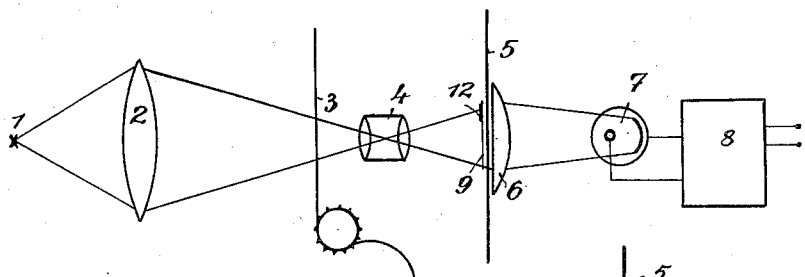
March 5, 1935. H. G. MÖLLER ET AL 1,993,564

TELEVISION APPARATUS

Filed Jan. 31, 1931 2 Sheets-Sheet 1

Fig. 1



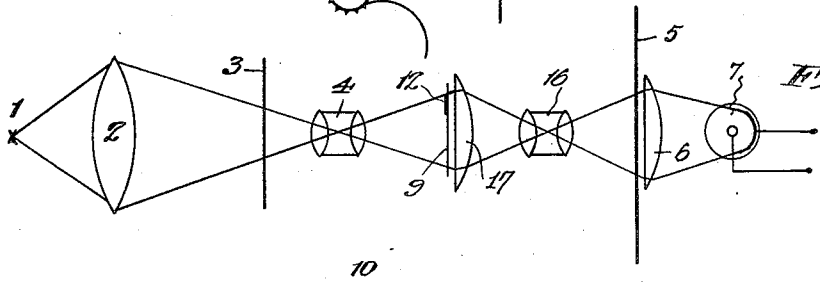


Fig. 4.

Fig. 2.

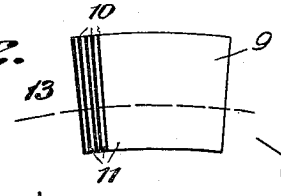
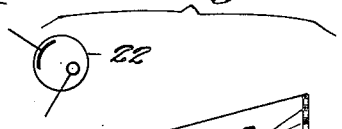


Fig. 5.



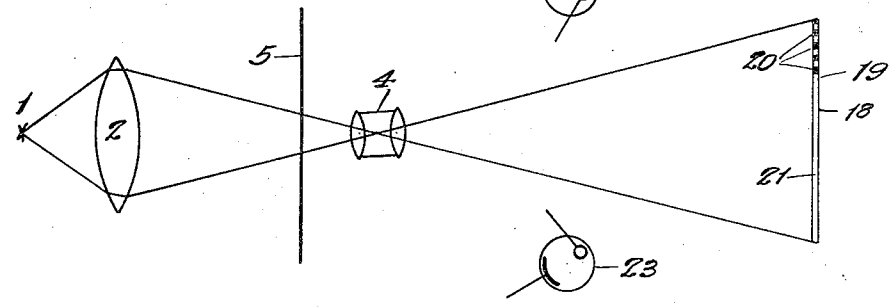
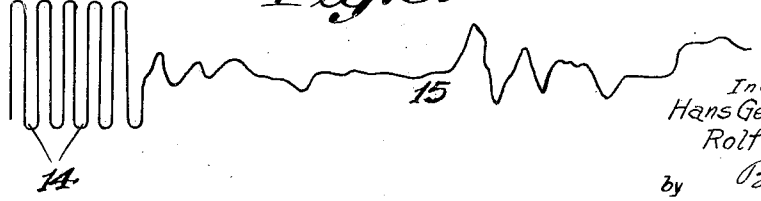


Fig. 3.



