

[54] VIDEO SPLIT SCREEN TECHNIQUE

[56]

References Cited

U.S. PATENT DOCUMENTS

[75] Inventors: Harvey L. Balopole, Whitestone;
Thomas H. Traynor, Lindenhurst,
both of N.Y.

3,982,063 9/1976 Brown et al. 358/134
4,139,860 2/1979 Micic et al. 358/183
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[73] Assignee: Fairchild-Weston Systems Inc.,
Syosset, N.Y.

Primary Examiner—John C. Martin
Attorney, Agent, or Firm—Thomas Langer

[21] Appl. No.: 230,182

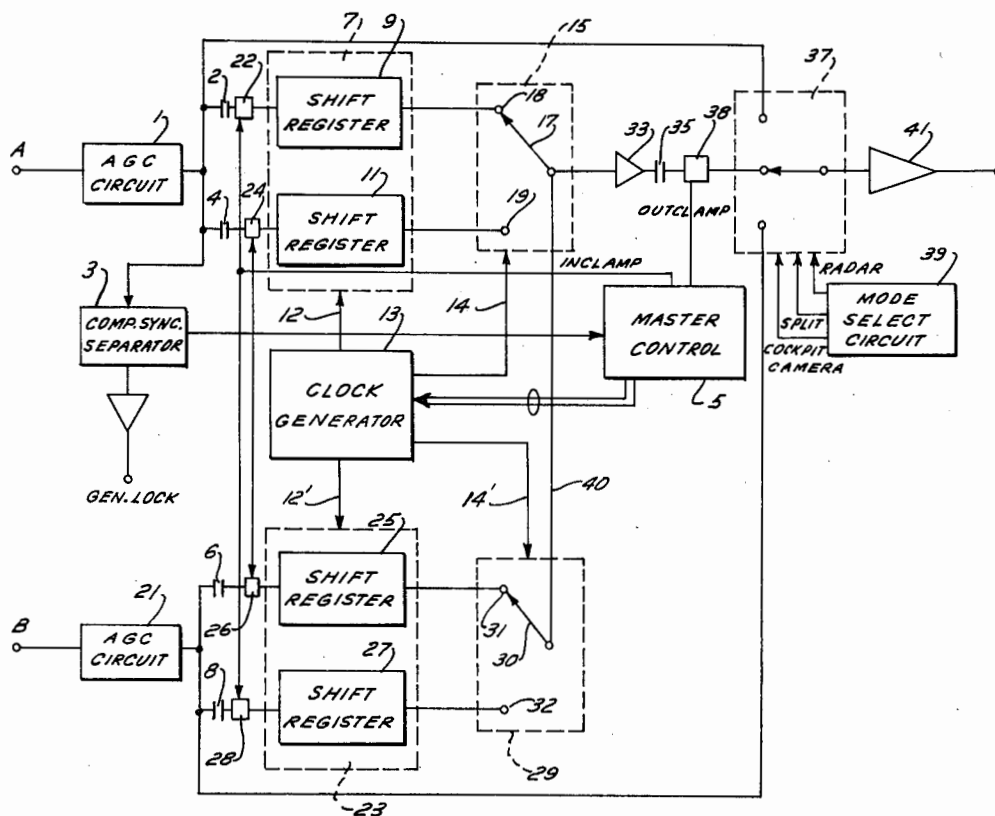
[57] ABSTRACT

A technique is provided for simultaneously displaying on a television screen juxtaposed pictures from two independent image sources. The required picture compression is achieved by storing analog samples of the video signals in an analog memory at one frequency and retrieving the samples at a higher frequency for display. A 2 to 1 picture compression is attained, for example, by retrieving the samples at twice the frequency at which they are stored.

