

July 28, 1942.

N. P. CASE

2,291,277

TELEVISION SIGNAL TRANSLATING CHANNEL

Filed Nov. 18, 1939

FIG. 1.

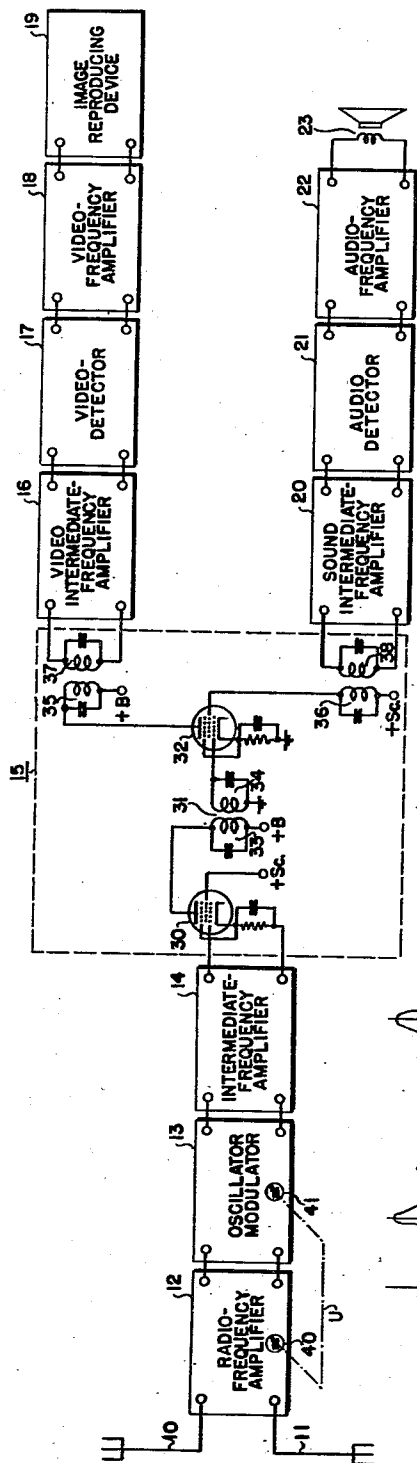


FIG. 2

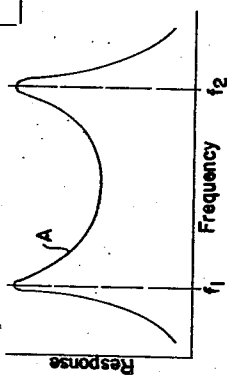
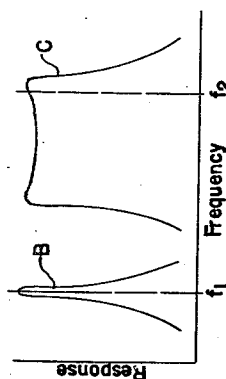


FIG. 3.



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2,291,277

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Application November 18, 1939, Serial No. 305,049

4 Claims. (Cl. 178—5.8)

This invention relates to television signal-translating channels adapted to translate a composite television signal including a video-modulated carrier wave and an adjacent audio-modulated carrier wave.

In accordance with present television practice, a transmitted composite television signal comprises a carrier wave modulated during successive intervals or trace periods by high-frequency and unidirectional components representative of light variations in an image being transmitted and of its background illumination, respectively, and modulated between the trace periods, that is, during retrace intervals, by synchronizing components which correspond to initiations of successive lines and fields in the scanning of the image. The transmitted composite signal of a conventional television transmitter comprises also an audio-modulated carrier wave adjacent the above-mentioned video-modulated carrier wave.

The above-mentioned composite television signal is usually received by means of a receiver the first amplifying stages of which have a pass band sufficiently broad to transmit at least one modulation sideband of each of the above-mentioned carrier-frequency signals of the composite signal. In this way only one tuning operation need be effected at the receiver in order to condition the receiver to receive both modulated signals. If the receiver is correctly tuned with reference to one of the carrier-frequency signals of the composite signal, tuning is also correct for the other of the carrier-frequency signals. Such receivers thus generally comprise selective circuits which have a response characteristic which is relatively flat over a wide frequency range including both the video-modulated carrier wave and the audio-modulated carrier wave to be received.

For television reproduction with high definition, it is necessary to transmit a relatively wide range of video-frequency signals, for instance, signals of a range of the order of three and one-half megacycles. However, the smaller cathode-ray reproducing tubes used in less expensive television receivers are incapable of utilizing all of the information which is conventionally transmitted by a modern television transmitting station; for instance, such tubes may have a resolving power corresponding to a band width of the order of only one megacycle. Obviously, in receivers utilizing such cathode-ray reproducing tubes, it is unnecessary to translate the entire modulation sideband of the received video-modulated signal. However, it is particularly desirable that there should be a high degree of amplifica-

tion at the carrier frequency of the video-modulated carrier wave as well as at the carrier frequency of the audio-modulated carrier wave in order to effect detection with a minimum degree of distortion. Furthermore, it is desirable to effect this high degree of amplification in as few amplifying stages as possible, in order to reduce the cost of the receiver to a minimum. Such results are typical of high-definition television receivers but have not been ordinarily realizable in low-cost, low-definition receivers.

