

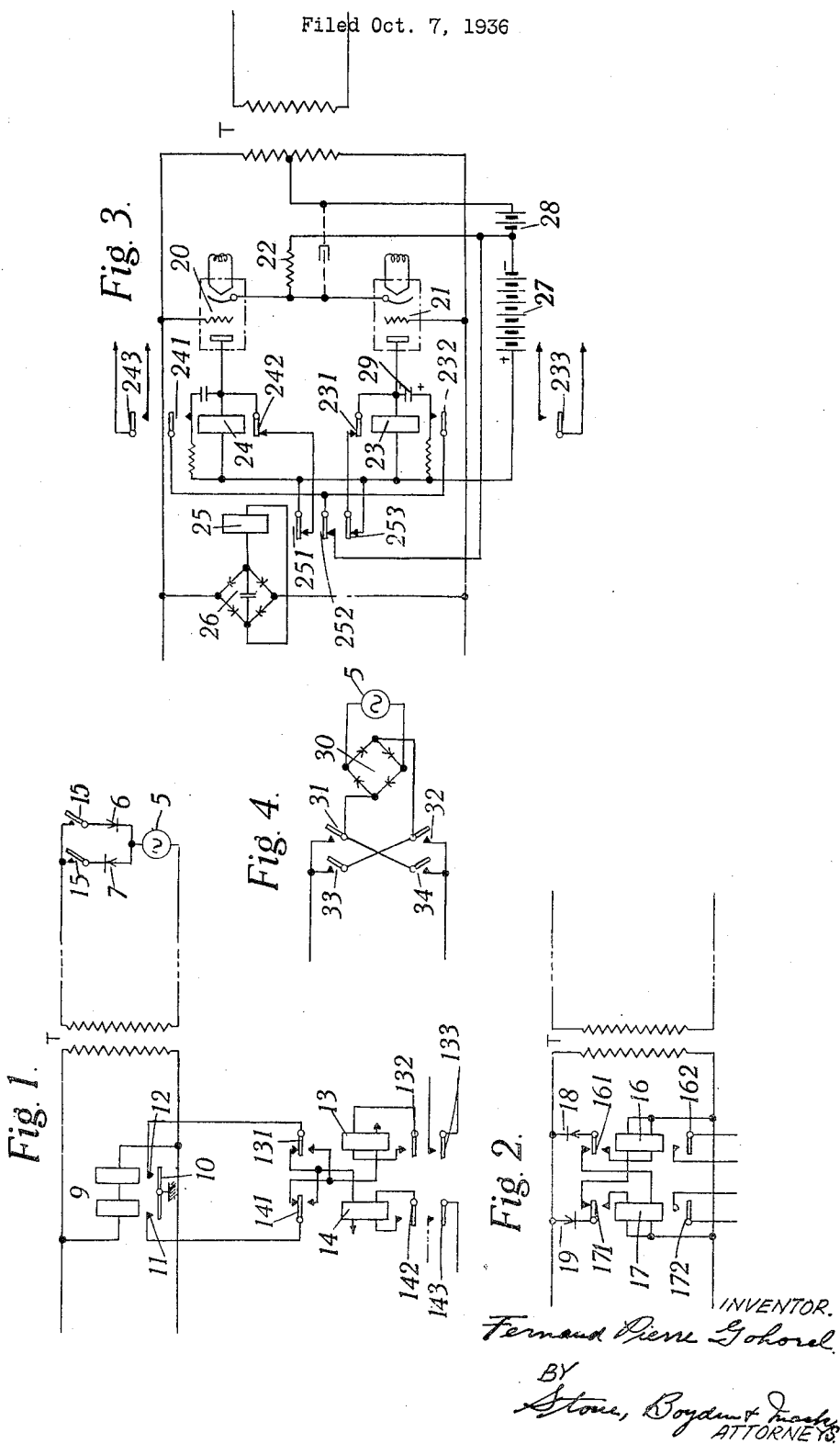
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REMOTE CONTROL SYSTEM

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REMOTE CONTROL SYSTEM

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The present invention relates to improvements in devices for signalling or remote control by alternating currents.

