

[54] VIDEO IMAGE POSITIONING CONTROL SYSTEM FOR AMUSEMENT DEVICE

[76] Inventor: Nolan K. Bushnell, 3572 Gibson, Santa Clara, Calif. 95051

[22] Filed: Nov. 24, 1972

[21] Appl. No.: 309,268

[52] U.S. Cl.... 178/69.5 TV, 178/5.8 R, 178/7.3 R, 178/7.5 D, 178/69.5 TV, 340/324 AD

[51] Int. Cl..... H04n 3/22, H04n 5/68

[58] Field of Search 340/146 AE, 347 DA, 347 AD, 340/324 AD, 146.3 F, 168 R, 273, 324 A, 324 R; 273/DIG. 28; 178/6.8, DIG. 29, 5.8 R, 69.5 TV, 69.5 G, 6, 7.3 D, 7.3 S, 7.3 R

[56] **References Cited**  
UNITED STATES PATENTS

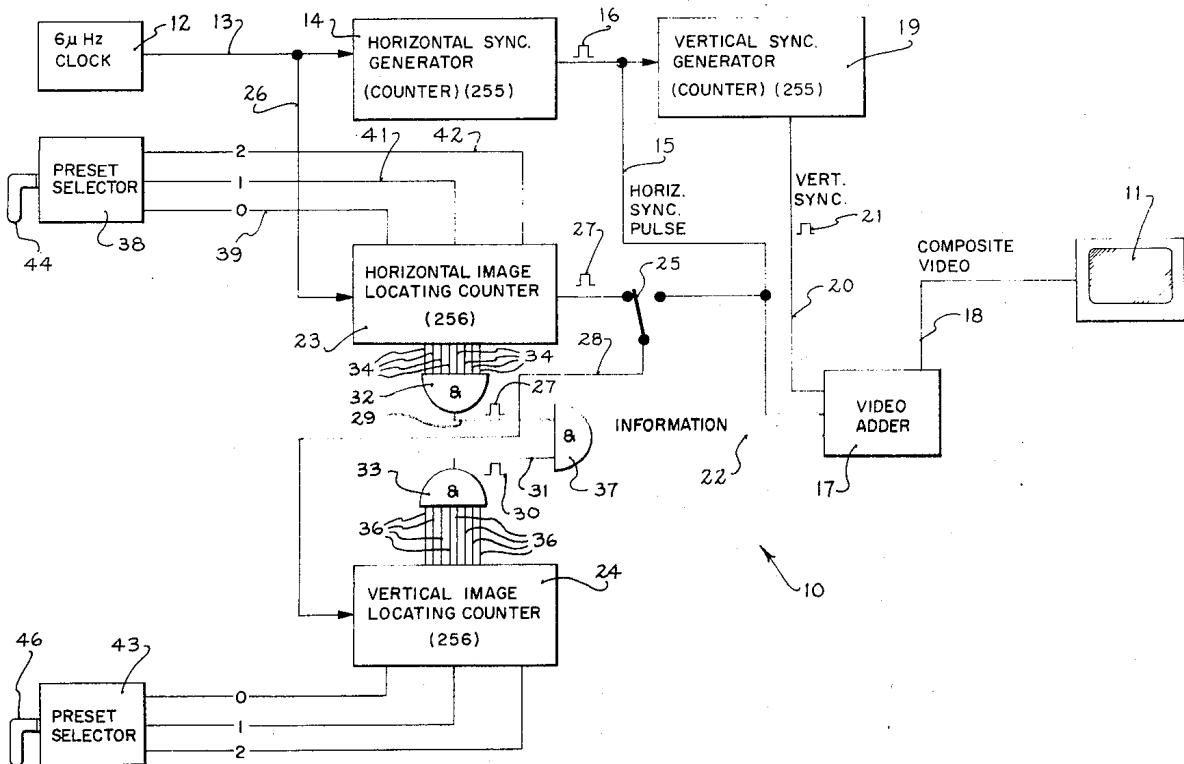
3,659,285	4/1972	Baer.....	178/5.8 R
3,631,457	12/1971	Hamada.....	340/324 A
3,659,284	4/1972	Baer.....	178/5.8 R

