

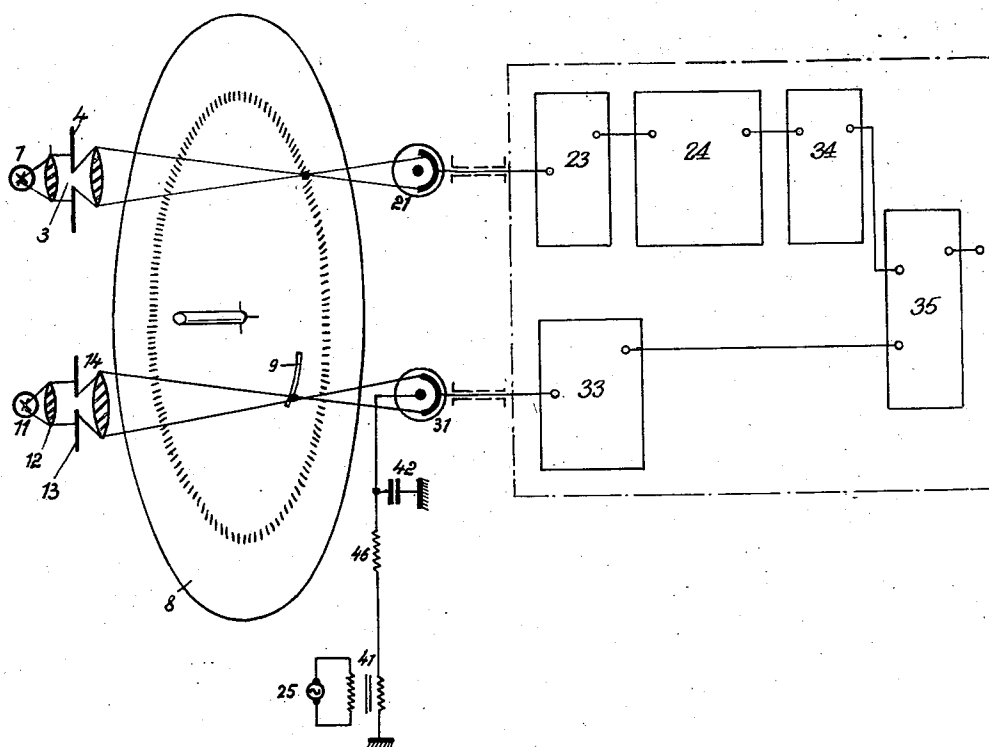
July 8, 1941.

K. SCHLESINGER

2,248,551

SYNCHRONIZATION OF DISK SCANNING MEANS

Filed Nov. 23, 1937



Inventor:

Wm. S. Gillingham,

UNITED STATES PATENT OFFICE

2,248,551

SYNCHRONIZATION OF DISK SCANNING
MEANSKurt Schlesinger, Berlin, Germany, assignor, by
mesne assignments, to Loewe Radio, Inc., a
corporation of New YorkApplication November 23, 1937, Serial No. 176,020
In Germany November 26, 1936

2 Claims. (Cl. 178—69.5)

The invention relates to television transmitters according to the interlaced line method. If the number of lines per image or frame amounts to 400 or more a scanning disk is desired that, for practical reasons, executes more than one revolution per field, i. e. in the case of two fields per frame or image, at least $N=4$ revolutions per image. In the following $N=4$ and a line frequency f is supposed.

It is known that in the interlaced line method there is required for the beginning of each frame change impulse a precision which can be ensured only by special methods. The relation between the number of frame changes and the number of line impulses must remain irrevocably constant, and the two signals must begin completely independently of each other. The method frequently employed of deriving the frame change impulses from the disk motor circuit does not ensure adequate precision and accordingly sufficiently steady location of the two part images screens one within the other. The most steady image was obtained by a purely optical method of signal generation. The line and frame synchronization signals are produced each by a separate photo-cell in conjunction with light-chopping slots in the disk. The special method according to the invention consists in that the approximately sinusoidal line synchronization signals are electrically filtered by a tuned amplifier, reduced in frequency and converted into sharp impulses of line frequency whilst the frame impulses are aperiodically amplified.

According to the invention, the number of the slots for producing the line synchronizing impulses is equal to the number of the desired line synchronizing impulses. Therefore, if multiple revolutions per image are necessary, a multiple number of the synchronizing impulses are produced by the disk. By using a disk producing a multiple number of the desired impulses, the distortions effected by the variations of the distances or apertures of the slots on the disk producing said impulses are reduced. The distortions effect a displacing of the image. The displacing fault is

$$= \frac{\Delta p}{p} = \frac{q \Delta f}{\pi f 2\varphi}$$

therein is:

q = a constant factor of the damping

f = the frequency of the impulses produced by the rotating disk.

