

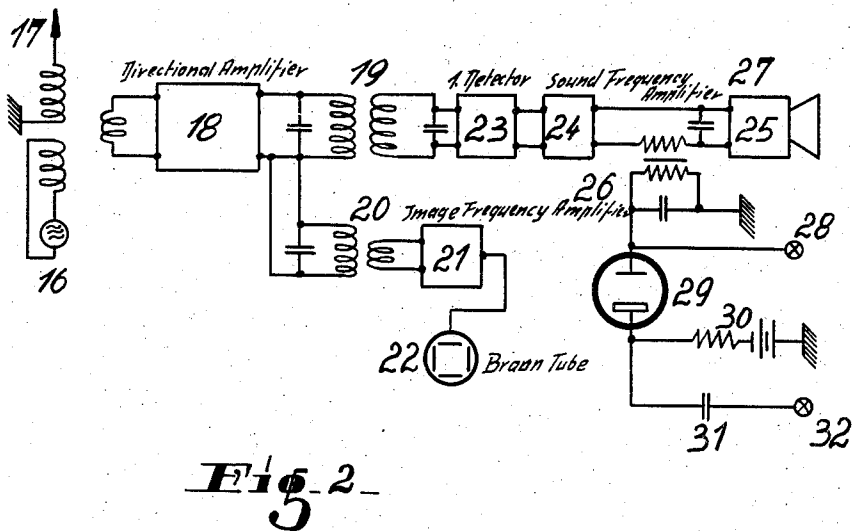
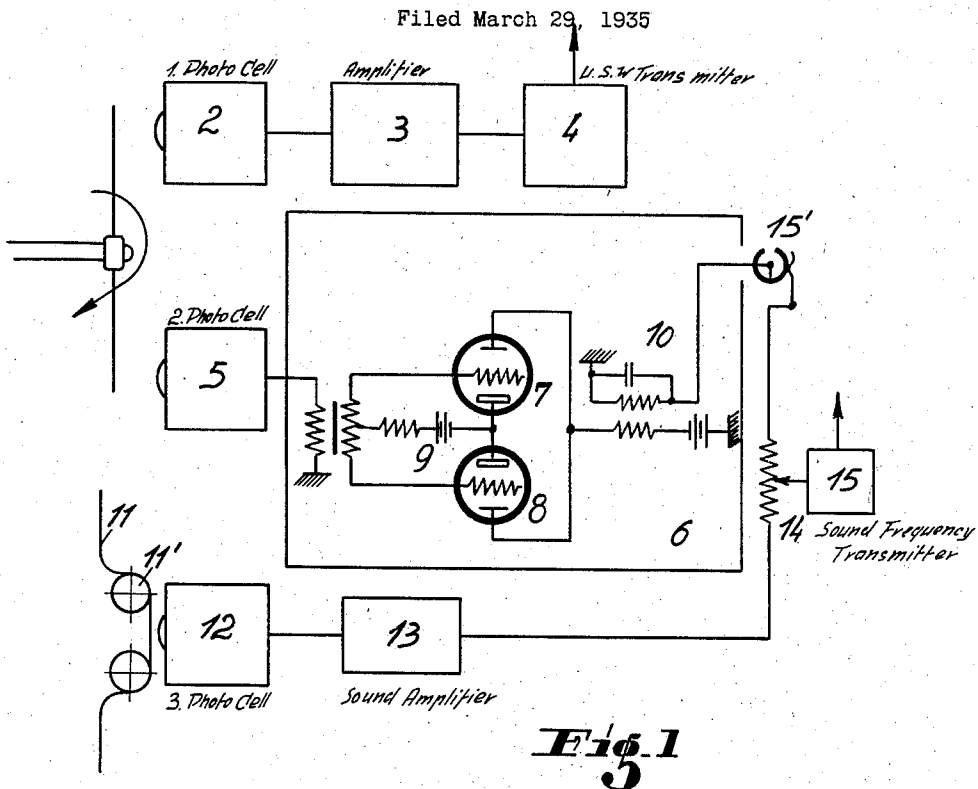
Jan. 24, 1939.

K. SCHLESINGER

2,144,776

SYNCHRONIZATION METHOD FOR TELEVISION

Filed March 29, 1935



Inventor:

Kurt Schlesinger

UNITED STATES PATENT OFFICE

2,144,776

SYNCHRONIZATION METHOD FOR
TELEVISIONKurt Schlesinger, Berlin, Germany, assigner to
Radioaktiengesellschaft D. S. Loewe, Berlin-
Steglitz, GermanyApplication March 29, 1935, Serial No. 13,681
In Germany March 31, 1934

10 Claims. (Cl. 178—5.6)

It is already known to perform synchronization of television receivers by the transmitter by means of pure frequency selection, in such fashion that the sound wave (ultra-short wave) accompanying the image transmission is additionally modulated with a control tone, which amounts to an integral multiple of the line-change frequency.