[22] Filed: Jan. 30, 1981

[51] Int. Cl.³ H04N 5/22
[52] U.S. Cl. 358/183; 358/180
[58] Field of Search 358/22, 180, 181, 183,
358/191.1, 182, 108, 134, 140

11 Claims, 5 Drawing Figures



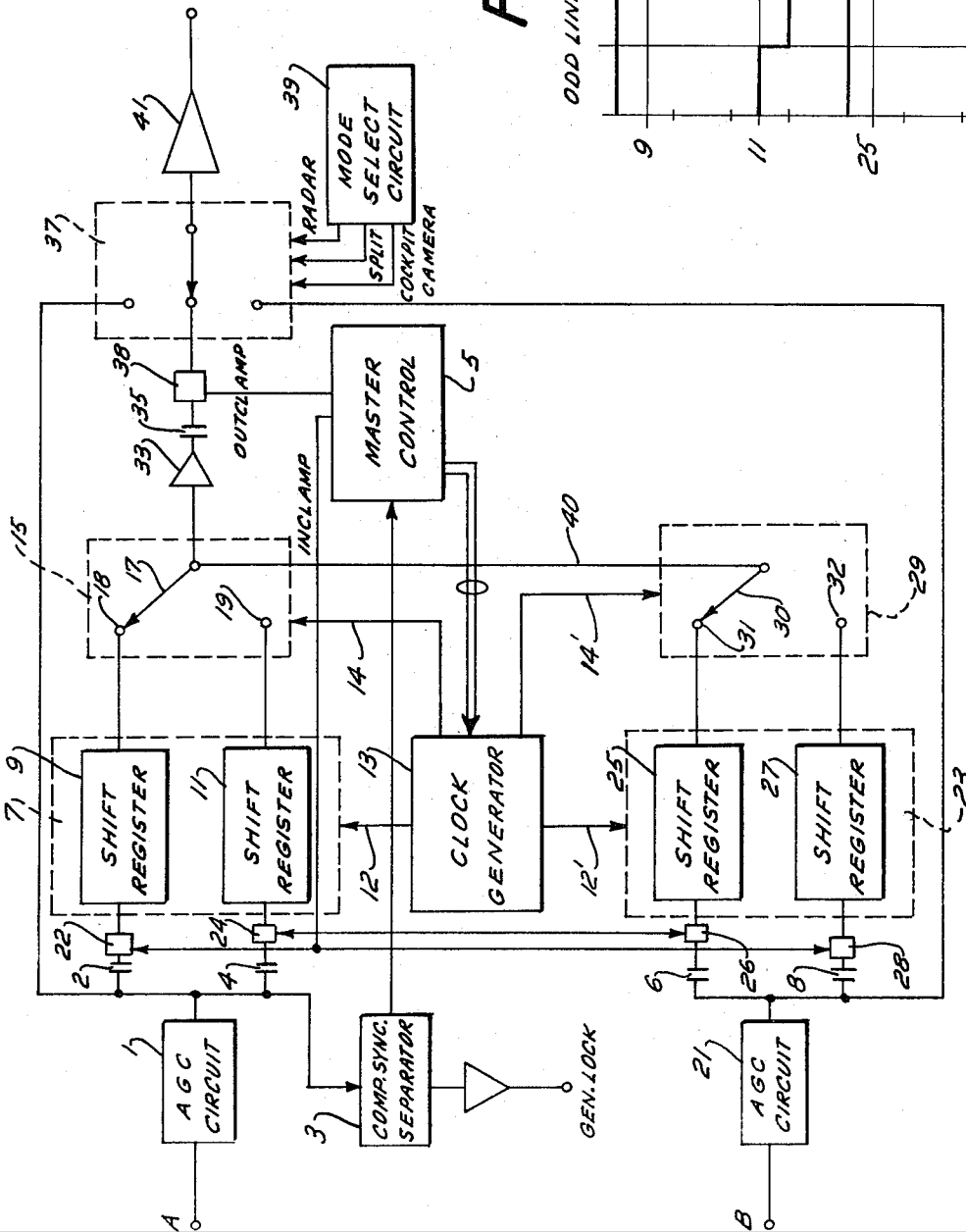


FIG. 2

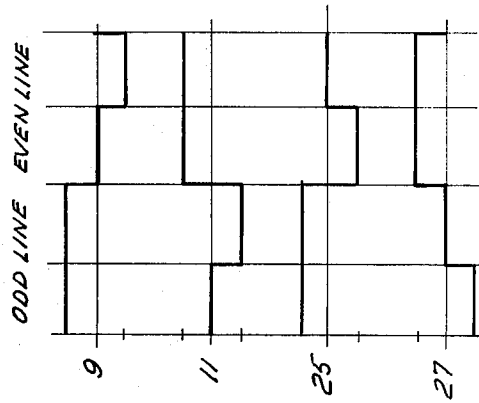


FIG. 1

FIG. 3

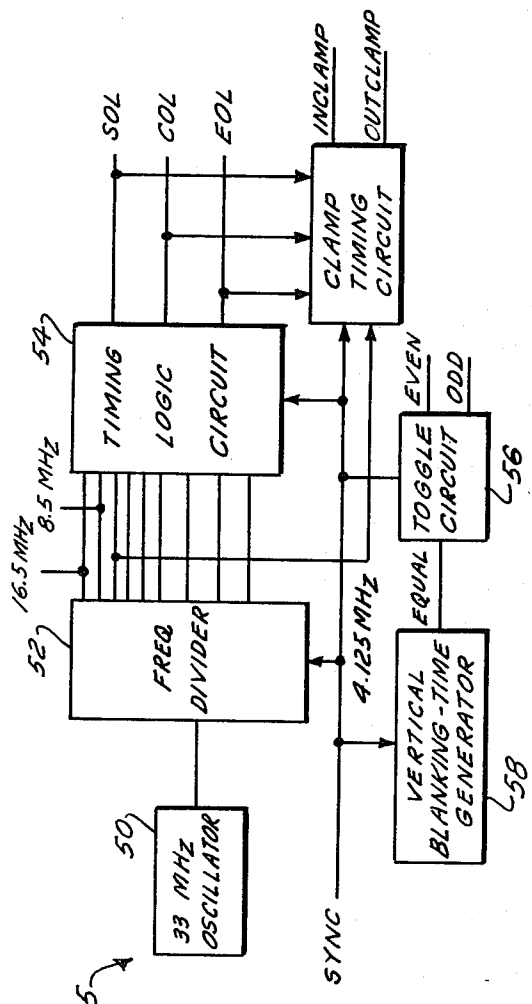
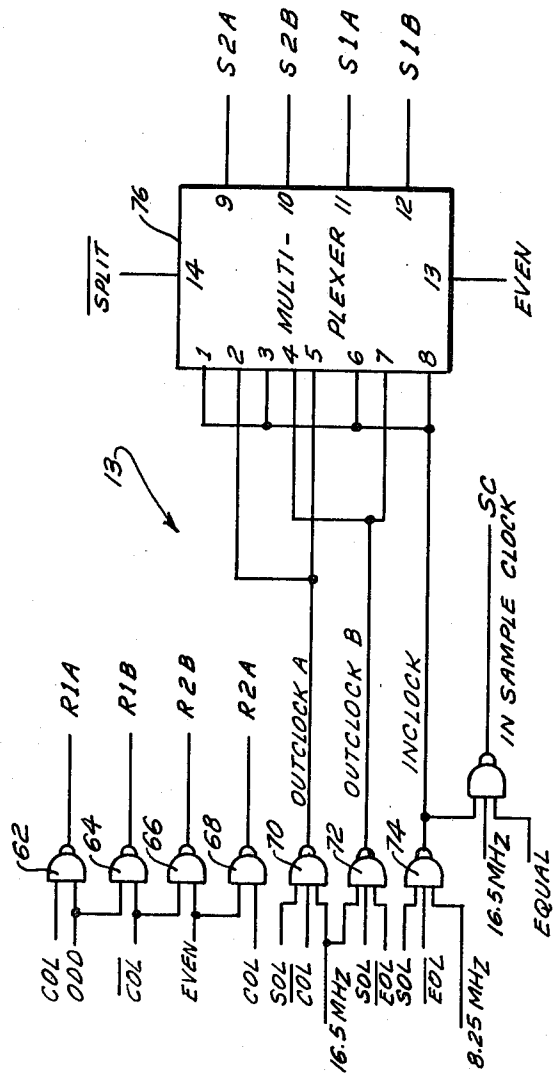


