Aug. 16, 1938. W. LOHSSE 2,127,414

REMOTE CONTROLLED ELECTRICAL REVERSING SWITCH

Filed July 9, 1935 2 Sheets-Sheet 1

Fig.1

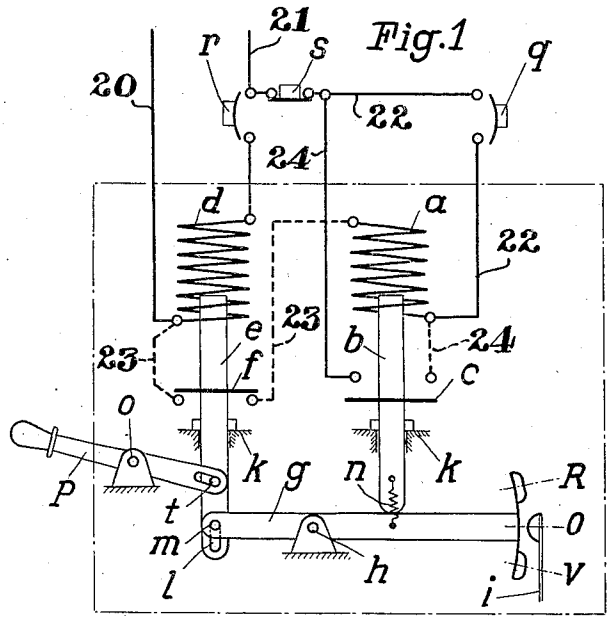
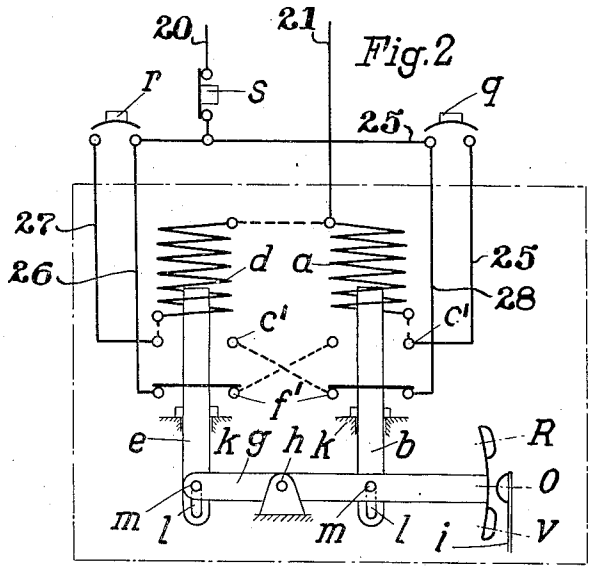


Fig.2



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Filed July 9, 1935 2 Sheets-Sheet 2