Inventors
Hans Georg Möller
Rolf Möller
by B. Singer
Attorney

March 5, 1935. H. G. MÖLLER ET AL 1,993,564

TELEVISION APPARATUS

Filed Jan. 31, 1931 2 Sheets-Sheet 2

Fig. 6

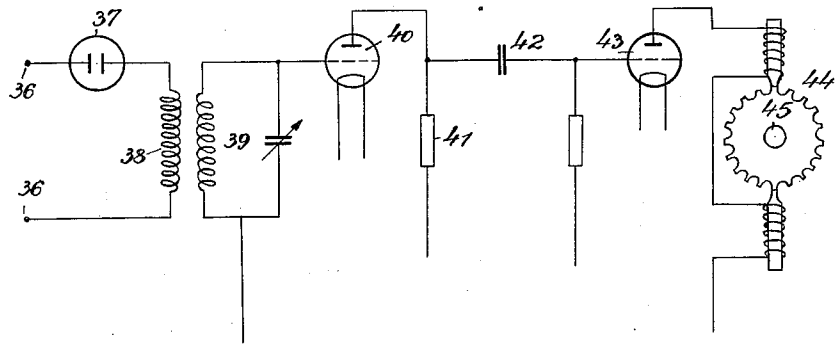


Fig. 7

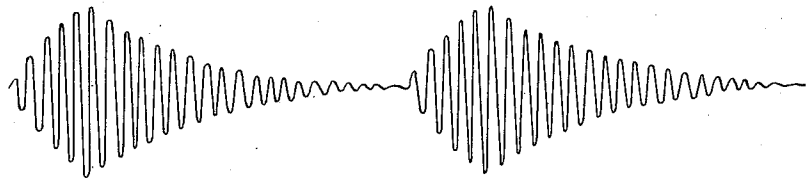
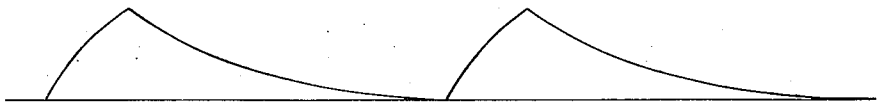


Fig. 8



Inventors
Hans Georg Möller
Rolf Möller
by B. Singer
Attorney

Patented Mar. 5, 1935 1,993,564

UNITED STATES PATENT OFFICE

1,993,564

TELEVISION APPARATUS

Hans Georg Möller, Bergedorf, near Hamburg, and Rolf Möller, Zehlendorf, near Berlin, Germany, assignors to the firm of Fernseh Aktien-Gesellschaft, Zehlendorf, near Berlin, Germany

Application January 31, 1931, Serial No. 512,740
In Germany February 5, 1930

2 Claims. (Cl. 178—69.5)

The invention relates to television transmission and particularly to new and useful improvements in a method of synchronizing a television receiver provided with a picture composing means wherein synchronizing current impulses are transmitted with each line of the picture together with the picture current.

It is an object of the invention to employ for the synchronizing of the receiver synchronizing impulses having a definite frequency which is different from any frequency contained in the picture current, in order to facilitate the separation of the synchronizing impulses from the picture current. After the synchronizing impulses have been filtered from the picture current they are employed for synchronizing the picture composing means.

Another object of the invention is to subdivide the synchronizing dash,—which is ordinarily employed in synchronizing systems of this type and arranged at the end of each line, particularly when line scanning is employed—into a series of uniformly spaced sections, whereby the synchronizing impulses are each transformed into an alternating current of definite frequency which is a multiple of the line frequency and different from any frequency contained in the picture current.

These and another objects of the invention are attained by applying a plurality of spaced vertical lines to a vertical margin of the picture and scanning the picture whereby synchronizing impulses of a frequency determined by the spacing of the vertical lines are produced. These synchronizing impulses have a definite frequency which is different from any frequency contained in the picture current and therefore can easily be filtered from the picture current and can be employed for synchronizing the picture composing means of the receiver.

In the drawings:

Fig. 1 shows diagrammatically the optical part of a television transmitter for transmitting film pictures,

Fig. 2 shows a diaphragm forming a part of the optical equipment,

Fig. 3 shows diagrammatically the current impulses when transmitting one line of the picture,

Fig. 4 shows diagrammatically a modified arrangement for the transmission of film pictures,

Fig. 5 shows diagrammatically an arrangement for the production of the synchronizing impulses in scanning objects,

Fig. 6 shows diagrammatically the synchronizing arrangement at the receiving side,

Fig. 7 shows diagrammatically the synchronizing impulses in the receiver, and

Fig. 8 shows diagrammatically the synchronizing current impulses conducted to the synchronizing device.

Reference numeral 1 in Figure 1 represents a source of light which by means of a lens 2 illuminates the motion picture film 3. The film 3 is projected with the aid of a lens system 4 onto the Nipkow disc 5 or more exactly onto that part of the Nipkow disc which is provided with the scanning apertures. A photo cell 7 is arranged axially behind a lens 6 which is arranged directly behind the Nipkow disc 5. The photo cell currents are conducted to an amplifier 8. A transparent diaphragm 9 (Fig. 2) is positioned directly in front of the Nipkow disc 5. This diaphragm 9 has the size of the area which is scanned by the scanning apertures in the Nipkow disc 5 and is provided on one of its vertical side margins with a series of uniformly spaced dark lines 10 which are substantially vertical and parallel to each other. The diaphragm 9 is otherwise absolutely transparent in its remaining area 11. In Fig. 1 the dark lines 10 are indicated at the place 12, and extend vertically to the plane of the drawing.