In the case of a 180-line image and 25 image changes this line frequency amounts to 4500 periods, so that as control tone a tone of 9000 or 13,500 periods is concerned, which does not interfere with the sound reception. At the receiver this tone, as also known, is separated by tuned circuits from the speech frequency band, and conducted as synchronizing frequency to a relaxation apparatus, which in certain connections allows automatically the passage of every second or third alternation and oscillates in synchronized fashion with the desired reduced relaxation frequency. The simultaneous distant control of the low image-change oscillation (25 periods) meets according to the known method with the difficulty that a corresponding, low control tone of 50 or 25 periods interferes considerably with the reception of the sound or with the unsteadiness of the mains always present in the apparatus.

The subject matter of the present invention is the idea of dispensing entirely with the transmission of a special control tone for the low relaxation frequency, and to derive the signals necessary in this connection from the 9000-period tone by the fact that this tone upon each change of image is interrupted at the transmitter for a brief space of time, whilst at the receiver the previously mentioned selection circuit for this tone is connected with a rectifier. The directional current taken from this rectifier accordingly remains constant during the entire image, and only changes when the control tone is briefly cut off. From the current, therefore, of this special rectifier according to the invention there may be obtained the synchronization potential for the image-change relaxation apparatus, whilst the synchronization for the line-relaxation apparatus may be tapped in direct fashion from the tone circuit itself.

Summarizing, therefore, the television transmission apparatus comprises two, preferably ultra-short wave transmitters, of which the one is modulated only with the contents of the picture, whilst the other is modulated with the accompanying text and also with the middle-frequency control tone. The frequency of the latter is an integral multiple of the line frequency. The control tone is interrupted at the transmitter

upon each change of image. At the receiver there is preferably employed—which is of great advantage in the performance of this method—a duplex connection system as already described previously by the applicant, which system is characterized by the fact that a single local oscillator has the two transmission waves heterodyned thereon simultaneously, whereby two different beat frequencies are produced. By means of an intermediate frequency selection the beat frequency of the image (of the order of 200 m.) is separated from the beat frequency of the sound transmitter (of the order of 1000 m.). The latter is demodulated by a rectifier and amplified in respect of low frequency. In this manner there is heard the accompanying text, and in addition the intermittent control tone is available. The latter, in accordance with the invention, is conducted to a sound selection circuit, which is connected with a special rectifier. At the sound circuit the control potential for the line relaxation apparatus is tapped in direct fashion, whilst behind the sound circuit rectifier the control potential is available for the image apparatus.

Naturally in place of the receiver as described having a common local oscillator there may also be employed a receiving station having two separate receivers for the image wave and sound wave. An arrangement of this kind, which is known per se, possesses, however, the disadvantage that so long as the sound wave has not been tuned the image is not steady, so that accordingly the detecting of a sound and image transmission is a difficult matter. In the duplex method according to the invention in conjunction with the stated method of synchronization the picture and sound are always heard simultaneously, so that no other than a steady sound-image can be received.

To explain the method reference is made to Figs. 1 and 2, which show by way of example a transmitter and receiver respectively. In the transmitter a Nipkow disc 1 is employed for scanning the image, and a photo-cell 2 in conjunction with a photo-amplifier 3 for amplifying the image current, whilst the image is radiated by means of an ultra-short wave transmitter 4. Preferably the line frequency is produced optically by slots in the Nipkow disc—in the manner known per se by means of an additional photo-cell 5. A frequency multiplication is produced by the connection shown in 6. The drawing illustrates a counter-cadence connection, in which, by means of two tubes 7 and 8, which operate in the lower bend (counter-potential 9) there is

produced in the manner known per se from the basic line frequency introduced a higher harmonic, which is filtered in the sound circuit 10 tuned to twice or three times the line frequency.

5 This control tone together with the speech of the sound strip 11, which is obtained by the sound cell 12 and the sound amplifier 13, is mixed for example at a resistance 14 in adjustable ratio, and then modulated on to the sound transmitter 15 oscillating on a wave, which is detuned as compared with the image wave, for example to the extent of approximately 2 mega-periods. By a special device, and in the most simple form for example a rotating cut-out 15', which may be operated synchronously for example by the film-advancing means 11', it is ensured in accordance with the invention that the control tone is interrupted once per image at the edge of the image.

