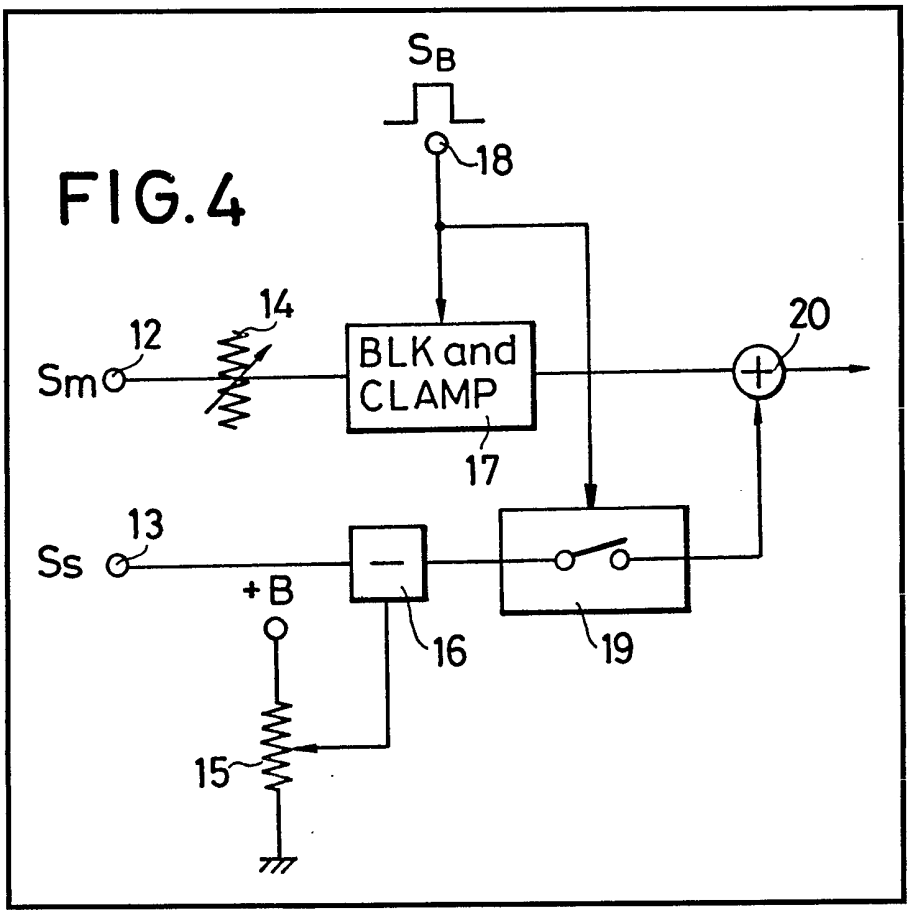
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(54) **Video signal mixing**

(57) A method of mixing video signals, for example for use in a receiver wherein a second programme is to be displayed inset within a first programme, comprises subtracting, at 16, from the second video signal S_s a dc voltage corresponding to its black pedestal level, clamping the first video signal Sm to its pedestal level during blanking intervals, S_B, when the second signal is to be displayed and adding the two signals during said blanking intervals. By this method, the brightness level of the inset programme is the same as the main programme.

