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TELEVISION APPARATUS

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Fig. 1

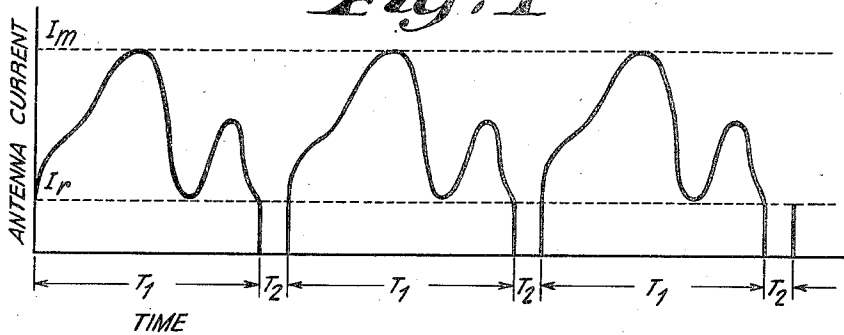


Fig. 2

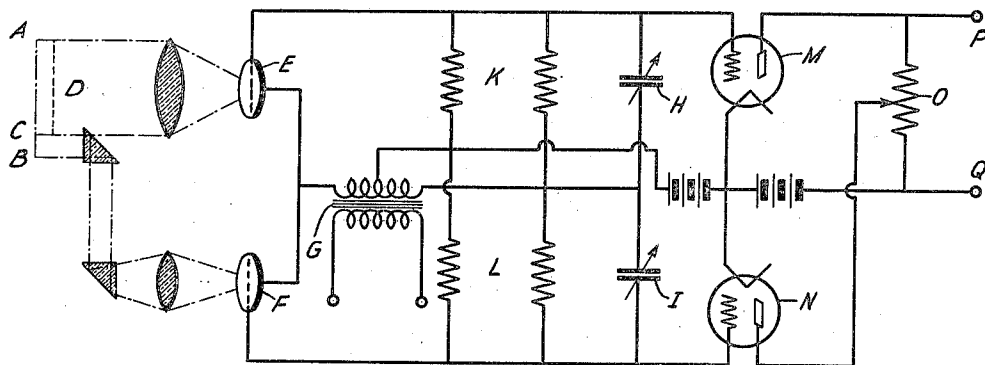
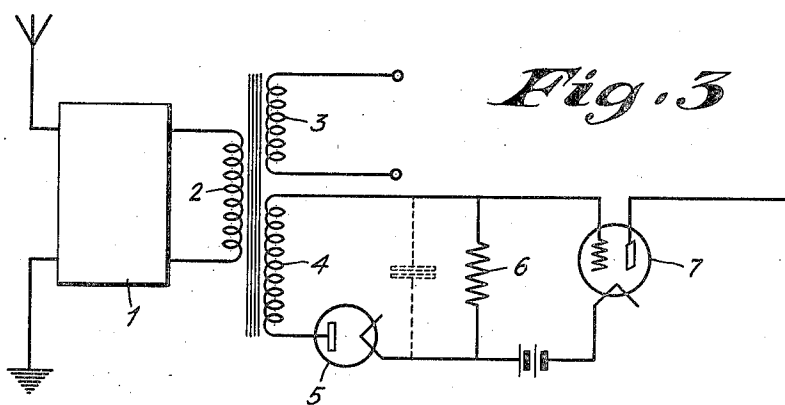


Fig. 3



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4 Claims. (Cl. 178—6)

This invention relates to a method of and means for telesynchronization of television apparatus.

For synchronizing television receivers from the transmitter there have in the main been proposed two ways and means, to wit, to transmit synchronizing impulses differing from the picture impulses or signals either by large amplitude or a distinct frequency character. But neither procedure has so far resulted in any really practical solution to the synchronizing problem, though the latter, as is well known, is of utmost importance in connection with television arts. The reasons are these: The method first mentioned is predicated upon amplitude selection at the receiving end, and the same operates with fairly adequate reliableness if the amplitude of the synchronizing impulses are chosen at least twice as strong as that of the picture signals proper. But this means that only one-fourth of the transmitter power becomes available for the picture, impulses, which, in turn, means a serious limitation in the range of the transmitter. The second method requires frequency selector means at the receiving end, and this would appear practicable only with a considerable expenditure for circuit elements for that end.