Assuming that in Fig. 1 the axis of the Nipkow disc 5 lies vertically under and parallel to the optical axis which passes through the center of the source of light 1 and through the lens system 4, the Nipkow disc 5 will then rotate with its circumference having the scanning apertures through the path of the light rays. A certain scanning aperture in the Nipkow disc 5 may be assumed to just move for instance along the dotted line 13 as shown in Figure 2. When the scanning aperture of the Nipkow disc enters the picture field, it will first pass the dark lines 10 and only then it will scan the film picture projected onto the Nipkow disc. The light, which is conveyed to the photo cell 7, is transformed into electrical impulses and the Fig. 3 shows diagrammatically the variations in amplitude during the scanning of one line of the film picture. The impulses 14 are produced by the scanning of the spaced dark lines 10, while the impulses 15 are produced by the scanning of the film picture, and are representative of the variation in brightness of one line. It is, of course possible to copy the dark lines 10 directly upon the film on one of its side margins

instead of using the diaphragm 9 as shown in Figure 2.

Owing to the fact that the diaphragm 9 cannot be arranged very close to the Nipkow disc 5 this arrangement has the disadvantage that the dark lines 10 cannot be reproduced very sharply at the receiver.

In this respect the Figure 4 shows an improved arrangement in which the same reference numerals are used for the same parts as in Figure 1. A lens system 16 is arranged between the Nipkow disc 5 and the diaphragm 9, the lens system 16 projecting the diaphragm 9 sharply outlined onto the Nipkow disc 5. In order not to suffer any loss of light, a condensing lens 17 is inserted between the diaphragm 9 and the lens system 16. It is to be remarked at this point that it is advisable not to darken that side margin of the film 3, which is projected by means of the lens system 4 upon the dark lines 10 of the diaphragm 9, but to maintain this margin transparent.

Figure 5 shows the invention employed in combination with a slight-spot-transmitter. Reference numeral 1 denotes a source of light, 2 a lens which projects the light rays onto the Nipkow disc 5. The latter is employed for scanning with the aid of a lens system 4, an object or scene (not shown) positioned in front of the screen 18. When the Nipkow disc 5 rotates a very intense light spot sweeps over the screen 18. The screen 18 may consist of a well diffused reflecting substance (white paper), and according to the invention is provided on one of its vertical margins with a series of spaced vertical dark lines 20 which are arranged in the same manner as shown in Figure 2. The object or scene to be transmitted by television is arranged in front of the white part 21 of the screen 18. The reflected light is taken up by the photo cells 22 and 23 and here also the current impulses during the scanning of a line vary similarly in amplitude as shown in Figure 3.

At the receiving side of the television system the current impulses 14 as shown in Figure 3 are separated or filtered from the picture current impulses 15 and are conducted to the synchronizing device. One of the possible receiving connections is shown in Figure 6. The receiver amplifier (not shown) is connected to the terminals 36 of a circuit in which the controlled light source 37 (glow lamp) is arranged in series with a coil 38 which is coupled with an oscillating circuit 39. This oscillating circuit is approximately tuned to the synchronizing frequency. The synchronizing current impulses amplified by the tube 40 are conducted over the resistance 41 and the condenser 42 to the grid of a rectifying valve 43 in the anode circuit of which a synchronizing device 44 for instance a La Cour wheel is arranged. The axis 45 of this wheel carries a picture composing means, for instance a Nipkow disc (not shown). Since the circuit 39 is damped the oscillations in the same will not reach immediately their maximum, but only after some time. If now during the transmission of the picture section of the film, (namely that part of a line representing the current impulses 15,) the oscillating circuit is not hit by oscillations of the synchronizing frequency, then the oscillations in the same will slowly return to zero.

It is therefore advisable, to damp this circuit in such manner that the oscillations just reach their maximum toward the end of the synchronizing impulses transmitted with each line and have returned again to zero just before the arrival of the synchronizing impulses of the next line.

Fig. 7 shows the approximate amplitudes of the oscillations which occur in the circuit 39, while Figure 8 shows the current amplitudes in the anode circuit of the rectifying valve 43. These current amplitudes are employed for the drive of the La Cour wheel.

The arrangements as shown in the drawings are only examples which may be employed for practicing the method of the invention and it is obvious to those skilled in the art that the invention is adaptable to various changes without changing the scope of the invention which we desire to protect by the following claims.

In the drawing:

1. The method of synchronizing a television receiver having a picture composing means in which a synchronizing dash is transmitted with each line of the picture together with the picture current, including the step of dividing said synchronizing dash into a series of uniformly spaced sections, whereby the synchronizing impulses are each transformed into an alternating current of definite frequency which is different from any frequency contained in the picture current, filtering said alternating current impulses from the picture current and employing the same for synchronizing the picture composing means.

2. The method of synchronizing a television receiver having a picture composing means in which synchronizing current impulses are transmitted with each line of the picture together with the picture current, including the steps of applying a plurality of spaced vertical lines to a vertical margin of the picture, scanning the picture, whereby synchronizing impulses of a frequency determined by the spacing of said vertical lines are produced, said synchronizing impulses having a definite frequency which is different from any frequency contained in the picture current, filtering said synchronizing impulses from the picture current and employing the same for synchronizing the picture composing means.

HANS GEORG MÖLLER.
ROLF MÖLLER.