

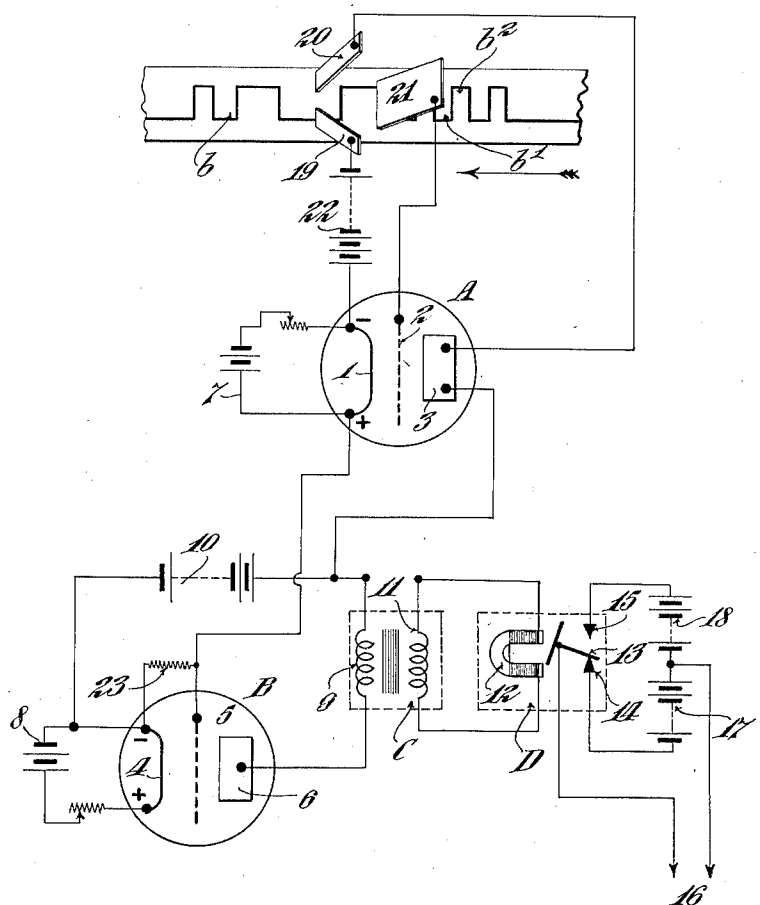
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METHOD AND MEANS FOR THE REPETITION OF TELEGRAPHIC SIGNALS

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METHOD AND MEANS FOR THE REPETITION OF TELEGRAPHIC SIGNALS.

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Various types of apparatus are already known which permit of the repetition, in the form of electric current impulses, of telegraphic signals recorded on a perforated band, for the purpose for example of effecting their automatic transmission after they have been locally handled, or to effect the retransmission thereof, the deciphering thereof through sound or their translation into printed characters or the like after they have been received from a distant station.

The present invention relates to the automatic repetition of telegraphic signals recorded as a continuous trace of sinuous form and in a conducting or semi-conducting medium upon a base of non-conducting material. It is an object of the invention to provide an improved method and means for the automatic repetition of such signals and a further object is to provide improved means for repeating the original signals recorded in the trace, in the form of current impulses adapted to operate a relay or similar reproducing or re-transmitting device. A still further object is to provide an improved method of and novel means for controlling the output of a thermionic signal producing device by using a sinuous conducting signal trace comprising idle circuit closing portions and operative circuit closing portions to energize separate circuits alternately, so as to vary an impedance connected across the grid-plate path of such thermionic signal producing device relatively to a fixed resistance connected across the filament-grid path thereof,

For the purposes of the present invention the electric conductivity of the sinuous signal trace need only be very small, of the order, for example, of the conductivity of india ink. The present method can, therefore, be carried out without employing special products.

The signals having been once recorded as a trace of the kind indicated above on a non-conducting band, the passage of the band beneath suitably arranged contacts, or the passage of such contacts over the band, produces alternately in two controlling circuits, adapted to be closed by different parts of the trace, feeble primary currents, if in ink, like india ink for example, has been used for recording these signals. These primary currents are then used to control the output of an amplifying device or system from which

are thus obtained secondary currents of higher intensity, the impulses of which reproduce exactly the recorded signals. Through the medium of any suitable apparatus, the signal impulses can then be automatically transmitted, retransmitted, deciphered or translated.

A preferred form of amplifying device for use in carrying the invention into practice is hereinafter described in detail and is characterized essentially by a combination of two three-electrode vacuum tubes or valves which are connected to each other and to the contacts beneath which the band bearing the semi-conducting trace passes, in a novel and improved manner and the output from which may excite a relay system repeating the signals inscribed on the band. The working of this two valve amplifying system is based fundamentally on the differences of potential produced successively between the grid and the filament of the first valve, according as successive different portions of the semi-conducting signal trace pass beneath the electric contacts. By reason of these differences of potential, the first valve is caused to act as a varying impedance which produces correspondingly varying differences of potential between the grid and the filament of the second valve and, consequently the passage through the filament-anode path of this second valve of current variations of increased amplitude adapted to produce, in known way, the operation of a relay for repeating the signals.