FIG. 4



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FIG.1

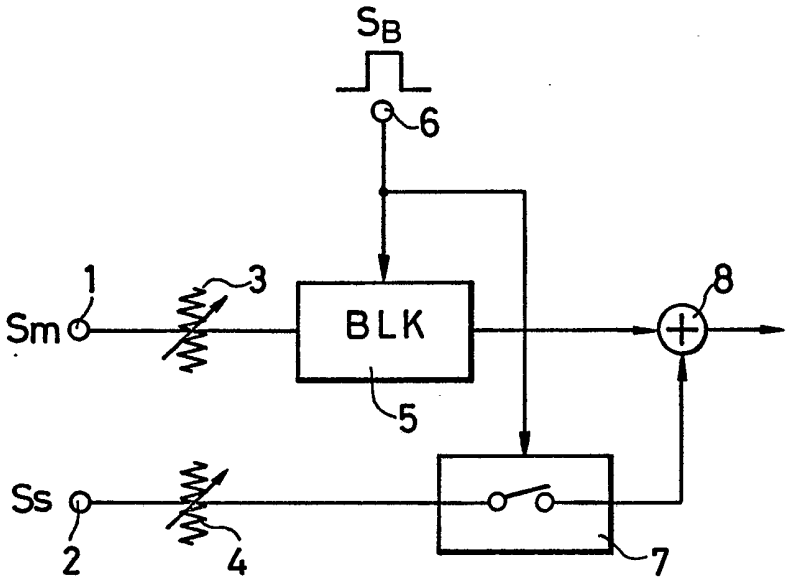


FIG.2A

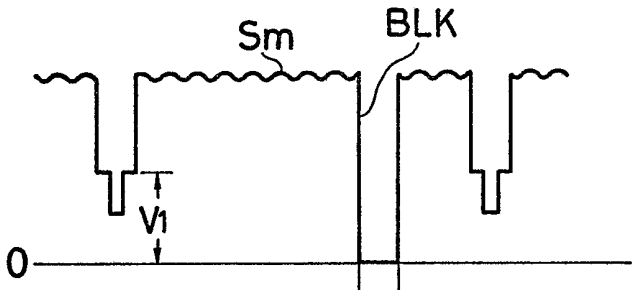


FIG.2B

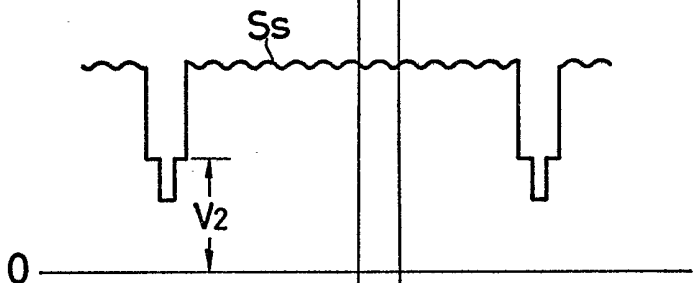


FIG.2C

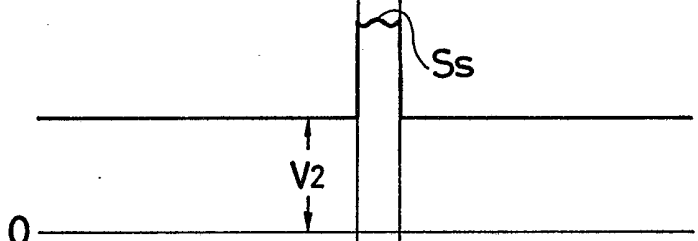


FIG.2D