Fig.3

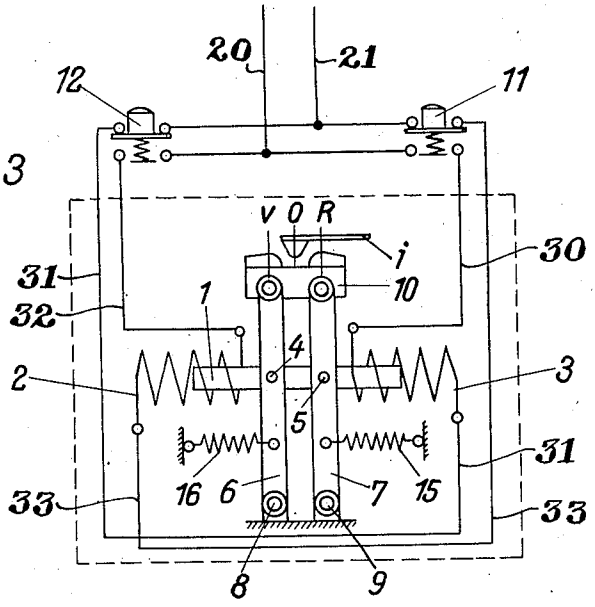
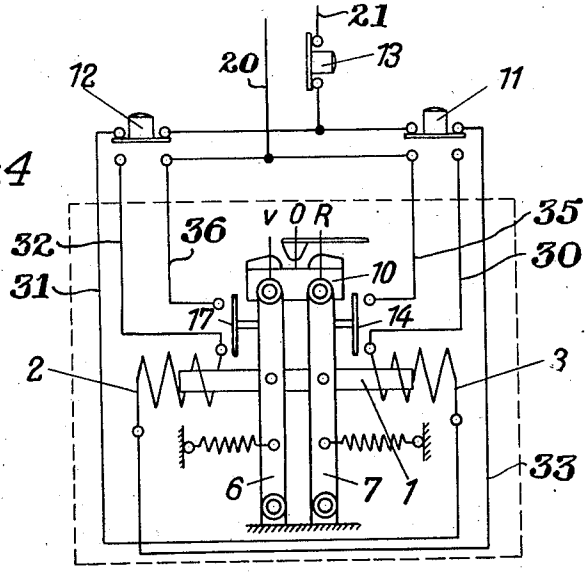


Fig.4



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UNITED STATES PATENT OFFICE

2,127,414

REMOTE CONTROLLED ELECTRICAL REVERSING SWITCH

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In Germany July 12, 1934

5 Claims. (Cl. 175—375)

The invention solves the problem of controlling from afar an electrical reversing switch having a multiplicity of switching positions and to move compulsorily the switch from any one position into another, as may be desired. This problem is solved by means of a number of impulse givers independent from one another, which is at least as great as the number of switching positions. A determined position of the switch is related to each impulse giver and the switch is necessarily moved into this position by the selection of the correct impulse giver.

As an example of application of the invention for the sake of simplicity an electrical reversing switch having only three switching positions is chosen. Any desired increase in the number of switching positions is, however, possible.

In the accompanying drawings wherein several approved embodiments of the invention are illustrated:

Fig. 1 is a diagrammatic view of an embodiment of the invention.

Figs. 2, 3 and 4 are similar views of three further embodiments of the invention.

In Fig. 1, *a* represents the coil of a switch magnet, *b* the armature of this magnet, *c* a holding contact for the exciting current circuit of coil *a*, *d* the coil of a second switching magnet, *e* its armature, and *f* an auxiliary contact secured on the armature *e* through which the exciting current circuit of coil *a* is passed.

A common contact lever *g* is rotatably mounted at *h* and carries the contact groups V and R, which in the corresponding switching positions of the lever *g* come into contact with the complementary contacts *i*. In the position of *g* indicated the contact groups V and R are out of contact with the complementary contacts *i*; the switch is here in the position of rest O. In the position of the switching lever *g*, in which the contacts V and *i* come into contact with each other, a motor connected to the contacts V can be switched into forward running. If the contacts R are in contact with *i*, the contacts R can be so chosen that the motor is connected for reverse running. The remote control switch *g* is able in this way to switch an electric motor into forward or reverse running and to disconnect the same motor completely from the network in the position O, which is in practice frequently desired.

The armatures *e* and *b* have stops *k* against which they abut in the neutral position of the switch lever *g*. The armature *e* has a longitudinal aperture *l* in which a bolt *m* secured on the lever *g* is movable; this permits *e* to be attracted by the coil *d* even when the armature *b* is attracted. The armature *b* has its lower end bearing against the switch lever *g* and is yieldably pressed against the latter by a spring *n*. Since the armature *b* in consequence of the stop *k* can only drop to the position indicated, which corresponds to the neutral position of the switch lever *g*, the spring *n* is tensioned when the armature *e* is attracted. The switch-closing pressure buttons *r* and *q* and the switch-breaking pressure button *s* serve for the remote control of the switch.

