unit, includes a microcomputer 10 which controls the general operation of the system, a key matrix 20 for input of a required function and execution time information input by a user, a superimposer controller 30 for controlling various superimposer functions, and a memory 40 for storing various functions and the necessary execution times of these functions.

The superimposer system can operate in various modes, for example, a Program Mode in which a number of Usual Modes such as a Read mode, Toggle mode, a Record mode, a Scroll mode, a Curtain mode or various other modes, and the execution times therefore, may be programmed into the memory 40 via the key matrix 20 and microprocessor 10. A superimposer may perform various functions corresponding to a particular usual mode, for example when in Read mode, the system may control the superimposer to perform a Read function, and similarly for other usual modes.

Referring to figure 3 of the accompanying drawings, the usual operation of a camcorder is as follows:

A camcorder operating routine starts with Step 3a in which camcorder parameters and system information are reset. In Step 3b, a key scan operation is executed to check whether or not there is any input from one or more camcorder keys. If there is an input from a camcorder key, the routine advances to Step 3c and one or more functions in accordance with a camcorder are performed. In step 3c, various operations may be performed, such as determining an operating mode of the camcorder (or a system thereof, such as a programmable superimposer system as described herein above), determining which type of key and/or input is active, and setting and storing flags which relate to various modes and functions of the keys and key inputs identified in the step 3c.

If there is no key input at Step 3b or the function of a key is completed in Step 3c, the routine proceeds to Step 3d in order to decide whether or not the camcorder is ready to perform a General Mode.

If it is determined at step 3d, that the General Mode is to be performed, the General Mode is controlled at Step 3e of the routine. If it is determined at Step 3d, that the General Mode is not to be performed, or that execution of the General Mode at Step 3e has been completed, an on-screen display (OSD) and/or other display are carried out at Step 3f. Following execution of Step 3f, the routine proceeds to step 3g, in which a superimposer function is controlled, following which, execution of the routine returns to Step 3b, and further cycles of the routine are carried out.

Referring to Figure 4 of the accompanying drawings, operation of a key function performance routine is now described.

When a key is activated, an input of the key input is sensed by a key-scan operation, for example one which occurs at Step 3b in Figure 3, and the operation of a corresponding key function is performed at Step 3c through a key function performance routine, one example of which is shown in Figure 4.

In general, the routine determines whether or not a system is in a Usual mode, a Reproduction mode, or a Program mode. If the system is not in a Reproduction or Program mode then the system is either in a Usual mode, or a Time key has been activated, or the system is in some other mode, for example a General mode. The routine also determines whether a key input is from a Program key, a Reproduction key, a Usual mode key or a Time key, and sets and/or stores various flags according to the various above modes which the system is in and/or the various key inputs determined. A more detailed description of the key function performance routine is now described:

It is determined whether a Program Mode is presently activated by checking a Program Mode flag at Step 4a. If the program mode is not presently activated, it is determined at Step 41 whether a Reproduction Mode is presently activated or not, by checking a Reproduction Mode flag.

If the system is in a Usual mode, it is determined at Step 4m whether the presently activated key is a Program Key or not. If the presently activated input key is a Program Key, a Program Mode flag is set at Step 4n. If

the presently activated key is not a Program Key, it is determined at Step 4o whether the presently activated key is a Reproduction Key or not. If the presently activated key is not a Reproduction Key, a cycle of the routine is terminated at step 4o. If the presently activated input key is a Reproduction Key, a Reproduction Mode flag is set at step 4p, and in order to indicate that it is a first mode to be performed, a Mode 1 flag is also set at Step 4p.

If, at Step 4a, it is determined that a Program mode is presently activated it is then determined at Step 4b whether the presently activated key is a Usual Mode key or not. If the present input key is determined to be a Usual Mode key, it is checked which mode flag is set at Steps 4c to 4e. If, at step 4c, it is determined that Mode 1 flag is not set, it is determined at Step 4d whether or not a Mode 2 flag is set. If the mode flag checked at Step 4d is not the Mode 2 flag, it is checked whether a Mode 3 flag is set or not. If it is determined that the Mode 3 flag is not set, then a cycle of execution of the routine finishes at Step 4e.

If, however, it is found in any of steps 4c, 4d or 4e respectively, that any one of the Mode 1 flag, the Mode 2 flag or the Mode 3 flag have been set, then in step 4f, operations of storing the respective Mode flag into a corresponding memory, resetting the respective presently activated Mode flag, and setting a respective next Mode flag are performed.

If, it is found in step 4b that the presently activated key is not a Usual Mode Key, but that the system is in Program mode, then in step 4g it is determined whether the presently activated key is a Time Key or not.

If the presently activated key is not a Time Key, execution of a cycle of the routine is terminated.