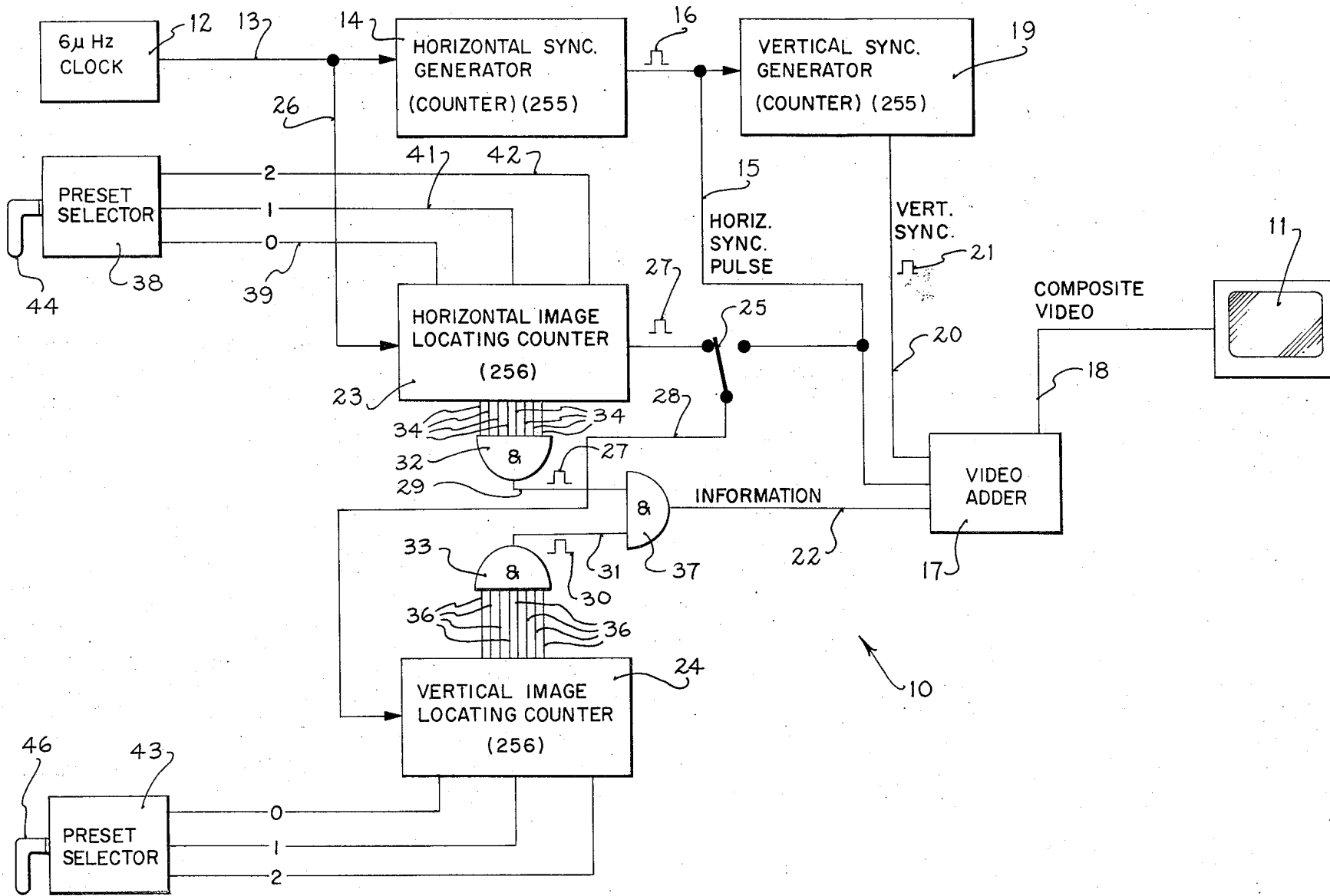
Primary Examiner—Robert L. Richardson  
Assistant Examiner—R. John Godfrey  
Attorney, Agent, or Firm—Flehr, Hohback, Test, Albritton & Herbert

