Dec. 31, 1940. E. C. CORK ET AL 2,227,066

TELEVISION AND LIKE SYSTEMS

Filed Jan. 14, 1936 2 Sheets-Sheet 1

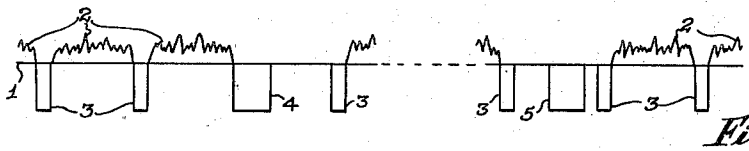


Fig. 1.

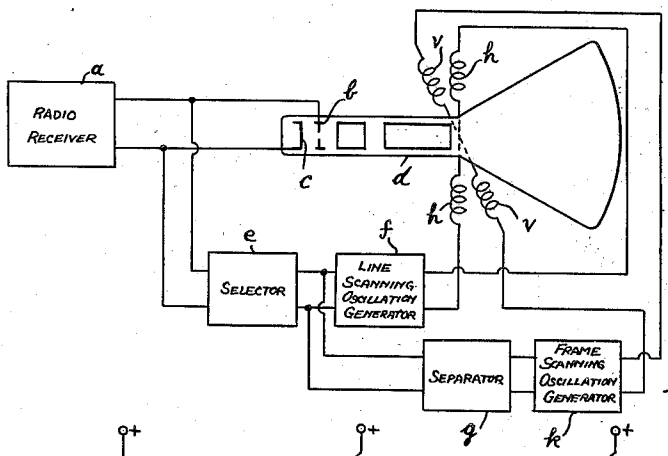


Fig. 2.

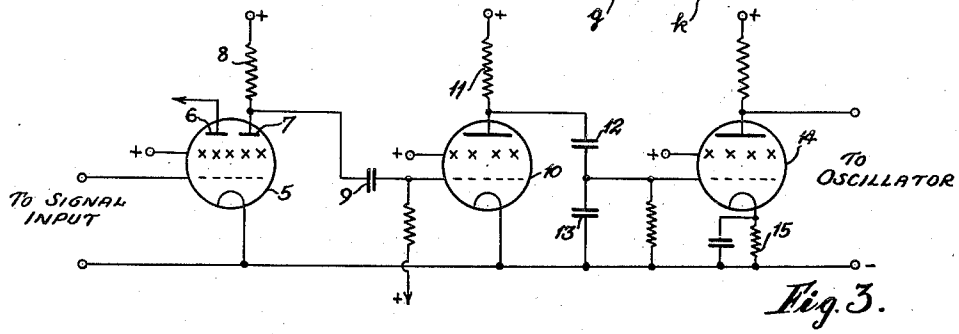


Fig. 3.

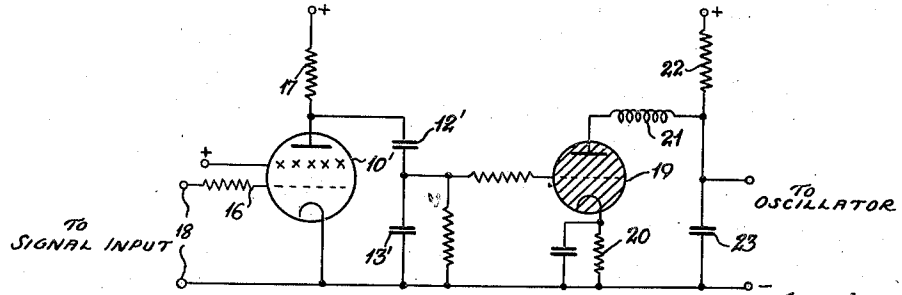


Fig. 4.

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TELEVISION AND LIKE SYSTEMS

Filed Jan. 14, 1936 2 Sheets-Sheet 2

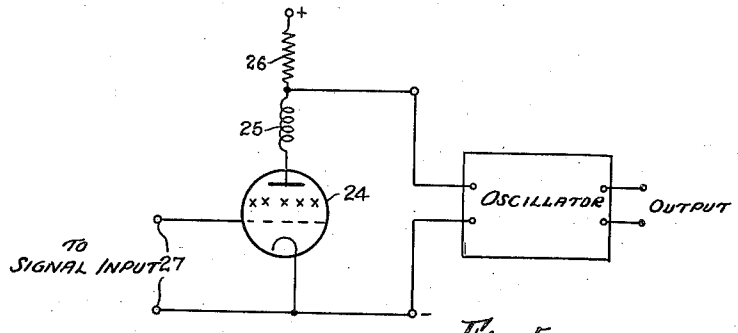


Fig. 5.

