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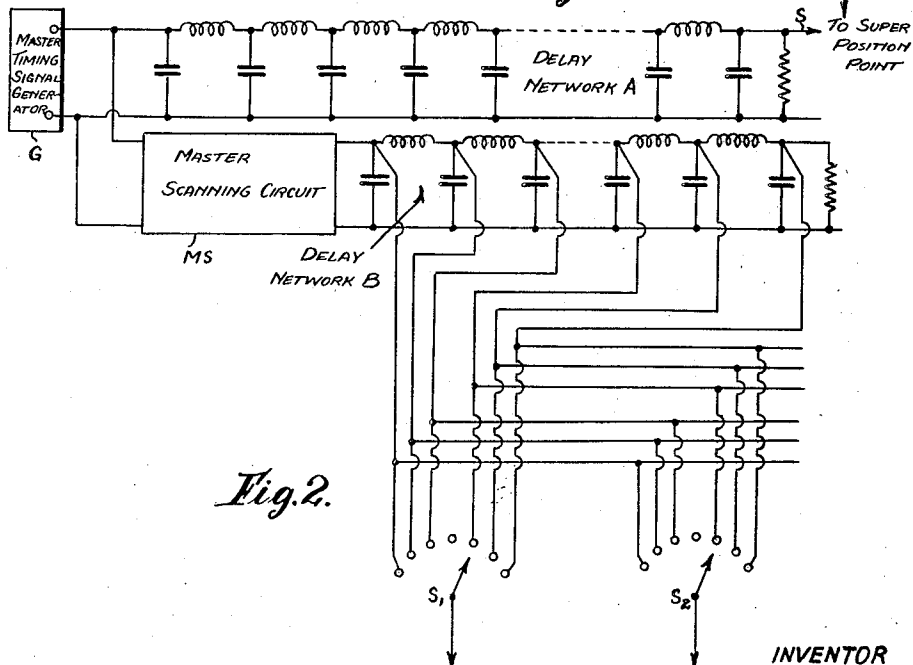
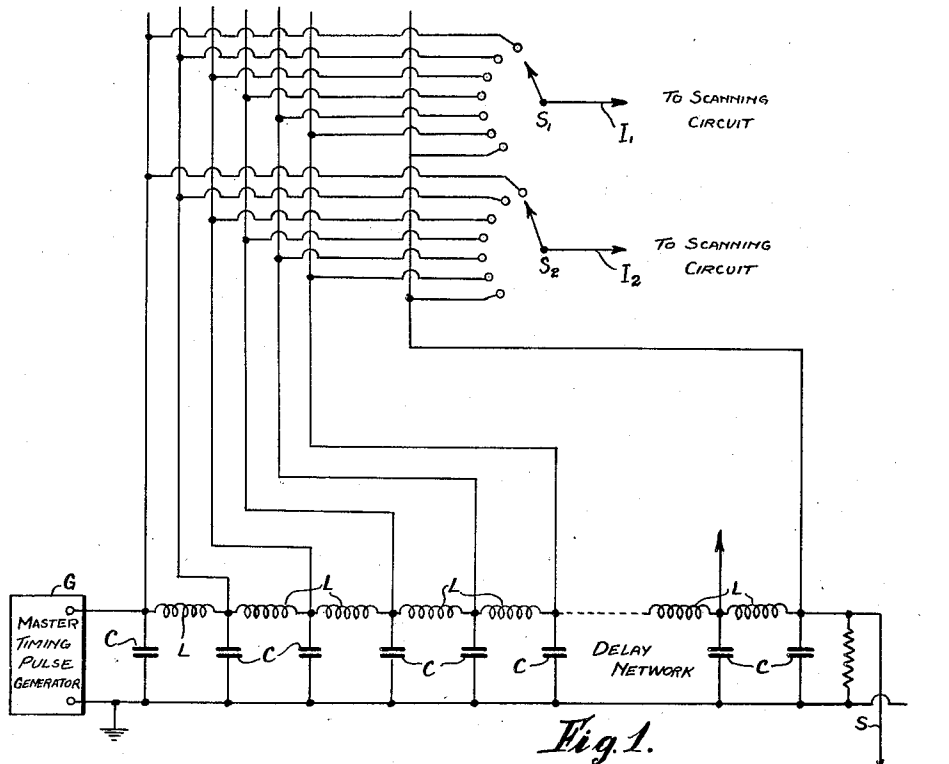
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TELEVISION AND LIKE TRANSMITTING SYSTEM