In Fig. 2 there is shown a receiver according to the duplex method. The receiver possesses a common local oscillator 16 and a common aerial 17. Both act inductively on a directional amplifier 18, at the output of which, therefore, the two carrier waves pertaining to the two transmission waves may be tapped and separated simultaneously by two band filters 19 and 20. Whereas the image is additionally passed through the medium of the image receiver 21 to the television tube 22, the carrier wave for the tone at first passes to a first rectifier 23. Following thereon it is amplified in the low-frequency amplifier 24 and conducted to the loudspeaker 25. At a resonance transformer 26 situated in the output circuit the control tone may accordingly again be recovered, whilst the same remains inaudible in the loudspeaker, on the one hand on account of its high pitch and on the other hand owing to the bridging condenser 27. The terminal 28 may be connected with the sound circuit 26 either direct or through the medium of a potential distributing means, and takes over the synchronization of the line relaxation apparatus in direct fashion. On the other hand there is provided the rectifier 29 according to the invention (in the drawing a diode), which rectifier is linked up with a working resistance 30 and is connected through the medium of a condenser 31 with the terminal 32. On each occasion when the control tone is interrupted there is accordingly obtained at the terminal 32 a positive current impulse. The terminal 32 may, therefore, be connected in direct fashion with the synchronization terminal of the image change relaxation apparatus.

Between the terminal 28 and the relaxation apparatus (not shown) there may be included if desired a frequency-reducing connection of the kind known per se, which reduces the control frequency to the line frequency. In this case it is possible to employ any desired relaxation apparatus.

At the same time there may also be provided in the transmitter means for disconnecting the image current during the generation of the image change and, if desired, also the line change. For this purpose there may be provided for example between the amplifier 3 and the transmitter 4 means (for example, a discharge tube), which are controlled by the line or image change and which, during the image change and if desired also the line change, short-circuit the connection line, which if desired may be positively biased.

I claim:

75 1. In a system for combined wireless trans-

mission of sound and vision a pair of transmitters radiating two different carrier frequencies, means to modulate one of said carrier frequencies by the video signals and the second one by the sound frequencies and simultaneously by the line frequency, and means to weaken said modulating line frequency at each frame change.

2. In a system for combined wireless transmission of sound and vision a pair of transmitters radiating two different carrier frequencies, means to modulate one of said carrier frequencies by the video signals and the second one by the sound frequencies and simultaneously by an ultra-audible frequency being an integral multiple of the line frequency and means to weaken said modulating multiple of the line frequency at each frame change.

3. In a system for combined wireless transmission of sound and vision a pair of transmitters radiating two different carrier frequencies, means to modulate one of said carrier frequencies by the video signals and the second one by the sound frequencies and simultaneously by the line frequency, and means to suppress completely said modulating line frequency during each frame change.

4. In a system for combined wireless transmission of sound and vision a pair of transmitters radiating two different carrier frequencies, means to modulate one of said carrier frequencies by the video signals and the second one by the sound frequencies and simultaneously by an ultra-audible frequency being an integral multiple of the line frequency, and means to suppress completely said modulating multiple of the line frequency during each frame change.

5. In a system for combined wireless transmission of sound and vision a pair of transmitters radiating two different carrier frequencies, means to modulate one of said carrier frequencies by the video signals and the second one by the sound frequencies and simultaneously by the line frequency, means to weaken said modulating line frequency at each frame change, and a receiver having means to secure automatically a correct reception of said video signals when said sound carrying frequency is correctly received.

6. In a system for combined wireless transmission of sound and vision a pair of transmitters radiating two different carrier frequencies, means to modulate one of said carrier frequencies by the video signals and the second one by the sound frequencies and simultaneously by an ultra-audible frequency being an integral multiple of the line frequency at each frame change, and a receiver having means to secure automatically a correct reception of said video signals when said sound carrying frequency is correctly received.

7. In a system for combined wireless transmission of sound and vision a pair of transmitters radiating two different carrier frequencies, means to modulate the first of said carrier frequencies by the video signals and the second one by the sound frequencies and simultaneously by the line frequency, and means to weaken said modulating line frequency at each frame change, said both carrier frequencies of the transmitter being not very different and the receiver being provided with a local oscillator of a frequency exactly in the middle between said carrier frequencies.

8. In a system for combined wireless transmission of sound and vision a pair of transmitters radiating two different carrier frequencies, means

to modulate one of said carrier frequencies by the video signals and the second one by the sound frequencies and simultaneously by an ultra-audible frequency being an integral multiple of the line frequency at each frame change, said both carrier frequencies of the transmitter being not very different and the receiver being provided with a local oscillator of a frequency exactly in the middle between said carrier frequencies.

9. In a system for combined wireless transmission of sound and vision a pair of transmitters radiating two different carrier frequencies, means to modulate one of said carrier frequencies by the video signals and the second one by the sound frequencies and simultaneously by the line frequency, means to weaken said modulating line frequency at each frame change, and a receiver

provided with a filter arrangement separating the multiple of the line frequency, a rectifier for said frequency and means to control the frame relaxation oscillation by said rectified frequency.

10. In a system for combined wireless transmission of sound and vision a transmitter radiating two different carrier frequencies, means to modulate the first of said carrier frequencies by the video signals and the second one by the sound frequencies and at once by an ultra-audible frequency being an integral multiple of the line frequency at each frame change, and a receiver provided with a filter arrangement separating the multiple of the line frequency, a rectifier for said frequency and means to control the frame relaxation oscillation by said rectified frequency.

KURT SCHLESINGER.