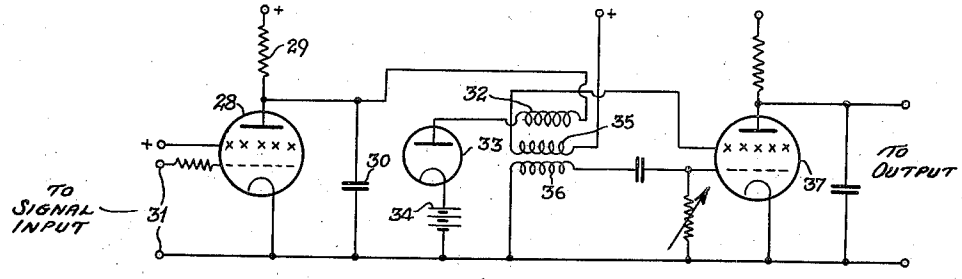


Fig. 6.

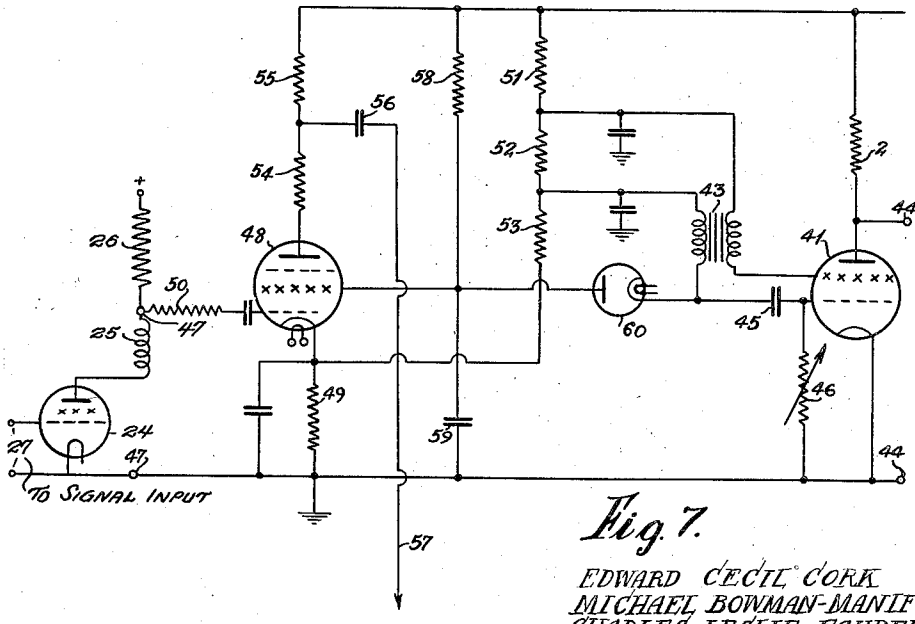


Fig. 7.

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# UNITED STATES PATENT OFFICE

2,227,066

## TELEVISION AND LIKE SYSTEMS

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Application January 14, 1936, Serial No. 59,022
In Great Britain January 15, 1935

15 Claims. (Cl. 178—7.5)

The present invention relates to television and like systems, and is particularly but not exclusively concerned with the problem of synchronising a scanning operation at a receiver of a television system with the scanning operation taking place at the transmitter.

It is usual to control the scanning operation at the receiver by means of impulses generated at the transmitter; in most systems in which, for example, a cathode ray tube is employed to reconstitute the transmitted picture, these impulses are caused to control the generation of saw-tooth scanning oscillations.

Two sets of synchronising impulses are usually transmitted; an impulse, known generally as a strip impulse, is generated immediately before or after the scanning of each strip of the picture to be transmitted, and a frame impulse is generated between complete scans of the picture or, in the case in which the object to be transmitted is a cinematograph film, between the scanning of successive frames. The strip impulses are generally arranged to be of substantially the same amplitude as the frame impulses.

In order that impulses of one set may be separated at the receiver from those of the other, it is usual to arrange that the frame impulses are of longer duration than the strip impulses; since then the frame impulses contain component frequencies lower than any in the strip impulses, the strip impulses may be substantially completely excluded from the frame synchronising apparatus at the receiver by means of a low-pass filter. The effect of this filter is to attenuate the strip impulses relatively to the frame impulses, with the result that the impulses are made to differ considerably in amplitude; they may then be separated from one another by an amplitude separation, or fed to a saw-tooth oscillation generator such for example as a blocking oscillator which requires an impulse of greater than a critical amplitude to trigger it off.

If it is necessary to exclude the frame frequency impulses from the strip synchronising apparatus at the receiver, this may be achieved by means of a high-pass filter.