The present invention has as one of its main objects that of providing ways and means adapted to remedy this situation. The invention will be explained in the following description taken together with the drawing in which Fig. 1 shows graphically the relation between antenna current and time for use in explaining the operation of the invention;

Fig. 2 shows diagrammatically a modulation circuit embodying the invention, and

Fig. 3 shows schematically a portion of a receiver adapted to work in accordance with the invention. It consists in that the transmitter current of relatively low static value, I_r (see Fig. 1), which, for instance, may be assumed to be $\frac{1}{4}$ th the maximum amplitude I_m (corresponding to $\frac{1}{4}$ th the transmitter energy above line) is modulated or shifted by the picture signals (time interval T_1) in proportion to the brightness values in upward direction, i. e., towards larger currents, while by the synchronizing signals (time-interval T_2) it is caused to disappear entirely, and that the synchronizing device locally mounted in the receiver station is of such property that it will only respond in case of zero keying (modulation) at the sending end.

A method of this nature offers the advantage that for synchronizing practically no additional

transmitter energy needs to be expended seeing that the maintenance of a slight residual current of an order of magnitude as hereinbefore stated, as is well known, is anyway useful for the insurance of high picture quality insofar as in that manner the non-linear lower end of the antenna current characteristic in the modulation of the picture signals is avoided. Another merit resides in the great simplicity of the receiving arrangements.

Fig. 2 shows fundamentally an exemplified embodiment of the means required at the sending end with a view to practice the basic idea of the present invention. Suppose that AB is the line or plane of motion of the scanning spot, and CB the "dead or blind picture angle" assumed to be available for synchronization. Let D be, for instance, a film conveyed at right angles to the plane laid through the drawing and which is to be transmitted. The light permitted to pass through the film is supposed to be directed towards a photoelectric cell E, while for the duration of the synchronizing interval, the spot, being of constant intensity, is directed towards the photocell F. Both of these photoelectric cells are fed by way of the transformer G, or else by way of two distinct transformers, with alternating potential of the same frequency. H and I are the neutrodyning condensers provided to compensate the capacitive cell current, K and L two parallel resistances serving as phase shifters. M and N are two amplifier tubes, which at the anode end, work upon one and the same resistance O. Neutralization of the two photoelectric cells, according to this invention, is effected in the presence of contrary illuminations, to be more precise, so that one thereof (E) is neutral in the absence of light, and the other one (F) in the presence of light. The result is that during the scanning of the picture, there will persist across the terminals PQ a constant, non-modulated residual voltage of the carrier wave, which will disappear only during the instants when the cell F is irradiated, that is, during the blind picture angle at the end of each line. In other words, the times with absence of current govern the change in line.

In a very similar way, one or more non-modulated lines between pairs of pictures may be utilized for the change in picture in that the light originating therefrom is also directed towards photocell F by the intermediary of suitable optical means.

The desired relationship between residual voltage and signal potential is regulable by the aid of the slider on contact O. Associated with the

points PQ in well known manner is an amplifier for the carrier wave whence the signals are fed to the modulator of the transmitter.

So far as the operation of the idea underlying the invention is concerned, it is immaterial whether the carrier frequency is included in the transmission or whether prior to transmission demodulation is effected with suppression of the auxiliary carrier. Neither is it absolutely necessary to combine the two photocell circuits with following amplification into one unit as assumed in Fig. 2, for as a matter of fact, both cells may be provided with separate amplifying means. But it is preferable in this connection to derive the carrier frequency from one and the same generator. Neutralization, finally, need not be effected directly at the photoelectric cells, indeed, this may be accomplished at some other point in the course of amplification by circuit schemes known in the earlier art.