Filed March 5, 1936

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

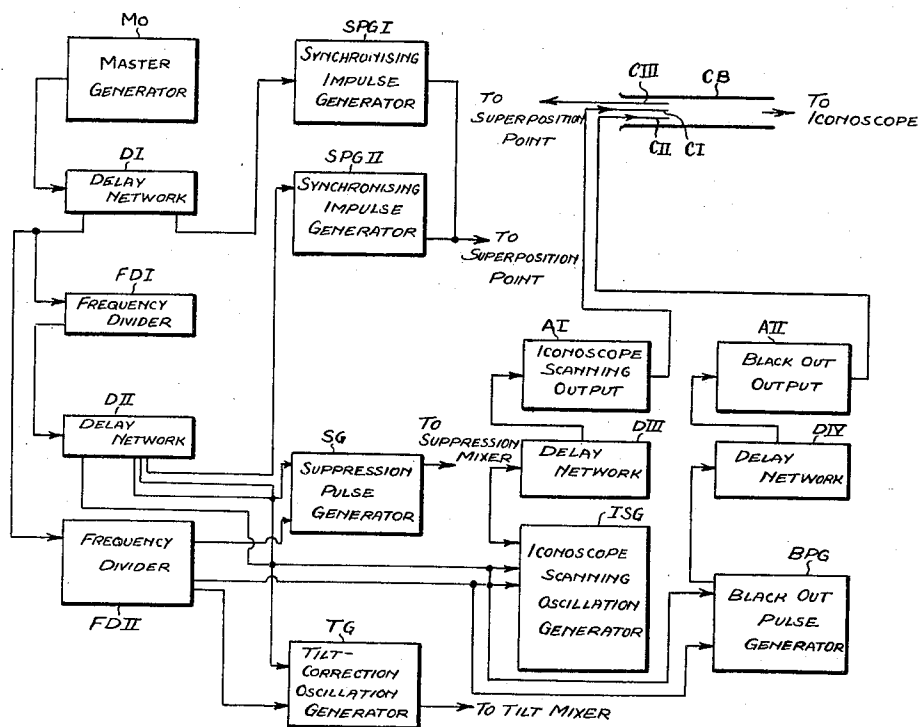


Fig. 3.

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TELEVISION AND LIKE TRANSMITTING
SYSTEM

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6 Claims. (Cl. 178—7.2)

The present invention relates to television and like transmitting systems of the kind in which synchronising signals are transmitted in intervals between trains of picture signals.

5 In systems of the kind referred to, it is usual to provide a generator of master timing-signals, these signals being used both to control the scanning process at the transmitter and for producing synchronising signals for combination
10 with the picture signals to be transmitted; the synchronising signals are used to control scanning at a receiver.

It is sometimes inconvenient to arrange that scanning at the transmitter should take place at
15 a point close to the master timing-signal generator or to the point at which synchronising signals derived from the master signals are superimposed upon the picture signals. In such cases, the master signals have to travel an electrical distance, say d , to the scanning point, and the picture signals have to travel back a distance which is also generally equal approximately to d to the point where the synchronising signals are
20 impressed on the picture signals. Usually, the superimposition of the synchronising signals upon the picture signals is effected at a point close to the master generator. It is thus clear that the effect produced by the master signals on the picture signals is delayed relative to the
25 synchronising signals by the time taken by signals travelling a distance approximately equal to $2d$.

It may also be desired to provide a plurality of scanning points at different electrical distances from the master generator and to transmit at
35 will signals from any one of these scanning points, or to combine signals from the several scanning points in any desired proportion for transmission. In such a case, the delays in the
40 signals from the various scanning points are different from one another.

It is the object of the present invention to provide means for avoiding or reducing the difficulties outlined above.

45 The present invention accordingly provides a television or like system of the kind in which synchronising signals are transmitted in intervals between trains of picture signals, and in which scanning is effected at a scanning point
50 at the transmitter under the control of master signals from a master generator, synchronising signals generated under the control of said master signals being combined with picture signals from said scanning point at a superposition point
55 the electrical distance of which from said master

generator by way of the synchronising impulse generator is different from the electrical distance between the superposition point and the master generator by way of the scanning point, the system being characterised in that means are
5 provided for compensating for the effect upon the relative phase of said picture signals and synchronising signals of the difference between said distances.