In systems employing a method such as that outlined above, for separating one set of synchronising impulses from another, it has been found that the operation of frame synchronising has tended to be upset by one or more elements of the low pass filter holding a residual charge after the strip synchronising impulse last received has ceased. The reason for this is that the time constant of the separating means is at least of the same order as the shortest interval between pulses. The residual charge adds to the charge due to the next succeeding impulse and increases its amplitude. In a case in which the impulses are applied to a blocking oscillator, the residual charge held by the filter results in the blocking oscillator being triggered-off earlier than it would otherwise be.

The effect referred to manifests itself more particularly in cases in which interlaced scanning is employed, and it tends to produce distortion of the reconstituted picture. In interlaced scanning, a different set of strips of the object to be transmitted is scanned in each of a small plurality of successive scans of the object, the strips of one of the sets being intercalated between the strips of another set. In such cases, the distortion above mentioned may take the following form: the strips in the reproduced picture may not be evenly interlaced, but may overlap one another, successive groups each comprising a number of strips equal to the number of part-scans making up a complete scan being separated by blank spaces.

To make this point more clear, it will be assumed that the object to be transmitted is scanned completely in two complete scans; the phases of successive framing impulses must then differ by one half of a strip scanning period with respect to the strip impulses, and it is convenient to arrange that one framing impulse occurs near to the end of a strip, while the next occurs near to the middle of a strip period. It will be clear that the residual charge due to the preceding strip impulse which is added to the frame impulses occurring near to the end of a strip is less than the residual charge which is added to the alternate framing impulses occurring near to the middle of a strip. The latter framing impulses thus trigger the blocking oscillator too soon, and the strips in the reproduced picture occur in pairs.

It may also be found that interfering pulses, such as those due to atmospherics, may upset the operation of synchronising. A pulse due to an atmospheric occurring just before a frame impulse may produce a residual charge sufficient to cause that frame impulse to take effect earlier than it would otherwise do, but since atmospherics occur at random intervals, the succeeding frame impulse may take effect at the correct time; distortion of the reproduced picture may arise from this cause whether interlaced scanning is employed or not.

Similar problems arise in systems other than

television systems in which it is desired to separate impulses of a longer duration from impulses of a shorter duration; certain code telegraph systems may be mentioned as examples of such systems. The invention is also applicable to such systems.

It is an object of the present invention to provide improved means for separating a set of impulses from another set of impulses of a different duration, in which the effect of one impulse on that following it may be avoided or reduced.

The present invention accordingly provides a method of separating impulses of relatively long duration from impulses of a relatively short duration, which method comprises the step of converting said impulses into derived pulses, the amplitude of each of which increases during a period of time substantially equal to the duration of the corresponding impulse to a maximum value which is dependent on said duration, and then falls to a minimum value at a rate which is greater than that of the increase and such that said minimum value is substantially fixed. In order that one impulse shall not affect that which follows it, it may be necessary to make the rate at which the amplitude of the derived pulses falls more rapid when the impulses succeed one another closely than when they are more widely spaced.

The invention further provides, for use in television systems, a method of separating frame impulses of relatively long luration from strip impulses of relatively short duration, which method comprises the step of converting said impulses into derived pulses, the amplitude of each of which increases, during a period of time substantially equal to the duration of the corresponding impulse, to a value which is dependent on said duration, and then falls, at a rate which is greater than that of the increase, and is such that, at least in the case of a pulse derived from a line impulse, a substantially fixed value is reached before the arrival of the next impulse.

According to a further feature of the invention, apparatus for separating impulses of relatively long duration from impulses of relatively short duration comprises an impedance element, and controlling means adapted to be fed with both long and short impulses and to cause the charge held by said impedance element to be changed in one sense during the impulses and in the opposite sense during the intervals between impulses, characterised in that the time constant of the circuit determining the rate of change during impulses is much longer than the time constant of the circuit determining the rate of change during intervals between impulses. The time constant of the first-named circuit may be five or more times that of the second-named circuit.

The invention also provides a method of operating apparatus according to the preceding paragraph, according to which the time constant of the second-named circuit is made much shorter than the interval between any short impulse and a longer impulse following it. According to another method of operating apparatus according to the preceding paragraph, the time constant of the first-named circuit is made longer than the duration of a long impulse.

In apparatus according to the invention, the controlling means may be arranged to prevent appreciable charging current flowing in said impedance element except when either a long or a short impulse is operative upon said controlling means. In these circumstances, since the impedance element only takes appreciable charge during the applied impulses, it will be clear that the long impulses give rise to a greater maximum charge than the short impulses. The impedance element may be a condenser, in which case two sets of substantially triangular voltage pulses of different amplitude are set up across the condenser or it may be an inductance coil. In the latter case, the charging current is conveniently caused to flow in a resistance arranged in series with the coil; triangular voltage pulses are then set up across the resistance. The triangular pulses of larger amplitude may then be separated from those of smaller amplitude by an amplitude selection for example. Alternatively, the triangular pulses may be fed directly to a utilising device which in the case of a television system for example, may comprise a saw tooth oscillation generator, and which is arranged to be responsive only to the pulses of larger amplitude.