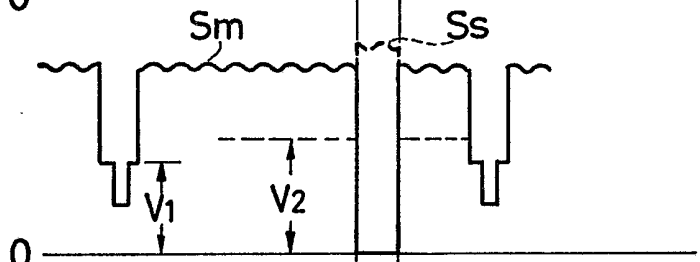


FIG.2E

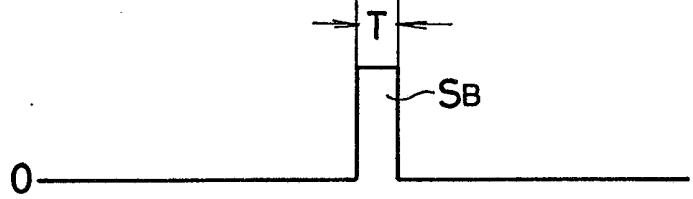


FIG.3

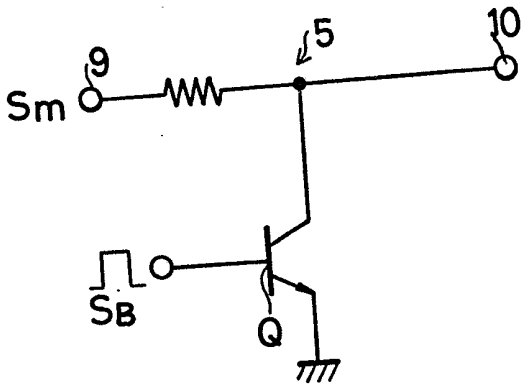


FIG.4

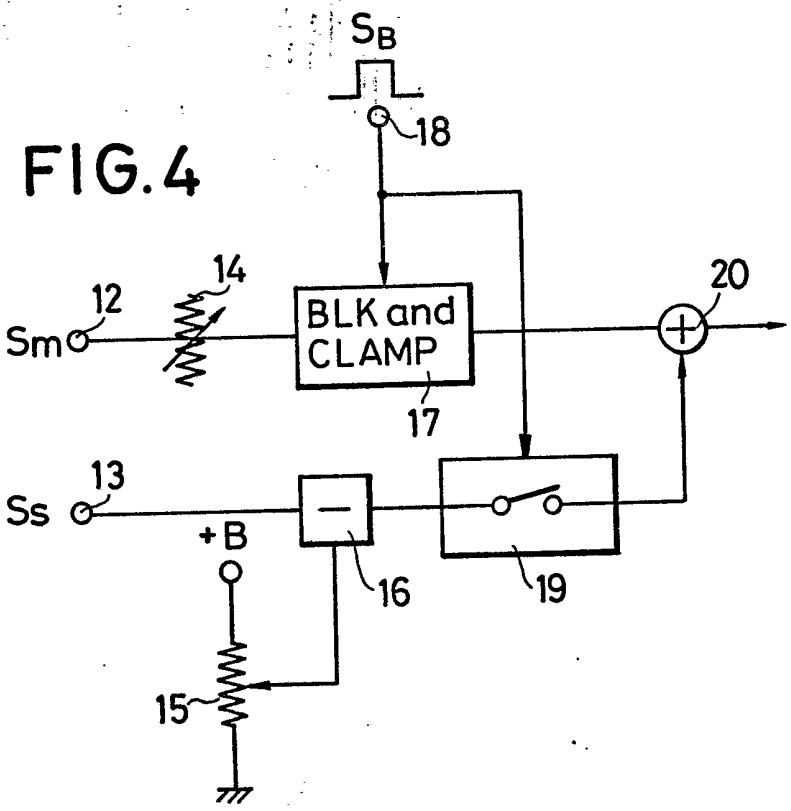


FIG.5A

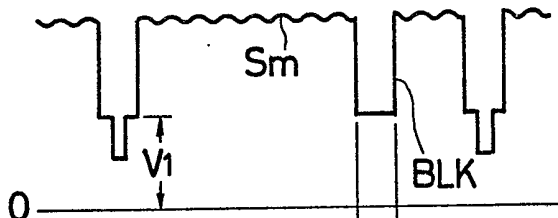


FIG.5B

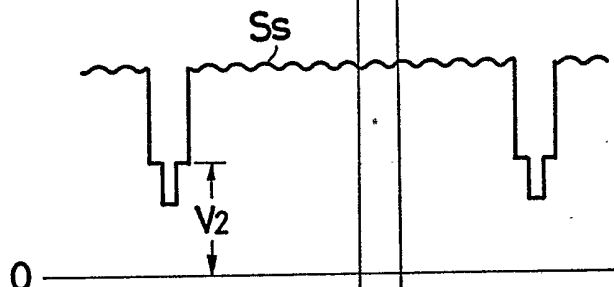