The supply conductors 20 and 21 are connected with the opposite ends of the coil *d* and constitute the control circuit for said coil, the circuit closing button *r* being interposed in the conductor 21. A branch conductor 22, in which the circuit closing button *q* is interposed, connects the supply conductor 21 with one terminal of the coil *a* and the opposite terminal of the latter is connected by a conductor 23 with the supply conductor 20, the auxiliary contact *f* being interposed in the conductor 23. The holding contact *c* closes a connection 24 leading from the conductor 22 to the terminal of the coil *a* following the energization of said coil by manual operation of the button *q*. The circuit opening button *s* is connected in the conductor 22 between the conductors 21 and 24, and, when operated, interrupts the flow of holding current to the coil *a*.

The arrangement operates as follows. By pressing on the button *q* the circuits 21, 22, 23 and 20 of the coil *a* close and the armature *b* is attracted and closes the holding contact *c* and conductor 24. Now the tensioned spring *n* brings the lever *g* into the position V. If the button *s* is pressed, the exciting current circuit of the coil *a* is broken, the armature *b* drops and the lever *g* returns into the position O.

If the button *r* is pressed the coil *d* is energized by the current flowing over the conductors 20 and 21 and attracts its armature *e*. By reason of the lost motion in the longitudinal aperture *l* the attraction of the armature *e* is unobstructed, even if the armature *b* was previously attracted. By reason of the lost motion from *e* the auxiliary contact *f* is first opened and in this way the exciting current circuit of the coil *a* is broken. From now on the armature *e* pulls the armature *b* by means of the contact lever *g* as far as the stop *k* out of the de-energized coil *a*; whereupon simultaneously the switch *g* is moved into the position R and the spring *n* is tensioned.

If the button *r* is opened the armature *e* drops under the influence of the spring *n* to its stop *k*

and the contact lever *g* returns into the position of rest O illustrated.

In Fig. 2 the individual parts are provided with the same reference letters as in Fig. 1 in so far as they are similar with the corresponding parts of Fig. 1. Deviating from Fig. 1 the armatures *e* and *b* are similar to one another and each has a longitudinal aperture *l*, which bears in the neutral position of the lever *g* against the bolts *m*, which are secured to the lever *g*. Further, each armature has here a stationary contact *f'* and a holding contact *c'*.

Whilst in the arrangement of Fig. 1 it was necessary to hold the pressure button *r* so long as it was desired to have the switch *g* in the position R, according to Fig. 2 a short depression of any one pressure button suffices to achieve a lasting condition.

If, for example, *q* is depressed, the armature *b* rises, opens the lower contact *f'* and closes the upper contact *c'*. The coil *a* now remains excited through this contact even if pressure button *q* is released. The same applies to the pressure button *r*, in regard to the upper contact *c'* of the switching magnet *e*.

According to the arrangement shown in Fig. 2, the supply conductor **21** is connected with one end of each coil *a* and *d* while the opposite end of the coil *a* is connected over a conductor **25** with the other supply conductor **20**. The circuit closing button *q* is interposed in the conductor **25** between the coil *a* and the supply conductor **20**. The holding contact *c'* of the coil *a* is connected with the stationary contact *f'* of the coil *d*, the last mentioned contact *f'* being connected by a conductor **26** with the supply conductor **20**. Thus after the button *q* has been actuated to energize the coil *a*, the armature *b* is attracted and closes the holding contact *c'* and maintains the coil *a* in energized condition, the current flowing from the conductor **21** through the coil *a*, holding contact *c'*, stationary contact *f'* of the coil *d* and the conductor **26** to the other supply conductor **20**. Incident to the actuation of the armature *b*, the switch lever *g* is actuated and the parts are maintained in this position until the flow of current to the coil *a* is interrupted by actuation of the circuit opening button *s* or the button *r* is actuated. Upon actuation of the circuit closing button *r*, on the other hand, the circuit of the coil *d* between the conductors **20** and **21** is closed over a conductor **27** and the armature *e* being raised closes the contact *c'* relating to the coil *d* and thereby establishes a holding circuit for the coil *d* from the supply conductor **21** through said coil, the related holding contact *c'*, the closed stationary contact *f'* of the coil *a* and the conductor **28** connected with the conductor **25** between the button *q* and the conductor **20**.