The controlling means is preferably a thermionic valve which is arranged to allow the impedance element to charge up during the time for which the impulses last. The mixed impulses are conveniently fed to the control grid circuit of the controlling valve. When the impedance element is a condenser, the valve is arranged to be conductive, and to prevent the condenser from charging up, during the intervals between impulses, and it is arranged to be insulating during the impulses. When an inductance coil is employed, however, the valve is arranged to be insulating at all times except when the impulses are operative.

Other features of the invention will appear hereinafter.

Certain embodiments of the present invention as applied to television systems will now be described by way of example with reference to the accompanying drawings: it will be assumed throughout this description that it is desired to separate framing impulses from strip impulses, the latter having the shorter duration; it will also be assumed that separation is effected at the receiver, and that the received signal, in which the two sets of impulses appear together, is of the form shown in Fig. 1.

In the drawings, Fig. 2 shows schematically, by way of example, a television receiver, employing a cathode ray tube as a picture-reconstituting device, to which the present invention is applicable, and Figs. 3 to 7 show various circuit arrangements suitable for use in the receiver of Fig. 2.

Referring to Fig. 1, the line 1 represents a datum line corresponding to black in the picture signals 2. The strip impulses 3 and the framing impulses, of which only two, numbered 4 and 5 are shown, are all of substantially the same amplitude and are transmitted in the blacker-than-black sense. The framing impulses are of longer duration than the strip impulses, and are adapted to give interlaced scanning in two traversals of the object to be transmitted. The framing impulse 4 commences at the end of a strip period, whilst the impulse 5 commences at the middle of a strip. The signal of Fig. 1 is given for purposes of explanation only, and the invention is of course not restricted to this particular form of signal. For example, a plurality of impulses may be transmitted at the end of

each frame, and the synchronising impulses may be in the same sense as the picture signals, but of greater amplitude. Furthermore, as has been stated, the invention is not limited to interlaced scanning; where, however, interlaced scanning is employed, the object to be transmitted may be completely scanned in more than two traversals.

In Fig. 2, the radio receiver *a* is arranged for the reception of a carrier wave modulated with a signal of the form shown in Fig. 1, this signal being extracted by detection and established between the modulator *b* and the cathode *c* of the cathode-ray picture-reconstituting device *d*. The signal of Fig. 1 is also applied to a selector *e* which serves to free the synchronising signals (3, 4 and 5) from picture signals (2), and to feed the synchronising signals to a line-frequency scanning oscillation generator *f* and to a separator *g*, the latter serving to separate frame scanning impulses from line scanning impulses and to feed the frame impulses to a frame-frequency scanning oscillation generator *k*. The generator *f* feeds saw-tooth line-scanning oscillations to scanning coils *h* and generator *k* feeds similar oscillations at frame frequency to coils *v*.

Referring to Fig. 3, which shows one form which the apparatus *e* and *g* may take, a screened grid valve having two anodes 6 and 7, has its anode 7 connected through a load resistance 8 to a point in a suitable anode current source, which is not shown for the sake of simplicity. All points in the figure bearing a positive sign are connected to this source, which has its negative terminal connected to the cathode of valve 5. The anode 6 of the valve 5 also has a load resistance, not shown, and is arranged to feed the received synchronising impulses to the strip-frequency scanning oscillation generator *f*, Fig. 2 which, since the received picture is to be reconstituted by means of a cathode ray tube, may conveniently comprise a saw-tooth oscillation generator such as a blocking oscillator.

It will be noted that all of the synchronising impulses have an initial steep transient portion. With the exception of that of impulse 5, and every alternate framing impulse thereafter and therebefore, these transient portions recur at the strip scanning frequency, and all of the synchronising impulses, including the framing impulses, are fed to the strip synchronising apparatus. The framing impulses, with the exception of those occurring during the strip periods, thus assist in maintaining the strip scanning operation in synchronism.

The received signal (Fig. 1) is fed to the control grid circuit of valve 5 in such a sense that the synchronising impulses drive the control grid potential in the positive direction. The control grid is biased to a point just beyond anode current cut-off, and thus of the received signal, only the synchronising impulses cause anode current to flow, the picture signals being ineffective.

The synchronising impulses, free from picture signals, are set up across resistance 8 and are fed through coupling condenser 9 to the control grid circuit of a screened grid valve 10. The control grid of this valve is biased to a small positive potential. The amplitude of the synchronising impulses at the control grid of the valve 10 is made such that each impulse swings the potential of that grid to a value more negative than that corresponding to anode current cut-off, so that the valve passes no anode current during the synchronising impulses.

