MULTICHANNEL TELEVISION CONTROLLER

This invention relates to a multichannel television display system having a picture in picture (PIP) function and to a method of operating said system.

Known multichannel systems display a single subscreen within the main screen. There are also known multichannel systems which have a plurality of subscreens within the main screen.

The present invention is particularly but not exclusively concerned with a menu-type multichannel display system by which a user can select a desired program on a television, while watching the television, by providing a multichannel display mode on the television using an existing picture in picture (PIP) function. In the multichannel display mode there is a plurality of subscreens which are sequentially tuned to different television channels so that a user can select a program from the displayed "menu" of sequentially tuned subscreens.

According to one aspect of the present invention, there is provided a method of selecting a television channel for display in a multichannel television display system capable of displaying simultaneously a plurality of television channels at respective display locations, the method comprising: storing channel information corresponding to television channels for display; displaying at the display locations respective video pictures corresponding to the stored television channels, wherein the display locations are sequentially tuned to receive video signals from a respective one of said stored television channels to display a moving picture at the tuned display location; and, in response to a channel select command from the user, whereby the user selects a television channel different from the television channel currently being displayed at the tuned display location,

displaying said selected television channel at the tuned display location, the method further comprising updating the stored channel information by storing the selected television channel.

According to another aspect of the present invention, there is provided a multichannel television display apparatus capable of displaying simultaneously a plurality of television channels, comprising: storage means for storing channel information corresponding to television channels for display; a plurality of display locations for displaying a respective plurality of video pictures corresponding to the television channels; a tuner for locating television channels according to the channel information stored in said storage means and operable to output video signals to display video pictures corresponding to the stored television channels at the respective display locations, said tuner being operable to tune said display locations sequentially to a respective television channel to display a moving picture at the tuned display location; and a controller having a control input actuable by a user, and being coupled to the storage means, the apparatus being arranged such that, when the user generates a channel select command at the control input to select a television channel different from the television channel currently being displayed at the tuned display location, the selected television channel is displayed at the tuned display location and the stored channel information corresponding to the television channel currently being displayed is updated by storing the selected television channel.

With a preferred embodiment of this invention, a user can edit and watch many different pictures on respective subscreens on a television while watching a main picture on the main screen display of the television, because N subscreens are displayed on the main screen by this invention. A user can, for example, edit and watch intermittently moving pictures on N subscreens.

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

Figure 1 is a block diagram of the hardware for the operation of an editor according to one embodiment of the present invention;

Figure 2 is a waveform diagram of the operation of the microcomputer shown in Figure 1;

Figure 3 is a table of the function of serial data output from the microcomputer;

Figure 4 is a diagram to show the sequential tuning operation of the multichannel display; and

Figure 5 is a flow chart of the operation of the editor according to one embodiment of the present invention.

In Figure 1, a main screen input selector 102, controlled by a microcomputer 100, is provided to control a main screen display of a television. The main screen input selector 102 operates as a multiplexer for selecting one of three inputs, tuner 1 (T1), tuner 1 (T2) and a line input, according to control signals Q0 and Q1.

A subscreen input selector 103 is provided for controlling display locations in the form of subscreens. The subscreen input selector operates as a multiplexer to select one of three inputs, said T1, T2 and the line input, according to control signals Q3 and Q4.

A video tape recorder (VTR) signal (Y/C) processing circuit 104 generates a final main screen display by receiving both a playback signal (PB input) from a video tape recorder and an output signal from said main screen input selector 102. If there is no playback signal from the video tape recorder, the signal from said main screen input selector 102 is selected

for the main screen display. If there is a playback signal from the VTR, the signal from the VTR tape is selected for the main screen display.

A PIP circuit 101 receives a mainscreen output signal from the VTR signal processing circuit 104 and a subscreen output signal from said subscreen input selector 103 and outputs a PIP video signal composed of main screen and subscreen signals through a mixer 110 under the control of the microcomputer 100.

The microcomputer 100 also controls a first tuner 105 and a second tuner 106 by decoding an output signal of a preamplifier 108 which receives a remocon signal from a remote control. The tuners 105 and 106 are used for displaying a plurality of channels on a single screen. If a signal on termal STB1 is high, the first tuner 105 becomes active, and if a signal on terminal STB2 is high, then the second tuner 106 becomes active.

If a multichannel up/down signal for a subscreen only is generated by the remote control, the signal on terminal STB1 is high and the signal on terminal STB2 is low. If a multichannel up/down signal for both the main screen and a subscreen is generated, both terminals STB1 and $\overline{\text{STB2}}$ become high.

Then, tuner control data (DATA) output from the microcomputer 100 with the control signals STB1, STB2 controls the channel to be selected, as shown in Figure 2, regulated by a clock signal CLK. A store or skip memory stores channel information for the television channels to be displayed.

A multiplexer 107, which receives output signals from the tuners 105 and 106 and a control signal Q2 from the microcomputer 100 is used for the auto fine tuning of said tuners.

The selection between the first tuner 105 and the second tuner 106 for the auto fine tuning is controlled by the control signal Q2.

