Dec. 16, 1941. R. ANDRIEU 2,265,988

ELECTRICAL IMPULSE SEGREGATION CIRCUIT

Filed Jan. 30, 1937

Fig. 1

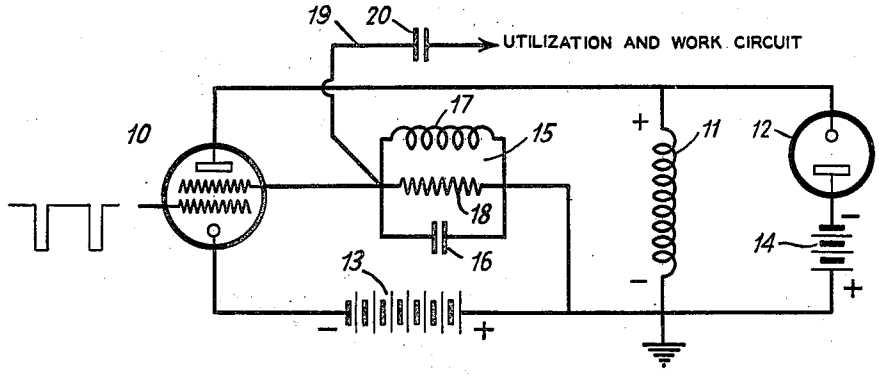


Fig. 2

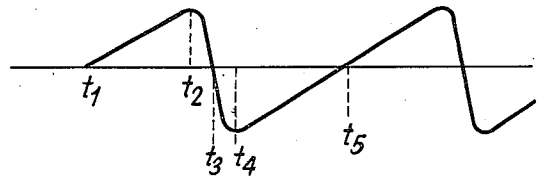


Fig. 3

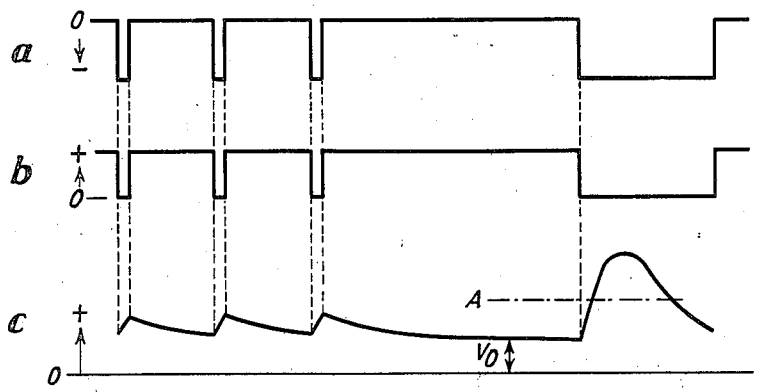
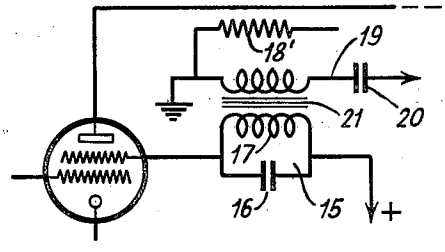


Fig. 4



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ELECTRICAL IMPULSE SEGREGATION CIRCUIT

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3 Claims. (Cl. 178—7.5)

To synchronize the line and line shift motion in television receiver apparatus in which the incoming picture is re-created upon the fluorescent screen of a cathode-ray tube, it is known to the prior art to transmit the horizontal and vertical impulses with like amplitude, but different duration of time. At the receiving end there is then required a frequency selector (filter) stage for the purpose of separating the two kinds of impulse from one another. Now, the operation of such frequency selector means, especially in interlacing methods comprising two sequences of lines per frame, is attended with certain difficulties. These are ascribable to the fact that the vertical impulse in one sequence of lines presents to the preceding horizontal impulse a time interval which differs from that of the other line sequence in the same picture or frame. A similar situation prevails if the complete transmission of a television frame is effected by three or more line sequences. The vertical impulse, in each line sequence, then presents another time space relative to the preceding horizontal impulse. It is due to this difference in the interval that the vertical impulse, in each line sequence, strikes the frequency selector circuit in a different state, with the result that, even if the shapes of the vertical impulses are perfectly alike, the said circuit will exhibit dissimilar reaction or response, and the vertical sweep of the spot on the screen of the Braun tube will differ from one line sequence to the next. The consequence is that the lines belonging to one sequence will fail to fit properly into the intermediary spaces of the other sequence or sequences, and this proves a serious annoyance in viewing the television picture, even if the vertical shift of the lines in relation to one another is but slight.