The anode circuit of valve 10 comprises a high resistance 11, and two condensers 12 and 13 are connected in series between the anode and the cathode of this valve. It will be clear that during the intervals between synchronising impulses, that is, when valve 10 is conducting, most of the current in resistance 11 flows through valve 10; little charge flows to condensers 12 and 13, and a certain small datum potential difference (which may be arranged to be approximately zero) is set up across condenser 13. However, during an impulse, when valve 10 is insulating, the condensers 12 and 13 charge up, condenser 13 reaching to a potential which exceeds the datum potential, and is dependent, inter alia, upon the duration of the impulse. Furthermore, when the impulse ceases, the potential difference across condenser 13 is relatively rapidly reduced to the datum value, and no residual charge due to the impulse remains to add to the next succeeding impulse.

In one arrangement, employing a received signal of the form shown in Fig. 1, the duration of each of the line impulses is 10 microseconds (ms.), the frame impulses each have a duration of 40 ms., and the minimum interval between successive line and frame impulses is 40 ms.; in this arrangement, the time constant governing the charging of condensers 12 and 13 is approximately 200 ms., while the effective time constant of discharge is approximately 5 ms.

A series of triangular voltage pulses, the amplitude of each of which rises during the impulse period to a maximum value dependent on the duration of the impulse and then falls at a relatively rapid rate to a substantially fixed minimum value, is thus set up across condenser 13. The triangular pulses due to the framing impulses are of greater amplitude than those due to the strip impulses, and the whole series of pulses is fed to a valve 14, which is arranged to effect an amplitude selection.

The control grid of valve 14 is biased relatively to its cathode by means of biasing resistance 15 and its associated shunt condenser to a point beyond anode current cut-off, and it is arranged that only the triangular pulses of greater amplitude are able to cause anode current to flow. There is thus set up in the output circuit of valve 14 a series of pulses each of which has the same phase as the framing impulse which initiated it. The output circuit of valve 14 is coupled to a blocking oscillator for example, which constitutes the frame-frequency generator *k*, and each pulse in the output circuit of valve 14 is arranged to initiate a return stroke of the saw-tooth frame scanning oscillation.

In the arrangement shown in Fig. 4, the valve 10', which corresponds to valve 10 in Fig. 3, has a resistance 16 in its grid circuit, and a load resistance 17 of high value in its anode circuit. The valve 10' may be shunted by a similar screened grid valve (not shown) to feed the line synchronising apparatus, or a double-anode valve may be employed in place of valve 10'. The received signal is applied to input terminals 18 in such a sense that the picture signals tend to make the control grid more positive; the control grid is biased so that picture black makes the grid slightly more positive with respect to the cathode than the potential at which grid current commences to flow, and the picture signals accordingly lie within the region of grid current, but owing to the voltage drop across resistance 16,

the actual grid potential remains substantially constant and unaffected by the flow of grid current. The synchronising impulses are arranged to reduce the grid potential to a point more negative than anode current cut-off.

Connected between the anode and cathode of valve 10' are two condensers 12' and 13' arranged in series. As in the arrangement of Fig. 2, a series of triangular pulses is set up across condenser 13', the pulses corresponding to the framing impulses being of greater amplitude than those corresponding to the strip impulses.

The whole series of pulses set up across condenser 13' is applied between the control grid and cathode of a grid-controlled gas discharge tube 19, the grid of which is so highly negatively biased by means of biasing resistance 20 and its associated shunt condenser that only the pulses of greater amplitude set up across condenser 13' are able to initiate the flow of anode current in the tube 19.

The anode circuit of the tube 19 comprises coil 21, resistance 22 and condenser 23 arranged as shown; the circuit 19, 21, 22 and 23 is self-oscillatory, and operates to set up a potential difference of saw-tooth wave form across condenser 23, and it is arranged that the frequency of this saw-tooth oscillation is equal to the frequency of the voltage pulses of greater amplitude, and hence to the framing frequency. The saw-tooth oscillation set up across condenser 23 is employed for scanning purposes. The valve 19 and its associated circuit thus constitutes the frame-oscillation generator *k* of Fig. 1.

In a modification of the arrangements of Figs. 3 and 4, the condensers 12 and 13, or 12' and 13' respectively, are connected in series between the anode of controlling valve 10 or 10' and the positive terminal of the anode current source. Now in the arrangements of Figs. 3 and 4, when an impulse arrives, the potential at the junction point of the two condensers becomes more positive, and the potential difference across condensers 13 and 13' increases. In the modified arrangements, although the potential at the junction point becomes more positive when an impulse arrives, the potential difference across condensers 13 and 13' decreases. The modified arrangements are fundamentally equivalent to those shown in Figs. 3 and 4, and in both cases the change in the charge on condensers 13 and 13' may be regarded as due to the flow of charging current tending to make the junction point of condensers 12 and 13, or 12' and 13' more positive.

