

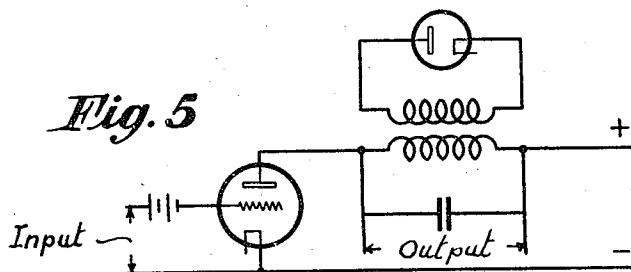
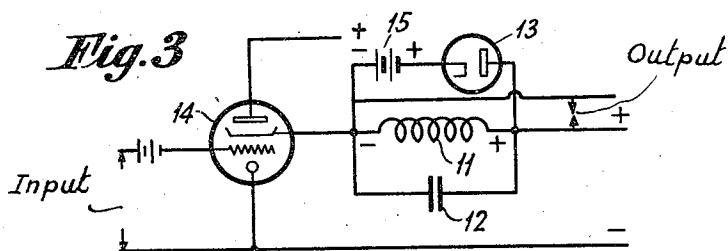
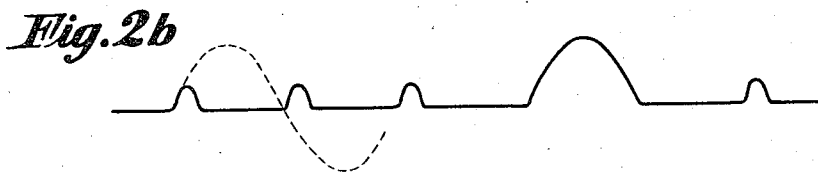
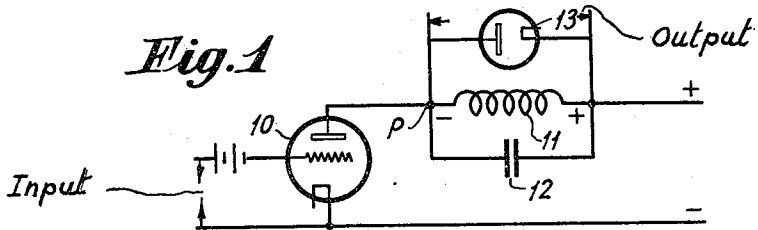
Nov. 28, 1939.

R. ANDRIEU

2,181,309

ELECTRICAL IMPULSE SEGREGATION CIRCUIT

Filed May 21, 1936



INVENTOR
R. ANDRIEU
BY *H.S. Grover*
ATTORNEY

UNITED STATES PATENT OFFICE

2,181,309

ELECTRICAL IMPULSE SEGREGATION
CIRCUIT

Robert Andrien, Berlin, Germany, assignor to
Telefunken Gesellschaft für Drahtlose Tele-
graphie m. b. H., Berlin, Germany, a corpora-
tion of Germany

Application May 21, 1936, Serial No. 81,037
In Germany April 9, 1935

6 Claims. (Cl. 250-27)

The invention relates to a circuit adapted to separate electrical impulses of longer duration from those of shorter duration, and is useful particularly to separate vertical and horizontal synchronizing impulses in television apparatus. It consists in providing an oscillatory circuit whose natural quarter-period is greater than the length of the short impulses and whose half period is somewhat less than the length of the long im-
pulses.

It is common practice to transmit vertical and horizontal synchronizing signals in television practice and the vertical synchronizing signals are of considerably longer duration than the horizontal synchronizing signals, although horizontal signals are transmitted much more frequently than the vertical synchronizing impulses, hence two sets of impulses varying considerably in frequency but of approximately the same amplitude are transmitted.

These signals may be utilized at the receiver for synchronizing purposes but segregation is necessary. Two methods of segregation may be taken advantage of, namely by way of frequency segregation or by changing the amplitude of the received sets of impulses and separating them by amplitude discriminating methods. My invention is an arrangement for changing the amplitude of the received impulses in accordance with their frequency and may best be understood by reference to the accompanying drawing in which:

Fig. 1 is a circuit arrangement embodying my invention.

Fig. 2a is a curve showing the relation between the vertical and horizontal signals.

Fig. 2b is a curve showing the relative amplitudes of the signals after being changed in accordance with my invention.

Fig. 3 is one modification of my invention.

Fig. 4 is a curve showing the relation between the impressed vertical and horizontal synchronizing signals to be used with the modification in Fig. 3.

Fig. 5 is a modification of that form of the invention shown by Figs. 1 and 3.

Referring to Fig. 1, 10 denotes a triode, and in the circuit thereof is connected an oscillatory circuit comprising a choke-coil 11 and a condenser 12, with a rectifier 13 being connected in parallel thereto.