Now, in order to preclude such different working of the frequency selector stage it has already been suggested in the prior art to omit at least the last horizontal impulse of each line sequence. What is thus attained is that the frequency selector stage, prior to the arrival of each vertical impulse has become adjusted to the same state so that the vertical motion of the spot occurs in exactly the same way in both line sequences.

According to the invention the frequency selector means in this latter case is to consist of a resonant circuit tuned to the line frequency and being damped at least aperiodically, the said resonance circuit being united with a current-carrying electrode of a tube whose control grid is influenced by synchronizing impulses, while associated with the oscillation circuit is an amplitude selector stage.

Two exemplified embodiments of the invention are illustrated in the accompanying drawing. In these the oscillation circuit is connected with the screen grid of a tube (it being noted in this connection that the screen grid of a tube, like the anode or plate, is a current-carrying electrode, contradistinct to the control grid which as a general rule has voltage impressed on it while carrying no current), the said tube producing the sawtooth current for magnetic deflection in the horizontal sense.

My invention will best be understood by reference to the drawing in which:

Fig. 1 is an embodiment of my invention,

Fig. 2 is an explanatory curve,

Figs. 3*a*, *b* and *c* are explanatory curves, and

Fig. 4 is another embodiment of my invention.

Referring to Fig. 1, **10** denotes a screen-grid tube, **11** the deflection coil, **12** a rectifier, **13**, **14**, two sources of D. C. potential, and **15** an oscillation circuit roughly tuned to the line frequency and being at least aperiodically damped. The said oscillation circuit comprises the condenser **16**, the choke-coil **17** and a resistance **18**. The resistance could also be arranged in series with the condenser or the choke-coil, or with both, in fact, a parallel arrangement is indicated in Fig. 1 merely by way of example.

There shall now be explained first the operation of the sawtooth generator, the assumption being made that at time t_1 the current flowing in coil **11** shall be zero, and that the control grid of the tube **10** is at no potential difference with respect to the catode. Through the tube **10** and the rectifier **12** there is then flowing a current in view of the fact that the potential **13** is higher than potential **14**. As a consequence, potential **14** will arise at the deflector coil **11** if the rectifier **12** is supported to be free from resistance. As a result, the current flowing through the coil **11** must present a linear rise with time until at instant t_2 a negative impulse arises at the control grid of tube **10** when the flow of current is interrupted. The coil then experiences a free half cycle (error in original text) in the course of which the current, at time t_3, passes through zero and thereupon tends to reach its crest value in the contrary sense. This maximum is attained at the instant t_4; at the same time, the voltage which, during the said alternation was acting in a sense as indicated by the plus and minus signs in the drawing passes through zero in view of the fact that it presents

a phase shift of 90 degrees in reference to the current in the coil. A brief instant after time t_4 the voltage across the coil, as will be seen, assumes the opposite sign as indicated in Fig. 1, and thereupon rises in accordance with a sinuous curve. As soon as the coil voltage has become higher than the voltage of the source of potential 14, the rectifier 12 which at the cut-off of the current in tube 10 has also become currentless, is re-opened with the result that the coil 11 is again acted upon by the source of D. C. voltage 14 so that the current flowing through the coil must again vary in proportion to the time. This variation involves the same differential quotient as in the interval t_1, t_2, seeing that the voltage 14 in both instances has the same sense. Hence, the current flowing in the coil decays and when the tube 10 has again become conducting for the current, the coil current will pass again through zero at the instant t_5, whereupon the cycle before described is repeated.

