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(54) IMPROVEMENTS IN OR RELATING TO TELEVISION SYSTEMS

(71) We, REDIFFUSION (HONG KONG) LIMITED, a Company incorporated under the Laws of Hong Kong, of Rediffusion House, 77—79 Gloucester Road, Hong Kong, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates generally to the field of television and is particularly concerned with the distribution of a number of video signals over a single transmission link, such as a coaxial cable.

In accordance with a first aspect of the present invention, there is provided a method for distributing the outputs of a plurality of video signal sources over a single transmission link, in which the plurality of video signal sources are synchronised with one another, the output signals of the video sources including synchronisation signals are sequentially sampled frame by frame in a cycle order to provide a combined output on a common output, a reference frame signal is applied to the common output between consecutive cycles, whereby a frame sampled from any one video source is transmitted in a respective predetermined position relative to the reference frame signal in the cycle, the synchronisation signals are removed from the video signals appearing at the common output and replaced by new synchronisation signals, the resultant signals are distributed over the transmission link to a receiver, the received synchronisation pulses are counted, the count being reset by the reference frame signal, and a desired frame is selected for display by sampling the received signal when the count of the synchronisation pulses corresponds to the position of the desired frame relative to the reference frame signal.

In accordance with a second aspect of the present invention, there is provided a television transmitting system comprising a plurality of synchronised video sources, means for generating a reference frame signal, a sampling circuit for sequentially sampling the outputs of the video sources and the output of the means for generating the reference frame signal in a cyclic order, whereby a combined output signal is generated which is applied to a common output and which comprises a plurality of cycles each consisting of a reference frame signal and one frame from each of the sources in a predetermined order, and a circuit connected to the common output for removing the synchronisation signals from the video signals appearing at the common output and for replacing the removed signals with new synchronisation signals.

Preferably, the reference frame signal includes for at least part of its duration a continuous wave component.

Conveniently, the sampling circuit comprises a counter and a plurality of electronic switches controlled by the counter, each electronic switch connecting the output of one of the video signal sources to a common output.

Preferably, the counter is connected to a reset circuit controlled by a circuit for detecting the presence of the reference frame signal on the common output, whereby the counter is reset by the reference frame signal to commence a new cycle of sampling.

A receiver may also be provided comprising a frame snatch system which includes means for detecting the reference frame signal in the incoming signal, a channel selector for selecting the number of a channel corresponding to one of the video signals which it is desired to display, a counter for counting frames following each reference frame, a storage circuit controlled by the said counter for storing the frame selected by the channel selector, and a video monitor for reproducing the stored frame. Particularly frames are identified as the Nth frame after

the reference frame. N being any positive integral number.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawing which is a schematic block diagram of a television system in accordance with the invention.

To the left of a dotted line 10 in the drawing, there is shown a transmission system, a receiver being shown to the right of the line 10.

In the transmission system, there are provided 80 cameras designated CAM 1 to CAM 80 respectively. All the cameras are connected to a common sync generator 12 so that the vertical and horizontal scanning in all the cameras is synchronized. The sync generator 12 is also connected to a reference frame generator 14 which generates a 1 MHz continuous wave.

The sync generator 12 is further connected to a pulse counter 18 which counts sync pulses. The pulse counter may comprise a 50 Hz oscillator locked onto the sync generator signal and a binary coded decimal (BCD) counter connected to the oscillator. The counter counts frames one by one and cyclically applies a sampling signal onto one of 81 lines each controlling a respective one of 81 electronic switches designated CH. 0 to CH. 80. The 81st line is connected to the switch CH. 0. The electronic switch CH. 0 is connected to the reference frame generator 14 and each of the other is connected to a respective one of the cameras CAM 1 to CAM 80. The outputs of all the electronic switches are connected to a common video line 16 on which there appears a signal which comprises cycles each having 81 frames of which the last frame is a reference frame consisting exclusively of a 1 MHz wave riding on the syncs and the eighty preceding frames are the respective video output signals of the cameras.

When the pulse counter reaches the count "8", the reset frame signal from generator 14 is applied to line 16 and detected by a reset signal detector 20. This detector controls a clearing signal generator 22 to reset the counter 18 to "00".

