May 27, 1924. 1,495,612

R. L. ROCKWELL

REVERSING SWITCH

Filed June 12, 1918 2 Sheets-Sheet 1

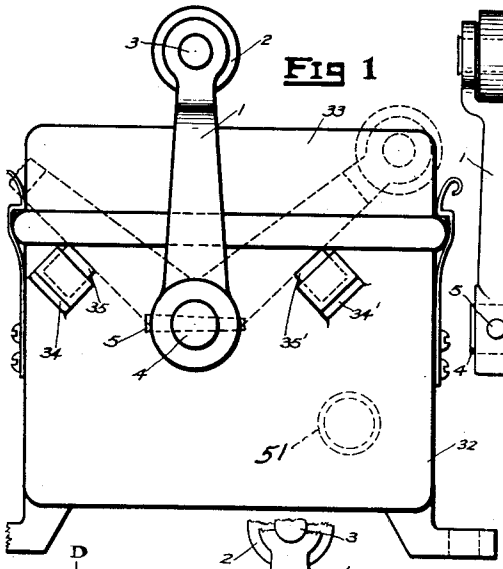


Fig 1

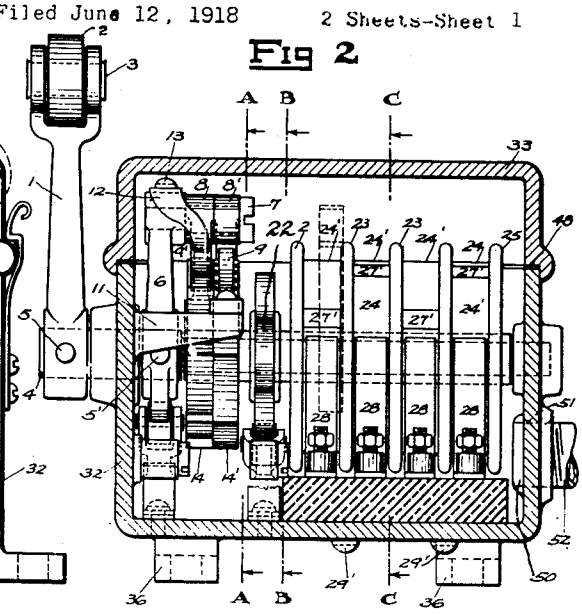


Fig 2

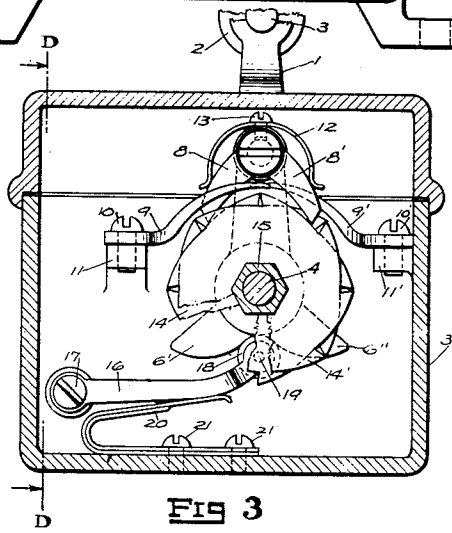


Fig 3

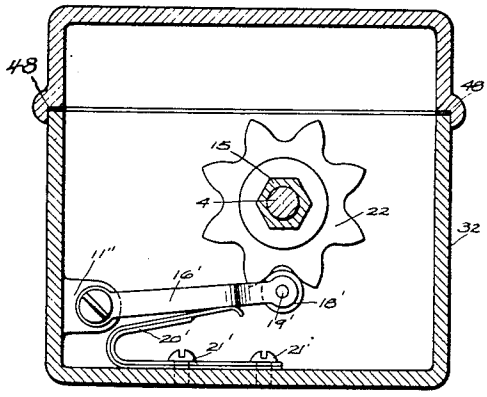


Fig 4

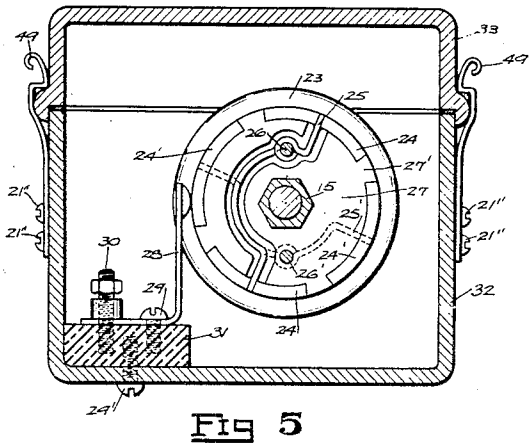


Fig 5

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2 Sheets-Sheet 2