If it is found that the presently activated key is a Time Key, it is checked whether a Time 1 flag is set or not at Step 4h. If the Time 1 flag is not set, it is checked at Step 4i whether the Time 2 Flag is set. If the Time 2 flag is not set, at step 4j it is checked whether a Time 3 flag is set or not. If the Time 3 flag is not set either, execution of a cycle of the routine comes to an end.

If, however, it is found that any Time flag is set in any one of steps 4h, 4i or 4j respectively, corresponding execution times are stored in a corresponding Time Memory, the present Time flag is reset, and then a next Time flag is set at Step 4k.

Referring to figure 5 of the accompanying drawings, a routine for establishing whether an execution time for performing a mode is to be set or not is described. Such a routine may, for example , be performed after a Reproduction key has been activated, as determined in steps 4a to 4e of the key function performance routine of figure 4 described hereinabove.

The execution time establishing routine of figure 5 serves to check whether or not a system is in a Reproduction Mode or not, and if so, which Reproduction mode flag is set. If a mode flag is set, the Reproduction mode is performed, and a corresponding Time flag is set. A more detailed explanation of the execution time routine now follows:

If at step 5a, a mode is checked, and is determined to be Reproduction mode, it is determined at step 5b whether a Reproduction Mode 1 flag is set or not. If the Reproduction Mode 1 flag is set, a corresponding mode is performed at Step 5e.

If it is found that the Reproduction Mode 1 flag is not set at Step 5b, at Step 5c it is checked whether the Reproduction Mode 2 flag is set or not. If the Reproduction Mode 2 flag is not set either, it is checked at Step 5d whether the Reproduction Mode 3 flag is set or not.

When any one of the above Reproduction Mode flags is set, the corresponding Reproduction Mode is performed, and a corresponding Time flag is set in Step 5e in order to establish an execution time for the corresponding Reproduction Mode.

Referring to figure 6 of the accompanying drawings, a timer routine is required to count an execution time corresponding to each mode.

At Step 6a, if a Time flag is set, for example, by a setting operation as occurs as a result of the above described execution time routine, or as a result of Step 4k of the above described performance routine, a set time is counted by a Count Timer at Step 6b. At step 6c, it is checked whether the Count Timer has finished counting, by checking if a Time Finish flag is set. Setting of the Time Finish flag indicates that execution of a corresponding Mode is finished. At the same time, preparations are made for execution of a subsequent mode by resetting a corresponding Time flag and by setting the next Time flag in step 6d.

By way of example, an operation of the programmable superimposer system and various routines described hereinabove will now be described with reference to figures 1 to 6 of the accompanying drawings:

In the operation, three Modes (Read 1, Read 2, and Toggle) are stored in the memory 40 in order to effect a 5-step function, an example of which is as illustrated in Figure 1B.

Referring to figure 1B of the accompanying drawings, the 5-step function commences with a usual video picture. In a Read 1 mode, a first image (image #1 in figure 1A) is read to the usual picture at step 1d, resulting in the first image being superimposed onto the usual picture. In a Read 2 mode, a second image (image #2 in figure 1A) is read to the usual picture, in step 1e, resulting in the second image being superimposed onto the usual picture. In a Toggle mode, the second image is replaced by the obverse of the second image in step 1f, and at a fifth step, the usual picture is recovered.

Although three modes are presupposed herein, in the operation of the preferred embodiment of the present invention a user may vary the type and the number of modes, and the invention is in no way restricted to the three modes described herein.

The programmable superimposer system can be programmed to activate a continuously variable superimposer function for example, the 5-step function shown in Figure 1b in response to a single input key, as follows:

First of all, a user activates a program key. Then a microcomputer 10 considers the current mode of the system as a usual mode at Steps 4a, and 41 of Figure 4. At Step 4m, the microcomputer recognizes that the input key is a Program mode key. The microcomputer then proceeds, at Step 4n, to set a Program Mode flag, a Mode 1 flag, and a Time 1 flag upon which a cycle of the flag setting and storage routine is terminated.

Next, the user inputs a first Read key (Read 1) in order to store the first mode (the Read mode) which is to be performed in the programmed superimposer function. In a second cycle of the flag setting and storage routine, at step 4a, the microcomputer 10 determines that the Program Mode flag is set and that a Program Mode is therefore operating. The microcomputer then judges at Step 4b whether the input key is a usual mode key or not (i.e. a usual mode key being for example a Read key, Scroll key, Curtain key, Record Key, Toggle key or other key relating to a single step superimposer function).

If at step 4b, it is determined that the input key is a usual mode key, step 4c is executed to decide whether a Mode 1 flag is set or not. If the Program Mode flag has been set at Step 4n, the microcomputer determines at Step 4c that the mode 1 flag is set. At Step 4f, data of the first Read Mode, which is the first mode to be performed, is stored in the memory 40, the Mode 1 flag is reset, and a Mode 2 flag is set to enable storage of a second mode to be performed.

