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(54) Chroma key signal generator for a video editing apparatus

(57) A chroma key signal generator for video editing apparatus provides a chroma key signal I from an input composite color video signal A. The chroma key signal generator includes a color selecting circuit 30 which provides one or more chrominance subcarrier signals having predetermined phases θ_0, θ_1, θ_2 from the gated 22 chrominance subcarrier burst signal separated from the input composite color video signal. One of these chrominance subcarrier signals is selected 34, phase adjusted 35, and phase compared 41 with the chrominance signal separated from the input color video signal. A chroma key signal I is provided when the phases of the compared signals are detected to be the same, the output of the phase comparator 41 being integrated 43, compared 45 with a reference signal from color saturation means 44, and mixed 46 with the synchronising signal.

FIG.1

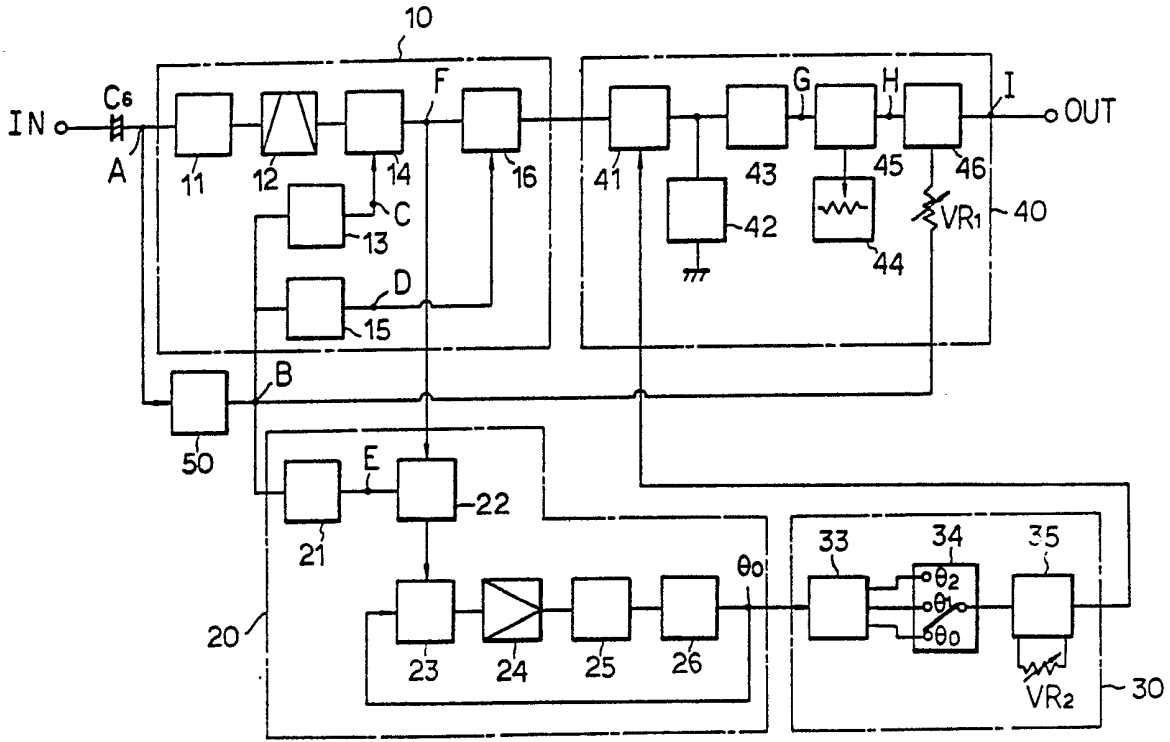

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FIG.1

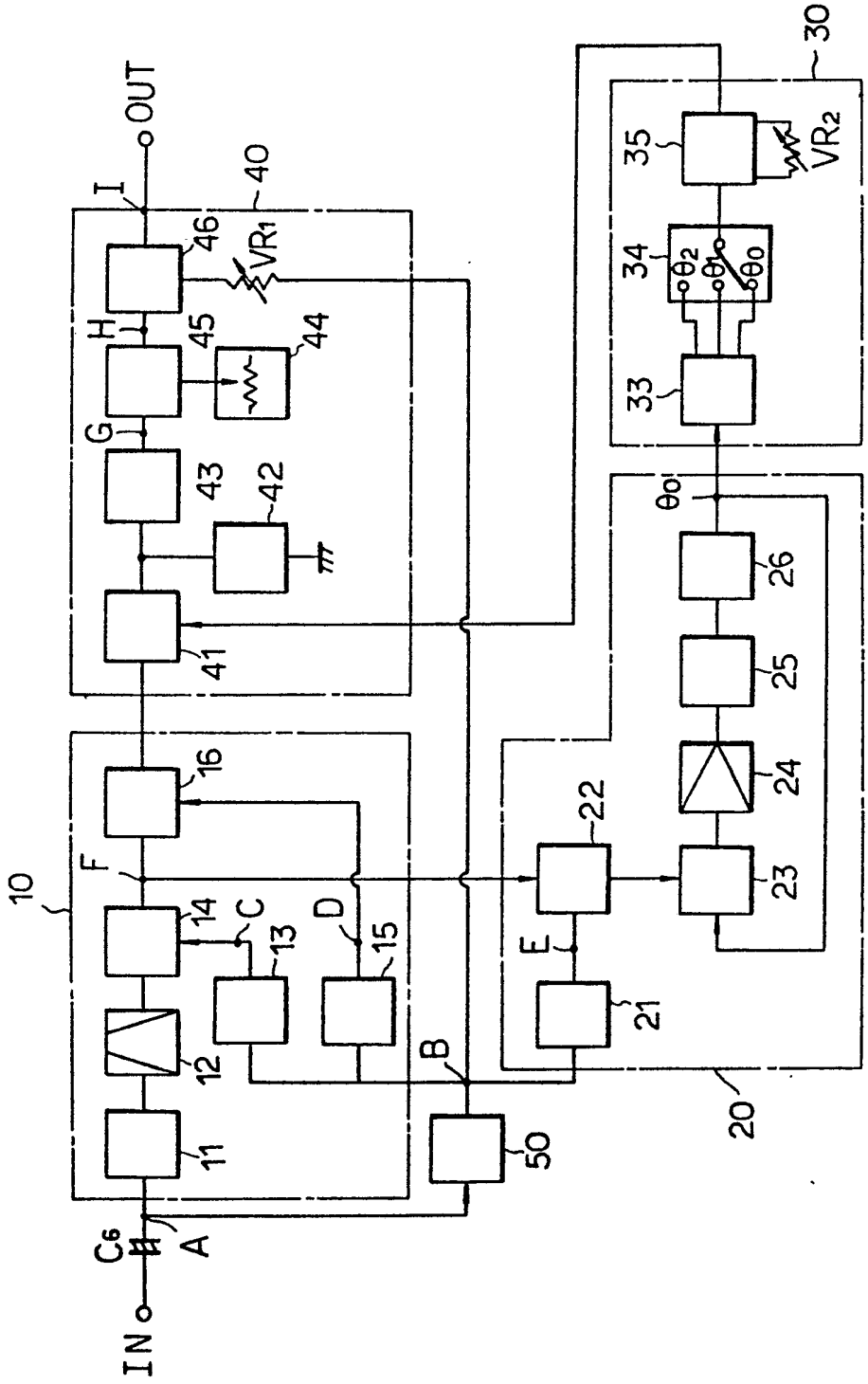

IN
OUT
A
B
C
D
E
F
G
H
I
10
11
12
13
14
15
16
20
21
22
23
24
25
26
30
33
34
35
40
41
42
43
44
45
46
50
VR1
VR2
θ0
θ1
θ2
C6