FIG.5C

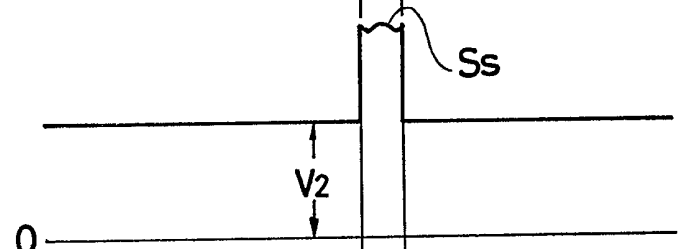


FIG.5D

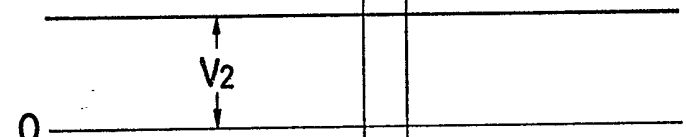


FIG.5E



FIG.5F

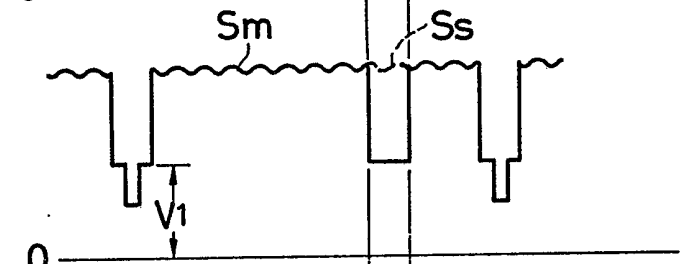


FIG.5G

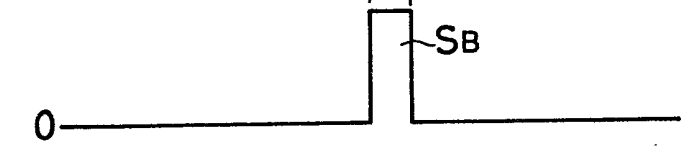
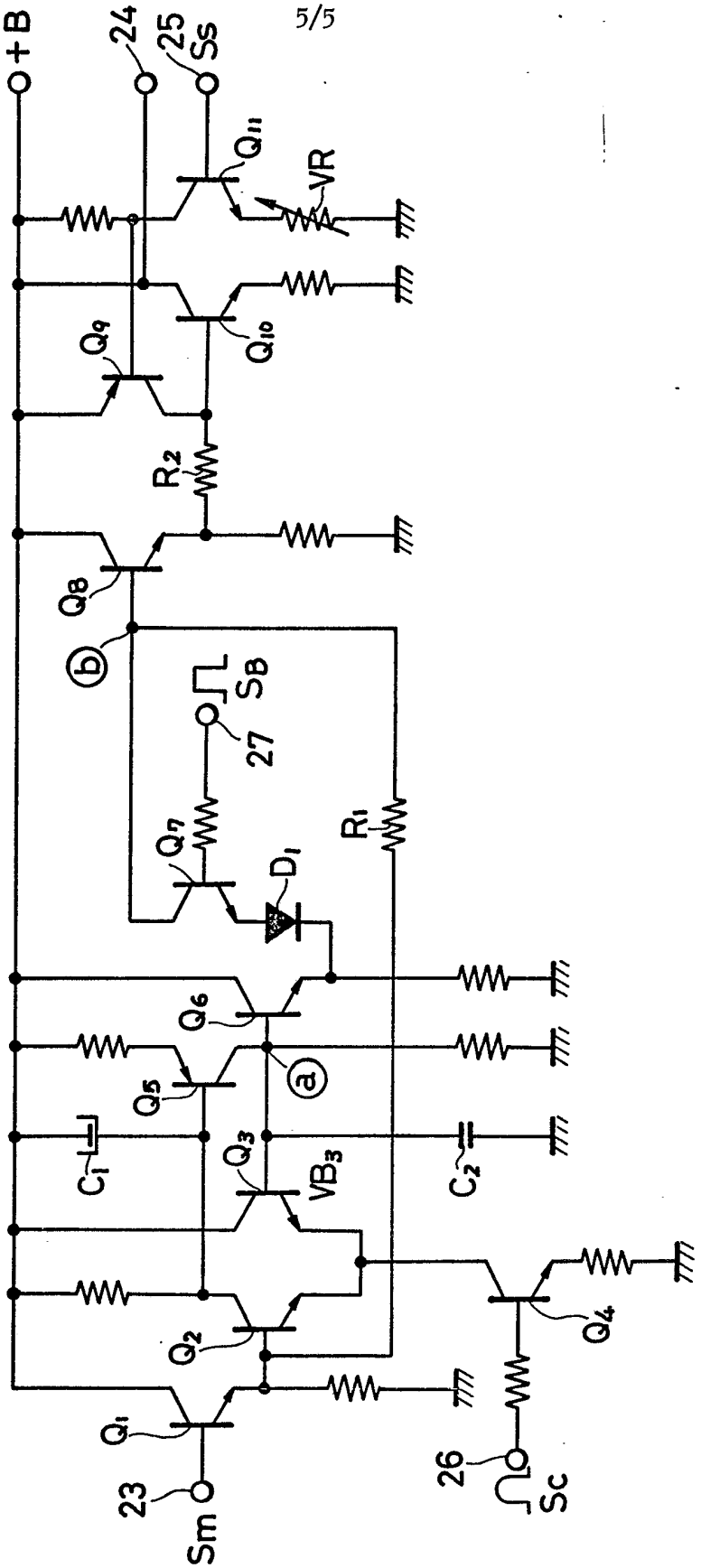


