

Dec. 31, 1940.

K. SCHLESINGER
SYNCHRONIZATION METHOD
Filed July 23, 1936

2,227,007

2 Sheets-Sheet 1

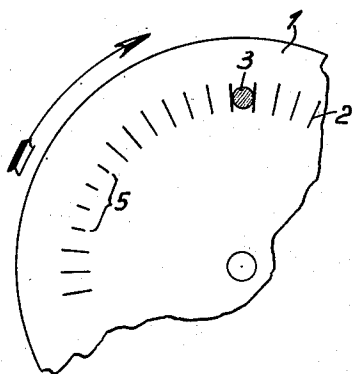


Fig. 1

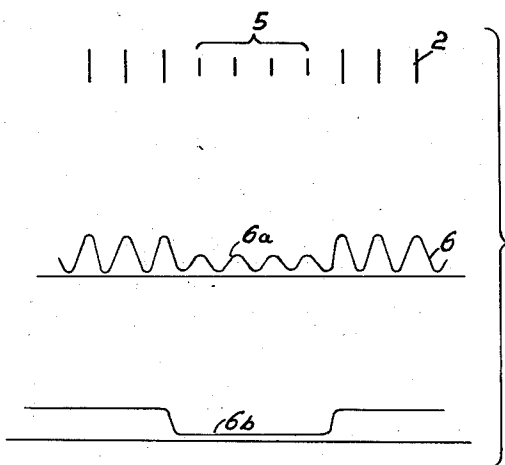


Fig. 2

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2 Sheets-Sheet 2

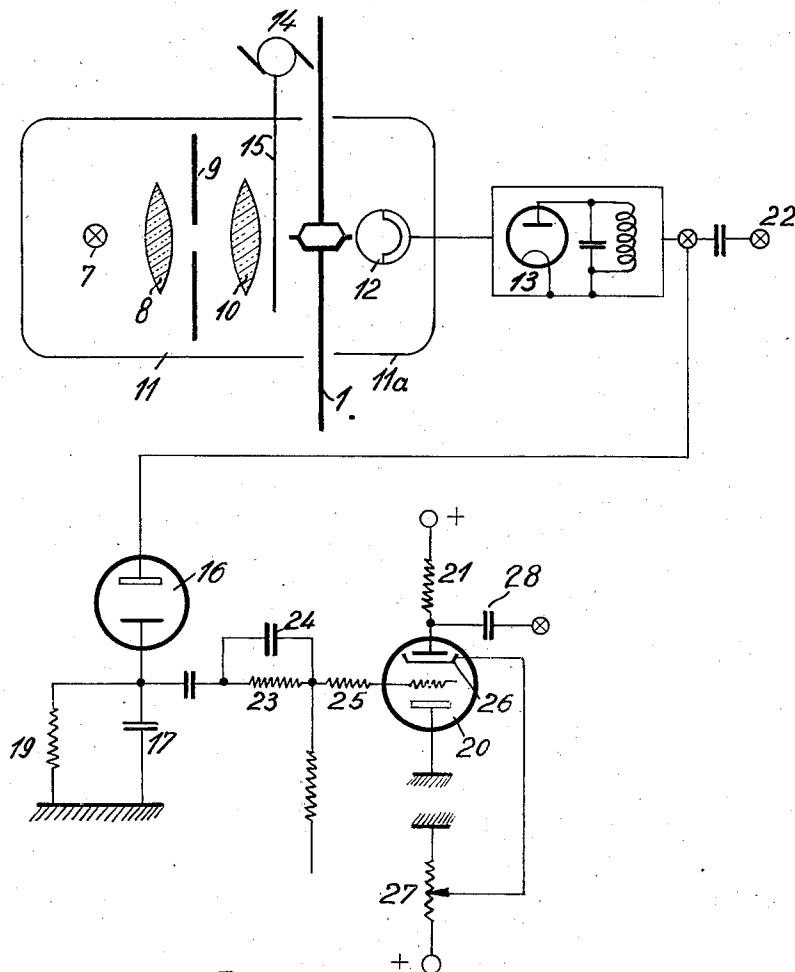


Fig. 3

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UNITED STATES PATENT OFFICE

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SYNCHRONIZATION METHOD

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mesne assignments, to Loewe Radio, Inc., a cor-
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2 Claims. (Cl. 178—69.5)

The present invention relates to the generation of synchronizing impulses in the transmitter of television systems in which the reception is performed by means of cathode ray tubes. Two kinds of synchronizing signals are wanted, line and frame change signals, and it is well known to generate it in the transmitter by two separate light sirens.

One object of my invention is a method of generating both groups of signals of higher frequency, the line signals (or in certain cases a multiple of it) and the frame signals by means of only one light siren.

Another object of my invention is to amplifying both groups of signals by means of the same amplifier tuned to the higher frequency.

Another object of this invention is to separate the lower frequency from the higher frequency used as a carrier by means of a rectifier.

The novel features which I believe to be characteristic for my invention are set forth with particularity in the appended claims. My invention, however, both as to its organization of operation together with further objects and advantages thereof may be best understood by reference to the following description taken in connection with the accompanying drawings, in which

Fig. 1 shows an embodiment of a light siren. In Fig. 2 the effect of the light siren is explained, and

Fig. 3 shows a mechanical and electrical arrangement according to the invention.

The light siren consists, e. g., of a rim of radial slots 2 (Fig. 1) in the scanning disc 1, of which one or more correspond to a scanning-aperture. On the front side of the disc there is projected a sharply defined light image, for example a circle 3, the diameter of which is equal to the spacing between the slots 2. Upon scanning the circle 3 by the slots 2 a practically sinusoidal oscillation is obtained by means of a photo-cell arrangement behind the disc 1 in a well known manner. The frequency of these oscillations thus produced is the above mentioned "higher frequency."