An on screen display (OSD) circuit 109, which is controlled by the microcomputer 100, outputs data to the mixer 110 in order to display characters on the screen. The main screen and subscreen signals from the PIP circuit 101 and the character signal from the OSD circuit 109 are superimposed by mixer 110. The superimposed signal is output from the mixer 110 to a video display.

Figure 3, illustrates bit strings representative of a ROTATE and a STROBE function of the PIP circuit 101. These functions are executed in response to the appropriate serial bit strings output from the microcomputer 100. In an embodiment having four PIP subscreens, if a "rotate" key is pressed during sequential tuning of the subscreens, the sequential tuning is inhibited and the strobe function bit string is output in serial format from a "strobe" terminal STB of microcomputer 100 to the OSD circuit 109.

Figure 4-A shows four sequentially tuned subscreens on a main screen in a multichannel mode. In this mode, the procedure for changing from a first channel (CH 03) to a second channel (CH 09) is as follows. A sequential tuning state is changed to an edit state by a single press of the "rotate" key of the remote control. In this context, the sequential tuning state means that four subscreens are tuned in rotation. In the edit state, the sequential tuning is inhibited at a state in which three out of the four subscreens are still subscreens (non-tuned subscreens) and the remaining one is a moving (or tuned) subscreen. For example, channels 01, 02 and 04 in Figure 4-B are still screens and channel 03 is a moving screen.

In this state, if a channel select key, such as the numerical key "9" of the remote control is pressed, the moving screen which is displaying channel 03 is changed to display channel 09 as shown in Figure 4-C. Thereafter, if the edit state is cancelled by pressing a "strobe" key, the four PIP displays are sequentially tuned once more.

If an "add" key of the remote control is pressed before said edit state is cancelled, the skip memory is updated.

Thus, according to the present invention, a user can change the programs displayed on a TV screen in multichannel mode as he wishes by using both the skip memory, update function and the channel select function and can obtain at will his favourite program on TV.

CLAIMS:

1. A method of selecting a television channel for display in a multichannel television display system capable of displaying simultaneously a plurality of television channels at respective display locations, the method comprising:

storing channel information corresponding to television channels for display;

displaying at the display locations respective video pictures corresponding to the stored television channels, wherein the display locations are sequentially tuned to receive video signals from a respective one of said stored television channels to display a moving picture at the tuned display location; and

in response to a channel select command from the user, whereby the user selects a television channel different from the television channel currently being displayed at the tuned display location, displaying said selected television channel at the tuned display location, the method further comprising updating the stored channel information by storing the selected television channel.

2. A method as claimed in claim 1, further comprising: in response to an edit command from the user, entering an edit mode in which further sequential tuning of the display locations is inhibited while the channel select command is supplied.

3. A method as claimed in claim 1 or 2, further comprising: displaying on a main screen a video picture corresponding to one of the stored television channels, wherein said display locations comprise subscreens in said main screen.

4. A method as claimed in claim 1 or 2, further comprising: displaying on a main screen display a video playback picture, wherein said display locations comprise subscreens in said main screen.

5. A method as claimed in any preceding claim, wherein the step of updating the stored channel information is responsive to an update command from a user.

6. A multichannel television display apparatus capable of displaying simultaneously a plurality of television channels, comprising:

storage means for storing channel information corresponding to television channels for display;

a plurality of display locations for displaying a respective plurality of video pictures corresponding to the television channels;

a tuner for locating television channels according to the channel information stored in said storage means and operable to output video signals to display video pictures corresponding to the stored television channels at the respective display locations, said tuner being operable to tune said display locations sequentially to a respective television channel to display a moving picture at the tuned display location; and

a controller having a control input actuable by a user, and being coupled to the storage means, the apparatus being arranged such that, when the user generates a channel select command at the control input to select a television channel different from the television channel currently being displayed at the tuned display location, the selected television channel is displayed at the tuned display location and the stored channel information corresponding to the television channel currently being displayed is updated by storing the selected television channel.

7. Apparatus as claimed in claim 6, in which said controller is operable to inhibit further sequential tuning of the display locations by the tuner in response to an edit command at the control input.

8. Apparatus as claimed in claim 6 or 7, in which the controller is operable to update the stored channel information in response to an update command generated at the control input.

9. Apparatus as claimed in any one of claims 6, 7 or 8, further comprising a main screen display, said tuner being operable to tune said main screen display to one of the television channels corresponding to the stored channel information.

10. Apparatus as claimed in claim 9, further comprising a video player input, said screen tuner being operable to tune said main screen display to a video player signal at said video player input.

11. Apparatus as claimed in any one of claims 6 to 10, further comprising a video mixer arranged to mix said video signals for the display locations with a main screen video signal output from said tuner to said main screen display, whereby said display locations comprise subscreens in said main screen display.

12. A method substantially as herein described with reference to the accompanying drawings.

13. Apparatus substantially as herein described with reference to the accompanying drawings and as shown in Figures 1 and 4 of the accompanying drawings.