Jan. 21, 1941. W. KOENIG 2,229,097

SELECTIVE REMOTE CONTROL APPARATUS

Filed May 26, 1938 2 Sheets-Sheet 1

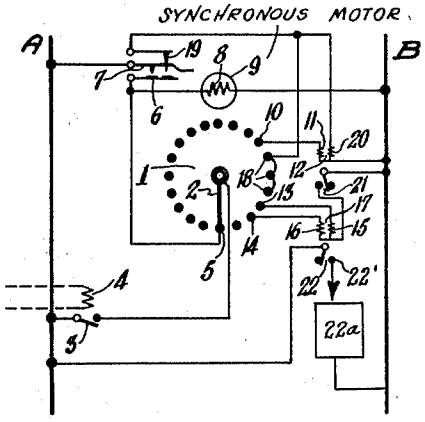

Fig. 1.

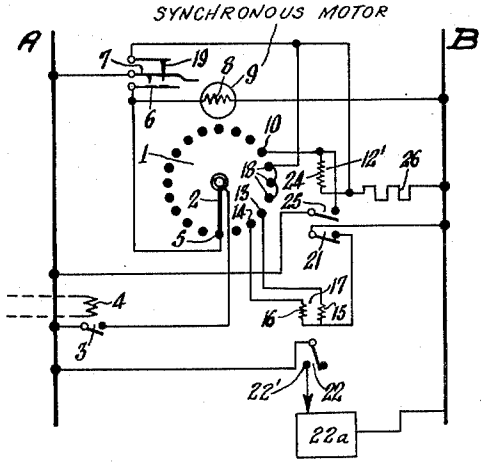

Fig. 2.

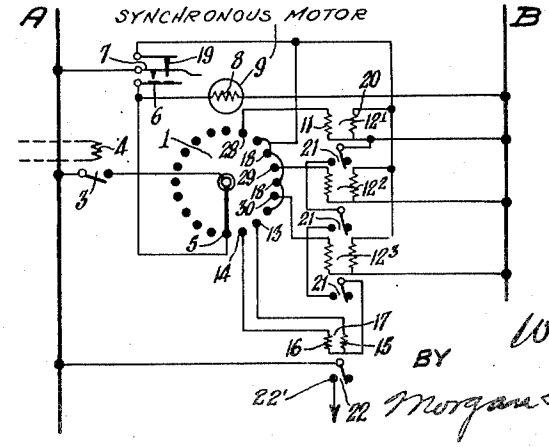

Fig. 3.

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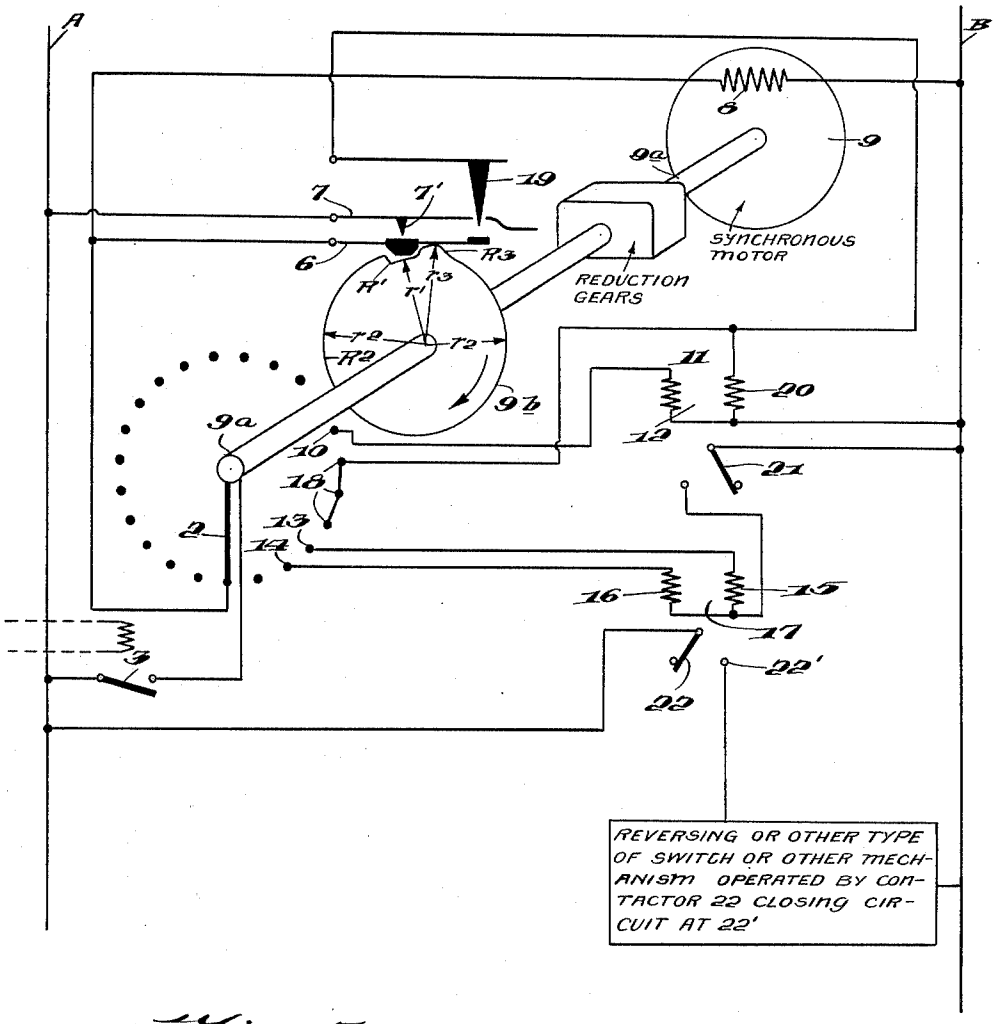