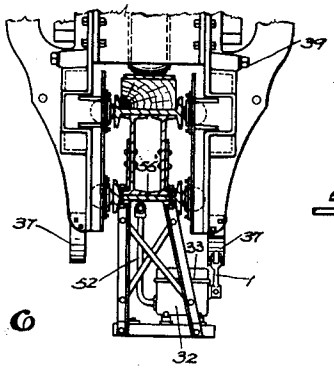


Fig 6

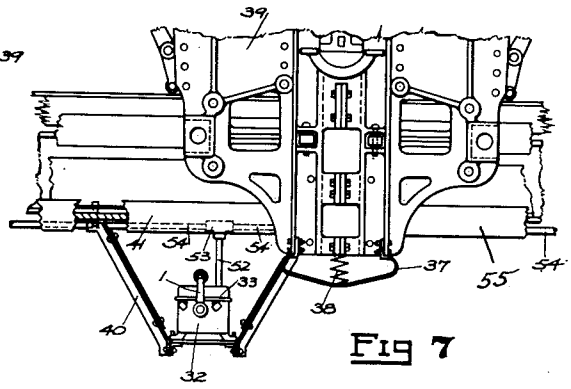


Fig 7

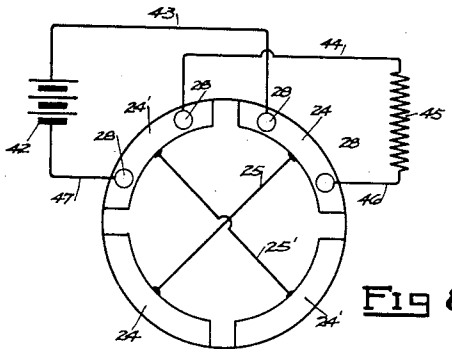


Fig 8

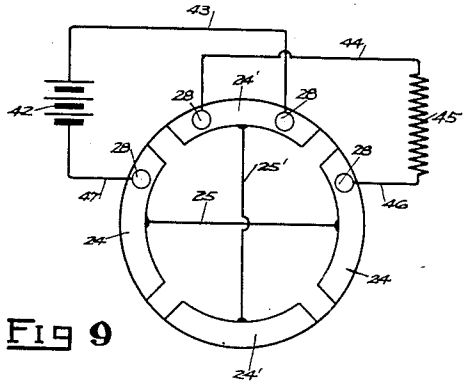


Fig 9

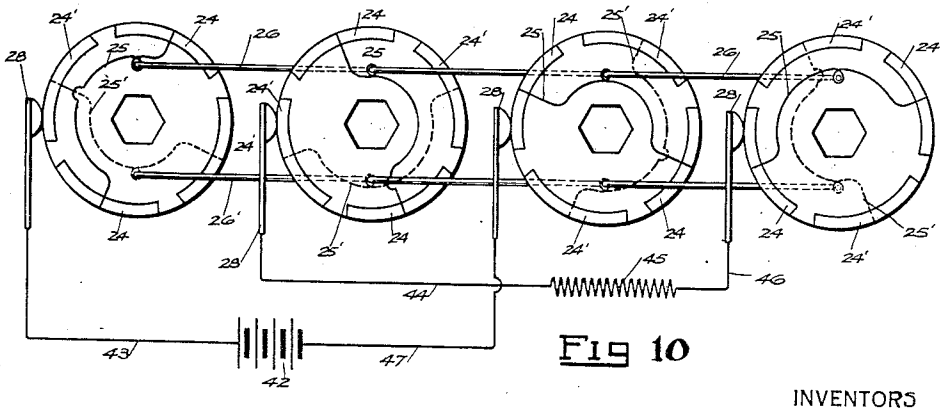


Fig 10

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Patented May 27, 1924. 1,495,612

UNITED STATES PATENT OFFICE.