FIG. 2

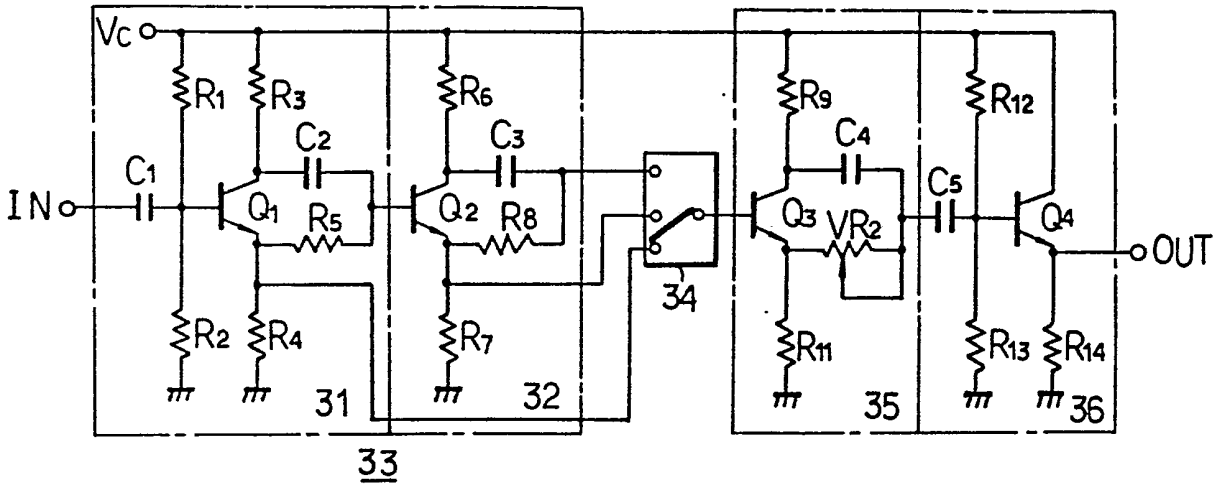

Vc
IN
C1
R1
R3
C2
Q1
R5
R2
R4
31
R6
C3
Q2
R8
R7
32
33
34
R9
C4
Q3
VR2
R11
35
C5
R12
Q4
R13
R14
36
OUT

FIG. 3

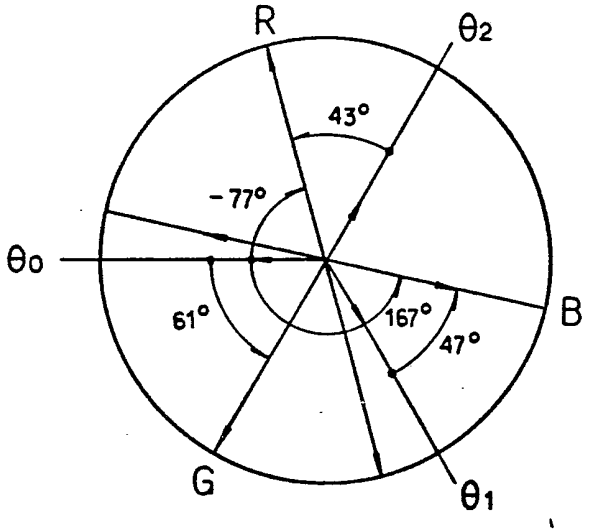

R
θ2
43°
-77°
θo
61°
167°
47°
B
G
θ1

FIG. 4

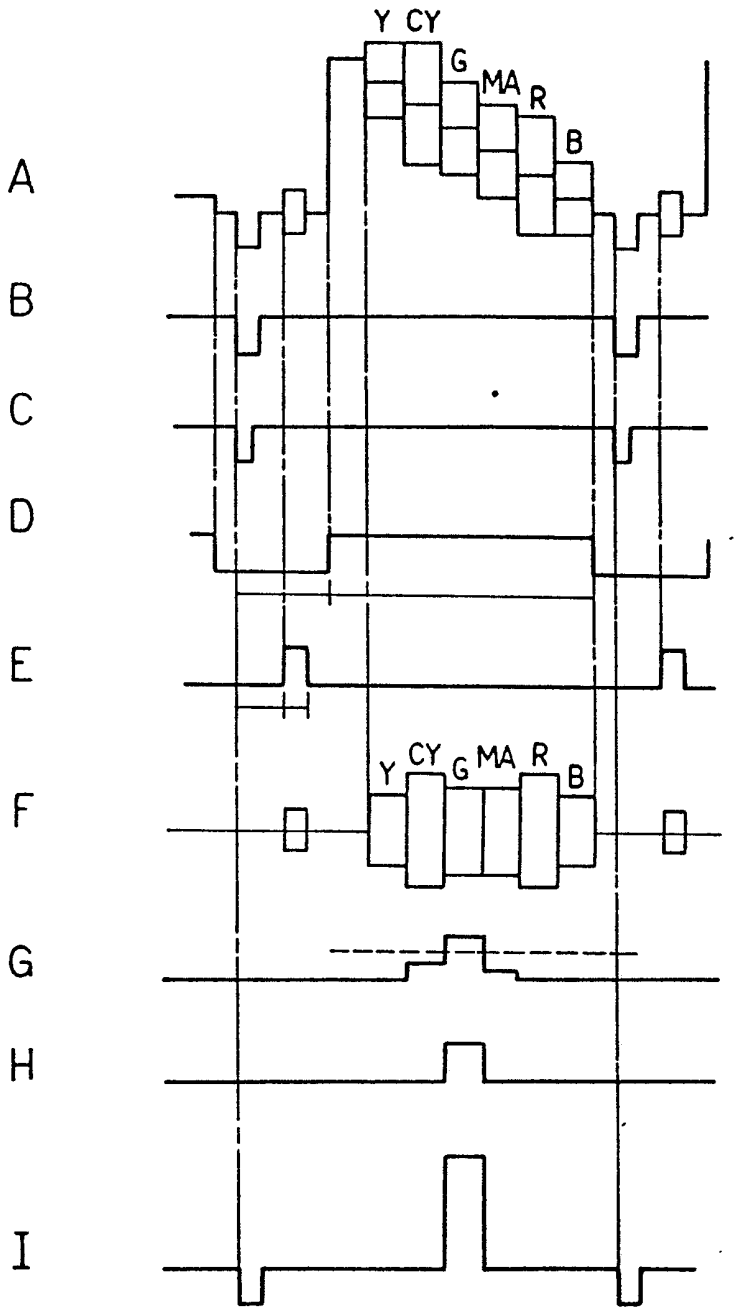
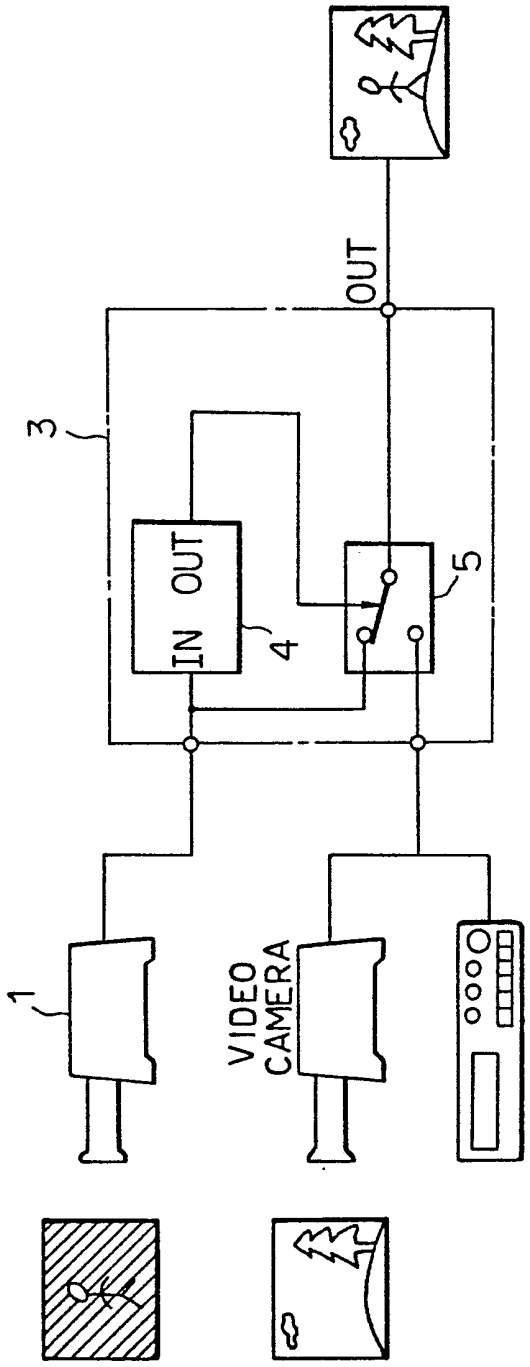


FIG. 5

PRIOR ART



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CHROMA KEY SIGNAL GENERATOR FOR A VIDEO EDITING APPARATUS

DESCRIPTION

The present invention relates to a chroma key signal generator for a video editing apparatus, and more particularly to a chroma key signal generator which enables the chroma key signal to be obtained from a composite video signal.