Fig. 4.

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Patented Jan. 21, 1941 2,229,097

UNITED STATES PATENT OFFICE

2,229,097

SELECTIVE REMOTE CONTROL APPARATUS

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Application May 26, 1938, Serial No. 210,197
In Switzerland June 21, 1937

1 Claim. (Cl. 177—353)

The invention relates to a receiving device for a remote control system connected to an alternating current network and designed to control or effect definite operations, and more particularly to such receiving devices controlled by a distant, impulse-sending transmitter, and wherein the selection or control of the different operations is determined by the length of time between a plurality of successive impulses.

The principal object of the invention is to provide a receiving device, connected to an alternating current network, which is started into operation by a starting impulse; this is followed by a preparing impulse, which prepares or sets a relay, which relay in turn is actuated by an operating impulse which follows the preparing impulse by a predetermined time interval. The time intervals between the several impulses determine which of the plurality of receiving devices connected to a common network will be operated by the impulses.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate several embodiments of the invention, and together with the description, serve to explain the principles of the invention.

Of the drawings:

Figure 1 shows an arrangement wherein tilting relays are employed;

Figure 2 is an arrangement in which holding relays are employed;

Figure 3 an arrangement wherein three primary relays are employed; and

Figure 4 is a diagrammatic view showing an amplification of the mechanism and wiring cooperating with the synchronous motor.

Receiving devices embodying the invention are applicable to the remote control of various mechanisms and operations, e. g., switching on and off of lighting networks, synchronization of clocks, and other like uses. The present invention is an improvement in distant control installations employing contact selectors at a transmitting and at a receiving station, which are run synchronously and in the same phase, in which system from time to time an impulse is sent out when the contact arm of the receiving selector contacts with one of the selector contacts connected to a controlling relay.

This invention relates to a receiving arrangement for remote control installations according to the combination method operating through contact selectors driven by synchronous motors, wherein in accordance with the invention at least one primary relay, which upon receipt of a preparing impulse, prepares a secondary or final relay for operation by an actuating impulse occurring at a predetermined time interval following the preparing impulse, whereby the secondary relay is actuated for effecting the desired operation. The primary relay is in series with the secondary relay, is connected to a selector contact and is connected to the off-normal contactor of the contact selector. The primary relay can be in the form of a tilting or multiple winding relay or of a holding relay.

When employing a tilting relay the two windings can be connected on one side with one network conductor and on the other side to a selector contact, or through the off normal contactor to the other network conductor. If the primary relay is a holding relay, the winding can be connected either on one side to one network conductor and on the other side to the selector contact, and also through the holding contactor and the off normal contactor to the other network conductor, or on one side to the selector contact and also through the holding contactor to one network conductor, and on the other side through the off normal contactor likewise to one network conductor and also through a resistance to the other network conductor. To prevent improper operation of the secondary relay, in case the current is on the contact selector at a time when it should be off, the selector contacts which are located between the selector contacts for the primary and secondary relays are connected to the off-normal contactor, so that the primary relay is thrown to its original position and therefore will not prepare the secondary relay for operation by the next impulse on the network.

The receiving means of the present invention has the advantage that with a great capability of selection the cost of required relays and contactors is very small. The employment of tilting relays has the further advantage that since the magnet system is only energized for a short time it can be considerably overloaded, whereby extremely small, simple and consequently inexpensive constructional forms can be employed.

It will be understood that the foregoing general description and the following detailed description as well are exemplary and explanatory of the invention but are not restrictive thereof.