The grid of the said triode 10 shall be assumed to be fed with the current impulses to be separated in the form of positive voltage pulses having a shape such as shown in Fig. 2a. During the intermissions or spaces, triode 10 blocks

the flow of current completely, while when an impulse occurs, the normally blocked triode 10 conducts current in accordance with the impulse. Fig. 2 shows the shape of the potential across the choke-coil 11. At the beginning of each im-
pulse, by way of the triode 10 as stated, the negative pole of the plate battery is united with point P so that the plate current starts to flow by way of the triode 10. During this rise of the current the choke-coil 11 sets up a counter electromotive force, the sense of which is indicated by plus and minus signs and which occasions a charge of the condenser 12 in the corresponding sense. If the impulse were to last for an unlimited length of time, then the voltage across the choke-coil would experience a change according to a sine law (indicated by the broken line in Fig. 2b). But if the short impulse ceases after a length of time which, as stated above, is short in contrast with the quarter-period of the oscillation circuit, the plate current of the triode will be blocked again prior to the expiration of the first quarter-period and this results in a fall of current in the choke-coil. A corresponding self-induction voltage is set up across the choke-coil which has a direction contrary to that of the plus and minus signs. Hence, the rectifier 13 becomes conductive for the current and it short-circuits the coil; and the result is that soon after termination of each brief impulse the voltage across the choke-coil 11 has again dropped or decayed to zero value. In other words, the brief impulses cause at the choke-coil 11 only voltage variations of a small amplitude. But in the presence of an impulse of greater duration, the oscillatory circuit undergoes a half-oscillation so that the voltage at the choke-coil first rises according to a sine curve in the sense of the indicated plus and minus signs, then drops and is finally reversed. At this instant the rectifier 13 becomes conductive even during the duration of the impulse and it damps the oscillatory circuit for the next alternation (half-oscillation) so strongly that further voltage variation is practically avoided entirely. The impulses of longer duration, as will be noted, occasion between the point P and the positive pole of the anode battery voltage impulses of a greater amplitude or value than the impulses of less duration. Hence, the circuit arrangement before described is suited for the separation of longer and shorter impulses from one another.

Fig. 3 shows an exemplified embodiment in which the oscillation circuit is included in the screen-grid circuit of a screen-grid tube 14. The

rectifier 13 in contrast to the circuit scheme shown in Fig. 1 allows the current to flow in the opposite sense, and in addition it has a negative biasing voltage 15.

Suppose the control grid of the screen grid tube is fed with the current impulses to be separated in the form of negative voltage pulses having a wave shape as shown in Fig. 4. During the pulse intermissions current flows through the tube 14 and thus also through the screen-grid circuit thereof. While pulses are proceeding, however, the flow of current through the tube 14 is blocked, hence, during the impulse intervals a drop of potential occurs across the choke-coil 11 having a direction as indicated by the plus and the minus signs in Fig. 3 and of a size which is governed by the ohmic resistance of the choke-coil 11 and the resistance of the path between screen-grid and cathode. By the voltage source 15 whose potential is opposite that of the ohmic voltage drop, a flow of current through the rectifier 13 is prevented during the impulse pauses. At the beginning of an impulse, however, the screen-grid current is suddenly interrupted and across the choke-coil 11 is set up an electromotive force of self-induction which has a sign opposite to that of the plus and minus signs indicated in Fig. 3. This voltage in itself and conjointly with the voltage source 15 blocks the rectifier 13 so that the shape of the voltage will at first not be influenced by this rectifier. The current created by the electromotive force of self-induction in the choke-coil charges the condenser in the corresponding polarity. If the blocking of the tube 14 were to persist for an unlimited length of time the voltage across the choke-coil would change according to a sine law. But when the brief impulses, after a while, which are short in contrast to the quarter-period of the oscillatory circuit, are terminated, a flow of screen-grid current will be initiated again prior to the expiration of the first quarter-period, and the E. M. F. of self-induction which is incidentally set up across the choke-coil 11 and which has the same sense as the indicated plus and minus signs, is short-circuited by way of the rectifier 13. Hence, the brief impulses create across the choke-coil 11 only voltage variations of small amplitude. In the presence of an impulse of longer duration, however, the oscillatory circuit goes through a full half cycle so that the potential across the choke-coil, in accordance with a sine law, rising first in a sense contrary to the indicated plus and minus signs, is thereupon caused to drop and is finally reversed. A short while after reversal of the voltage, the rectifier becomes conductive for current even while the impulse proceeds and this damps the oscillatory circuit for the following semi-cycle to such a marked degree that further change of voltage is precluded practically completely. Hence, the impulses of greater length cause across the choke-coil 11 voltage impulses of greater amplitude than the impulses of briefer duration, so that the circuit organization before described will be found fit for separating long and short impulses.

If the assumption that the half-period of the oscillatory circuit is somewhat less than the duration of the longer impulses is abandoned, and if, say, the supposition is made that the longer impulses are of the same length as, or of slightly less length than what is required by the oscillatory circuit for a half-cycle, the considerations made by reference to Figs. 1 and 3 will still hold good in so far as upon each longer impulse the

voltage across the choke-coil 11 will be built up to a crest value and thereupon drop off again, whereas, in the case of a shorter impulse, only an inappreciable rise of voltage will occur across the choke-coil. In other words, a separation of the longer from the shorter impulses is possible even without the supposition that the half-period should be somewhat less than the duration of the longer impulses.