ROBERT L. ROCKWELL, OF SEATTLE, WASHINGTON, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ERNEST G. HOWE, TRUSTEE, OF SEATTLE, WASHINGTON.

REVERSING SWITCH.

Application filed June 12, 1918. Serial No. 239,671.

To all whom it may concern:

Be it known that I, ROBERT L. ROCKWELL, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented a new and useful Improvement in Reversing Switches, of which the following is a specification.

This invention relates to new and useful improvements in reversing switches, the primary use of which is to reverse the batteries supplying current to the primary relay circuits of the signal system more thoroughly disclosed in the co-pending application for Letters Patest, Serial No. 239,673, filed June 12, 1918. The reversing switch, however, is applicable as a means for reversing the current from a source of electrical supply to any devices connected to it where the reversal must be effected by means of a small movement of an operating lever, and the object of this improvement is to provide a reversing switch that embodies simplicity and ruggedness in construction.

A further object resides in the arrangement of a switch that will effect a complete reversal of a current from the source of electrical supply or a battery for each definite deflection of the operating handle.

A further object resides in the design of the construction of a reversing switch that will automatically effect the definite deflection of the operating handle in event the operating handle has not been moved the exact predetermined distance.

A further object resides in the provision of means for precluding oscillation of the operating handle.

Further objects will appear from the following specification, illustrated in the accompanying drawings, and finally pointed out in the appended claims.

In the drawings, Figure 1 is an end view of the switch from the lever end thereof; Fig. 2 is a view of the working mechanism taken along line D—D of Fig. 3; Fig. 3 is a section through the switch taken along line A—A of Fig. 2; Fig. 4 is a section through the switch taken along line B—B of Fig. 2; Fig. 5 is a section through the switch taken along line C—C of Fig. 2; Fig. 6 is an end elevation of the rail, truck and side view of the reversing switch and the support upon which it is mounted; Fig. 7 is a side elevation of the truck and rail showing the application of the impact shoe and end view of the reversing switch upon which it is mounted; Figs. 8 and 9 are elementary diagrams showing the fundamental arrangement of contact segments, contact fingers, battery, and the device through which the current is to be reversed; and Fig. 10 is a diagram of the electrical connections of the reversing switch.

Referring more particularly to the drawings, in which like reference numerals indicate like parts, the numeral 1 indicates the handle of the reversing switch, the movement of which to either right or left being limited by means of stops 34 and 34′, which are cast integral with the casing 32. Fitted into recesses in these stops are rubber cushions 35 and 35′ which serve to cushion the blows of the operating handle against the stops.

The relation of this reversing switch to the mono-rail track and power truck is shown in Fig. 7 wherein 37 indicates the form of so-called impact shoe 37 mounted on truck 39, and 38 is a spring that is disposed to depress the central portion of the impact shoe, the object being to provide for slight variations in the relative positions of the reversing switch and the car truck; the mechanical arrangement of the truck being such that as the car is loaded the truck frame will be depressed slightly relative to the track and, therefore, to the reversing switch fastened thereto. Two impact shoes are provided on each side of the truck to insure the operation of the reversing switch in event the car is turned end for end for track switching operations.

The supports for the reversing switch consist of angle irons 40, bent, braced, riveted and bolted as indicated in Figs. 6 and 7 to form a substantial, rigid and accessible support for the reversing switch.

It is apparent from inspection of Figs. 6 and 7 that as the car is moving, viz from right to left along the track, the impact shoe 37 will engage operating handle 1 and deflect it to the left. In the system of signals, of which this reversing switch is a component part, this deflection of the operating handle must effect one reversal of the battery and be operative again in either direction.

