

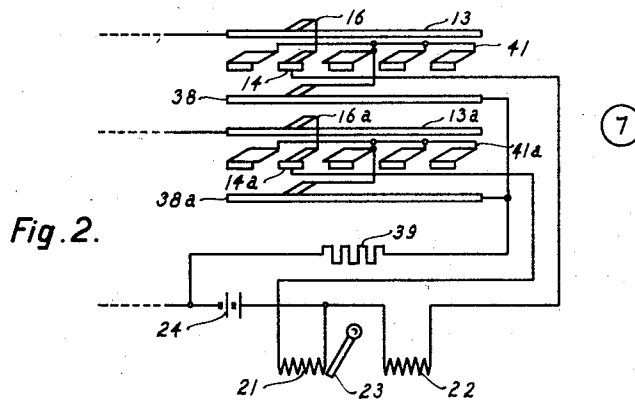
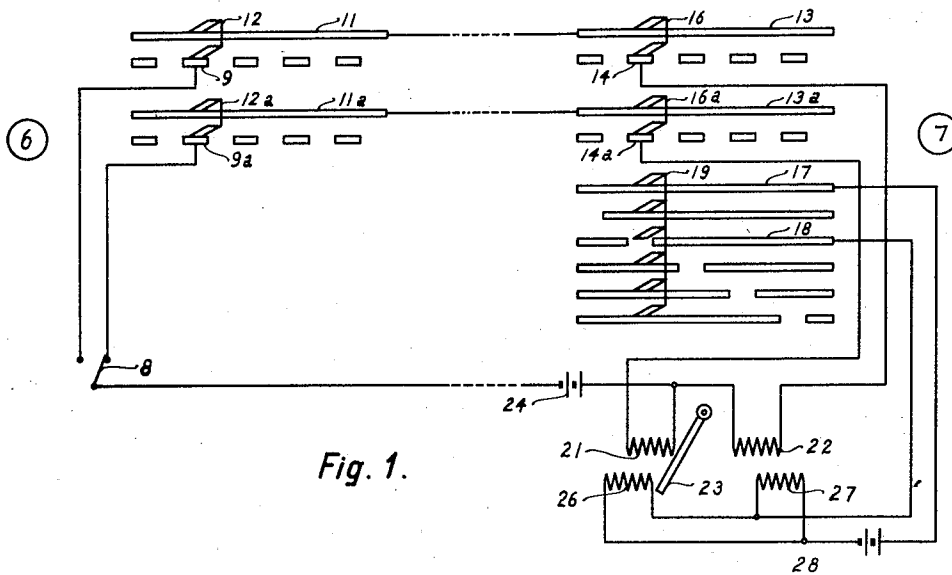
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REMOTE SUPERVISORY CONTROL SYSTEM

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REMOTE SUPERVISORY CONTROL SYSTEM

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This invention relates to improvements in systems for the remote supervision and control of electrical apparatus such as the control of a substation located at a distance from a central power plant.

If a device, which is capable of selecting or connecting the several portions of apparatus to be controlled, is placed in each substation and in the central station and the several selecting devices are operated in synchronism; a number of different current impulses or signals may be successively sent over the same conductors connecting the synchronous selectors or switches for the purpose either of operating a unit of the apparatus to be controlled or of giving a signal to be noticed by an attendant. But only one series of impulses or one signal can be transmitted over the conductors at the same time and the devices receiving and indicating the signals would, accordingly, be energized and de-energized periodically which is undesirable. It is essential to the satisfactory operation of remote control systems that a signal be retained at least for a sufficient period of time to permit the receiving station attendant to take notice of the signal or to permit the operation of the apparatus to be controlled. It is also very desirable that a positive indication be given to the attendant in case the conductors between the selectors or switches are disturbed in any manner.

It is, therefore, among the objects of the present invention to provide means whereby the operation of a device by an impulse, transmitted from one point of a remote control system to another point thereof, will be continued until the operation produced by the first impulse is canceled by a second impulse.

Another object of the invention is to provide means for positively indicating disturbances or failures of any character in the circuit connecting the transmitting and receiving stations of a system for the remote control of electrical apparatus.

Objects and advantages, other than those above set forth, will be apparent from the following description and the drawings in which;

Figure 1 is a diagrammatic representation, embodying the present invention, of a remote control system for electrical apparatus, and

Fig. 2 is a diagrammatic representation of a modified and simplified form of the signal receiving portion of a remote electrical control system.

