

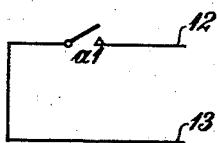
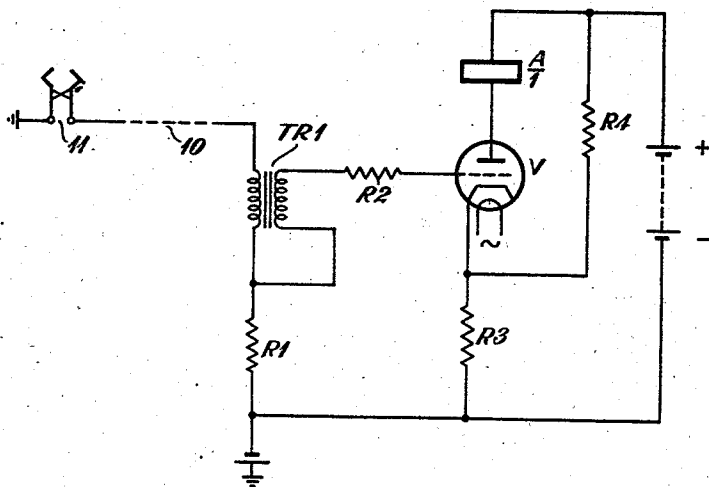
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2,400,908

ELECTRICAL SIGNALING SYSTEM

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## ELECTRICAL SIGNALING SYSTEM

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2 Claims. (Cl. 179-16)

The present invention relates to electrical signaling systems such as automatic telephone systems in which impulses are utilised to effect the positioning of selective apparatus and like operations, and it is more particularly concerned with arrangements for correcting impulse distortion whereby the operating range and capabilities of such systems may be increased.

In cases where direct current impulsing is employed the reactive characteristics of the line or lines over which the impulses are transmitted produces a distorting effect on the wave shape of each transmitted signal impulse, which effect is operative on the fall and rise of current at the beginning and end of each impulse, so that the received impulse wave shapes instead of having the substantially rectangular form which they possessed at the transmitting end have decremental and incremental slopes approximately characteristic respectively of the discharge and charge of a condenser through a resistance.

The invention has for its general object the provision of a simple and efficient method of correcting distorted direct current impulses.

According to one feature of the invention in order that a signal responding device may respond rapidly to changes of current corresponding to the beginning and end of a signal impulse, the signal responsive device is subjected to a dual control, one corresponding to the current as received and the other derived from surge voltages created at the beginning and end of each impulse to assist the operation or restoration respectively of the signal responsive device.

According to another feature of the invention the line signaling current is caused to flow at a receiving point through a winding of a transformer, the voltage developed across resistance in the circuit of said winding being effective on the grid of a thermionic valve in the anode circuit of which is an impulse receiving relay, while the transformer is so arranged that surge voltages generated therein at the beginning and end of each signal impulse augment the rate of change of the voltage derived from the resistance in such manner as to produce a resulting current in the valve anode circuit having incremental and decremental slopes which are very steep.

The invention will be better understood from the following description of one method of carrying it into effect, reference being had to the accompanying drawing.

This shows circuits of a current operated impulse shaping device for correcting the characteristics of direct current impulses received over

a line or lines from a distant impulse sending or repeating point.

The correcting device shown may form the impulse receiving part of an impulse repeater or of a selecting switch operable over a junction line in an automatic telephone system and it is assumed in the present instance that the line comprises the single conductor 10 which on seizure by the distant transmitting point is assumed to be earthed via the impulsing contacts 11.

10 The line 10 terminates on the primary winding of transformer TR1 which is connected to the earthed exchange battery via resistance R1. The automatic bias resistances R3 and R4 ensure that the grid of valve V will normally be negatively biased with respect to the cathode by a potential such that the valve will pass negligible current and will neither operate nor hold the impulsing relay A which is connected in circuit with the anode voltage supply source for the valve and is preferably of the high speed type.

When the correcting equipment is taken into use by the connection of earth via impulsing contacts 11 to line 10, current flows through the primary winding of transformer TR1, which is preferably of low inductance, and through resistance R1 to battery, whereupon the voltage developed across resistance R1 is communicated via the secondary winding of transformer TR1 and resistance R2 to the valve grid which it renders less negative with respect to its cathode than in its normal condition and sufficient anode current thereupon flows to secure the operation of relay A.