Referring now in detail to the exemplary embodiment of Fig. 1, in the contact selector 1 of the receiving station, the contact or wiper arm 2 is connected to one network conductor A through

the working contactor 3 of an impulse-receiving relay 4, which relay is controlled by the transmitter (not shown). The selector contact 5 is connected to the network conductor A through an off-normal contactor 6, which in the initial position of the contact arm 2 is separated from the contactor 7. The selector contact 5 is also connected through the winding 8 of the synchronous motor 9, which drives the contact selector 1, to a network conductor B. The selector contact 10 is connected to one winding 11 of a primary relay 12 formed as a tilting relay. The selector contacts 13, 14 are connected to the windings 15 and 16, respectively, of a secondary or final relay 17, likewise in the form of a tilting relay; and the selector contacts 18 located between the selector contacts 10 and 13, are connected to the network conductor A through an off-normal contactor 19, which in the initial position of the contact arm 2 is likewise separated from the contactor 7.

The control and operation of contacts 6, 7 and 19 may be effected by any suitable mechanism, such, for example, as illustrated in Fig. 4. Motor 9 is connected, through suitable reduction gearing, to drive a shaft 9*a*, on which shaft is mounted a cam 9*b* and the wiper or contact arm 2. The cam is provided with a short, low portion R_1, having a radius r_1, with a large circular portion R_2 having a little larger radius r_2 and with a projection R_3 having a still larger radius r_3. When contact 3 is closed, the motor starts, moving portion R_2 of the cam into contact with 6, closing a circuit with 7 at 7', to maintain the motor in operation. The motor continues in operation until a revolution is nearly completed, when cam portion R_3 raises 6 into contact with the off-normal contactor 19, which closes a circuit A, 7, 6, 19, 20, B, to thereby energize coil 20 of relay 12 to restore said relay to initial position.

On the receipt of an impulse in the receiving relay 4, the working contactor 3 is momentarily closed. The synchronous motor 9 is thereby energized through the circuit A, 3, 2, 5, 8, B, and will then set the contact arm 2 of the contact selector 1 in rotation. Shortly after the starting of the synchronous motor 9 the contactors 6, 7 are closed, by the action of portion R_2 of cam 9*b*, to close a circuit through the winding 8 of motor 9 to maintain it in operation. The break between the contact arm 2 and the selector contact 5, which took place shortly after the starting of the synchronous motor 9, has consequently no effect on the operation of the synchronous motor 9. At the same time the receiving relay 4 is obviously also deenergized, so that its working contactor 3 will again drop.

As soon as the contact arm 2 comes on to the selector contact 10, on the simultaneous receipt on an impulse, the winding 11 of the primary relay 12 is energized through the circuit A, 3, 2, 10, 11, B. The working contactor 21 is then thrown over, and thereby the secondary or final relay 17 is connected to the network conductor B and so is prepared for actuation by the next impulse. On the engagement of the contact arm 2 with the selector contact 13, the winding 15 of the secondary relay 17 is energized through the circuit A, 3, 2, 13, 15, 21, 22', 22*a*, B, and the working contactor 22 is thrown over, and the connection made by mechanism shown diagrammatically at 22*a* for effecting the desired operation in the appropriate manner.

Shortly before reaching the initial position of the contact arm 2, the two contactors 6 and 7 are pressed against the off-normal contactor 19, by cam portion R_3 so that the latter is momentarily closed. The winding 20 of the primary relay 12 is thereby energized through the circuit A, 7, 19, 20, B, so that the working contactor 21 is switched off again from the windings 15, 16 of the secondary relay 17. It thus again takes up the position shown in Figure 1, where portion R_1 of the cam is directly below contactor 6. In the initial position of the contact arm 2, the contactor 6 again opens and the contactor 7 is again raised, whereby it is separated from the contactor 6. By reason of the now interrupted energizing current circuit A, 7, 6, 8, B, the synchronous motor 9 will come to rest. The arrangement now takes up again the position shown in the figure with the exception that the working contactor 22 of the secondary relay 17 remains closed.

If the working contactor 22 of the final relay 17 is to be brought back into the position shown in Figure 1, the procedure already described must be repeated, only now the last impulse, that is to say, the final impulse is received when the contact arm 2 comes on to the selector contact 14. Then on energization of the winding 16 the working contactor 22 is again changed over.

In case the receiving relay 4 remains energized, as by a continued current, when it should be deenergized, (a condition which might result from some interference with the transmission of the impulses), the apparatus would not function as it should, because no current should be on arm 2 when it engages contacts 18. If current is on arm 2 at this time, a circuit is closed through 3, 2, 18, 20, B, to energize coil 20 and return it to its original or unprepared position.