Usually the said superposition point is closer to
10 the master generator than is the said scanning point, and in such a case a suitable delay network may be provided between the master generator and the superposition point.

It will be understood that the signals transmitted from the master generator to the scanning
15 point usually comprise signals of line frequency and signals of frame frequency, although in some cases only one frequency is required.

Where there are a plurality of different scanning points at different distances from the master generator, a network giving a delay at least
20 as great as that experienced by signals travelling to and from the furthest scanning point may be provided between the master generator and the said superposition point, means being then
25 provided whereby signals from said master generator for controlling the scanning at any of the several scanning points may be derived from suitable tapping points in said network.

30 The invention will be described by way of example with reference to the accompanying drawings, in which Figs. 1 and 2 show circuit diagrams of two arrangements according to the invention, and in which Fig. 3 illustrates a further
35 more complex arrangement according to the invention. In the drawings, the apparatus at the superposition point and at the scanning points has been omitted for the sake of clearness, and since the invention is not primarily concerned
40 with the details of this apparatus.

Referring to Fig. 1, a master timing pulse generator indicated by G generates a series of pulses at frame frequency together with a series of
45 pulses at line frequency, and these are fed into one end of a delay network comprising in this example series inductances L and shunt condensers C. Signals from the other end of the network are fed by lead S to the superposition point
50 at which synchronising signals are superposed upon picture signals. A plurality of scanning points is employed, each of which uses, for example, a so-called "Iconoscope," that is to say, a cathode ray tube comprising a mosaic screen of
55 photo-sensitive elements upon which an image to

be transmitted is cast and which is scanned by a cathode ray. The scanning circuit of each "Iconoscope" is connected to the arm of a multi-way switch; two such switches S_1 , S_2 are shown, the scanning circuits being connected to the switch arms by leads I_1 and I_2 respectively. The switches S_1 , S_2 etc. enable the signals from the generator G , which are to be applied to the scanning circuits, to be taken from a desired suitable point along the delay network, the desired point being determined by the length of the lead connecting the scanning circuit with the network.

The generator G , network L , C , switches S_1 , S_2 , etc., and the apparatus at the superposition point are usually arranged close together, and each of the "Iconoscopes" may then be connected to this apparatus through a multi-core cable containing the lead I_1 or I_2 and a lead for conveying the picture signals from the "Iconoscope" to the superposition point. The proportion of picture signals applied from each "Iconoscope" to the superposition point may be adjusted in known manner by means of suitable fade switches.

In one example, the delay network has 12 sections and is arranged to have a cut-off frequency of 1 megacycle per second, the time delay per section being then 0.32 micro-second. If the average velocity of the signals along the cable in each direction is 2×10^5 kilometers per second, each section will correspond in time delay to 32 metres of cable and will be suitable for a maximum length of cable, on any of the associated "Iconoscopes," of about 400 metres. Where there is provided a number of "Iconoscopes" with cables of different lengths, these lengths are preferably arranged to be integral multiples of the length corresponding in time delay to one section of the network.

If desired, separate delay networks can be provided for the line and frame frequency pulses.

The pulses arriving at the "Iconoscopes" may be used in known manner to control the generation of saw-tooth oscillations which in turn are used to deflect the ray over the mosaic screen. They may also be used to provide "black out" pulses which are applied to a suitable control electrode and serve to cut off the ray during the return strokes. In a preferred arrangement, however, the saw-tooth oscillations are generated at a point close to the switches S_1 , S_2 , etc., and transmitted down the cables to the "Iconoscopes." The picture signals generated are in the form of trains of picture signals with intervals between trains and the phase of these intervals will be determined by the pulses received from the generator G .

If the correct tapping point on the delay network is selected for the particular length of cable in use, the time by which these intervals are effectively delayed, due to the transmission of signals from G to the "Iconoscope" and the transmission of the picture signals to the superposition point, is equal to the delay experienced by the signals travelling along the network from G to the superposition point.

The network, instead of consisting of "lumped" impedance elements L and C as shown may be constituted by a "distributed" impedance member such as a continuous cable which may be suitably coiled so as to occupy a conveniently small space. A suitable number of tapping points is brought out to switches S_1 , S_2 , etc., as before.

Where it is not desired to have a number of completely independent scanning circuits for the

several "Iconoscopes," a circuit such as is shown in Fig. 2 may be used.