One feature of the invention resides in a signalling or remote control system having at the receiving end apparatus which is responsive to alternating current and operates selectively in accordance with the direction of the first half-cycle received. Another feature of the invention resides in a signalling or remote control system having at the transmitting end means for selectively controlling the direction of the first half-cycle received at the receiving end.

Another of the features of the invention resides in the construction of such a device comprising at the controlled station, a polarised relay and two auxiliary control relays, the direction of the first displacement of the armature of the said polarised relay being determined by the direction of the first half-cycle received from the control station and the said displacement having the effect of causing the closing of the circuit of one of the auxiliary relays which, on its operation, renders impossible the operation of the second auxiliary relay during the whole of the time of the control in progress.

Another feature of the invention resides in a mode of construction comprising, at the controlled station, two circuits connected to the control circuit; in each of these two circuits there are inserted a relay and a device which passes the current in one direction, only these devices passing current in different directions; the connection of these relays is such that the excitation of one causes the opening of the exciting circuit of the other. The reception of the first half-cycle of a controlling impulse causes, according to its direction, the excitation of one of the relays, the operation of the second relay being, consequently, rendered impossible during the whole of the time of the control in progress.

On each of these relays there may be provided an auxiliary winding, which is inserted on the response of the relay of which it forms part, and which maintains the said relay during the reception of the half-cycles of opposite direction to those which cause the response.

Another feature of the invention consists in a mode of construction in which two "thyratrons" are employed, which are connected in such a manner that each of them is capable of being rendered conductive to the reception of current impulses of a certain direction; the operation of one of the "thyratrons" causes the blocking of the other, which is thus rendered insensitive to

current impulses of such direction as would normally cause its operation.

Another feature of the invention resides in a connection of the "thyratrons" employing a common resistance in the cathode circuits, the passage of the current of one of the "thyratrons" consequently bringing the cathode of the two "thyratrons" to a sufficiently positive potential, with respect to that to which the control grids are brought on the reception of the control alternating currents, to cause the blocking of the non-conductive "thyatron."

The provision of transformers in a remote control or signalling system is not in itself a feature of the present invention. On the contrary, it is due to the fact that transformers are necessary in telephone systems and like remote control or signalling systems that it is necessary to operate such systems with alternating current. Thus the object of the invention is to provide a remote control or signalling system which will operate over existing systems including transformers and operating with alternating current, such as for operating control equipment in automatic or semi-automatic telephone systems.

Various other features will be apparent from the following description given by way of non-limiting example, of different modes of construction of the invention, and by reference to the accompanying drawing, in which:

Fig. 1 is a diagram of a control or signalling system comprising, at the controlled station, a polarised relay and two auxiliary control relays,

Fig. 2 is a diagram of a controlled station comprising two receiving circuits shunted across the control circuit,

Fig. 3 is a diagram of a receiving station employing two "thyratrons,"

Fig. 4 is a diagram of a transmitting station employing for the sending of the controlling impulse, the rectified current of the two alternations of the alternating current transmitter.

Referring to Fig. 1, it is seen that the control system shown consists at the transmitting station, of an alternating current generator 5, two devices 7 and 6 which pass the current in one direction only, such as, two rectifiers, and two interrupters 15' and 15.

The connection of the two rectifiers 7 and 6 is made in such a manner that the current which is capable of traversing one of them is of the opposite direction to that which is capable of traversing the second.

At the receiving station there is provided a polarised relay 9 having an armature 10, which,

when the relay is not excited, is maintained in the position shown in the figure, and two auxiliary relays 13 and 14.

The transformer T may be provided either at the transmitting station or at the receiving station.

The general operation of the system is as follows: If one of the interrupters 15' or 15 is closed, the presence of one of the rectifiers 6 and 7 has the effect of admitting into the primary of the transformer T only the positive or negative half-cycle of the current alternations of the generator 5.

At the output of the transformer T alternating current alternations will be obtained, the first half-cycle of which will always have the same direction. This results in the armature 10 of the polarised relay being attracted in one direction by the first half-cycle of the first alternation.

Finally it is seen that if the interrupter 15 has been closed, the armature 10 will be attracted, for example, towards the left, whereas if the interrupter 15' has been closed, the said armature will be attracted towards the right.