In general, a chroma key apparatus which is a kind of a video editing apparatus includes a chroma key signal generator for providing a chroma key signal in response to specific hues of the chrominance signal of the color video signals, and a selection switch for selecting one among two or more chrominance siganls according to this key signal, so that two or more color video signals can be mixed.

In the conventional chroma key signal generator of the above type, the chroma key signal is generated by utilizing three primary color signals of red(R), green(G) and blue(B). However, it is not possible to use the chroma key signal generators for VCRs and/or a color TV set as the primary color signals R, G and B are not

attainable in the video cassette recorder or the color TV set which processes the composite video signals as color difference signals. Accordingly, at least one additional video camera is required to generate a chroma key signal, and thereby the conventional chroma key signal generators are subjected to restriction in use.

It is an object of the present invention to provide a chroma key signal generator for a video editing apparatus, by which the chroma key signal can be obtained from the composite video signal, thus having extended the range of use.

In accordance with the present invention, there is provided a chroma key signal generator for a video editing apparatus comprising: chrominance signal separating means for separating a chrominance signal from a color video signal; color synchronizing means for providing successive chrominance subcarrier signals by detecting the color synchronizing signal from the chrominance signal; color selecting means providing one or more chrominance subcarrier signals having predetermined phase differences from the chrominance subcarrier signal respectively, electing and providing a specific chrominance signal by adjusting the phase of the selected chrominance subcarrier signal; and

phase detecting means comparing the phase of the specific chrominance signal selected in the color selecting means with that of the chrominance signal provided from the chrominance signal separating means and providing the maximum output as a chroma key signal when the phases of the chrominance signals are detected to be the same in the above comparison.

FIG. 1 is a block diagram of a preferred embodiment according to the present invention;

FIG. 2 is a circuit diagram of the chrominance selecting circuit according to the present invention;

FIG. 3 is a vector diagram of the chrominance signal for explaining the chraminance selecting circuit of the present invention;

FIG. 4 is a waveform diagram for dipicting the waveforms appeared at various points in FIG. 1; and

FIG. 5 is a schematic view for explaining the conventional chroma key apparatus.

Referring to FIG. 1 of the drawings, the color video signal (FIG. 4-A) which is supplied to the input terminal IN is provided to both of a chrominance signal separating circuit 10 and a synchronizing signal

separating circuit 50 via a coupling capacitor C6 respectively.

As shown in FIG. 1, the chrominance signal separating circuit 10 comprises a buffer 11, a band pass filter 12, a clamp pulse generator 13, an amplifier 14, 14, a blanking pulse generator 15 and a blanking circuit 16.

The chrominance signal separating circuit 10 allows only the color signal component of the chrominance subcarrier signal (3.58 MHz) of the composite video signal, which is provided via the buffer 11, to pass through the band pass filter 12.

The chrominance signal separating circuit 10 compensates the gain of the color signal lowered in the above filtering process while providing impedance matching, and clamps the chrominance signal (FIG 4-F) which is separated through the amplifier 14 which fixes the color signal at a constant level by the clamp pulse (FIG. 4-C) received from the clamp pulse separator 13 such as monostable multivibrator generating the clamp pulse using the synchronizing signal(FIG. 4-B), supplied from the synchronizing signal separator 50 as a trigger signal.

The clamped chrominance signal (FIG. 4-F) is passed through the blanking circuit 16 which receives the blanking pulse (FIG. 4-D) from the blanking pulse generator 15 such as a two-stage monostable multivibrator to pass during only the effective chrominance signal period. Thus it is possible to supply only the chrominance signal with a stable phase to the phase detecting circuit 40, which will be described later.