φ = the proportion of the number of the produced impulses to the number of the desired impulses.

It is seen, that the displacing fault can be reduced by a large proportion φ .

The invention will be fully understood from the detailed description which will now be given of an exemplary embodiment thereof which is illustrated in the accompanying drawing and which shows a diagram of the optical and electrical elements.

In the drawing 8 is the scanning disk provided with a four-turn spiral of scanning apertures (not shown) and, for producing the synchronization signals, with a rim of slots 6 for the line and a slot 9 for the frame impulses. The number of the slots 6 is equal to the number of the desired single impulses. Each of these two systems of slots is illuminated by a separate device. The lamp 1 (respectively 11) projects light by way of a condensing lens 2 (12) onto a diaphragm 3 (13), which is reproduced sharply onto the disk 8 by a reproducing lens 4 (14). This reproduction is performed at such a scale that the image of the diaphragms produced on the disk 8 is smaller than the radial height of the slots. Thus it is avoided that a fluttering of the disc influences the amplitude of the signals. Tangentially the length of the line light spot is made equal to the distance between two slots. In this way an approximately sinusoidal time curve of the photo-cell current is obtained.

The light beam chopped by the disk 8 is conducted to the photo-cell 21 (31) and converted into electrical currents. According to the invention there are employed two entirely different electrical methods of treatment for the line and for the frame change impulses.

The frequency supplied by the photo-cell 21 is equal to $4f$. It is amplified by sharply selective resonance circuit of the filtering system 23. A frequency reducer 24 is synchronized by line-frequency and supplies in its output a sine oscillation of line frequency. A sine impulse converter 34 converts the sine oscillations of the line frequency into impulses of adjustable duration.

The impulses supplied by the photo-cell 31 are aperiodically amplified by means of a resistance-coupled amplifier 33. Since the disk rotates four times per image, it supplies four impulses per image, whereas only two are required.

The halving is usually effected by a shutter. According to the invention, the problem is solved in a more simple way by feeding the photo-cell 31, instead with D. C., with alternating current 25 of frame frequency by means of a transformer

41, resistance 46 and condenser 42 serving for filtering out higher harmonics. It is presumed that the source 25 is the alternating voltage mains feeding the synchronous motor driving disk 8 and that the frame signal occurs at the maximum of that voltage. This way only every second light impulse is able to produce an electric impulse. Of course, the alternating voltage may, instead of to the photo-cell, also be applied to any stage of the following aperiodic amplifier 33.

The output of the amplifier 33 and the output of the sine impulse converter 34 are connected to a mixing stage 35. In this stage the line synchronizing impulses and the frame impulses are mixed together.

Preferably the mixing stage 35 is a tube having at least two independent series disposed control grids. In this case the outputs of 33 and 34 are connected each to one of the control grids. The tube is connected so that its anode current is interrupted at least by one of the impulses arriving at one of the grids.

For removing distortions of the amplitude of the signals effected by the relative movements between disk and light image it is proposed that on the disk is projected a sharply defined light image. The dimensions of this light image shall be smaller than those of the slots for producing the signals.

I claim:

1. A television transmitter for odd-line interlaced scanning at two fields per frame, comprising a scanning disk, said disk being provided with a peripheral row of slots the number of which is equal to the number of lines per frame for producing the line synchronizing signals and a single slot for producing the field synchronizing signals, means for rotating said disk at $2N$ revolutions per frame where N is a whole num-

ber of the order of two or more, a separate light beam and photo-cell associated with the line synchronizing slots and the field synchronizing slot for producing a first series of voltage variations of $2N$ times the line frequency and a second series of voltage variations of N times the field frequency, respectively, means to reduce by $2N$ times the frequency of said first series of voltage variations, means to convert the reduced series into line synchronizing impulses, means to reduce by N times the frequency of said second series of voltage variations to produce field synchronizing impulses, and means to combine the line and the field synchronizing impulses into a common composite series.

2. A television transmitter for odd-line interlaced scanning at two fields per frame, comprising a scanning disk, said disk being provided with a peripheral row of slots the number of which is equal to the number of lines per frame for producing the line synchronizing signals and a single slot for producing the field synchronizing signals, means for rotating said disk at four revolutions per frame; a light beam and photo-cell associated with the peripheral slots for producing a first series of voltage variations of four times the line frequency, a second light beam and photo-cell associated with the field synchronizing slot for producing a second series of voltage variations of two times the field frequency, means to reduce by one-fourth the frequency of said first series of voltage variations, means to convert the reduced series into line synchronizing impulses, means to reduce by one-half the frequency of said second series of voltage variations to produce field synchronizing impulses, and means to combine the line and field synchronizing impulses into a single composite series.

KURT SCHLESINGER.