FIG. 4



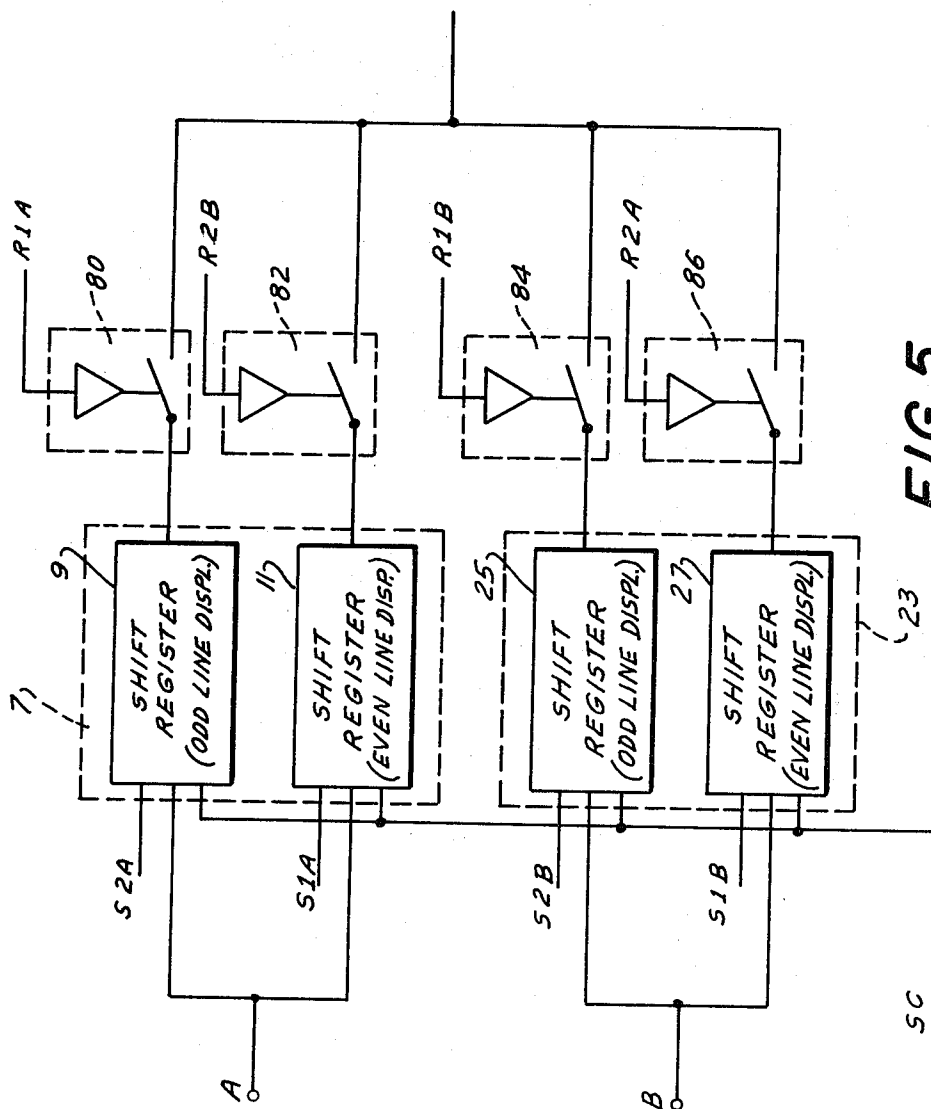


FIG. 5

VIDEO SPLIT SCREEN TECHNIQUE

BACKGROUND OF THE INVENTION

This invention relates to a technique for video display and more particularly to a split screen display which is obtained by compressing independently derived images and juxtaposing them on the screen of a television monitor for simultaneous presentation.