Fig. 5 shows an arrangement in which the synchronising impulses are converted into triangular voltage pulses of different amplitudes by causing them to initiate the flow of charging current in an inductance.

Referring to Fig. 5, a screened grid valve 24 has in its anode circuit an inductance coil 25 in series with a resistance 26. Means (not shown) are provided whereby the control grid of valve 24 is so biased, relatively to the cathode thereof, that no anode current flows in the absence of applied signals, and a received signal (such as that of Fig. 1) is applied to input terminals 27 in such a sense that only the synchronising impulses cause anode current to flow, the picture signals having no effect. The time constant of the coil 25 and resistance 26 is made longer than the duration of a framing impulse, and during each synchronising impulse, the valve 24 conducts and a current gradually builds up in coil 25. At the end of the pulse, the valve insulates and the charging current is shut off; triangular voltage pulses are thus set up across resistance 26.

Means (not shown) are preferably provided, in the arrangement of Fig. 5, for damping the back electromotive force set up across the coil 25.

A backed-off diode valve may be employed, if desired, to separate the triangular voltage pulses of greater amplitude from those of smaller amplitude. An arrangement employing a diode valve is shown in Fig. 6.

Referring to Fig. 6, a screened grid valve 28 has an anode resistance 29, and a condenser 30 connected between its anode and cathode. Means (not shown) are provided whereby the control grid of valve 28 is biased, relative to the cathode thereof, so that picture black makes the grid slightly more positive (relative to the cathode) than the potential at which grid current commences to flow, and the received signal is applied to the input terminals 31 in such a sense that the picture signals lie within the region of grid current, the synchronising impulses reducing the anode current in the valve to zero. As in the arrangement of Fig. 3, triangular voltage pulses are set up across condenser 30.

These voltage pulses are established across a circuit comprising a winding 32 of a three coil transformer, a diode valve 33, and a source of potential difference 34 which is arranged with its positive pole connected to the cathode of diode 33. The potential of the source 34 is greater than the potential set up at the anode of the diode by the voltage pulses of smaller amplitude set up across condenser 30, but is less than the potential due to the pulses of greater amplitude. Each of these latter pulses thus causes current to flow in the diode 33 and winding 32; in a modified arrangement, which is sometimes found preferable, the positions of diode 33 and coil 22 are reversed, the anode of the diode being connected to the anode of valve 28.

The windings 35 and 36 of the transformer form a part of the frame frequency blocking oscillator, which is of a known kind, and comprises a blocking oscillator valve 37; for the sake of simplicity, it is not proposed to describe either the construction or the method of working of this blocking oscillator, since these details are not of primary importance from the point of view of the present invention. It will suffice to say that the blocking oscillator can be arranged to generate a saw-tooth oscillation of the same frequency as controlling impulses applied to the blocking oscillator valve 37; when current flows in diode 33 and winding 32, due to a pulse of greater amplitude across condenser 30, the impulse which is accordingly set up across winding 36 is fed to the grid circuit of blocking oscillator valve 37, and initiates a return stroke of the saw-tooth oscillation.

A dry contact rectifier may be employed in place of the valve 33 in the arrangement shown in Fig. 6; preferably the winding 32 of the three-coil transformer is electrostatically screened from the remaining windings.

Referring now to Fig. 7, which shows diagrammatically a preferred form which the apparatus *e*, *g* and *k* of Fig. 2 may take, a screen grid valve 41 has its anode connected to the positive terminal of a source (not shown) of anode current, the negative terminal of which is earthed, through a resistance 42, and has its control and screen grid circuits coupled together by means

of an iron-cored transformer 43. The valve 41 is adapted to operate as a blocking oscillator, and to generate saw-tooth scanning oscillations which are taken off from a suitable condenser (not shown) connected between terminals 44. A condenser 45 is connected in the control grid circuit of valve 41, and the grid of this valve is connected to its cathode through a leak resistance 46.

Received television signals of a form such as that illustrated in Fig. 1 already referred to, are fed to input terminals 27 and, for example, by an arrangement similar to that disclosed by Fig. 5, are established between the control grid and cathode of a pentode valve 48 in such a sense that the picture signals cause the control grid potential to increase in the positive direction relative to the cathode potential.

Now the D. C. component of the picture signals is arranged to be present in the received signals, and in the case of a transmission by modulated carrier, it is arranged that the output from the signal detector at the carrier amplitude corresponding to black in the picture is somewhat positive relative to earth; valve 48 is connected through a conducive coupling to the output electrode of the signal detector, and the control grid is accordingly biased negatively to a corresponding suitable extent relatively to its cathode by means of biasing resistance 49, which is in series with resistances 51, 52 and 53 between the positive and negative terminals of the anode current source, and grid current thus flows while picture signals of any amplitude from black upwards are present on the control grid. A high resistance 50 is connected in series with the control grid-cathode path of valve 48, and the flow of grid current thus produces substantially no change in the control grid potential of the valve. The picture signals accordingly produce substantially no changes in anode current, and the synchronising impulses are thus effectively freed from them.