FIG.6


+B
24
25
Ss
Q11
VR
Q10
Q9
R2
Q8
b
SB
27
Q7
D1
R1
Q6
a
Q5
C1
Q3
VB3
C2
Q2
Q4
Q1
23
Sm
26
Sc

SPECIFICATION

Video signal mixing

This invention relates to video signal mixing. In some kinds of television receiver, a reduced size picture of one broadcast channel is inserted into a picture of another broadcast channel on one screen, or letters or figures are inserted into a picture of one broadcast channel. The reduced picture, or the letters or figures to be inserted will hereinafter be called the "sub-picture". The picture into which the sub-picture is inserted will hereinafter be called the "main picture". Video signals for the main picture and the sub-picture will be called the "main video signal" and the "sub video signal", respectively.

Blanking intervals are formed at predetermined portions of the main video signal, and the sub video signal is inserted into the blanking intervals so formed. The blanking level is nearly equal to zero. Generally, the pedestal levels of the main video signal and the sub video signal are different from each other. Accordingly, when the sub video signal, and the brightness of the main picture and sub-picture are different from each other.

However, it is visually preferable that the brightnesses be equal to each other, and two external variable resistors may be provided for removing such difference. In this case, the variable resistors must both be individually adjusted, which is troublesome.

According to the present invention there is provided a video signal mixing method in which a blanking portion is formed at a predetermined interval in a first video signal by a blanking signal, and a second video signal is inserted into the formed blanking portion of the first video signal, a pedestal level of said first video signal is detected and held, and the blanking level of said blanking portion is clamped at the held pedestal level of said first video signal with the application of said blanking signal.

According to the present invention there is also provided a video signal mixing apparatus in which a blanking portion is formed at a predetermined interval in a first video signal by a blanking signal, and a second video signal is inserted into the formed blanking portion of the first video signal, the apparatus comprising means to detect and hold a pedestal level of said first video signal, and means to clamp the blanking level of said blanking portion at the held pedestal level of said first video signal with the application of said blanking signal.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a block diagram of a previously proposed video signal mixing apparatus;

Figures 2A to 2E are waveforms occurring in the apparatus of Fig. 1;

Figure 3 is a circuit diagram of an example of a part of the apparatus of Fig. 1;

Figure 4 is a block diagram of a video signal mixing apparatus for explaining the principle of the invention;

Figures 5A to 5G are waveforms occurring in the apparatus of Fig. 4; and

Figure 6 is a circuit diagram of an embodiment of video signal mixing apparatus according to the invention.

Before proceeding to a detailed description of the invention and in order to assist understanding thereof, a previously proposed apparatus will be described with reference to Figs. 1 to 3. In Fig. 1, a main video signal S_m is supplied to an input terminal 1, while a sub video signal S_s as shown in Fig. 2B is supplied to another input terminal 2. The main video signal S_m and the sub video signal S_s are supplied through external variable resistors 3 and 4 to a blanking circuit 5 and to a switching circuit 7, respectively. When a blanking signal S_B having a width T as shown in Fig. 2E is supplied to a blanking input terminal 6, the main video signal S_m as shown in Fig. 2A is obtained from the blanking circuit 5, and the switching circuit 7 is closed to sample the sub video signal S_s. Fig. 3 shows one example of the blanking circuit 5. In Fig. 3, the main video signal S_m is supplied to an input terminal 9. When the blanking signal S_B as shown in Fig. 2E is supplied to a base terminal of a transistor Q to turn it on, the main video signal S_m is muted for the time T, namely blanked to zero for the time T as shown in Fig. 2A. The main video signal S_m having the blanking interval is obtained from an output terminal 10.