Referring more specifically to the drawings by characters of reference, the reference numeral 6 indicates the portion of a remote control system for electrical apparatus which portion of the circuit will be hereinafter designated as the transmitter and which is located in the control station and indicates the portion of the system which will be hereinafter known as the receiver and which is located in the station to be controlled. In other words, the impulses operating to actuate a unit of apparatus to be controlled or a signal to be given originate at 6 and perform the operating or signalling action at 7.

The transmitter 6 includes a double throw switch 8, each side of which is connected as shown with a conductive segment 9, 9a of a selector. The segments are connected with conductive rings 11, 11a of the selector which is shown as a developed rotary switch, by brushes 12, 12a. The selectors may be formed as a disk or drum which may be rotated by a suitable constant speed means in such manner that the brushes periodically contact with the segments or else, as is preferable, the brushes may be rotated in contact with the segments and conductive rings of the stationary selector disk or drum.

The receiver 7 includes a selector, similar to that used in the transmitter 6, which is provided with conductive rings 13, 13a connected with the rings 11, 11a of the transmitter selector. Segments 14, 14a of the receiver selector are conductively connected with the rings 13, 13a by brushes 16, 16a. A second receiver selector is provided with a plurality of interrupted rings 18, all of the rings being conductively connected by a brush 19 to a complete ring 17.

The segments 14 of the first receiver selector are connected with actuating coils 21, 22,

of a relay of which the armature 23 thereof may be formed as a pivotally mounted indicator. A battery 24 or other suitable source of current is arranged in the connection between the coils 21 and 22 and the blade of the double throw switch 8. The supply circuit for actuating coils 21 and 22 is controlled by switch 8 and by the transmitting selector. Holding coils 26 and 27 are arranged adjacent each of the actuating coils 21, 22 of the relay in such manner that each pair of coils, as 21, 26, act on the armature in the same direction. The holding coils are provided with a suitable source of current such as the battery 28 and the supply of current thereto is controlled by the second receiver selector as will be apparent from the description hereinafter.

The use of holding coils and of the second receiver selector may be avoided by doubling the number of rings on the first receiver selector and connecting a resistance 39 thereto as may be seen in Fig. 2. Rings 38 are arranged in interposed relation with rings 13 and the resistance 39 is connected between the bars 38 and the line from battery 24 to switch 8. Auxiliary brushes 41 are arranged to contact with the segments 14 and the bars 38 for the purpose of retaining a closed circuit to the energized coils 21 or 22 even when brushes 16 are moved to interrupt contact with the coils 21 or 22. The resistance 39 is inserted into the circuit to limit the current of battery 24 which is designed and is used for the entire circuit containing the high resistance of the transmission lines. The same result may be obtained by eliminating resistance 39 and connecting the rings 38 to only a part of current source 24.

It will be understood that only so much of the system has been illustrated and described as is necessary to disclose the arrangement and operation thereof clearly, and that the various portions of the system required for the control of one unit of apparatus will be multiplied as the units of apparatus are duplicated. It will, however, be apparent that the several selectors and the sources of voltage need not be duplicated for more extensive systems.

The system is shown at the moment during which an operation is to be performed or an indication is to be given. Current flows from battery 24 through switch 8 to segment 9a. Brush 12a conducts the current to ring 11a from which it is transmitted to ring 13a and flows over brush 16a to segment 14a to energize coil 21 which attracts armature 23. Before brushes 12a and 16a leave segments 9a and 14a, contact will have been made by brush 19 with one of the rings 18 which are connected with the holding coils 26 and 27. Both of the holding coils are energized but because armature 23 is already within the range of attraction of coil 26, the armature

will not be affected by coil 27, the attractive force of the two coils being equal, and will remain in the position shown during the remaining portion of the revolution of the selectors.

A new impulse will be sent over the circuit, above described, for each revolution of the selectors so long as the switch 8 is in the position shown and during such impulse period the circuit of coils 26 and 27 will be momentarily opened at brush 19. If switch 8 is reversed current will flow from battery 24 over switch 8, segment 9, brush 12, rings 11 and 13, brush 16, segment 14 and coil 22 which attracts armature 23. During the remaining portion of the revolution of the selectors, armature 23 is retained in its new position by holding coil 27 in the same manner as was described above.