A single master scanning circuit MS is provided, from which can be taken scanning oscillations of saw-tooth or other suitable wave form to control the scanning process; master timing signals from the generator G are employed to control the generation of the scanning oscillations. A delay network B is connected to the output on the circuit MS and tapings are connected from this network B to a plurality of switches of which two, S_1 , S_2 are shown, which permit connection to be made between the scanning circuit of any one of a number of "Iconoscopes" and any one of a number of points along the network B . A stage of amplification is preferably arranged in each of the scanning circuits at the "Iconoscopes" for the scanning oscillations.

The generator G is also connected through a second delay network A to the superposition point by the lead S . The network A is arranged to provide a delay at least equal to that caused by the longest cable to be used between the master scanning circuit MS and any of switches S_1 , S_2 , etc., and the length of cable used to any "Iconoscope" connected to S_1 , S_2 , etc., can then be compensated for by suitable adjustment of the corresponding switch S_1 or S_2 , etc.

In this example, the "black out" pulses may be generated from the scanning oscillations either at each "Iconoscope" or at the end of the associated cables near to the master circuit MS .

Furthermore, a second set of conductors to convey impulses to provide "black out" may be taken from tapings on network A to a further set of suitable switches and thence to the "Iconoscopes." These further switches may be ganged with the corresponding switches S_1 , S_2 so that "black out" impulses and scanning oscillations for any "Iconoscope" are taken from corresponding points on the networks A and B respectively.

A further arrangement according to the invention, which is particularly suitable for use in interlaced scanning systems such as are described in United States application Serial No. 38,524, is illustrated in Fig. 3.

A generator MO provides master oscillations at twice the line frequency which are fed to a generator $SPGI$ of synchronising impulses of relatively long duration and twice the line frequency through a delay network DI . Oscillations from master generator MO are also fed through a frequency-divider FDI , which divides the frequency of the applied oscillations by a factor of 2, to a second delay network DII , from which delayed impulses at the line frequency are taken to a second generator $SPGII$ of synchronising impulses of line frequency and relatively short duration.

A second frequency divider $FDII$ arranged to divide the frequency of applied oscillations by a factor of 405 is fed with oscillations from master oscillator MO , and divided-frequency oscillations from network DII and frequency-divider FDI are fed to a generator SG , which provides impulses for use in the suppression of spurious signals which may be generated by the "Iconoscope."

Oscillations from network DII and frequency divider $FDII$ are also fed to a generator ISG of scanning oscillations for the "Iconoscope," to a generator BPG of black-out pulses for use at the "Iconoscope" and to a generator TG of "tilt-correction" oscillations; the latter are employed to correct for a form of distortion introduced by

the "Iconoscope," which manifests itself as a spurious signal superimposed on the picture signals.

Two further delay networks DIII and DIV are fed respectively with oscillations from generator ISG and pulses from generator BPG. Network DIII feeds one conductor CI of a cable CB, which passes to the "Iconoscope," through an amplifier and output stage AI, while network DIV feeds a second conductor CII of the cable through an output stage AII. The third conductor CIII of cable CB serves to convey picture signals from the "Iconoscope" to the superposition point, and synchronising impulses are also fed to that point from generators SPGI and SPGII.

The delay introduced by network DI is arranged to be equal to the maximum delay introduced by the "Iconoscope" cable. The master oscillations fed from MO to FDI are delayed less by network DI than the oscillations fed from MO to SPGI, the difference being compensated for by network DII. The latter delays oscillations fed to ISG less than oscillations fed to SPGI, and networks DIII and DIV serve to compensate for the difference between the delay undergone by oscillations passing from MO to SPGI, and the delay introduced by the cable CB. Networks DIII and DIV may have suitable tapping points associated with switches to facilitate the use of cables of different lengths.

I claim:

1. A picture transmission system comprising means, situated at a scanning point, for scanning an object of which an image is to be transmitted to generate trains of picture signals having spacing periods between successive trains, a master generator for generating master controlling signals, means for utilising said master signals to control the operation of said scanning means, a generator of synchronising signals of a frequency which is the same as the frequency of recurrence of said trains, means for utilising said master signals to control the operation of said synchronising signal generator, means for superposing said synchronising signals upon said spacing periods at a superposition point the electrical distance of which from said master generator by way of said synchronising signal generator is different from the electrical distance between said superposition point and said master generator by way of said scanning point, and means for compensating for the difference between said two distances.