As can be seen in FIG. 1, the phase detecting circuit 40 comprises a phase comparator 41, a 3.58MHz trap circuit 42, a integrating amplifier 43, a color saturation selecting circuit 44, a level comparator 45 and a mixer 46.

The clamped chrominance signal (FIG. 4-F) is also supplied to the color synchronizing circuit 20.

As shown in the drawing, the color synchronizing circuit 20 comprises a color synchronizing gate pulse generator 21, a color synchronizing gate circuit 22, a phase comparator 23, an amplifier 24, an integrator 25 and a voltage controlled oscillator 26.

The color synchronizing circuit 20 picks up only the color synchronizing signal via the color synchronizing

gate circuit 22 which is adapted to pass only the color synchronizing signal in response to the synchronizing gate pulse (FIG. 4-F) received from the color synchronizing gate pulse generator such as the two-stage monostable multivibrator generating the color synchronizing gate pulse with the synchronizing signal of the synchronizing signal separator 50 to be the trigger signal,and obtain the chrominance subcarrier signal from the phase-locked loop circuit comprising the phase comparator 23, the amplifier 24, the integrator 25 and the voltage-controlled vibrator 26, the signal then being supplied to the color selecting circuit 30.

The color selecting circuit 30 comprises a phase shifting means 33, a selection switch means 34 and a phase adjusting means 35. The color selecting circuit 30 outputs one or more chrominance subcarrier signals having a certain phase difference in comparison to the chrominance subcarrier signal which is provided through the phase shifting means 30, and one of those chrominance subcarrier signals is selected by the selection switch means 34.

Additionally, the color selecting circuit 30 also selects the specific chrominance signal by means of fine phase adjustment in the phase adjustment means 35 on

the selected signal and then supplies the selected signal to the phase detecting circuit 40.

One example of the color selecting circuit 30 is shown in FIG. 2.

As shown in FIG. 2 the phase shifting means 33 obtains a chrominance subcarrier signal having the same phase θ_C as the provided chrominance subcarrier signal in the emitter output of the transistor Q1 in the first phase shifting circuit 31. Also, the above means 33 obtains the first chrominance subcarrier signal having the phase difference θ_1 of 120° in the emitter output of the transistor Q2 by applying the collector output signal, the phase of which is inverted as much as 180° from that of θ_o to the base of the second stage phase shifting circuit 32 via a capacitor C2 which serves as the delay means for delaying 60° of the phase, and then obtains the second chrominance subcarrier signal having the phase difference θ_2 of 120° in comparison to the first chrominance subcarrier signal by passing the collector output signal which is inverted by 180° from the phase θ_1 of the first chrominance subcarrier signal through a capacitor C3 which serves as the delay means for delaying 60° of the phase.

Therefore, the chrominance subcarrier signal with the phase θ_o, the first and second chrominance subcarrier signals with phases θ_1 and θ_2 are applied to each of the terminal of the selection switch means 34 respectively. The chrominance subcarrier signal which is selected in the selection switch means 34 is applied to the phase adjusting means, for example, the phase shifting circuit 38 in which the phase shift φ may be denoted as the following equation:

$$\varphi = 2\tan^{-1} (1/ (2\pi .f.VR2.C2))$$

According to the change of the resistance value of the variable resistor VR2, the selective phase θ of the signal $X(\theta)$ is defined as follows:

$$\theta = \theta n \pm \varphi \quad (n = 0, 1, 2)$$

Now, referring to FIG. 3, when the selection switch means 34 selects the chrominance subcarrier signal with phase θ_1 and adjusts the variable resistor VR2 in order to make the phase to be delayed by 59° as shown in FIG. 2, the green color G is selected as the specific hue as shown in FIG. 3. This signal selected with the specific phase is supplied to the phase detecting circuit 40 through the buffer 36.

The phase detecting circuit 40 applies the output

signal of the phase comparator 41, for example, comprising a multiplexer and a tuned circuit, to the integrating amplifier 43 via the 3.58 MHz trap circuit 42, the phase comparator being adapted to compare the phases of the chrominance signal supplied from the chrominance signal separating circuit 10 and the specific chrominance signal which is selected in the color selecting circuit 30 and generates the maximum output when the two signals have the same phase. The integrating amplifier 43 integrates the A.C. signal in order to obtain a mean value signal (FIG. 4-G) , which is then amplified and applied to the level comparator 45.