The operation of the modified receiver shown in Fig. 2 is the same as that described with respect to Fig. 1 in that current flows over battery 24 to the transmitter 6, ring 13a, brush 16a, segment 14a to coil 21 which attracts armature 23. During the next instant, i. e. before brush 16a has left segment 14a, brush 41a which is always in contact with ring 38a will have made contact with segment 14a thereby completing the circuit from battery 24 over resistance 39, ring 38a and brush 41a to segment 14a and coil 21 so that the coil remains in energized condition after brush 16a has left segment 14a. Coil 21 being energized through resistance 39, which limits the current supplied to the coil, thus retains armature 23 in the position attracted until the full current of battery 24 is applied to coil 22 by reversal of switch 8. Each of the coils 21 and 22 therefore acts as both the actuating and the holding coil for one position of the armature 23.

If a system such as is shown in Figs. 1 and 2 is used, the operating or indicating action of armature 23 may fail to take place because of interruption of the transmission lines between the transmitter and receiver or because of failure of the battery 24. In case either of the transmission lines for a circuit is broken, no impulse can be transmitted over that circuit and in case the battery 24 fails, no impulse can be transmitted over any of the circuits. In such case it is desirable that a positive failure indication be given. Considering the circuits to be energized as above described, interruption of any one of the transmission lines in such circuits or failure of battery 24, will de-energize coil 21, for the position of the selectors shown, and will permit armature 23 to return to its middle position where it may be retained by one of the numerous means now known for that purpose. Energization of holding coils 26 and 27 shown in Fig. 1 will then be without effect on the armature because the coils will neutralize each other.

With respect to Fig. 2, failure of the transmission lines or of battery 24 will cause de-energization of coil 21 and the armature 23 may return to its central position and will remain in its middle position even though coils 21 or 22 are energized through resistance 39.

The selectors in both the transmitting and receiving stations are operated in synchronism and the selectors in the receiver are preferably operated by the same driving means to simplify the system as much as possible. It will be understood that either the segments and bars or the brushes may be made fixed or movable as may be most convenient.

Although but one embodiment of this invention has been illustrated and described, it will be understood that various other embodiments are possible, and that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

The invention claimed is:

1. In a system for transmitting electrical signals to a remote point, a transmitting selector, a receiving selector operating in synchronism with said transmitting selector, said selectors being connected to form portions of a plurality of signalling circuit a relay controlled by cooperation of said transmitting selector and said receiving selector and having a plurality of windings, some of the windings providing means for moving the armature of said relay into a plurality of signalling positions, the windings being divided into actuating coils and holding coils, the actuating coils being connected with said transmitting selector through said receiving selector for signalling operation of the system, a source of current connected with and controlled by said receiving selector for energizing the actuating coils of said relay, and an auxiliary selector for controlling the energization of the holding coils to open the circuits to the holding coils during energization of the actuating coils upon cooperation of said transmitting and said receiving selector to retain the armature of said relay in a signalling position upon deenergization of the previously energized actuating coil and for periodically checking the completion of the previously energized signalling circuit connected with said transmitting selector.

2. In a system for transmitting electrical signals to a remote point, a transmitting selector, a receiving selector operating in synchronism with said transmitting selector, said selectors forming portions of a plurality of signalling circuits, a relay controlled by cooperative action of said transmitting and said receiving selector and having a plurality of windings, certain of the windings comprising means to effect movement of the armature of said relay into a plurality of signalling

positions, certain of the windings being effective to cause the armature to be retained in the signalling position after de-energization of the signalling windings, a source of current connected with and controlled by said receiving selector for energizing the said windings for effecting said movement into signalling positions, and an auxiliary selector operating synchronously with said transmitting and said receiving selectors for controlling the energization of the second said windings to retain the armature of said relay in a signalling position upon de-energization of a previously energized signalling winding and for controlling the periodic indication of completion of the corresponding circuits connected with said transmitting selector.

3. In a system for transmitting signals from a transmitting station to a remote receiving station, a transmitting selector at the transmitting station, a receiving selector at the receiving station operating in synchronism with said transmitting selector, a relay at the receiving station having an armature biased to a given position and a plurality of holding windings and a plurality of actuating windings for selectively moving the armature to a plurality of positions from the one said position, the holding windings retaining the armature of said relay in the selected position to which it is moved by the actuating windings, means including said selectors for selectively energizing the actuating windings when said selectors reach positions allotted to the windings of said relay, an auxiliary selector operating in synchronism with said receiving selector, and means controlled by said auxiliary selector for energizing the holding windings during operation of the other selectors and de-energizing the holding windings for an interval while the actuating windings are selectively energized by said other selectors.

In testimony whereof we have hereunto subscribed our names this 25th day of July, A. D. 1929.

ADOLF RITTER.
OTTO PLECHL.