According to the invention, the "lower frequency" (frame frequency) is produced as a modulation of the higher frequency in the following way:

At a certain place 5 of the rim 4 or more adjacent slots are wholly or partially (as drawn) obturated. In Fig. 2 the oscillations produced by the regular slots 2 are marked with 6. Corresponding to the partially obturated slots 5 the amplitudes 5a are reduced. By rectification of

the wave 6 negative impulses 6b are obtained, the frequency of which is equal to the number of revolutions of disc 1, i. e., the "lower frequency."

It is understood that this way the higher frequency is used as a carrier of the lower frequency so that both may be amplified in the same amplifier tuned to the frequency of 6, of course before rectification.

In certain cases (interlaced line method), the lower frequency is wanted to be a sub-multiple of the scanning disc frequency, so that it is impossible to obtain the lower frequency by closing some of the slots. A method of obturation to be used in this case will be described on hand of Fig. 3.

In Fig. 3 there is again shown the disc 1, in front of which there is situated a lamp 7 which projects parallel light on to the disc by means of a collimator lens 8. A diaphragm 9 of circular or other form, dependent on the desired light image 3 (Fig. 1), is situated behind the collimator 8 and is reproduced sharply on the disc by a reproducing lens 10. The complete optical arrangement is encased up to the disc by a light-tight casing 11. A photo-cell 12 is situated behind the disc likewise in a light-tight casing 11a, and is connected with a highly selective multi-circuit tone amplifier 13, which is tuned to the basic frequency generated by the slots. Thus the higher or line frequency is to be tapped between 22 and earth.

Between light source 7—10 and photo-cell 12 there rotates a shading arm 15, which is driven by a synchronous motor 14 and periodically interrupts the light. The interruption has the duration of the designed image-change signal, and amounts, therefore, to several line periods. (See Fig. 2.) The frequency of interruptions (lower frequency) may be equal to or be a multiple or submultiple of the period of revolution of the disc 1.

According to the invention there is connected to the output of the photo-amplifier 13, a rectifier consisting preferably of a diode 16, a blocking condenser 17 and a leak-resistance 19. The impulses 6b of Fig. 2 of the "lower frequency" obtained by the rectifier are positive or negative, according to the polarization of 16, and are, preferably by means of a filter 23, 24 and a series resistance 25 conducted to the control grid of an amplifier tube 20. It has been found in practice, that a single screening grid tube is quite sufficient to generate at its anode frame change impulses, the amplitude of which is just as great

as the amplitude of the line-tone oscillation, which is taken direct from the amplifier output at 22. The frame-change impulses may be taken, for example, at the ends of the anode resistance 21 of 10-30,000 ohms, preferable in series with a condenser 23.

It is suitable to employ a screening grid tube 20, since with the aid of a bias potentiometer the amplitude of the generated impulses may be regulated easily at the screen grid 26 without any variation in the working conditions of the control grid circuit, which operates with fixed biases.

The method may naturally also operate with a periodic brightening of the illumination instead of a periodic obturation, as described. In this case all polarities are reversed. In Fig. 1 and Fig. 2 the closed or nearly closed slots 5 are replaced by wider ones, in Fig. 3 instead of the shading member a window or radial slot is employed and at 6a and 6b the amplitudes become higher instead of smaller.

The method may be employed with all the better result the higher the carrier frequency may be. In the case of a slotted disc with a multiple slot frequency as compared with the line frequency and subsequent reduction to the line frequency the amplifier 13 is traversed by a carrier wave of particularly high frequency, and it is possible therewith to produce special line and image change signals. In the case of a 180-line image the normal line-frequency, for example, amounts to 4,500, and in the method making use of interlaced lines and a double spiral disc the line frequency amounts to approximately 9,000 and in the method of employing 4 spirals to 18,000 periods. The duration of the image-change signal amounts in comparison therewith to approximately $\frac{1}{4000}$ sec. and may accordingly be taken with an adequate efficiency from the carrier oscillation even in the case of very selective amplifiers.

It may be specifically pointed out that in the above there have merely been described particular embodiments of the general idea according to the invention, and that the stated measures may be employed and claimed both in combination as well as singly.

I claim:

1. A system for generating relatively high frequency line synchronizing impulses and relatively low frequency frame synchronizing impulses for television image transmission comprising a disc having a plurality of radial slits of a predetermined length located near the periphery of the disc and uniformly spaced around the disc, the slits lying within a relatively small sector of the disc having a length different from the length of the remaining slits, means to rotate said disc, means to project a substantially circular beam of light onto the disc in the region of the slits, the diameter of the beam of light being substantially equal to the spacing between the slits, a light responsive element positioned to receive the light projected through the slits to produce potential variations of the said relatively high frequency, the potential variations being modulated in intensity by the slits lying within the said relatively small sector of the disc, and means to demodulate the modulated voltage variations to produce voltage variations of the said relatively low frequency.

2. A system for generating relatively high frequency line synchronizing impulses and relatively low frequency frame synchronizing impulses for television image transmission comprising a disc having a plurality of apertures of a predetermined size located near the periphery of the disc and uniformly spaced around the disc, the apertures lying within a relatively small sector of the disc having a size different from the size of the remaining apertures, means to rotate the disc, means to project a beam of radiant energy onto the disc in the region of the apertures, the circumferential dimension of the beam of radiant energy being less than the spacing between the apertures, a radiant energy responsive element positioned to receive the radiant energy projected through the apertures to produce potential variations of a multiple of line synchronizing impulse frequency, the potential variations being modulated in intensity by the apertures lying within the said relatively small sector of said disc, and means to demodulate the modulated voltage variations to produce potential variations of a multiple of frame synchronizing impulse frequency.

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