During the rise of current in the primary winding of the transformer at commencement of the signal a voltage is induced in the secondary winding which serves to augment the rising applied voltage derived from resistance R1 and so steepens the initial rising slope of the wave form of the anode current flow.

On the first "break" impulse of a dialled impulse train, contacts 11 open and the current flow in the primary winding of the transformer falls, whereupon the potential on the valve grid reverts correspondingly towards its normal negative value. During the fall of signal current a voltage is again induced in the secondary winding of the transformer which voltage tends to assist in restoring the normal negative potential on the valve grid and by this means the decremental slope of the fall of anode current resulting from the beginning of the break impulse is considerably steepened and relay A releases rapidly.

At the end of the first impulse when contacts

If reclose, the current again rises in transformer TR1, whereupon the grid is rendered less negative in the same manner as for the beginning of the signal current, and relay A re-operates. Transformer TR1 functions as before to steepen the rising slope of the impulse and the resulting impulse produced in the anode circuit becomes one in which the decremental and incremental slopes are very steep thus approaching the ideal rectangular form of impulse.

Similar remarks apply for each succeeding impulse of a train, and relay A will therefore at its armature a1 deliver impulses which are corrected as regards their ratio to any suitable form of output circuit connected to leads 12 and 13.

It will be appreciated that the correcting device is not limited in application to the particular arrangement shown as either loop impulsing or single leg impulsing could be employed as desired. The voltage developed across resistance R1 could moreover be arranged to cause a decrease in the normal anode current of valve V and so release a normally operated relay A in its anode circuit, which relay would be provided with a normally closed "break" contact instead of a "make" contact as shown.

In cases where the received signal is so distorted that the desired correction cannot be achieved in one stage it is possible that advantage might be gained by using a two-stage correction arrangement in which the partially corrected signal would be passed from a first stage through a second stage before being extended to the output circuit.

It will be appreciated that the invention is not limited to the construction illustrated but that modifications may be made therein without departing from the spirit of the invention. It will also be understood that the invention is applicable to alternating current impulses after rectification where there is sufficient current output to ensure that changes thereof will appreciably affect the grid voltage, for instance it may be used in a second stage of a voltage impulse-correcting device described in my co-pending application Ser. No. 451,306, filed on the same day as the present application.

I claim:

1. In a signaling system, an electronic valve having a control grid, a circuit connected to said

grid including, in series, a resistor and one winding of a transformer, a potential connected to said circuit to bias said grid negatively, whereby said valve normally is non-conductive, another circuit including in series said resistor and a second winding of said transformer, means for impressing upon said last circuit direct current impulses of such polarity as to produce in said resistor a voltage tending to bias said grid positively, thereby to render said valve conductive, the two windings of said transformer being so related that the surge voltage induced in said one winding by said second winding at the beginning of each impulse tends also to bias said grid positively thereby to increase the speed with which said valve becomes conductive, and the surge voltage induced in said one winding by said second winding at the end of each impulse tending to bias said grid negatively thereby to increase the speed with which said valve becomes non-conductive.

2. In a signaling system, an electronic valve having an anode, a cathode and a control grid, a source of direct current potential, two resistances each having one end connected to the cathode of said valve, the other end of the respective resistances being connected to opposite terminals of said direct current source, a connection from the positive terminal of said source to the anode of said valve, a connection from the negative terminal of said source to the grid of said valve, whereby said valve normally is biased to cut off, said last connection including, in series, a third resistance and one winding of a transformer, a circuit including, in series, said third resistance and a second winding of said transformer, means for impressing upon said circuit impulses of such polarity as to produce in said third resistance a voltage tending to bias said grid positively, the growth of current in said second transformer winding at the beginning of each such impulse effective to induce in said one winding thereof a surge voltage tending also to bias said grid positively, whereby said valve is rendered conductive by each said impulse, and the decay of current in said second winding at the end of each impulse effective to induce in said one winding a surge voltage tending to bias said grid negatively, thereby to accelerate the cut off of said valve.

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