In order to explain the operation in detail of the system it will be assumed that the interrupter 15 has been closed and that the rectifier 7 passes only the positive half-cycles of the alternating current generated by 5. As has been explained, there will be received in the control wires of the receiving station a series of alternating current alternation of which, the first half-cycle of the first alternation will be positive. As has been assumed, the armature 10 will be attracted towards the left and will complete with the contact 11 which is associated with it, the following exciting circuit of the relay 13:

Earth armature 10, contact 11, springs 141 and its resting contact, lower winding of 13 and battery.

The relay 13 responds and by its armature 131 breaks at its resting contact the energizing circuit of the relay 14. The said relay 14, therefore, will be unable to respond when, under the action of the negative half-cycle of the first alternation as well as the following alternations, the armature 10 is attracted towards the right.

By means of its armature 132, the relay 13 short-circuits its upper winding so as to retard the said relay in its release and prevent it dropping off during the passage of the armature 10 from one to the other of its working positions.

By means of its armature 133 and its working contact, the relay 13 closes the signalling or controlling circuit of the controlled station. 133a represents one device or signal controlled at or from the controlled station.

To summarise, it is seen that, during the whole of the time in which the interrupter 15 remains closed, the relay 13 will be maintained in responsive condition, the relay 14 remaining at rest.

According to the same process, if the interrupter 15' had been closed, 15 being open, the relay 14 would have responded and the relay 13 would have remained at rest. 143a represents another device or signal controlled at or from the controlled station.

In the layout of the receiving station shown in Fig. 2, in the state of rest, two circuits comprising a rectifier and a relay in series are connected to the control circuit.

The arrangement of the rectifiers 18 and 19 is such that the current which is capable of traversing them is of opposite direction.

Assuming that, as in the previous case, the in-

terrupter 15 at the controlled station, which remains identical with that of Fig. 1, has been closed, then the first half-cycle of the first alternation received, being of positive direction, will traverse the rectifier 19 and will cause the excitation of the relay 16 through its upper winding.

The relay 16, on responding, breaks by means of its armature 161 the energizing circuit of the relay 17 and returns this circuit on its lower winding, the direction of which is such that the flux which it produces for a received current of opposite direction to that which traverses the upper winding has the same direction.

The relay 16 will therefore be maintained at response under the action of the alternations received, during the whole of the time in which the interrupter 15 remains closed, the relay 17 being unable to respond.

According to the same process, if the interrupter 15' has been closed, the relay 17 would have responded and the relay 16 would have remained at rest.

The operation of the system employing two "thyratrons" at the receiving station will now be explained with reference to Fig. 3.

As is shown in the figure, a resistance 22 common to the two "thyratrons" is placed in the cathode circuit 35.

The value of the polarisation of the said "thyratrons" is such that, the increase in voltage applied to the grid by the first half cycle of received energy will assume a value which will cause the starting of one of the "thyratrons", depending on whether the first half cycle of the first alternation is positive or negative.

Assume that the first alternation received has caused the starting of the "thyatron" 21. It will be noted moreover that, during the reception of the first alternation, the relay 25 fed by the rectifier 26 responds and is maintained during the whole of the time of the signalling in progress.

The "thyatron" 21 having become conductive, an exciting current will traverse the relay 23, its short-circuiting path being opened by the armature 253 of the relay 25 on response of the latter. The relay 23, closes a control circuit by means of its armature 233. The said relay by means of its armature 232, also prepares a discharge circuit for the condenser 29 which is charged, after the establishment of the current in the "thyatron" 21, the plates of the said condenser taking the polarities indicated in the figure.

On the other hand, the cathode-plate current which flows in the "thyatron," owing to the presence of the resistance 22, produces a modification of the value of the polarity at the terminals of the cathode of each of the "thyratrons." The new tension thus placed on the cathode will have the effect of preventing the operation of the "thyatron" 20 when the half-alternation of opposite direction is received.

At the end of the reception of the series of control alternations the relay 25 drops off.

By means of its armature 252 it closes the following circuit of the condenser 29:

Positive plate of the condenser, armature 232, working contact, armature 252, resting contact, resistance 22, cathode of 21, anode of 21, negative plate of 29.