Now, in order to explain the operation of the oscillation circuit 15 the assumption shall be made that the voltage at the control grid of the tube 10 is rendered negative only for the duration of the free alternation of the coil. Hence, the horizontal impulses have a shape such as shown in Fig. 3*a*. The corresponding form of the plate current and also the shape of the screen-grid current (plotted on a different scale) is shown in Fig. 3*b*. In the oscillation circuit 15, during the arrival of the horizontal impulse, there occurs a certain voltage fluctuation equal to the frequency of the horizontal impulse. Upon each and every interruption of the plate current also the screen-grid current experiences a break; and the magnetic field of the choke-coil 17 as well as the charge of the condenser start to produce a current in the sense of reducing the voltage prevailing across the condenser 16 the sense of which is indicated by plus and minus signs. This corresponds to a rise of potential of the screen grid to ground. When the flow of screen-grid current is resumed, the potential across the condenser 16 grows again in the sense of the indicated plus and minus signs, and the screen grid potential is shifted again in the negative sense until the next horizontal impulse comes in. The potential variations of the grid therefore have a trend as indicated on the left-hand side, Fig. 3*c*. If prior to the vertical impulse one or more horizontal impulses drop out, the condenser 16 is able to adjust itself to a constant potential. In the presence of zero resistance of the choke-coil 17, this is also zero, while in the presence of a finite resistance of the said choke-coil it would correspond to the fall of potential set up by the screen-grid current at the parallel connection of this finite resistance and the resistance 18. This constant potential is designed by V_0 in Fig. 3*c*. But if, then, by the vertical impulse the screen-grid current is interrupted for a comparatively long period of time, the resonance circuit experiences a complete aperiodic oscillation. Hence, the potential of the screen grid assumes a higher value than what is possible during the brief horizontal impulses, in fact, it has a shape as roughly indicated on the right-hand side in Fig. 3*c*. The powerful voltage amplitude may be utilized for the object of initiating the vertical change by the aid of an amplitude selector means which, for example, may be set to the value A, Fig. 3*c*, and which is rendered operative by way of lead 19 containing a blocking condenser.

In the second exemplified embodiment as shown in Fig. 4 the damping resistance 18' is in transformer coupling relationship with the oscillation circuit 15, contradistinct to the direct coupling in Fig. 1. The amplitude selector stage is operated by way of the transformer 21.

This circuit scheme offers the merit that such voltage variation as may happen in the voltage source 13 (consisting as a general rule of a power pack) of a frequency of 25 cycles will be unable to cause a shift (displacement) of the lines comprised in the first sequence or partial scan in relation to those of the second sequence seeing that the transformer will be able to handle and transfer a frequency of 25 cycles only to a very slight degree. A frequency component of 25 cycles may be due to the fact that in one line sequence of a picture or frame, there occurs one horizontal impulse more than in the respective other series, and that these line sequences having an additional impulse occur at a frequency of 25 cycles.

What I claim is:

1. An apparatus for utilizing sets of signals of substantially the same amplitude and of differing frequencies comprising a thermionic vacuum tube having anode, cathode, control and screen electrodes, means for biasing the anode of said thermionic tube positively with respect to the cathode thereof, electromagnetic energy storage means connected in the anode-cathode circuit of said tube, means for substantially linearly storing energy in said electromagnetic energy storage means, means for rendering said thermionic tube impervious to current flow by means of said sets of signals to be utilized, and a resonant circuit connected in the screen electrode-cathode circuit of said thermionic tube, and means coupling said resonant circuit to a work circuit.

2. Apparatus in accordance with claim 1, wherein there is provided in addition a diode and a source of biasing potential connected serially with said diode, said series connection of said diode and said source of potential being connected substantially in parallel with the electromagnetic energy storage means connected in the anode-cathode circuit of said thermionic tube.

3. Apparatus in accordance with claim 1, wherein said resonant circuit is resonant to one of said sets of impulses.

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