The modified receiving mechanism disclosed in Figure 2 differs from the arrangement of Figure 1 only in that for the primary relay a holding relay 12' is employed instead of a tilting relay. The winding 24 of this holding relay 12' is connected on one side to the selector contact 10 and the holding contactor 25 connected to the network conductor A, and on the other side through the off-normal contactor 19 to the network conductor A and through a resistance 26 to the network conductor B.

On the engagement of the contact arm 2 with selector contact 10, the winding 24 of the holding relay 12' is energized, the two contactors 21, 25 are accordingly attracted, in which operation the winding 24 remains energized through the holding contactor 25. Shortly before the contact arm 2 reaches its initial position, the off-normal contactor 19 is momentarily closed by cam portion R_3. The winding 24 is then short-circuited and thereby de-energized, whereby the contactors 25, 21 drop. In this operation, when the winding 24 is short-circuited, the resistance 26 prevents any simultaneous short-circuiting of the line AB. The operation otherwise proceeds as in the arrangement shown in Fig. 1. Any further explanation of the method of operation of this arrangement is, therefore, unnecessary.

The form shown in Fig. 2 can also be made so that the off-normal contactor 19 is connected in series with the holding contactor 25. The off-normal contactor 19 which is then normally closed is here momentarily opened shortly before reaching the initial position of the contact arm 2, whereby the holding current circuit for the primary relay 12' is opened and thereby de-energized.

In the forms shown in Figs. 1 and 2 only one primary relay is employed. Obviously a plurality of primary relays can be employed. Thus in Figure 3 there is shown a constructional form with three primary relays made as tilting relays. Each of these primary relays 12^1, 12^2, 12^3 again comprises two windings 11, 20, which are all connected on one side to the network conductor B and on the other side one winding of each relay is connected to the off-normal contactor 19, and the other winding to a selector contact 28, 29, 30 respectively. The contactors 21 of the primary relays 12^1, 12^2, 12^3 are arranged in series with one another, namely, between the secondary relay 17 and the network conductor B. The unused selector contacts 18 arranged between the selector contacts 28 and 13 are here also connected to the off-normal contactor 19.

The method of operation is here essentially the same as in the arrangements already described. Only here, on the contact arm 2 reaching the selector contacts 28, 29, 30, 13 or 14, an impulse must be sent out from time to time, in which operation the contactors 21 of the primary relays 12^1, 12^2, 12^3 must be successively thrown over. The setting back of these contactors 21 here also takes place by the momentary closure of the off-normal contactor 19 shortly before the contact arm 2 reaches the zero position. In all these exemplarily disclosed forms, a selector contact could also be employed for the off-normal contactor. It is then necessary that an impulse must also be sent out when the contact arm 2 engages this off-normal selector contact.

It will be clear that with these embodiments any conceivable combination selection can be made. The arrangements according to Figs. 1 and 2, the contact selectors of which have twenty contacts, comprise a double combination. According to the rules of the theory of combinations, taking the contacts two at a time, there are 190 possible selections. The arrangement according to Fig. 3 with twenty selector contacts, taking the contacts four at a time, permits 4845 possible selections. Any utilization of such a large number of possible selections will obviously not be required in practice. It, however, above all things ensures the advantage that the number of selector contacts can be considerably reduced, whereby the receiving arrangement is small and the time of transition is short. Also for the receiving arrangement the decade or decimal method, a sub-group of the combination method can be employed. Moreover, the two methods can be employed simultaneously in one receiving arrangement.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claim without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:

A selective system responsive to a plurality of impulses spaced from each other by given time intervals, comprising a rotary contact arm, a plurality of spaced contacts with which the contact arm makes successive contact, a normally inoperative constant speed motor for driving the arm, means including a selected first one of said contacts normally engaged by the arm for closing a circuit to the motor upon the receipt of the first impulse, means for closing an independent circuit for the motor, including a switch closed whenever said rotary arm is not in position to engage said contact, a primary relay, circuit connections including said contact arm and a second selected one of said contacts for actuating said primary relay upon the receipt of a second impulse in proper time relation to said first impulse, said relay having means whereby it is maintained in operated position after the impulse ceases, a secondary relay, means whereby said primary relay prepares a circuit for the secondary relay when it is operated, means including a third selected contact and said rotary contact member for completing the circuit to said secondary relay upon receipt of a third impulse in proper time relation to the first impulse, means whereby the primary relay is restored to unoperated condition shortly before the contact arm reaches the normally engaged contact and additional means including said rotary arm and other contacts located between said second contact and said third contact for restoring said primary relay upon the occurrence of an impulse while the rotary arm engages said other contacts.

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