A video processing amplifier 24 is provided which serves to remove the sync pulses obtained from the respective cameras and to replace these by clean sync signals derived directly from the sync generator 12. The provision of this circuit 24 ensures that in the event of failure of one of the cameras the counting sequence for the remaining cameras is not disrupted and only the frame of the failed camera is lost.

The output signal of the synchronization signal regenerating circuit is applied to a carrier frequency modulator 26.

In the receiver, the video signal is applied to a signal frequency board 28 which derives the received carrier frequency signal and produces a video signal and a frame sync signal. The video signal is applied to a memory unit 30 and also to a detector 32 for detecting the 1 MHz reference frequency and the frame sync signal is applied directly to a frame pulse counter 34. The frame pulse counter 34 is reset by the signal from the detector 32 of the reference frequency and counts frame synchronization signals to allow a frame from a desired camera to be selected. The selection is effected by means of a channel selector 36 which is connected to a digital display 38 by means of which the number of a desired channel may be selected manually. The channel selector 36 includes a keyboard connected to a binary coded generator which in turn applies a signal to the frame pulse counter 34. When the frame in the field pulse counter corresponds to the desired frame as set on the manual keyboard, a record command signal is applied by the frame pulse counter to the memory unit which may, for example, consist of a magnetic disc. The memory unit then snatches the video frame, that is to say the one frame is recorded on the memory unit and is continuously played on a video monitor 40.

Whilst the described system enables a plurality of channels to be transmitted on a single transmission link it will be appreciated that the updating frequency of each channel is reduced in proportion to the number of channels combined on the same link. The system can, however, enable, for example, 500 channels or frames of information to be transmitted sequentially provided an updating delay of once in every 10.02 seconds is acceptable.

WHAT WE CLAIM IS:—

1. A method for distributing the outputs of a plurality of video signal sources over a single transmission link, in which the plurality of video signal sources are synchronised with one another, the output signals of the video sources including synchronisation signals are sequentially sampled frame by frame in a cyclic order to provide a combined output on a common output, a reference frame signal is applied to the common output between consecutive cycles, whereby a frame sampled from any one video source is transmitted in a respective predetermined position relative to the reference frame signal in the cycle, the synchronisation signals are removed from the video signals appearing at the common output and replaced by new synchronisation signals, the resultant signals are distributed over the transmission link to a receiver, the received synchronisation pulses are counted, the count being reset by the reference frame signal, and a desired frame is selected for display by sampling the received

the reference frame. N being any positive integral number.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawing which is a schematic block diagram of a television system in accordance with the invention.

To the left of a dotted line 10 in the drawing, there is shown a transmission system, a receiver being shown to the right of the line 10.

In the transmission system, there are provided 80 cameras designated CAM 1 to CAM 80 respectively. All the cameras are connected to a common sync generator 12 so that the vertical and horizontal scanning in all the cameras is synchronized. The sync generator 12 is also connected to a reference frame generator 14 which generates a 1 MHz continuous wave.

The sync generator 12 is further connected to a pulse counter 18 which counts sync pulses. The pulse counter may comprise a 50 Hz oscillator locked onto the sync generator signal and a binary coded decimal (BCD) counter connected to the oscillator. The counter counts frames one by one and cyclically applies a sampling signal onto one of 81 lines each controlling a respective one of 81 electronic switches designated CH. 0 to CH. 80. The 81st line is connected to the switch CH. 0. The electronic switch CH. 0 is connected to the reference frame generator 14 and each of the other is connected to a respective one of the cameras CAM 1 to CAM 80. The outputs of all the electronic switches are connected to a common video line 16 on which there appears a signal which comprises cycles each having 81 frames of which the last frame is a reference frame consisting exclusively of a 1 MHz wave riding on the syncs and the eighty preceding frames are the respective video output signals of the cameras.

When the pulse counter reaches the count "8", the reset frame signal from generator 14 is applied to line 16 and detected by a reset signal detector 20. This detector controls a clearing signal generator 22 to reset the counter 18 to "00".

A video processing amplifier 24 is provided which serves to remove the sync pulses obtained from the respective cameras and to replace these by clean sync signals derived directly from the sync generator 12. The provision of this circuit 24 ensures that in the event of failure of one of the cameras the counting sequence for the remaining cameras is not disrupted and only the frame of the failed camera is lost.