The potential of the condenser 29 is applied suddenly to the terminals of the "thyatron" 21, the polarity being such that the discharge is interrupted during a very short time, but is sufficient to cause the stopping of the "thyatron."

After the stopping of the "thyatron," the re-

lay 23 drops off. The receiving equipment is ready to receive a new control.

In Fig. 4 there is shown a layout of the transmitting station which allows of utilising the two alternations rectified by the rectifier 30, of the current emitted by the generator 5.

If either the two interrupters 33 and 34 or 31 and 32 are closed, there will be obtained in the primary of the transformers an undulating current, the polarity of which will be inverse in one or the other case.

Therefore, at the terminals of the secondary of the transformer an alternating current will be obtained, the first half-cycle of which will have a polarity determined by the operation of the control interrupters, and which, consequently, may be utilised for the control of the different systems previously described.

It is obvious that the above description has been given only by way of non-limiting example and that, in particular, it is possible to employ at the transmitting station any arrangement which allows of obtaining a certain direction of the first half-alternation received at the receiving station, and to combine several receiving devices connected to the same line and operating for different frequencies, without departing from the present invention.

I claim:

1. Electric transmission system comprising an impulse producing station adapted to emit impulses each comprising a plurality of uni-directional pulsations of current, means at said station for determining selectively the direction of said uni-directional pulsations of current, an impulse responsive station, a supply line between said impulse producing station and said impulse responsive station, means in said supply line for converting said uni-directional pulsations of current into an impulse comprising a plurality of cycles of alternating current, and means at said impulse responsive station responsive to the alternating current impulses received for effecting a selection in accordance with the direction of the first half-cycle received of said alternating current impulse.

2. Electric transmission system comprising a control station adapted to emit uni-directional pulsations of current, means at said control station for determining selectively the direction of said uni-directional pulsations of current, a controlled station, a supply line between said control station and said controlled station, and means in said supply line for converting said uni-directional pulsations of current into alternating current impulses, said controlled station comprising a first and a second device for passing current in one direction only, said devices being arranged to pass current in opposite directions, a first and a second control relay for effecting the controls required, each having a first and a second winding, and a first change-over switch and a second change-over switch operated respectively by the second relay and the first relay, the first winding of the first relay being connected in series through the first change-over switch with the first device for passing current in one direction only, and the first winding of the second relay being connected in series through the second change-over switch with the second device for passing current in one direction only, the second winding of the first relay being connected in series through the second change-over switch with the second device for passing current in one direction only, and the second winding of the second

relay being connected in series through the first change-over switch with the first device for passing current in one direction only, each of said switches, on excitation of the first winding of the relay with which it is associated, substituting in the series path the circuit of the second winding of said relay for the circuit of the first winding of the other relay, whereby one only of the control relays is operated by the first half alternation received at the control station, the relay operated being retained in the operative condition during the whole of the time of the control in progress and rendering inoperative the other relay during such time.

3. Electric transmission system comprising a control station, a controlled station, a supply line connecting said stations, means at said control station for supplying alternating current to said controlled station and for selectively controlling the direction of the first half-cycle received at the controlled station, said control station comprising a first and a second device for passing current in one direction only, said devices being arranged to pass current in different directions, a first and a second control relay each having a first and a second winding, and a first and a second switch operated respectively by the second and the first relay, each of said switches having a first and a second pole, the first of said devices for passing current in one direction only being arranged in series through the first pole of the first of said switches with the first winding of the first relay, and the second of said devices being arranged in series through the second pole of the second of said switches with the first winding of the second relay, the first of said devices being arranged in series through the second pole of the first of said switches with the second winding of the second relay, and the second of said devices being arranged in series through the second pole of the second of said switches with the second winding of the first relay, each of said switches, on excitation of the first winding of the relay with which it is associated, substituting in the series path the circuit of the second winding of said relay for the circuit of the first winding of the other relay, whereby said second winding maintains the relay excited at response during the reception by the controlled station of the half-cycles of opposite direction to those which cause the excitation of its first winding.