In the accompanying drawing is represented diagrammatically by way of example one arrangement according to the invention.

As here shown the apparatus comprises two valves A, B each with three electrodes of which 1, 2, 3 and 4, 5, 6 are respectively the filament, the grid and the plate. 7 and 8 are the filament heating batteries.

The apparatus comprises also a transformer C the primary circuit 9 of which is connected on the one hand to the plate 6 of the valve B, on the other hand to the plate 3 of the valve A and to the positive pole of a battery 10, which constitute a plate battery for both of the valves A and B and the negative pole of which is connected to the filament 4 of the valve B.

The secondary circuit 11 of the transformer C is closed on the windings 12—12 of a polarized relay D, the armature 13 of which,

by engaging contacts 14 or 15 closes the local circuit 16 on one or other of the batteries 17 or 18.

a is the band of paper or other suitable material driven with a uniform movement, in the direction indicated by the arrow, in any suitable way. On this band have been traced by means of an ink (such as india ink or the like) or any other material which leaves a conducting trace, signals constituted by a sinuous line or mark b extending into two paths b^1 and b^2 one being the idle path and the other the operative path.

During its movement the band a is borne upon by a set of three contacts 19, 20, 21, the first of which coincides with the idle path, the second with the operative path and the third with both of these paths simultaneously.

The contact 19 is connected to the filament 1 of the valve A through the medium of a battery 22, which has its positive pole connected to the negative end of the said filament 1 and the function of which is to provide a negative grid bias for the grid 2 of the same valve, when required, as hereinafter explained. The contact 20 is connected to the plate 3 of the valve A and the contact 21 is connected to the grid 2 of the same valve.

The action of the apparatus is as follows:
In the position illustrated, the contact 19 or idle contact, is electrically connected to the contact 21 through the signal trace b , so that a conducting path then exists from the negative end of the filament 1, through the battery 22, contact 19, trace b and contact 21 to the grid 2. The trace being of low conductivity, feeble currents only can flow therein but this is of no consequence, since the only function of the battery 22 is to influence the potential of the grid 2. As will be seen from the figure, when the contacts 19 and 21 are connected as above described, the grid 2 of the valve A will be connected to the negative pole of the aforesaid grid bias battery 22 and consequently become negative relatively to its filament 1. The filament-plate path 1—3 of this valve is then non-conductive so that substantially no current from the battery 10 can then flow through this path, which, it will be observed, is connected in shunt across the grid-plate path of the valve B. The grid 5 of the valve B being connected to the filament 4 thereof by a very high resistance 23, then acquires the potential of the negative end of the said filament 4, and a current, which however is comparatively feeble, can therefore proceed from the battery 10 through the filament-plate path 4—6 and the plate circuit of this valve, the circuit including the primary winding 9 of the transformer C, as will readily be apparent on reference to the drawing. It is obvious, however that this plate current can have no effect through the transformer C upon the relay D.

If now, owing to the progression of the

band a beneath the contacts 19, 20, 21, the contact 20, or operative contact meets a trace portion in the operative path b^2 and is thus electrically connected to the common contact 21 by the trace the grid 2 of the valve A becomes connected through the contact 21, trace b and contact 20 to the plate 3 of the said valve, which plate is itself connected to the positive pole of the plate battery 10, common to the valves A and B. The grid 2 of the valve A therefore suddenly becomes highly positive and allows current from the battery 10 to flow through the filament-plate path 1—3 of this valve through the high resistance 23. The value of this resistance 23 being very high relatively to that of the filament-plate path 1—3 of the valve A, the grid 5 of the valve B is, through the medium of this filament plate path, brought to a potential approximating to that of the positive pole of the plate battery 10 and therefore it becomes highly positive with respect to the filament 4. The current which flows in the plate circuit of this valve B and therefore in the primary winding 9 of the transformer C therefore suddenly increases. This powerful current impulse is transmitted, inductively in the well known manner from the primary winding 9 to the secondary winding 11 of the transformer C, producing in the secondary circuit thereof a current impulse powerful enough to excite strongly the windings 12 of the polarized relay D.

A reverse impulse will be produced when the contacts 20, 21 at the operative track cease to be connected and the contacts 19, 21 at the idle path are re-connected.

Thus therefore at every passage beneath the contacts 19—20, a change of path from the trace b of the band a is corresponded to by a sudden variation in the current passing through the primary winding 9 of the transformer C. These current variations induce in the circuit of the secondary winding 11 of the transformer and of the windings 12 of the relay D currents which cause the relay armature 13 to pass alternately from the contact 14 to the contact 15 according as the ink trace b connects the idle contact 19 or the operative contact 20 to the common contact 21. The local circuit 16 of the relay D will then furnish through the batteries 17 and 18 impulses of current in alternate directions reproducing exactly the recorded signals and may be utilized, by employing any suitable apparatus, for automatic transmissions, re-transmissions, decipherings, translations etc. of the signals sent out.

The present invention is particularly applicable to automatic transmission, without any special mechanism or perforated band, of telegraphic signals simply traced for this purpose on a band of paper or the like.