The elementary diagram of Fig. 8 shows the fundamental arrangement of contact

segments 24 and 24′, contact fingers 28, battery 42 and the device 45 through which the current is to be reversed for each 45° of rotation of the moving element carrying the contact segments. The connections for the position shown in Fig. 8 are such that current will flow from the battery 42 through connecting wire 43, contact finger 28, segment plate 24, wire 46, coil 45, wire 44, finger 28, segment plate 24′, finger 28, wire 47 and back to battery 42. In Fig. 9 the relation between these parts is shown after the moving element has been turned to the right through 45°. It will be noticed that the current flow through coil indicated at 45 will in this case be from the top to the bottom. It is apparent that a rotation to the right or to the left through 45° from this position will again cause current to flow upward through the coil 45. If the moving element is turned from the position illustrated either to the right or left through 45° the current will flow downwardly through coil 45. The operation of this simple arrangement has been more fully described in detail in the co-pending application of the signal system and will hence be no further elaborated upon.

The relative positions of the several contact fingers and segments of this elementary device necessitate objectionable mechanical features in the practical construction of the device. For mechanical reasons it has been deemed best to develop a reversing switch of the so-called barrel type, the mechanical features of which warrant the use of the more complicated electrical connections necessitated by this design, which are shown in Fig. 10, to be more fully hereinafter described. It will suffice to state that this arrangement is such that the battery will be reversed for each 45° of rotation from the position indicated the same as in the fundamental arrangement shown in Figs. 8 and 9.

Referring to the mechanical construction of the reversing switch, 2 illustrates a roller disposed within the bifurcated portions upon the extremity of the handle 1, shown in Figs. 1, 2 and 3, supported on pin 3, the object of which is to reduce the shock and wear due to the operation of the switch by impact shoe 37. This handle 1 is secured to the horizontal shaft 4 by means of a taper pin 5, the shaft 4 being held in alignment by means of bearings in the ends of the casing 32, as shown in Fig. 2. It is to be observed that this shaft passes through the bearing on the operating lever end of the casing but only part way through the bearing on the other end of the casing, and is of uniform diameter up to a point past where arm 6 is mounted thereon. This arm is secured to the shaft 4 by taper pin 5′. Past this point the shaft 4 has been reduced in diameter and carries the hexagonal sleeve 15, upon which are mounted ratchet wheels 14 and 14′, spacing wheel 22, and the moving element of the reversing switch itself.

Attached to the upper end of lever 6 by means of screw 7 are two dogs 8 and 8′. These dogs engage respectively ratchet wheels 14 and 14′ and are held in position by means of spring 12 which is attached to lever 6 by means of screw 13, as shown in Figs. 2 and 3. 11 indicates a projection cast integral with casing 32 that projects from the lever end wall toward the interior, as shown in Fig. 2, and carries at its end the curved strip 9, and 11′ indicates a projection from the back side wall of casing 32 provided to carry a second curved strip 9′. The function of these strips is to enable the operating handle 1 to move the rotating member in either direction and return to its normal vertical position, leaving the rotating member in the new position.

It is to be observed that as lever 1, Fig. 3, is deflected to the left, pawl 8 will engage ratchet 14 after the handle has moved through approximately 50°, thus rotating the moving element 45° to the left for a 50° deflection of the operating handle. The function of curved strip 9 is to lift dog 8′ clear of ratchet wheel 14′, thus allowing handle 1 to return to the vertical position, leaving the moving element in the new position. If handle 1, in Fig. 3, is caused to be deflected 50° to the right, curved strip 9′ will raise dog 8 clear of ratchet wheel 14, thus allowing the moving element to be turned through 45° to the right.

The operating handle 1 is returned to the normal vertical position in each operation by means of lever 16, pivoted at one end on screw 17 and bifurcated at the other end to take the roller wheel 18 which rotates about pin 19 and engages the wing-like projections 6′ and 6″ of lever 6. The lever 16 is forced upwardly by means of spring 20, fastened to the bottom of the casing 32 by means of screws 21.

It is obvious as lever 1 is deflected either to the right or to the left, lever 16 will be forced downwardly and spring 20 thereby compressed. The force exerted by this spring through lever 16 is sufficient to return the lever to the vertical position under all conditions of operation and at the same time prevent excessive oscillation of the lever 1 after being returned to the vertical position.