After the first mode to be performed is stored as described hereinbefore, the user decides whether the next step to perform is storing of a second usual mode, or storing of an execution time for the first mode.

4a -> 4b -> 4c -> 4d -> 4e -> 4f and steps 4a -> 4b -> 4g -> 4h -> 4i -> 4j -> 4k, respectively.

After a key for a continuously changeable multiple step function has been defined as described hereinabove with reference to Figure 4, the continuously changeable multiple step function can be performed as follows: When the user inputs a Reproduction Key, the microcomputer 10 recognizes that the reproduction key is presently activated at Step 4o after the route 4a -> 4l -> 4m -> 4o, in Figure 4 has been followed. The microcomputer then sets a Reproduction Mode flag and a Reproduction Mode 1 flag at Step 4p.

When the microcomputer 10 recognizes that the presently activated key is a Reproduction Key by the procedure of steps 4a -> 4l, it is determined at Step 5b, in Figure 5, whether a Reproduction Mode 1 flag is set. Since the Reproduction Mode 1 flag is set at Step 4p, the first read mode (Read 1) is performed at Step 5e.

At step 5e, the microcomputer 10 also checks the execution time of the first read mode by the timer interrupt routine of Figure 6. It is checked at Step 6c whether a Time Finish flag is set in order to indicate that execution of the first read mode is finished, and then the second Read Mode (Read 2) flag is set at Step 4k.

A Toggle mode is performed in the same way as the first Read mode (Read 1) after performing the second read mode.

The above described preferred embodiment of the present invention may overcome the abovementioned inconvenience of a conventional camcorder by previously

programming a desired superimposer function or series of functions, and by storing the time required to accomplish each superimposer function.

The preferred embodiment of the present invention may also have an advantage in that a series of a superimposer functions can be continuously performed with a single key input, by programming a desired operation in advance.

The foregoing description shows only a preferred embodiment of the present invention. Various modifications are apparent to those skilled in the art without departing from the scope of the present invention which is only limited by the appended claims. Therefore, the embodiment shown and described is only illustrative, not restrictive.

Whilst methods and apparatus have been described hereinabove predominantly with reference to a camcorder, the invention is not restricted to such apparatus, but is also intended to apply to any other video systems, for example a video recorder or a video image processing system.

* C L M S *

CLAIMS:

1. A method of operating a programmable superimposer of a camcorder, the camcorder including a microcomputer, a key matrix, a superimposer controller and memory device, said method comprising the steps of:

(a) in a storage mode, entering a succession of superimposer functions for subsequent single-key execution, by storing a succession of mode flags, each of said mode flags corresponding to a given program mode, and storing a plurality of time flags, each of said time flags corresponding to a desired operating period of the given program modes; and

(b) in a reproduction mode, subsequent to activation of said single-key, executing said succession of superimposer functions by executing the program modes in accordance with the stored mode and time flags.

2. A method of operating a programmable superimposer according to claim 1, further comprising the steps of:

checking whether an input key indicates the selection of a program mode or not;

if said input key does not indicate a program mode, checking whether said input key indicates a reproduction mode or not;

if said input key indicates the selection of a program mode, setting a program mode flag, a mode 1 flag and a time 1 flag or, if said input key is a reproduction key, setting a reproduction mode flag and a reproduction 1 flag;

if there is a mode key input and a mode flag is set, storing said mode flag, resetting said mode flag, and setting a next mode flag; and

if there is a said mode key input and a time flag is set, storing a time value, resetting a time flag, and setting a next time flag.

3. A method of operating a programmable superimposer according to Claim 2, further comprising the steps of:

if said input key indicates a reproduction mode, checking a reproduction mode flag and performing a corresponding reproduction mode; and

counting a respective mode performance time for an execution of said step, and performing a next mode if said time equals or exceeds a predetermined value.

4. A method of operating a programmable superimposer according to Claim 3, wherein said counting step comprises the steps of:

checking whether a timer is set to a set time or not; and

if said timer is set to a set time, checking whether said set time is a time of a predetermined value;

if said set time is of said predetermined value, setting a corresponding mode completion flag, resetting a present time flag, and setting a next mode time flag.

5. A method according to any one of the preceding claims wherein said modes include one or more of the following:

a Read mode, a Toggle mode, a Curtain mode, a Record mode, a Scroll mode.

6. A method according to claim 5, wherein said modes have respective corresponding superimposer functions of: a Read function, a Toggle function, a Curtain function, a Record function, a Scroll function.

7. A method according to claim 5 or 6 in which said programmable superimposer is arranged for continuous editing of a video picture simultaneously with recording thereof.

8. A programmable superimposer substantially as hereinbefore described with reference to Figures 1 to 6 of the accompanying drawings.

9. A method of operating a programmable superimposer substantially as hereinbefore described with reference to Figures 1 to 6 of the accompanying drawings.