The level comparator 45 compares the level of the mean value signal(FIG. 4-G) with that of the reference signal (shown by dashed line in FIG. 4-C) from the color saturation selecting means 44, so that when a signal with a color saturation above a certain level is detected even if the signal and the rest have the same phase, it generates the output signal (FIG. 4-H) as the chroma key signal. This chroma key signal is supplied to the mixer 46 in order to be synchronized with the video signal and mixed therein with the synchronizing signal, being supplied from the synchronizing signal separating circuit 50 through a variable resistor VR1, to

output a chroma key control signal (FIG. 4-I).

Referring to FIG. 5 showing the conventional chroma key apparatus 3 having a chroma key signal generator 4 and a selection switch 5, the chroma key signal generator 4 can provide the chroma key signal by utilizing three primary color signals from at least one additional video camera 1 , and thus it is impossible to use the conventional chroma key signal generator 4 for video cassette recorders and/or a color television set.

From the foregoing, it is apparent that the present invention provides a chroma key signal generator for a video editing apparatus which produces the chroma key signal only when a chrominance siganl with a color saturation above a certain level and the same phase as that of the specific chrominance signal is inputted and detected by comparing the phase of the specific color signal which is selected with reference to the phase of the color synchronizing signal which is obtained from the composite video signal with that of the input chrominance signals.

Therefore, the chroma key apparatus according the present invention is possible to edit the video signals by using only a video cassette recorder and another video cassette recorder, or a color television

set and a video cassette recorder, without the necessity of using a video camera.

Furthermore, since the chrominance signal separating circuit and the color synchronizing circuit are included in the existing video cassette recorders and color television sets, the chroma key function can be adopted easily and in low cost with those or similar appliances.

CLAIMS

1. A chroma key signal generator for a video editing apparatus comprising: chrominance signal separating means for separating a chrominance signal from a color video signal, color synchronizing means for providing successive chrominance subcarrier signals with the same phase and frequency by picking up a color synchronizing signal from said chrominance signal, color selecting means providing one or more chrominance subcarrier signals having predetermined phase differences from said chrominance subcarrier signal respectively and selecting one among said chrominance subcarrier signals, said color selecting means providing a specific chrominance signal by adjusting the phase of the selected chrominance subcarrier signal, and phase detecting means comparing the phases of said chrominance signals provided from said chrominance signal separating means and said color selecting means and providing a chroma key signal when the phases of said chrominance signals are detected to be the same.

2. The chroma key signal generator of claim 1, wherein said color selecting means comprises phase shifting means for providing one or more chrominance subcarrier

signals having predetermined phase differences from said chrominance subcarrier signal provided from said color synchronizing means, selection switch means for selecting one among said chrominance subcarrier signals and phase adjusting means for providing a specific chrominance signal by adjusting the phase of the chrominance subcarrier signal selected by said selection switch means.

3. The chroma key signal generator of claim 1, wherein said phase detecting means comprises a phase comparator for comparing the phases of said chrominance signals provided from said chrominance signal separating means and said color selecting means and providing the maximum output in case that they have the same phase, a integrating amplifier for amplifying and providing a D.C signal obtained by integrating the output of said phase comparator, a level comparator for providing said chroma key signal by comparing the level of said D.C signal with a reference level, and a mixer for mixing said chroma key signal with said color synchronizing signal.

4. A chroma key signal generator for a video editing apparatus comprising a chrominance signal separating means for separating a chrominance signal from a color video signal, color selecting means for providing a plurality of chrominance subcarrier signals having predetermined phase differences in relation to a chrominance subcarrier signal derived from said separated chrominance signal and for permitting selection of said chrominance subcarrier signals, and phase detecting means for comparing the phases of said chrominance signals provided from said chrominance signal separating means and said color selecting means and providing a chroma key signal when the phases of said chrominance signals are detected to be in a predetermined relationship.

5. Video editing apparatus including a chroma key signal generator according to any preceding claim.

6. A chroma key signal generator substantially as hereinbefore described with reference to Figures 1 to 4 of the accompanying drawings.

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