In Fig. 1 further a rotatable lever *p* is illustrated which is pivotally connected at *o* with the armature *e*. *p* permits the system to be brought directly by hand into any desired position. It will be recognized from the constructional examples that each impulse current circuit has a number of locking contacts *f* of which one is opened on selecting another impulse giver. It will be recognized further that to each impulse giver holding contacts of the magnet switch controlling the switch are related as for example the pressure button *q* to the holding contact *c*.

The locking contacts *f* are controlled according to the constructional example shown by a lost motion of the magnet switch engaging on the contact lever *g*. The locking contacts *f* can also, however, be controlled from the pressure buttons, for example in the way that on switching in a pressure button the relevant locking contact *f* is mechanically opened.

Further, nothing prevents arranging the locking contact *f* on the switch lever *g*. Likewise the armature of each magnet switch can carry, in addition to the holding contact for the other magnet, the main contacts of the switching position related to it, so that lever *g* serves merely for the mechanical locking of both switch magnets. The operation of this system differs in no way from that above mentioned.

Figs. 3 and 4 show by way of example two further practical embodiments of the invention.

According to Fig. 3 a single magnet armature **1** is alternately influenced by the magnet coils **2** and **3**. The armature **1** is at **4** and **5** pivotally connected with the levers **6** and **7** respectively, the fixed fulcrums of which are indicated at **8** and **9**. The upper ends of the levers **6** and **7** carry a contact bridge **10** on which contact groups V, R and O are located. *i* denotes the complementary contacts, which in accordance with the position of the levers **6** and **7** will abut against one of these contact groups.

The impulse givers consist of push buttons **11** and **12**. In the shown position the push button **12** rests against its upper contacts. If this contact is depressed its lower contacts are connected. Springs **15**, **16** are also provided, which tend to hold the lever system in the position O.

The supply conductor **20** is connected in common to one lower contact of each push button **11** and **12**, the other lower contact of the push button **11** being connected by a conductor **30** with one terminal of the coil **3** the opposite terminal of which is connected with a conductor **31** connected with one of the upper contacts of the push button **12**. The other upper contact of the button **12** is connected with the other supply conductor **21**. Thus upon depression of the button **11** a circuit is closed from the conductor **20** across the lower contacts of the button **11**, the conductor **30**, coil **3**, conductor **31** and upper contacts of the push button **12** to the supply conductor **21** whereby the coil **3** is energized. The other lower contact of the button **12** is connected by a conductor **32** with one terminal of the coil **2** the opposite terminal of which is connected by a conductor **33** with one of the upper contacts of the button **11**, the other contact of which is connected with the supply conductor **21**. Thus upon depression of the push button **12** a circuit is closed from the conductor **20**, lower contacts of the button **12**, conductor **32**, coil **2**, conductor **33** and the upper contacts of the button **11** to the supply conductor **21** whereby the coil **2** is energized. The alternate energization of the coils **2** and **3** causes the lever system to move from left to right out of the intermediate position.

If, when the coil **3** is energized the button **12** is depressed, at first the coil **3** is switched off and immediately thereupon the coil **2** is switched in over the lower contacts of the button **12**, whereby the lever system **6**, **7** is forced into the position R. The lever system will however only remain in this position as long as the push button **12** remains depressed. As soon as the button **12** is released the exciting circuit of the coil **2** is again interrupted, and the lever system is returned to the zero position. The contacts of the push button **11** will also only remain operative as long as the push button **11** remains depressed.