It is an object of the present invention, therefore, to provide an improved low-definition television receiver adapted to reproduce a composite television signal including a video-modulated carrier wave and an adjacent audio-modulated carrier wave.

It is a further object of the invention to provide an improved low-definition television receiver of the type under discussion which embodies one or more of the above-mentioned advantages of high-definition television receivers.

In accordance with the present invention, a television signal-translating channel adapted to translate a composite television signal including a video-modulated carrier wave and an adjacent audio-modulated carrier wave comprises, a band-pass selector in the channel having a continuous pass band including the video-modulated carrier wave and the audio-modulated carrier wave. This band-pass selector includes tuned circuits considerably over-coupled to provide a response at the secondary tuned circuit which varies with frequency and is double-peaked with a substantial valley between the peaks. The reactive constants of the selector are so proportioned that one of the peaks coincides substantially with the carrier frequency of the video-modulated carrier wave to be translated and the other of the peaks coincides substantially with the carrier frequency of the audio-modulated carrier wave to be translated.

For a better understanding of the invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the accompanying drawing, Fig. 1 is a circuit diagram, partly schematic, of a cathode-ray tube television receiving system including a signal-translating channel embodying the present invention; while Figs. 2 and 3 are graphs illustrating certain of the operating characteristics of the receiver of Fig. 1.

Referring now more particularly to the drawing, the system there illustrated comprises a receiver of the superheterodyne type including an antenna system 10,11 connected to a radio-frequency amplifier 12 to which are connected in cascade, in the order named, an oscillator-modulator 13, an intermediate-frequency amplifier 14, and a television signal-translating channel 15 embodying the present invention. The signal-translating channel 15 is adapted to translate a composite intermediate-frequency television signal including a video-modulated carrier wave and an adjacent audio-modulated carrier wave in a manner more fully described hereinafter. Connected in cascade to an output circuit of signal-translating channel 15, in the order named, are a video intermediate-frequency amplifier 16, a video-modulation detector 17, a video-frequency amplifier 18, and an image-reproducing device 19. Connected to another output circuit of signal-translating channel 15, in the order named, are a sound intermediate-frequency amplifier 20, an audio detector 21, an audio-frequency amplifier 22, and an audio-reproducing device 23.

The stages or units just described, with the exception of unit 15, may all be of conventional well-known construction so that detailed illustrations and descriptions thereof are deemed to be unnecessary herein. Referring briefly, however, to the operation of the system described above, composite television signals including a video-modulated carrier wave and an adjacent audio-modulated carrier wave intercepted by antenna circuit 10,11 are selected and amplified in radio-frequency amplifier 12 and supplied to the oscillator-modulator 13, wherein they are converted to a composite intermediate-frequency signal which, in turn, is selectively amplified in the intermediate-frequency amplifier 14 and delivered to signal-translating channel 15, wherein the signal is further amplified and the signals of the two types are separated in a manner which will be described more fully hereinafter. The video intermediate-frequency signals are further amplified in unit 16 and the video-modulation components of the received television signal are derived by detector 17 and supplied to the video-frequency amplifier 18, wherein they are amplified and from which they are supplied to the control element of the image-reproducing device 19.

It will be understood that suitable synchronizing circuits are necessary for image-reproducing device 19 and that such synchronizing circuits, which may be entirely conventional, have been omitted from the circuit of Fig. 1 in the interest of simplification. Detected synchronizing-signal components derived at detector 17 may be utilized to synchronize the operation of image-reproducing device 19 in a manner well understood in the art.

The sound intermediate-frequency signals delivered by signal-translating channel 15 to sound intermediate-frequency amplifier 20 are amplified therein and delivered to audio detector 21 wherein the audio-modulation components are derived and supplied to the audio-frequency amplifier 22, wherein they are amplified and after which they are reproduced by signal reproducer 23.

Coming now to the portion of the system involving the present invention, the signal-translating channel 15 comprises a vacuum-tube amplifier 30 having input electrodes coupled to in-

termediate-frequency amplifier 14 and having an output circuit in which there is coupled a band-pass selector 31 having a continuous pass band including the intermediate-frequency video-modulated carrier wave and the audio-modulated carrier wave and which includes inductively-coupled tuned circuits 33 and 34, which are considerably over-coupled to provide a response at the secondary tuned circuit which varies with frequency and is double-peaked with a substantial valley between the peaks. A second vacuum-tube amplifier 32 is provided in signal-translating channel 15 having input electrodes coupled to the output terminals of band-pass selector 31. Amplifier 32 includes an output electrode in circuit with which there is included a relatively broadly tuned selector circuit 35,37 having a pass band including the carrier frequency of the video-modulated carrier wave of the composite received signal. The tube 32 also includes a screen electrode in circuit with which there is included a relatively sharply-tuned selector 36,38 resonant at the carrier frequency of the audio-modulated carrier wave of the composite received signal. The selector circuit 35,37 is coupled to the input circuit of intermediate-frequency amplifier 16, while selector circuit 36,38 is coupled to the input circuit of intermediate-frequency amplifier 20.