[57] **ABSTRACT**

For controlling the location of an image and to cause the image to move variously with respect to perpendicular coordinates, such as X, Y coordinates, on a video display tube, a first set of counters is arranged to generate artificial, horizontal and vertical sync pulses for use in conjunction with a video adder for controlling the image on a TV screen. A second set of counters driven from the same clock source as the first supplies information signals to the video adder for controlling the location at which the image will be displayed. Each of the two predetermined counters constituting the second set of counters is capable of being preset to any of a plurality of counts so as to cause a horizontal or vertical displacement of the image on the face of the display tube with respect to the locus defined by the count generated by the first set of counters.

5 Claims, 1 Drawing Figure





PATENTED FEB 19 1974

3,793,483

## VIDEO IMAGE POSITIONING CONTROL SYSTEM FOR AMUSEMENT DEVICE

### BACKGROUND OF THE INVENTION

This invention pertains to a video image control system for causing a video image to be displayed on a video display tube and to travel selectively in a plurality of directions on the tube. of the tuve. This invention is particularly useful in conjunction with entertainment devices of the kind wherein images are displayed on video tubes and controlled by an operator.

Heretofore, various types of schemes have been arranged for controlling the position of images displayed on picture tubes for purposes of entertainment but many of these systems are typified by relatively expensive components and circuitry rendering the entire apparatus somewhat expensive and difficult to service as well as inflexible in adapting to different programs and displays.

Accordingly, there is a substantial need for a relatively simplified video image control system with a high degree of flexibility and such is provided in accordance with the present invention herein.

### SUMMARY OF THE INVENTION AND OBJECTS

In general, there is provided a video image control system for causing a video image to be displayed on a video display tube and caused to travel selectively in a plurality of directions thereon. The system includes a pulse-generating clock means for generating a continuous stream of signals at a predetermined frequency. A first counting means comprising, in general, a pair of predetermined counters is coupled to count the signals from the clock means and to provide a first output signal upon attainment of a predetermined count and also a second output signal upon attainment of a multiple of the first named predetermined count. A video adder is employed of a type for receiving and combining horizontal sync pulses, vertical sync pulses, and information signals so as to provide a composite video signal of a type to be coupled to the video display tube. Means supplying the first and second output signals to the adder permit the first and second output signals to function as horizontal and vertical sync pulses respectively. A second counting means (preferably coupled to count the clock signals from the same clock source as above) provides a third output pulse therefrom upon attainment of a given predetermined count and a fourth output pulse upon attainment of a multiple of the given predetermined count. Means for generating an information signal in response to the conjoint occurrence of both the third and fourth output pulses and for supplying the information signal to the video adder serves to provide the composite video signal thereof with its information portion to be displayed. Finally, means for selectively varying the count of one of the counting means with respect to the count of the other counting means serves to relatively displace the information signal in time so as to move the image along at least one coordinate axis on the video display tube.

### BRIEF DESCRIPTION OF THE DRAWING

The single FIGURE of the drawing discloses a video image control system according to the invention.

## DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

A video image control system 10 for causing a video image to be displayed on a video display tube 11 (such as a T.V. picture tube) and caused to travel thereon selectively in a plurality of directions includes a pulse-generating clock means 12 such as a 6MHz clock of conventional construction. Accordingly, signals are generated along line 13 at a 6MHz frequency to be connected by the predetermined counter 14 which functions to generate an output pulse in response to every 255 counts received at the input side.

Counter 14 is of a conventional binary type which is preset by one count in order to establish an output signal therefrom after counting 255 additional counts for purposes as will be explained further below. Thus, a first output signal 16 functions as a horizontal sync pulse to be supplied to the video adder 17 also of conventional construction via line 15. Adder 17 is of a general type known to the art wherein horizontal sync pulses, vertical sync pulses, and information signals can all be combined to generate a composite video signal on its output side as represented by line 18.