Fig. 4 shows the switching diagram of a similar

arrangement which differs from that shown in Fig. 3 in that it is only necessary to depress the buttons 11 and 12 for a short time to cause the lever system 6, 7 to remain in the position in which it is brought by the movement of the armature 1. In the Figs. 4 and 3 corresponding parts carry the same reference numerals.

The circuit connections in Fig. 4 consist of supply conductors 20 and 21 in which latter a normally closed control button 13 is interposed. The conductor 21 is connected with one upper contact of each of the push buttons 11 and 12, the other upper contact of the button 11 being connected at 33 with one terminal of the coil 2 and the other upper contact of the button 12 being connected with one terminal of the coil 3 by the conductor 31. The supply conductor 20 is connected with one lower contact of each of the push buttons 11 and 12, the other lower contact of the button 11 being connected by a conductor 30 with the opposite terminal of the coil 3 and the other lower contact of the button 12 being connected with the opposite end of the coil 2 by a conductor 32. A branch conductor 35 is connected with the supply conductor 20 and a holding contact 14 is secured to the right hand side of the lever system 6, 7. When the lever system is moved to the right, the holding contact 14 bridges the conductors 30 and 35 thereby establishing a holding circuit for the coil 3 after the depression and release of the button 11. At the left side of the lever system 6, 7 a second holding contact 17 is arranged which is adapted to establish an electrical connection between the conductor 32 and a conductor 36 connected with the supply conductor 20 whereby a holding circuit for the coil 2 is established which is operative after depression and release of the push button 12.

If the button 12 is depressed while the coil 3 is energized, the exciting circuit of the coil 3 is first interrupted between the upper contacts of the button 12 and immediately thereupon the coil 2 is excited over the lower contacts of the button 12, whereby the contact group R is switched in by the armature 1 being attracted and the lever system 6, 7 being forced to the left.

When the button 13 is depressed the one coil (2 or 3), which at that moment is excited, will be cut out and the lever system 6, 7 will again return to the position O.

I claim:

1. In combination a main unitary switching element movable to at least three positions of adjustment, control circuits, switch operating electro-magnets each including a winding and an armature, a mechanical connection between each armature and said switching element, the windings of said electro-magnets being interposed in said circuits, a plurality of independently selectable control devices in said circuits corresponding to the number of positions of said switching element for controlling the energization of said windings, a locking circuit for the winding of at least one of said electro-magnets, and means influenced incident to the energization of the coil of the other electro-magnet for opening said locking circuit.

2. In combination, a main unitary switching element movable to at least three positions of adjustment, control circuits, switch operating electro-magnets each including a winding and an armature, a mechanical connection between each armature and said switching element, the windings of said electro-magnets being interposed in said circuits, a plurality of independently selectable control devices in said circuits corresponding to the number of positions of said switching element for controlling the energization of said windings, a locking circuit for the winding of each of said electro-magnets, and means influenced incident to the energization of the coil of one of said electro-magnets for opening the locking circuit of the other electro-magnet.

3. An arrangement as claimed in claim 1 characterized in that said connection between the armatures and the main switch is a lost motion connection whereby the opening of said locking circuit is effected prior to actuation of the main switch in response to energization of the second mentioned electro-magnet.

4. In combination, a main unitary switching element movable to at least three positions of adjustment, control circuits, switch operating electro-magnets each including a winding and an armature, a mechanical connection between each armature and said switching element, the windings of said electro-magnets being interposed in said circuits, a plurality of independently selectable control devices in said circuits corresponding to the number of positions of said switching element for controlling the energization of said windings, a locking circuit for the winding of at least one of said electro-magnets, said locking circuit being constituted in part by the control device for the winding of the other electro-magnet whereby upon energization of the last mentioned electro-magnet said locking circuit is opened.

5. An arrangement as claimed in claim 1 characterized by the provision of manually operable means for actuating said main switching element.

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