It will be understood that radio-frequency amplifier 12 and oscillator-modulator 13 may be tuned to any one of a plurality of composite television signals by means of any suitable tuning control such as that schematically shown by uncontrolled condensers 40,41.

Coming now to the operation of the circuit of Fig. 1, it will be assumed that band-pass selector 31 has a coupling substantially greater than the critical value so that it has a marked double-peaked frequency-response characteristic with a substantial valley between the peaks, such as that illustrated by curve A of Fig. 2 of the drawing. The reactive constants of selector 31 are so proportioned that one of the peaks of curve A coincides substantially with the frequency f_2 of the intermediate-frequency video-modulated carrier wave while the other of the peaks coincides substantially with the frequency f_1 of the intermediate-frequency audio-modulated carrier wave. Tuned selector 36, 38 is designed to have a sharply-peaked frequency-response characteristic, such as that illustrated by curve B of Fig. 3, while tuned selector 35, 37 is designed to have a frequency-response characteristic sufficiently broad to pass the range of video-frequency signals to be utilized as represented by curve C of Fig. 3. Under the conditions assumed, it is seen that a substantial gain at each of the intermediate carrier frequencies f_1 and f_2 is provided by the stage of amplification including tube 30 and selector circuit 31. The video-modulation signal output of band-pass selector 31 is amplified in a conventional manner by vacuum tube 32 and selector 35, 37 to provide the intermediate-frequency input for amplifier 16. Amplification of the audio-modulation output of selector 31 is also provided due to the action of the screen circuit of tube 32, in which is included selector 36, 38. The tuned circuit 36, which is resonant at the intermediate audio-modulated carrier frequency, is also effective to act as a trap for the video-frequency channel of the receiver. In this manner, the two intermediate-frequency carrier waves are effectively separated for separate utilization.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A television signal-translating channel adapted to translate a composite television signal including a video-modulated carrier wave and an adjacent audio-modulated carrier wave comprising, a band-pass selector in said channel having a continuous pass band including said video-modulated carrier wave and said audio-modulated carrier wave, said band-pass selector including tuned circuits considerably over-coupled to provide a response at the secondary tuned circuit which varies with frequency and is double-peaked with a substantial valley between the peaks, the reactive constants of said selector being so proportioned that one of said peaks coincides substantially with the carrier frequency of said video-modulated carrier wave and the other of said peaks coincides substantially with the carrier frequency of said audio-modulated carrier wave.

2. A television signal-translating channel adapted to translate a composite television signal including a video-modulated carrier wave and an adjacent audio-modulated carrier wave comprising, a vacuum-tube amplifier including an output circuit, a band-pass selector coupled to said output circuit having a continuous pass band including said video-modulated carrier wave and said audio-modulated carrier wave, said band-pass selector including tuned circuits considerably over-coupled to provide a response at the secondary tuned circuit which varies with frequency and is double-peaked with a substantial valley between the peaks, the reactive constants of said selector being so proportioned that one of said peaks coincides substantially with the carrier frequency of said video-modulated carrier wave and the other of said peaks coincides substantially with the carrier frequency of said audio-modulated carrier wave.

3. In a television receiver of the superhetero-

dyne type tunable to a plurality of frequency bands, an intermediate-frequency signal-translating channel adapted to translate a composite television signal including a video-modulated carrier wave and an adjacent audio-modulated carrier wave comprising, a band-pass selector in said channel having a continuous pass band including said video-modulated carrier wave and said audio-modulated carrier wave, said band-pass selector including tuned circuits considerably over-coupled to provide a response at the secondary tuned circuit which varies with frequency and is double-peaked with a substantial valley between the peaks, the reactive constants of said selector being so proportioned that one of said peaks coincides substantially with the carrier frequency of said video-modulated carrier wave and the other of said peaks coincides substantially with the carrier frequency of said audio-modulated carrier wave.

4. A television signal-translating channel adapted to translate a composite television signal including a video-modulated carrier wave and an adjacent audio-modulated carrier wave comprising, a band-pass selector in said channel having a continuous pass band including said video-modulated carrier wave and said audio-modulated carrier wave, said band-pass selector including tuned circuits considerably over-coupled to provide a response at the secondary tuned circuit which varies with frequency and is double-peaked with a substantial valley between the peaks, the reactive constants of said selector being so proportioned that one of said peaks coincides substantially with the carrier frequency of said video-modulated carrier wave and the other of said peaks coincides substantially with the carrier frequency of said audio-modulated carrier wave, a broadly-tuned selector circuit coupled to said selector and having a pass band including the carrier frequency of said video-modulated carrier wave for selecting the video-modulated component of said translated composite signal, and a sharply-tuned selector circuit coupled to said selector and resonant at the carrier frequency of said audio-modulated carrier wave for selecting the audio-modulated component of said translated composite signal.

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