The anode of valve 48 is connected to the positive terminal of the anode current source through two resistances 54 and 55 in series, and the junction point of these resistances is connected through condenser 56 to the input circuit of a strip frequency blocking oscillator (not shown) by means of lead 57. If resistances 54 and 55 are made sufficiently large, then, with a suitable screen-grid potential, the synchronising signals are freed from picture signals by anode current limitation, and the separation is then not dependent upon the flow of grid current. The resistance 50 is retained in this case, however, and serves to reduce the load on the source of signals due to the input capacity of valve 48. Resistances 54 and 55 may have respectively the values 50,000 ohms and 200,000 ohms.

Current is fed to the screen grid of valve 48 through resistance 58, and a condenser 59 is connected between the screen grid and earth. In operation, the synchronising impulses swing the control grid of valve 48 negatively to such an extent that current in the anode and screen grid circuits of this valve is cut-off. Synchronising impulses appearing at the anode are led to the strip-frequency blocking oscillator. The resistance 54 serves, firstly, to determine the amplitude of the triggering pulse fed to the blocking oscillator valve 41, and, secondly, to prevent loading of the line-frequency oscillator transformer (not shown) by the valve 48; the latter may arise, for example, should the shape of the synchronising signal be such that current commences to flow in valve 48 before the oscillation generated by the blocking oscillator ceases. During each synchronising impulse appearing at the control grid of valve 48, condenser 59 receives a charge. When the impulse ceases, the condenser 59 discharges through the screen grid-cathode path of valve 48.

A series of substantially triangular voltage pulses is thus set up across condenser 59, the pulses each having an amplitude dependent on the duration of the synchronising impulse to which it is due, and on the magnitude of condenser 59. The frame impulses thus produce triangular pulses of greater amplitude than do the strip impulses.

The whole series of triangular pulses is established between the anode and cathode of a diode valve 60. The cathode of the diode 60 is connected to the junction point of resistance 52 and 53 and is thus biased positively relative to earth, the magnitude of this bias being made greater than the steady potential of the anode of diode 60, that is, the potential of the screening grid of valve 48 in the absence of synchronising signals by an amount such that current flows in diode 60 only when a triangular pulse due to a frame impulse is applied to it. The diode 60 is connected in series with one winding of transformer 43, and when a frame impulse is received on the grid of valve 48, a pulse of current flows in the diode and in the transformer winding, and the blocking oscillator valve 41 is thus triggered off.

It will be observed that since the valve 48 is a pentode, disturbances from the strip-frequency blocking oscillator which may be fed back along lead 57 to the anode of valve 48 are prevented by the screening action of the suppressor grid, from affecting the frame frequency oscillator. Furthermore, disturbances from the frame-frequency oscillator are to some extent prevented from reaching the strip-frequency oscillator by the diode 60. However, in general, the scanning oscillation generated by the frame-frequency oscillator lasts for several line intervals, and during a part of the cycle of this oscillation, the diode 60 may conduct, and this may result in the potential of the screen grid of valve 48 being reduced to such an extent that the anode current of this valve is cut off. Should this happen, strip synchronising impulses are prevented from reaching the strip-frequency oscillator, which may accordingly fall out of synchronism. This effect may be avoided by giving the screening grid of the valve 48 a suitably chosen high positive potential, or by connecting the cathode of diode 60 not to the lower end of the control grid winding of transformer 43, but to a suitable tapping point therein, in which case resistance 52 may be short-circuited.

The invention is, of course, not limited to the arrangements described, and many modifications and elaborations of these arrangements, within the scope of the appended claims will be apparent to those versed in the art.

We claim:

1. In a method of separating impulses of relatively long duration from impulses of a relatively short duration, the steps of converting the impulses into derived impulses, increasing the amplitude of each of the derived impulses in accordance with the duration of the first two named impulses, and decreasing the amplitude of the derived impulses at a rate greater than that of the rate of increase to a predetermined minimum value.

2. In a method of separating frame impulses of

relatively long duration from line impulses of relatively short duration, the steps of converting the impulses into derived impulses, increasing the amplitude of each of the derived impulses in accordance with the duration of the first two named impulses, decreasing the amplitude of the derived impulses at a rate greater than that of the rate of increase to a predetermined minimum value, and initiating successive derived impulses only after the cessation of the preceding derived impulse.

3. Apparatus for separating impulses of relatively long duration from impulses of a relatively short duration, comprising an impedance element, means for storing energy in said impedance element, means for controlling the time periods during which the storing means is operative by received impulses, means for enabling the stored energy to change in one sense during the time said impulses are received, and an electrical network having a time constant much shorter than said last named means for enabling the stored energy to change in the opposite sense during intervals between received impulses.