The output signal of the synchronization signal regenerating circuit is applied to a carrier frequency modulator 26.

In the receiver, the video signal is applied to a signal frequency board 28 which derives the received carrier frequency signal and produces a video signal and a frame sync signal. The video signal is applied to a memory unit 30 and also to a detector 32 for detecting the 1 MHz reference frequency and the frame sync signal is applied directly to a frame pulse counter 34. The frame pulse counter 34 is reset by the signal from the detector 32 of the reference frequency and counts frame synchronization signals to allow a frame from a desired camera to be selected. The selection is effected by means of a channel selector 36 which is connected to a digital display 38 by means of which the number of a desired channel may be selected manually. The channel selector 36 includes a keyboard connected to a binary coded generator which in turn applies a signal to the frame pulse counter 34. When the frame in the field pulse counter corresponds to the desired frame as set on the manual keyboard, a record command signal is applied by the frame pulse counter to the memory unit which may, for example, consist of a magnetic disc. The memory unit then snatches the video frame, that is to say the one frame is recorded on the memory unit and is continuously played on a video monitor 40.

Whilst the described system enables a plurality of channels to be transmitted on a single transmission link it will be appreciated that the updating frequency of each channel is reduced in proportion to the number of channels combined on the same link. The system can, however, enable, for example, 500 channels or frames of information to be transmitted sequentially provided an updating delay of once in every 10.02 seconds is acceptable.

WHAT WE CLAIM IS:—

1. A method for distributing the outputs of a plurality of video signal sources over a single transmission link, in which the plurality of video signal sources are synchronised with one another, the output signals of the video sources including synchronisation signals are sequentially sampled frame by frame in a cyclic order to provide a combined output on a common output, a reference frame signal is applied to the common output between consecutive cycles, whereby a frame sampled from any one video source is transmitted in a respective predetermined position relative to the reference frame signal in the cycle, the synchronisation signals are removed from the video signals appearing at the common output and replaced by new synchronisation signals, the resultant signals are distributed over the transmission link to a receiver, the received synchronisation pulses are counted, the count being reset by the reference frame signal, and a desired frame is selected for display by sampling the received

signal when the count of the synchronisation pulses corresponds to the position of the desired frame relative to the reference frame signal.

2. A television transmitting system comprising a plurality of synchronised video sources. means for generating a reference frame signal. a sampling circuit for sequentially sampling the outputs of the video sources and the output of the means for generating the reference frame signal in a cyclic order. whereby a combined output signal is generated which is applied to a common output and which comprises a plurality of cycles each consisting of a reference frame signal and one frame from each of the sources in a predetermined order, and a circuit connected to the common output for removing the synchronisation signals from the video signals appearing at the common output and for replacing the removed signals with new synchronisation signals.

3. A television transmitting system according to claim 2, wherein the means for generating a reference frame signal provides an output which includes for at least part of its duration a continuous wave component.

4. A television transmitting system according to claim 2 or 3, wherein the sampling circuit comprises a counter and a plurality of electronic switches controlled by the counter, each electronic switch connecting the outut of one of the video signal sources to the common output.

5. A television transmitting system according to claim 4, wherein the counter is connected to a reset circuit controlled by a circuit for detecting the presence of the reference frame signal on the common output, whereby the counter is reset by the reference frame signal to commence a new cycle of sampling.

6. A television transmitting system according to any one of claims 2 to 5, wherein the new synchronisation signals are derived directly from a synchronisation pulse generator the output of which synchronises the outputs of the video signal sources.

7. A television transmitting system according to any one of claims 2 to 6, comprising a receiver having a frame snatch system which includes means for detecting the reference frame signal in the incoming signal, a channel selector for selecting the number of a channel corresponding to one of the video signals which it is desired to display, a counter for counting frames following each reference frame, a storage circuit controlled by the said counter for storing the frame selected by the channel selector, and a video monitor for reproducing the stored frame.

8. A method for distributing the outputs of a plurality of video signal sources over a single transmission link substantially as hereinbefore described with reference to the accompanying drawing.

9. A television transmitting system substantially as hereinbefore described with reference to the accompanying drawing.

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