2. A picture transmission system comprising means, situated at a scanning point, for scanning an object of which an image is to be transmitted to generate trains of picture signals having spacing periods between successive trains, a master generator for generating master controlling signals, means for utilising said master signals to control the operation of said scanning means, a generator of synchronising signals of a frequency which is the same as the frequency of recurrence of said trains, means for utilising said master signals to control the operation of said synchronising signal generator, means for superposing said synchronising signals upon said spacing periods at a superposition point the electrical distance of which from said master generator by way of said synchronising signal generator is less than the electrical distance between said superposition point and said master generator by way of said scanning point, and a delay network arranged in the path from said master generator to said superposition point by way

of said synchronising signal generator for compensating for the difference between said two distances.

3. A picture transmission system comprising means, situated at a scanning point, for scanning an object of which an image is to be transmitted to generate trains of picture signals having spacing periods between successive trains, a master generator for generating master controlling signals, means for utilising said master signals to control the operation of said scanning means, a generator of synchronising signals of a frequency which is the same as the frequency of recurrence of said trains arranged closely adjacent said master generator, means for utilising said master signals to control the operation of said synchronising signal generator, means for superposing said synchronising signals upon said spacing periods at a superposition point the electrical distance of which from said master generator by way of said synchronising signal generator is less than the electrical distance between said superposition point and said master generator by way of said scanning point, a first delay network arranged between said synchronising signal generator and said superposition point, and a second delay network arranged between said master generator and said scanning point.

4. In a television transmission system in which the scanning unit is located at a point remote from the synchronizing signal generator, the method of transmission which comprises the steps of developing a master control signal, controlling the scanning synchronism by means of said master control signal, developing trains of video signals in accordance with the light values of elemental strips of the optical image to be scanned, transmitting said video signals along an electrical path to a point remote from the point of development of the video signals, developing synchronizing signals to be generated under the control of the master control signal, establishing a junction of superposition of the video signals with the synchronizing signals developed, and delaying the transmission of the master control signals to the synchronizing signals generated for a predetermined time interval which bears a definite relationship to the ratio of the distance along the electrical path from the point of generation of the master control signal to the point of superposition of the video and synchronizing signals to be transmitted by each of the two paths of transmission.

5. A picture transmission system comprising means situated at a plurality of scanning points for scanning objects of which an image is to be transmitted to generate trains of picture signals having spacing periods between successive trains, a generator for generating master controlling signals located at different electrical distances from the plurality of scanning means, means for utilizing said master signals to control the operation of said scanning means, a generator of synchronizing signals of a frequency which is the same as the frequency of recurrence of said trains, means for utilizing said master signals to control the operation of said synchronizing signal generator, means for superpositioning said synchronizing signals upon said spacing periods at a superposition point the electrical distance of which from said generator by way of said synchronizing signal generator is less than the electrical distance between said superposition point and said master generator by way of any of said

scanning points; a delay network arranged in the path from said master generator to said super-position point by way of said synchronizing signal generator for compensating for the difference
5 between said two distances, said network being arranged to be capable of introducing a delay at least as great as that experienced by master signals travelling from said master generator to the farthest of said scanning points and thence
10 to said super-position point, means for enabling master signals to be taken off from any of a plurality of tapping points in said network, and means for feeding master signals taken off from said tapping points to any one of said scanning
15 points at will

6. A picture transmission system comprising means situated at a plurality of scanning points for scanning an object of which an image is to be transmitted to generate trains of picture signals having spacing periods between successive
20 trains, a master generator for generating master controlling signals, means for utilizing said master signals to control the operation of any of

said scanning means, a generator of synchronizing signals of a frequency which is the same as the frequency of recurrence of said trains arranged closely adjacent said master generator, means
5 for utilizing said master signals to control the operation of said synchronizing signal generator, means for super-positioning said synchronizing signals upon said spacing periods, a super-position point the electrical distance of which from
10 said master generator by way of said synchronizing signal generator is less than the electrical distance between said super-position point and said master generator by way of said scanning point, a first delay network arranged between
15 said synchronizing signal generator and said super-position point, a second delay network arranged between said master generator and any of said scanning points, and means for connecting any of said scanning points to any one of a plurality of tapped points in said second delay
20 network.

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