4. Apparatus as claimed in claim 3 and wherein the time constant of the electrical network is made shorter than the interval between any short impulse and a subsequent long impulse.

5. Apparatus as claimed in claim 3 wherein the time constant of the last named means is made longer than the duration of a long impulse.

6. A television synchronizing system including apparatus for separating impulses of relatively long duration from impulses of a relatively short duration, said apparatus comprising an impedance element, a circuit for enabling a charge held by said impedance element to change in one sense during said impulses, a circuit having a time constant much shorter than that of said first-named circuit for enabling the charge held by said impedance element to change in the opposite sense during intervals between impulses, controlling means for preventing substantial charging current flowing in said impedance element except when one of said impulses is operative upon said controlling means, means for feeding both long and short impulses to said controlling means an oscillation generator, and means to initiate oscillations of said generator by potentials arising from the charge in said impedance element.

7. Apparatus according to claim 6, for use in television systems, wherein said controlling means comprises a discharge device, means for feeding composite signals comprising picture signals and frame and line synchronising impulses to said controlling means, and means for operating said discharge device to control the charging of said impedance element and amplitude separation means to segregate said impulses from picture signals.

8. Apparatus for separating impulses of relatively long duration, from impulses of a relatively short duration, said apparatus comprising a condenser, a thermionic valve having the anode-cathode path thereof arranged effectively in shunt with said condenser, means for feeding said long and short impulses to said valve, means for causing said path to be conducting in the absence of an impulse of either duration and means to make said path non-conducting when an impulse is present, and a source of charging current for said condenser.

9. Apparatus according to claim 8, comprising a thermionic valve having a cathode, an anode and a control grid, means including the condenser for increasing the potential of the control grid in a positive sense relative to said cathode, and means for biasing said control grid normally to cut-off potential, and means to reduce said cut-off potential to make the valve conductive only in accordance with the impulses of relatively long duration.

10. Apparatus according to claim 8, comprising a unidirectionally-conducting device, a source of potential difference in series with said device, and means for establishing derived voltage pulses set up across said condenser across said device and said source in series, the magnitude and sense of the potential difference of said source being such that current flows in said device only when a derived pulse of greater amplitude exists across said condenser.

11. A television synchronizing system including apparatus for separating impulses of relatively long duration from impulses of a relatively short duration, said apparatus comprising an inductance coil, a thermionic valve having the anode-cathode path thereof arranged effectively in series with said coil, means for feeding said long and short impulses to said valve, means for rendering said path non-conducting in the absence of an impulse of either duration and to become conducting when an impulse is present, a source of charging current for said coil, an oscillation generator, and means to initiate oscillations of said generator in accordance with a flow of current through said inductance coil.

12. A television synchronizing system including apparatus for separating impulses of relatively long duration from impulses of a relatively short duration, said apparatus comprising an inductance coil, a thermionic valve having the anode-cathode path thereof arranged effectively in series with said coil, means for feeding said long and short impulses to said valve, means for rendering said path non-conducting in the absence of an impulse of either duration and to become conducting when an impulse is present, a source of charging current for said coil, a resistive impedance adapted to be traversed by said charging current, an oscillation generator, and means to initiate oscillations of said generator in accordance with the flow of current through said inductance coil.

13. Apparatus according to claim 12, comprising a thermionic valve having a cathode, an anode and a control grid, means for causing derived voltage pulses set up across said resistive impedance to cause the potential of said control grid to increase in the positive sense relative to said cathode, and means for biasing said control grid relative to said cathode to a negative potential which is of such a magnitude that, in operation, only those voltage pulses which correspond to longer impulses cause anode current to flow.

14. Apparatus according to claim 12, comprising a unidirectionally-conducting device, a source of potential difference in series with said device, and means for establishing derived voltage pulses set up across said resistive impedance across said device and said source in series, the magnitude and sense of the potential difference of said source being such that current flows in said device only when a derived pulse of greater amplitude exists across said resistive impedance.

15. In a television system in which synchronizing impulses of two different time durations but with equal amplitudes are transmitted sequentially with picture signals, the method of syn-

chronizing a picture reproducer at a receiving point, which comprises the steps of receiving the picture signals and both the synchronizing impulses, separating the picture signals from the synchronizing impulses, converting the synchronizing impulses into impulses having different amplitudes determined by the time duration of the corresponding impulse, separating the lower amplitude converted synchronizing impulses from the higher amplitude converted synchronizing impulses, initiating energy flow of a first source of wave energy by the separated lower amplitude impulses, initiating energy flow of a second source of wave energy by the separated higher amplitude impulses, and controlling the picture reproducer by both of the controlled sources of wave energy.

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