The ways and means to be adopted at the receiving end with a view to practicing the basic idea of the invention shall be explained in more detail at least in principle by reference to Fig. 3. The radio receiver 1, say a transposition type of receiver shall be assumed to comprise an audio frequency output transformer (or some other coupling means) with two secondary windings 3 and 4. One of these windings, say 3, shall be supposed to be employed, as known in the prior art, for the brightness (light) control of the receiving apparatus, which, as to the rest, may be of any suitable pattern, whereas the second winding 4 shall serve for synchronization. With this end in view, a rectifier 5 is provided in series with a resistance 6 which is so connected as to act at the same time as the grid leak of tube 7. The transformer windings and other circuit elements are so chosen that, with proper and thorough modulation of the receiver light the direct current component arising at 6 will also suffice for blocking the tube 7 as long as the transmission current is greater than, or equal to, the static value I_r (Fig. 1, time intervals T_1); but if, on the contrary, the transmission current drops to zero (intervals T_2), tube 7 because of not being blocked assumes a state where current is transmitted. In case the Braun tube serves as a reproducing device, tube 7, for instance, in the form of a thyratron may be connected directly as a discharge tube for a pair of deflector plates. If the receiver comprises a local synchronizing source (relaxation wave or other generator), then the current impulses furnished from 7 may be utilized for synchronizing the latter (for instance, by what is known as entrainment or coherence action).

The times T_2 (Fig. 1) are utilized in a way as described for line-change. For the change of pictures, say, between two consecutive pictures, there will be no objection in sacrificing the time of several lines so that the corresponding times where current is absent will, as to order of magnitude, be 100 times as long as the periods when a line-change happens. For the automatic regulation of picture change there shall be supposed to be provided a similar circuit (4, 5, 6, 7) as for the change of lines, except that in parallel relation to the resistance 6 a condenser 8 shall be assumed to be connected being of such a size that the line-change impulses will practically produce no alteration in the direct current voltage drop at 6 and are thus precluded from tube 7, so that only the

picture-change impulses will become operative in this circuit. On the other hand, safeguarding of the line-change device from the picture-change impulses is not required inasmuch as every picture-change coincides with a line-change.

Particular attention must be drawn to the great simplicity of tele-synchronization of Braun tubes by the ways and means here disclosed, and also to the great efficiency and economy attained in the building of receiver equipment.

The invention is suited equally for radio as well as for wire transmission.

I claim:

1. A system for synchronizing television apparatus, comprising light responsive means to produce signals representing sequentially occurring light values on elemental areas of an elemental strip of a subject, light responsive means to produce signals representing a completion of a series of signal represented light values, an amplifier system for amplifying the produced signals, means to control the first mentioned signal producing means to provide a predetermined minimum output different from zero from the amplifier in the absence of light in said first signal producing means, and means to provide substantially zero output from the amplifier when light is present in said second signal producing means.

2. A system for synchronizing television apparatus comprising means to receive repeating series of signals each separated by an absence of signals to represent synchronizing periods, comprising means to receive and amplify the signals, means to produce from the signals proportionally varied electro-optical effects, a rectifying device connected with the receiver amplifier means, an electronic tube connected with the output of the rectifier, and means for controlling the electronic tube by the rectified signals to bias the tube to zero output during periods of signal reception and to remove the bias to provide maximum output only during predetermined periods of interruption.

3. A system for synchronizing television apparatus, comprising light responsive means to produce signals representing sequentially occurring light values of elemental areas of an elemental strip of a subject, means to modulate carrier wave energy in accordance with said produced signals, means for amplifying the modulated carrier wave energy, a load circuit for said amplifying means, means to provide a predetermined minimum of unmodulated carrier wave energy different from zero in the load circuit in the absence of light in the first named means, and means for reducing the minimum carrier wave energy to zero only at predetermined time intervals.

4. A system for synchronizing television apparatus, comprising light responsive means to produce signals representing sequentially occurring light values of elemental areas of an elemental strip of a subject, means to modulate carrier wave energy in accordance with said produced signals, means for amplifying the modulated carrier wave energy, a load circuit for said amplifying means, means to provide a predetermined minimum of unmodulated carrier wave energy different from zero in the load circuit in the absence of light in the first named means, and means for reducing the minimum carrier wave energy to zero only at the end of scanning each elemental strip.

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