Referring again to Fig. 1, when the blanking signal S_B is supplied to the input terminal 6, the main video signal S_m as shown in Fig. 2A and the sub video signal S_s sampled as shown in Fig. 2C are supplied to a mixing circuit 8. The main video signal S_m has a pedestal level V_1 as shown in Fig. 2A, and the sub video signal S_s has another pedestal level V_2 as shown in Fig. 2B. Generally, the pedestal levels V_1 and V_2 are different from each other. When the pedestal level V_1 is lower than the other pedestal level V_2, a mixed video signal as shown in Fig. 2D is obtained from the mixing circuit 8, although the level of the sampled sub video signal S_s should be aligned with the level of the main video signal S_m in the mixed video signal. The external variable resistors 3 and 4 should be adjusted to remove the difference between the pedestal levels V_1 and V_2.

Next, the principle of the invention will be described with reference to Figs. 4 and 5.

In Fig. 4, the main video signal S_m is supplied to an input terminal 12, while the sub video signal S_s is supplied to another input terminal 13. The main video signal S_m is

supplied through an external variable resistor 14 to a blanking and clamping circuit 17. The sub video signal S_s is supplied to a subtractor 16. Further, a *dc* voltage V_2 derived from a potentiometer 15, as shown in Fig. 5D, is supplied to the subtractor 16. The *dc* voltage V_2 is equal to the pedestal level V_2 of the sub video signal S_s. An output terminal of the subtractor 16 is connected through a switching circuit 19 to a mixing circuit 20. Further, the blanking and clamping circuit 17 is connected to the mixing circuit 20. A blanking signal S_B is supplied to an input terminal 18.

When the blanking signal S_B as shown in Fig. 5G is supplied to the input terminal 18, the main video signal S_m as shown in Fig. 5A is obtained from the blanking and clamping circuit 17. As shown in Figure 5, the blanking level of the blanked portion of the main video signal S_m is clamped at the pedestal level V_1. The *dc* voltage V_2 is subtracted from the sub video signal S_s as shown in Fig. 5B by the subtracter 16. As a result, only a variable signal component of the sub video signal S_s is supplied to the switching circuit 19. When the switching circuit 19 is closed with the blanking signal S_B, the variable signal component of the sub video signal S_s is sampled, as shown in Fig. 5E, and is supplied to the mixing circuit 20. The sampled variable signal component of the sub video signal S_s is inserted into the formed blanking interval BLK of the main video signal S_m, in the mixing circuit 20. As a result, the mixed video signal as shown in Fig. 5F is obtained from the mixing circuit 20. As shown in Fig. 5F, the levels of the main and sub video signals S_m and S_s are aligned with each other.

Next, an embodiment based on the above-described principle of this invention will be described with reference to Fig. 6.

In Fig. 6, a main video signal S_m is applied through an input terminal 23 to the base of a transistor Q_1. The emitter of the transistor Q_1 is connected to a transistor Q_2, and through a resistor R_1 to a transistor Q_8. The main video signal S_m obtained from the transistor Q_8 is applied through a resistor R_2 to a transistor Q_{10} to be amplified. The amplified video signal is derived from an output terminal 24.

On the other hand, a sub video signal S_s is applied to a sub video signal input terminal 25 at the blanking time of the main video signal S_m as shown in Fig. 5A. The sub video signal S_s is supplied through a transistor Q_{11} to the base of another transistor Q_9 forming a variable constant current source, and it is inserted into the blanking period of the main video signal S_m through the transistor Q_9.