Also, the existence of the rectifier 13 does not constitute an indispensable presupposition for the desired separation of the impulses. What the rectifier merely does is that after completion of each brief impulse the current flowing in the choke-coil 11 is aperiodically returned to its initial value and that after the first half-cycle, inside the duration of the longer impulses, no appreciable potential is able to build up across the choke-coil. If the rectifier were dispensed with, then each impulse would merely release a damped oscillation train, although the amplitude level of the first half-cycle would depend upon the length of impulse in the same way as discussed by reference to Figs. 1 and 3. Hence, also in the absence of the rectifier 13 a distinction or discrimination between the longer and the short impulses would be possible, although it is a fact that the rectifier 13 acts in a way so as to create more accurately defined conditions and that an impulse of strictly constant length, i. e., of the duration of the half-cycle of the oscillatory circuit is produced even in the case where a change in the duration of the longer impulses is caused which, for example, may be due to the addition of a disturbing action or stray to the longer impulses or that the longer impulses are produced with variable length.

The invention, moreover, is not confined to an arrangement of the oscillation circuit in the plate or screen-grid circuits. On the contrary, the oscillation circuit may be disposed in the circuit of any current-carrying electrode of a controlled tube.

Finally, the rectifier 13 may be coupled with the choke-coil by way of a transformer.

I claim:

1. An apparatus for converting a plurality of sets of electrical impulses of differing duration but substantially the same amplitude into a plurality of sets of electrical impulses of different amplitudes, which comprises a normally blocked vacuum tube amplifier an electrical oscillation circuit connected in one of the current-carrying circuits of said amplifier, said oscillation circuit having a natural duration of oscillation whose quarter-period is greater than the period of the highest frequency impulses impressed on the amplifier and whose half-period is of the same order as the duration as the lowest frequency impulses impressed on the amplifier, and means for impressing said electrical impulses onto a control electrode of said vacuum tube for rendering said tube conductive.

2. An apparatus for converting a plurality of sets of electrical impulses of differing duration but substantially the same amplitude into a plurality of sets of electrical impulses of differing amplitudes, which comprises a normally blocked vacuum tube amplifier, an electrical oscillation circuit whose quarter-period of oscillation is greater than the duration of the highest frequency impulses impressed on the amplifier and whose half-period is of the same order of duration as the lowest frequency impulses impressed on the amplifier said oscillation circuit being

connected in an anodic circuit of said amplifier, a rectifier connected in parallel with the oscillation circuit, and means for impressing said electrical impulses onto a control electrode of said vacuum tube for rendering said tube conductive.

3. An apparatus for converting a plurality of sets of electrical impulses of differing duration but substantially the same amplitude into a plurality of sets of electrical impulses of differing amplitudes, which comprises a normally blocked vacuum tube amplifier, an electrical oscillation circuit whose quarter-period of oscillation is greater than the duration of the highest frequency impulses impressed on the amplifier and whose half-period is of the same order of duration as the lowest frequency impulses impressed on the amplifier connected in an anodic circuit of said amplifier, a triggered rectifier connected in parallel with the oscillation circuit, and means for impressing said electrical impulses onto a control electrode of said vacuum tube for rendering said tube conductive.

4. An apparatus for converting a plurality of sets of electrical impulses of differing duration but substantially the same amplitude into a plurality of sets of electrical impulses of differing amplitudes, which comprises a normally blocked vacuum tube amplifier, an electrical oscillation circuit whose quarter-period of oscillation is greater than the duration of the highest frequency impulses impressed on the amplifier and whose half-period is of the same order of duration as the lowest frequency impulses impressed on the amplifier connected in an anodic circuit of said amplifier, a rectifier coupled to the oscil-

lation circuit, and means for impressing said electrical impulses onto a control electrode of said vacuum tube for rendering said tube conductive.

5. An apparatus for converting a plurality of sets of electrical impulses of differing duration but substantially the same amplitude into a plurality of sets of electrical impulses of differing amplitudes, which comprises a normally blocked vacuum tube amplifier, an electrical oscillation circuit whose quarter-period of oscillation is greater than the duration of the highest frequency impulses impressed on the amplifier and whose half-period is of the same order of duration as the lowest frequency impulses impressed on the amplifier connected in an anodic circuit of said amplifier, a triggered rectifier coupled to the oscillation circuit, and means for impressing said electrical impulses onto a control electrode of said vacuum tube for rendering said tube conductive.

6. The method of developing impulses to control an electronic beam deflecting system which comprises producing a series of impulses of like amplitude and differing duration amplifying the impulses, producing under the control of the amplified impulses oscillations at the frequency of the oscillatory network so as to develop damped oscillations of differing amplitudes, said developed damped impulses being of one selected amplitude value for one of the impressed series of differing duration impulses and of a different selected amplitude for the other of said impressed series and differing duration impulses.

ROBERT ANDRIEU.