It may be applied likewise to the repetition of such signals after automatic reception

thereof, or for a retransmission, or for their deciphering by sound reading, or finally for the translation into printed characters by the operation of any translating apparatus working under the action of electric currents sent into the local circuit 16.

What I claim is:—

1. A method for the repetition of telegraphic signals recorded as a continuous trace of sinuous form and of a conductive character upon a base of non-conducting material, said method consisting in utilizing different parts of the said sinuous trace to complete alternately separate, electric circuits, whereof one circuit actuates potential controlled means to produce electric current impulses while the other circuit acts on the said potential controlled means to prevent it from producing electric current impulses.

2. A method for the repetition of telegraphic signals recorded as a continuous trace of sinuous form and of a conductive character upon a base of non-conducting material, said method consisting in utilizing different parts of the said sinuous trace to complete alternately, separate electric circuits, whereof one circuit actuates potential controlled means to produce electric impulses to influence signal repeating means while the other circuit acts on said potential controlled means to prevent it from producing current impulses sufficiently powerful to influence said repeating means.

3. The method of controlling the output of a thermionic electric impulse producing device, said method consisting in causing a sinuous conducting signal trace comprising idle circuit closing portions and operative circuit closing portions to energize separate circuits alternately, so as to vary an impedance connected across the grid-plate path of said thermionic device relatively to a fixed resistance connected across the filament-grid path of said device.

4. For the repetition of telegraphic signals recorded as a continuous trace of sinuous form and of a conducting character upon a band of non-conducting material, apparatus comprising, in combination with the non-conducting band bearing the trace, contacts between which and the band relative movement takes place to close alternately, alternative circuits corresponding to and controlled by different paths on the trace and means whereby the closure of a circuit through one path of the trace is caused to actuate means for producing signal impulses while the closure of a circuit through another part of the trace is caused to prevent the said means from functioning to produce signal impulses.

5. Apparatus according to claim 4, comprising two alternative circuits subject to closure through different parts of the signal trace and means for causing the one circuit,

when closed, to increase and the other circuit, when closed, to diminish the impedance of a thermionic valve system.

6. For the repetition of telegraphic signals, apparatus comprising, in combination, a non-conducting base bearing a sinuous signal trace of conductive character, part of which signal trace lies in an idle path while another part thereof lies in an operative path, a contact for the idle path, a contact for the operative path and a contact common to both paths, a circuit including the first and last named, and a circuit including the second and last named of these contacts respectively, an electron discharge device common to both said circuits, a current source for said electron discharge device, means for causing the first named circuit to increase the impedance of said electron discharge device, means for causing the last named circuit to diminish the impedance of said electron discharge device and means for producing current impulses, said last named means being rendered effective or ineffective according as the impedance of the electron discharge device is diminished or increased.

7. Apparatus according to claim 6, wherein the electron discharge device is a three-electrode valve whereof the grid is rendered negative with respect to the filament when the circuit corresponding to the idle path of the trace is closed, and positive with respect to the filament when the circuit corresponding to the operative path of the trace is closed.

8. Apparatus according to claim 6, wherein the means for producing current impulses consists of a three-electrode valve, in combination with a source of current, and a high resistance shunting its filament-grid path, its grid-plate path being shunted by the electron discharge device of variable impedance, whereby the grid potential of the said valve and consequently its impedance to the flow of current from the source of supply, varies in accordance with changes in the impedance of the electron discharge device.

9. Apparatus for the repetition of telegraphic signals recorded as a continuous trace of sinuous form and of conductive nature upon a non-conducting base, comprising in combination with said non-conducting base and conducting trace thereon, and contacts between which and the base relative movement takes place to close alternately, alternative circuits corresponding to and controlled by different paths on said trace, of a signal repeater, a valve for supplying signal impulses to said repeater, a high resistance shunted across the filament grid path of said valve and a variable impedance shunted across the grid-plate path of said valve, said variable impedance being caused to become high or low in proportion to the resistance shunting the said filament grid path, according to

whether the sinuous trace, co-operating with the circuit controlling contacts, close one or the other of the two alternative circuits.

10. For the repetition of telegraphic signals recorded as a continuous trace of sinuous form and of a conducting character upon a band of non-conducting material, apparatus comprising in combination with the band bearing the said trace, three contacts between which and the band movement can take place, one of said contacts coinciding with the idle path of said trace, another of said contacts coinciding with the operative part of said trace and the third contact coinciding with both of such paths forming part of the said trace, a thermionic valve, an electric battery having its positive pole connected with the filament of said valve and its negative pole connected to the first mentioned contact, the grid and plate of said valve being connected

respectively to the thirdly and secondly mentioned contacts, a second thermionic valve, a high resistance connecting the filament and grid of said second valve, and electric transformer, a relay, a local circuit controlled by said relay, a second electric battery having its negative pole connected to the filament of said second valve and its positive pole connected to the plate of the first mentioned valve and to one end of the primary winding of the transformer, the other end of said winding being connected to the plate of the secondly mentioned valve and the secondary winding of said transformer being in circuit with the relay and means for heating the filament of each valve.

Signed at Paris, France, this 4th day of December, 1926.

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