The horizontal sync pulses 16 are counted by a second predetermined counter 19 whereby, upon arriving at a suitable multiple thereof, such as 255 (again preset by one), an output signal 21 will serve to function as a vertical sync pulse fed via line 20 to video adder 17 for purposes noted above.

Accordingly, at this point, video display tube 11 is in a position to receive information signals superimposed upon the raster generated by the horizontal and vertical sync pulses 16, 21 respectively.

These information signals are fed to adder 17 along an input represented by lead 22 in a manner whereby the video image being displayed on tube 11 can be advanced or retarded along each of a pair of substantially mutually perpendicular axes or coordinates by means as now to be described.

Accordingly, the position of the image on tube 11 can readily be controlled by a second set of counters 23, 24 each of which constitutes a conventional binary counter having (eight) outputs generating a count representing a total of 256. Counter 23 is designated as a horizontal image locating counter and is preferably fed directly from clock means 12 via an input represented by lead 26 whereby, upon attainment of a predetermined count of 256, for example, counter 23 serves to provide a third output pulse 27 on the output line 28 via mode control switch 25 so as to provide (in one mode of operation) an input to the vertical image locating counter 24. Counter 24 is also a conventional binary predetermined counter capable of attaining a count up to and including 256.

Each of counters 23 and 24 is arranged to provide a single output on lead 29, 31 respectively from AND gates 32, 33. Thus, third output pulse 27 also appears via lead 29 as an input to AND gate 37.

Accordingly, only when there is a common state on each of the eight terminals 34 into AND gate 32 will there be an output signal 27 appearing on line 29 and similarly only when there is a common state on each of the inputs 36 will there be an output signal 30 on line 31. However, upon the conjoint occurrence of signals on both lines 29, 31 an AND gate 37 of conventional construction serves to provide an information signal on

line 22 for adder 17 to utilize in providing the composite video output on line 18.

Having in mind only the foregoing explanation, it is readily evident that the image generated on tube 11 will remain stationary at only a given location in view of the fact that the first counting means including counters 14 and 19 produces pulses 16 and 21 at the same rate as the second counting means including counters 23 and 24.

However, in order to induce a relative change in position of the image across the face of tube 11 along one or more coordinate axes, the count from the horizontal and/or vertical image locating counters 23, 24 is varied by applying a preset selector input as now to be described.

Counter 23 is coupled directly to a preset selector 38 of known type wherein a preset count of 0, 1 or 2 is respectively applied via the leads 39, 41, 42 and, thus, counter 23 can start its count one count behind counter 14 (remembering that counter 14 is preset to a count of 1), even with counter 14, or one count ahead of counter 14 depending upon whether the preset selector has been operated to select input 39, 41 or 42 respectively. A similar preset selector 43 serves to control counter 24 so that it, too, can operate one count behind, or one count ahead, or even with the count generated from the vertical sync generator counter 19.

As shown in the drawing, preset selectors 38 and 43 are respectively shown controlled by manually operated handles 44, 46 whereby a player can, through manual manipulation of the handles 44, 46, control the positioning of an image on tube 11 merely by varying the state of one or both selectors 38, 43.

From the foregoing, it will be readily apparent that there has been provided a simplified readily servicable image control system suitable and adapted for use as an entertainment device or other manually controlled means whereby differences in the counts generated between horizontal and vertical sync pulses on the one hand and the horizontal and vertical image locating counters on the other hand serves to provide selected relative positioning of the images on the screen.

Whenever relative movement of the image on tube 11 is desired to be confined to a single axis, mode control switch 25 is shifted so that armature 25a opens the circuit to lead 28 while coupling lead 15 to lead 28 for supplying horizontal sync pulses 16 to counter 24 without any relative displacement between their respective counts. However, the output from the vertical image locating counter 24 is still free to introduce a relative displacement of the image under control of manual preset selector 43.

The attainment of a full count (of 256) by counter 23 serves to gate out the vertical image locating counter 24 via AND gate 37 to adder 17 when counter 24 has attained its full count.