Several approaches are known for simultaneously displaying two independently derived images on the same screen. One approach superimposes the two images. U.S. Pat. No. 3,569,966 and 4,001,499 are exemplary of this approach. Another approach is to juxtapose the two images for simultaneous display on the same screen. For some purposes superimposition is not desirable because the resulting picture would be meaningless or confusing. For example, the military requires a split screen display in its combat aircraft for training purposes. More specifically, training aircraft now employ a television camera in the cockpit which looks out of the windscreen at the view available to the pilot. In addition, it has within its field of view the heads-up display available in modern aircraft which presents important information to the pilot on the surface of the windscreen superimposed on the outside scene. In addition to the cockpit camera, the aircraft is equipped with radar. It is advantageous to the pilot, after he is back on the ground, to see the video outputs from the cockpit camera and the radar juxtaposed on the same screen. This enables him, as well as his instructor, to review and evaluate his actions and thereby learn from them.

Picture compression of what would otherwise cover the entire screen of a television monitor is obviously required in order to juxtapose the independently derived images on one screen. One technique accomplishes the picture compression by chopping off one or both sides of the picture and utilizes only the middle portion. Just enough of each picture is eliminated so that it, along with another similarly chopped picture, fit on the screen. This technique is useful when the eliminated portions of the picture are relatively unimportant, such as with separate views of the pitcher and base runner in a televised baseball game. The compressed picture eliminates part of the baseball field and other fielders from each picture but retains the most interesting elements, namely the pitcher and baserunner. However, for some cases such as in the combat aircraft environment discussed by way of example above, the entire picture is significant and, therefore, picture compression must be accomplished in some other manner. One solution has been to selectively eliminate the video information for a selected number of points along the raster scan line. U.S. Pat. No. 4,134,128 generates a given number of samples of the received analog television signal for conversion to digital form and subsequent storage in a digital memory. The stored information is then recalled and displayed. To compress the picture, every other sample of the digitized picture, for example, is eliminated and consequently not written into the memory. Thus, when the stored information is clocked out of the memory at the normal rate, a 2 to 1 picture compression is achieved. U.S. Pat. No. 4,152,719 and published U.K. pat. application Ser. No. 2,016,857 disclose alternative techniques for selectively storing less information than is available. Retrieval from memory at the normal rate then acts to suitably vary the picture size. U.S. Pat. No. 4,220,965, on the other hand,

stores all the available information but, for retrieval from memory, addresses only selected memory locations. This, again, results in the use of a reduced number of digitized picture samples and provides picture compression dependent on the ratio of samples stored to samples retrieved.

Each of the above-mentioned techniques results in some information being lost from the detected image in the process of compressing the picture. This is particularly aggravated, of course, in the first-mentioned "chopping" approach. However, the second approach of eliminating selected digitized samples also can reduce resolution and picture quality. Furthermore, the latter approach requires A/D circuitry and a sizeable memory which add to the complexity, cost, size and weight of the apparatus yet still fail to retain in the compressed picture a significant portion of the detected image.

SUMMARY OF THE INVENTION

The primary object of the invention is to provide picture compression with a minimum loss of image information in the displayed picture.

Another object of the invention is to simplify the apparatus required to generate a compressed picture.

A further object of the invention is to reduce the weight, size and cost of picture compression apparatus.

Still another object of the invention is to juxtapose two independently derived images for simultaneous display on one screen.

Yet another object of the invention is to provide picture compression apparatus to readily combine two independently derived images in juxtaposition on a screen flexible enough to handle a variety of image sources.

In order to accomplish these and other objects of the invention, one aspect of the invention is directed to an apparatus for producing horizontal compression of a raster scan television picture comprising a source of analog video signals; analog memory means coupled to said source for storing said video signals; timing means coupled to said analog memory means for storing said video signals in said analog memory means at a given frequency and for retrieving the stored video signals from said analog memory means at a frequency higher than said given frequency for input to a television monitor.

The compressed picture thus produced can be used to juxtapose two independently derived images on one screen. For example, each image can be compressed by two so both will have room on one screen. The invention thus further involves synchronization of the two sources, and control of the retrieval of stored samples such that one compressed picture appears for each first half of a scan line and the other compressed picture appears for the second half of the scan line.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram depicting the preferred embodiment of the invention.

FIG. 2 is a timing diagram which symbolically depicts the storing and retrieval of image samples by the circuit of FIG. 1.

FIG. 3 is a block diagram showing the master control block of FIG. 1 in greater detail.

FIG. 4 shows partially schematically and partially in block diagram from details of the clock generator of FIG. 1.

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