A clamp pulse S_c occurring at the pedestal period of the main video signal S_m is applied to an input terminal 26. For example, the clamp pulse S_c may be obtained by retarding the horizontal synchronising signal to the pedestal period. While the clamp pulse S_c is supplied to the input terminal 26, a transistor Q_4 is in the conductive state. The transistors Q_2 and Q_3 form a differential amplifier, and are put in the active state. An output in accordance with the pedestal level of the main video signal is obtained from the trnasistor Q_2 and is smoothed by a capacitor C_1. The smoothed output is amplified by a transistor Q_5. The output of the transistor Q_5 is smoothed at a point *a* by another capacitor C_2. The smoothed output is applied as a base voltage V_{B3} to the transistor Q_3. Accordingly, whenever the clamp pulse S_c is supplied to the input terminal 26, the pedestal level is compared with the base voltage V_{B3}. A feedback loop is formed so that the difference between the pedestal level and the base voltage V_{B3} becomes equal to zero. As a result, the base voltage V_{B3} is clamped at the pedestal level, and it is supplied through a transistor Q_6 to a cathode of a diode D_1. In the condition, when the blanking signal S_B is supplied to an input terminal 27, the transistor Q_7 becomes conductive. Thereby, a voltage at a point *b* connected to the base of the transistor Q_8, namely the collector voltage of the transistor Q_7 becomes nearly equal to the base voltage V_{B3} clamped at the pedestal level. The voltage V_{B3} is applied through the transistor Q_6 as an emitter follower to the cathode of the diode D_1. The voltage V_{BE} of the transistor Q_6 is cancelled by the diode D_1. As a result, the voltage V at the point *b* becomes nearly equal to V_{B3}. When the blanking signal S_B is supplied to the base of the transistor Q_7, the main video signal S_m is blanked by the voltage drop across the resistor R_1. As a result, the main video signal S_m having the blanking interval BLK, the blanking level of which is nearly equal to the pedestal level V_1, is obtained from the transistor Q_8, as shown in Fig. 5A.

The sub video signal S_s sampled by the blanking signal S_B, as shown in Fig. 5C, is supplied to the input terminal 25. The output of the transistor Q_{11}, to the base of which the sampled sub video signal S_s is supplied, is controlled by a variable resistor VR corresponding to the potentiometer 15 of Fig. 4. The transistor Q_9 functions as the constant current source. Accordingly, the alternating or signal components of the sampled sub video signal S_s as shown in Fig. 5E are obtained as the voltage drop of the resistor R_2 at the collector of the transistor Q_9. Thus, the alternating components of the sampled sub video signal S_s is inserted into the blanking interval BLK of the main video signal S_m, as shown in Fig. 5F.

With this embodiment, the brightnesses of the pictures of the main and sub video signals S_m and S_s can be simultaneously adjusted. In the above description, the voltage to be subtracted from the sub video signal S_s is equal to the pedestal level of the sub video signal S_s. However, as occasion demands, the volt-

age to be subtracted may be different from the pedestal level of the sub video signal S_s.

CLAIMS

1. A video signal mixing method in which a blanking portion is formed at a predetermined interval in a first video signal by a blanking signal, and a second video signal is inserted into the formed blanking portion of the first video signal, a pedestal level of said first video signal is detected and held, and the blanking level of said blanking portion is clamped at the held pedestal level of said first video signal with the application of said blanking signal.

2. A method according to claim 1 wherein said second video signal is sampled by said blanking signal, and the sampled second video signal is inserted into said blanking portion of the first video signal.

3. A method according to claim 2 wherein a dc voltage is substracted from said sampled second video signal.

4. A method according to claim 3 wherein the level of said dc voltage is equal to the pedestal level of said second video signal.

5. A method according to claim 1 wherein a dc voltage is subtracted from said second video signal, said second video signal is sampled by said blanking signal, and the sampled video signal is inserted into said blanking portion of the first video signal.

6. A method according to claim 5 wherein the level of said dc voltage is equal to the pedestal level of said second video signal.

7. A video signal mixing apparatus in which a blanking portion is formed at a predetermined interval in a first video signal by a blanking signal, and a second video signal is inserted into the formed blanking portion of the first video signal, the apparatus comprising means to detect and hold a pedestal level of said first video signal, and means to clamp the blanking level of said blanking portion at the held pedestal level of said first video signal with the application of said blanking signal.

8. A video signal mixing method substantially as hereinbefore described with reference to Figs. 4 and 5 of the accompanying drawings.

9. A video signal mixing apparatus substantially as hereinbefore described with reference to Fig. 6 of the accompanying drawings.

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