I claim:

1. In a video image control system for causing a video image to be displayed on a video display tube and caused to travel selectively thereon in a plurality of directions, said system including a pulse-generating clock means for generating a continuous stream of signals at a predetermined frequency, first counting means coupled to count said signals and to provide a first output signal upon attainment of a predetermined count and a second output signal upon attainment of a multiple of said predetermined count, a video adder of a type for

receiving and combining horizontal sync pulses, vertical sync pulses, and information signals to provide a composite video signal to be coupled to the video display tube, means for supplying said first and second output signals to said adder to function as horizontal and vertical sync pulses respectively, second counting means coupled to count said clock signals and to provide a third output pulse therefrom upon attainment of a given predetermined count and a fourth output pulse upon attainment of a multiple of said given predetermined count, means for generating an information signal in response to the conjoint occurrence of both said given predetermined counts, and means for supplying said information signal to said video adder to provide the composite video signal thereof with an information portion to be displayed, and means for selectively varying said given counts with respect to the first named said predetermined counts to relatively displace the information signal with respect to the positioning of said horizontal and vertical sync pulses thereby moving said image in a direction determined by the relative difference between said predetermined counts and said given counts.

2. In a video image control system according to claim 1 wherein the last named means includes means for selectively varying both of said given counts.

3. In a video image control system according to claim 1 wherein said second counting means includes first and second predetermined counters, and means coupled to said first and second counters serving to preset a selected initial count therein to initiate the count thereof at one of a number of selected counts displaced in time with respect to said predetermined counts of the first named said counting means so as to relatively displace the information signal with respect to the occurrence of said horizontal and vertical sync pulses.

4. In a video image control system for causing a video image to be displayed on a video display tube and caused to travel selectively in various directions thereon, said system including pulse-generating clock means for generating a continuous stream of signals at a predetermined frequency, a first counting means comprising first and second predetermined counters, said first predetermined counter being coupled to receive and count pulses from said clock means to provide a first output signal upon attainment of a predetermined count therein, said second predetermined counter being coupled to count said first output signals and to provide a second output signal upon counting a multiple of said first output signal, a video adder of a type for receiving and combining horizontal sync pulses, vertical sync pulses, and information signals to provide a composite video signal to be coupled to the video display tube, means for supplying said first and second output signals to said adder to function as horizontal and vertical sync pulses respectively, second counting means comprising first and second predetermined counters, said first counter of said second counting means being coupled to count said clock signal to provide a third output signal upon attainment of a predetermined given count, said second counter of said second counting means being coupled to count said third output signals and to provide a fourth output signal upon counting a multiple of said third output signal, means responsive to conjoint occurrence of said third and fourth output signals for generating an information signal, means for supplying said information signal to

5

said video adder to provide the composite video signal with information to be displayed, and means for selectively varying the count of one of said first predetermined counters with respect to the other of said first predetermined counters to relatively displace the information signal along an axis on said display tube, and means for selectively varying the count of one of said second predetermined counters with respect to the other of said second predetermined counters to relatively displace the information signal along another axis on said display tube extending substantially perpendicular to the first named axis.

5. In a video image control system for causing a video image to be displayed on a video display tube and caused to travel selectively thereon in a plurality of directions, said system including pulse-generating clock means for generating a continuous stream of signals at a predetermined frequency, first counting means coupled to count said signals and to provide a first output signal upon attainment of a predetermined count and a second output signal upon attainment of a multiple of said predetermined count, a video adder of a type for

6

receiving and combining horizontal sync pulses, vertical sync pulses, and information signals to provide a composite video signal to be coupled to the video display tube, means for supplying said first and second output signals to said adder to function as horizontal and vertical sync pulses respectively, second counting means operatively coupled to count said clock signals and to provide a third output pulse therefrom upon attainment of a given predetermined count and a fourth output pulse upon attainment of a multiple of said given predetermined count, means for generating an information signal in response to the conjoint occurrence of both said given predetermined counts, means for supplying said information signal to said video adder to provide the composite video signal thereof with information to be displayed, and means for selectively varying the count of one of said counting means with respect to the count of the other counting means to relatively displace said information signal along an axis on said video display tube.

\* \* \* \* \*

25

30

35

40

45

50

55

60

65