4. A remote control circuit selecting system comprising an impulse producing means, an impulse responsive means, an alternating current transmission system interconnecting said impulse producing and impulse responsive means, a source of continuous alternating current at said impulse producing means, means for supplying alternating current impulses of a plurality of cycles duration to said alternating current transmission system and for selectively controlling the direction of the first half cycle of said impulses, means at said impulse responsive means selectively responsive to said alternating current impulses in accordance with the direction of said first half-cycle for selecting and establishing one of two desired circuits, and means responsive to succeeding cycles of said alternating current impulse for maintaining said selected circuit established for the duration of said impulse.

5. Electric transmission system comprising a control station, a controlled station, a supply line connecting said stations, means at the control station for supplying alternating current impulses of a plurality of cycles to said controlled

station over said supply line and for selectively controlling the direction of the first half-cycle of said received impulse received at the controlled station, said controlled station comprising a polarized relay, two control circuits either one of which is closed by said relay depending upon the direction of the first displacement of the armature of said polarized relay, and means responsive to succeeding received cycles of said impulse for preventing opening of said closed control circuit during the time that the alternating current is received at the control station.

6. Electric transmission system comprising a control station, a controlled station, a supply line connecting said stations, means at the control station for supplying alternating current impulses of a plurality of cycles to said controlled station over said supply line and for selectively controlling the direction of the first half-cycle received at the controlled station, said controlled station comprising a polarized relay, two auxiliary control relays associated with said polarized relay, the circuit of one or other of said auxiliary control relays being completed on the first displacement of the armature of said polarized relay, means controlled by operation of either of said relays to render the other unresponsive to succeeding half cycles of said alternating current impulses and for maintaining said operated relay circuits established for the duration of said impulse.

7. Electric transmission system comprising a control station, a controlled station, a supply line connecting said station, means at the control station for supplying alternating current impulses of a plurality of cycles to said controlled station over said supply line and for selectively controlling the direction of the first half-cycle received at the controlled station, said controlled station comprising two receiving circuits each including in series a control relay, a switch, and a device allowing current to pass in one direction only, said devices being arranged to allow current to pass in different directions, one of said switches being associated with one of said relays, and the other of said switches being associated with the other of said relays, each of said switches breaking on the excitation of its associated relay, the exciting circuit of the other relay, whereby said other relay is rendered inoperative during the whole of the time of the control in progress, and means for rendering the relay excited by the first half-cycle received responsive during the reception of the half-cycles of a direction opposite to that of the first half-cycle.

8. Electric transmission system comprising a

control station, a controlled station, a supply line connecting said stations, means at said control station for supplying alternating current impulses of a plurality of cycles to said controlled station over said line for and selectively controlling the direction of the first half-cycle received at the controlled station, said control station comprising a plurality of "thyratrons" for effecting the controls required, means for rendering conductive one of the "thyratrons" selectively depending upon the direction of the first half-cycle received at the controlled station and means for extinguishing said "thyratrons" upon cessation of said alternating current impulse.

9. Electric transmission system comprising a control station, a controlled station, a supply line connecting said stations, means at the said control station for supplying alternating current impulses of a plurality of cycles to said controlled station over said line and for selectively controlling the direction of the first half-cycle received at the controlled station, said control station comprising a plurality of "thyratrons" for effecting the controls required, and means for rendering conductive one of the "thyratrons" selectively depending upon the direction of the first half-cycle received at the controlled station, means associated with each of the "thyratrons" for blocking the operation of the other "thyratrons" in response to operation of one of said "thyratrons", and means for extinguishing said "thyratrons" upon cessation of said alternating current impulse.

10. Electric transmission system comprising a control station, a controlled station, a supply line connecting said stations, means at said control station for supplying alternating current impulses of a plurality of cycles over said line to said controlled station and for selectively controlling the direction of the first half-cycle received at the controlled station, said control station comprising two "thyratrons", means for rendering conductive one or other of the "thyratrons" depending upon the direction of the first half-cycle received at the controlled station, a common resistance in the cathode circuits of said "thyratrons", whereby the passage of current in one of said "thyratrons" brings the cathode to a sufficiently positive potential with respect to the potential to which the control grids are brought on the reception of the controlling alternating currents that the other "thyration" is rendered insensitive to current half-cycles of a direction that would normally cause its operation, and means for extinguishing said "thyratrons" upon cessation of said alternating current impulse.

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