To provide for some slight oscillation of lever 1 upon returning to the vertical position, dogs 8 and 8′ have been shown of such length that they will allow approximately a movement of the lever 5° from the vertical in either direction before they will engage corresponding ratchet wheels.

Sleeve 15 has been given the section shown in order to secure a constant relation between the various elements mounted there-

on without the use of keys or other complicated fastenings, it being only necessary to press these elements into place upon the spindle 4.

The spacing device shown in Fig. 4 consists of the toothed wheel 22 pressed into place on sleeve 15 and engaging roller 18'. This roller is carried at the end of the forked lever 16' by means of pin 19'. The lever 16' being pivotally attached to lug 11'' cast integral with casing 32 and is held in engagement with the toothed wheel by spring 20' attached to the bottom of the casing by screws 21'. The spring pressure is such that in case the moving element is turned through more than 22½° in either direction from the position shown, or a similar position, this arrangement will effect the required additional amount of rotation to secure the needed 45° previously mentioned.

24 and 24' are contact-segments which dove-tail into place on insulated disk 27 as shown in Fig. 5. Each contact-segment is slotted on one side at the center to receive an end of wire 25 or 25' which serve to connect diametrically opposite contact-segments with one or the other of the horizontal conductors 26 and 26'. The conductors 25 and 25' are placed on opposite sides of the insulated disk 27 in suitable grooves as shown in Fig. 5 so that they are well insulated from the sleeve 15 and from the horizontal conductor other than the one to which they are electrically connected. These contact-segments are preferably made of silver and also the cylindrical pads at the end of contact fingers 28, thus insuring good electrical contact between the segments and contact fingers at all times. Contact fingers 28 are mounted relative to the rotating member, as shown in Figs. 2 and 5, upon a piece of suitable insulating material 31, secured to casing 32 by means of screws 29' and are held in position by screws 29. 30 represents a form of combined fastening screw and terminal to which the electrical conductors are attached.

Referring to Fig. 10, it will be seen that the position indicated will result in current flow from the positive terminal of battery 42, through connecting wire 43, and contact finger 28, segment 24', wire 25' of the first contact-segment disk, thence through conductor 26' and wire 25', segment 24', and contact finger 28 of disk 2, through wire 44, coil 45, from left to right; thence through wire 46 and contact finger 28, segment 24 and wire 25 of the fourth contact-segment disk; thence through conductor 26 and wire 25, contact-segment 24 and contact finger 28 of the third contact-segment disk; thence through wire 47 back to the negative terminal of battery 42.

If we assume the rotating member shown in diagram in Fig. 10 to be rotated 45° to the left, it will have the position shown in Fig. 2. In that case, current would flow from the positive terminal of battery 42, through wire 43, and 28, 24' and 25' of the first contact-segment disk; thence through conductor 26', and 25', 24' and 28 of the fourth contact-segment disk, and wire 46 to the right terminal of coil 45, through 45 from right to left, wire 44 and 28, 24 and 25 of the second contact-segment disk; thence through conductor 26 and 25, 24 and 28 of the third contact-segment disk, and wire 47 back to the negative terminal of battery 42. This gives a current flow through coil 45 in the reverse direction. If the movable element were rotated 45° to the right from the position indicated in Fig. 10, the flow of current would be from the positive terminal of battery 42, through wire 43 and 28, 24 and 25 of the first contact-segment disk, conductor 26 and 25, 24 and 28 of the fourth contact-segment disk; thence through wire 46 to the right terminal of coil 45, through coil 45 from right to left, wire 44 and 28, 24' and 25' of the second contact-segment disk, conductor 26' and 25', 24' and 28 of the third contact-segment disk; thence through wire 47 back to the negative terminal of battery 42. It is thus seen that a movement of the rotating element 45° either to the right or left of a given position will effect a reversal of current in the device to which the battery is supplying current.

Disks of insulating material 23 are placed between the contact-segment disks as shown in Fig. 2 to insulate wires 25 and 25' of the separate disks, maintain alignment of contact-segments 24 and 24', and insure each contact finger 28 making connection with only one set of segments.

Projections 27' (of insulating disks 27) between contact segments 24 and 24' serve to keep the contact disks in place by means of the dove-tail arrangement shown in Fig. 5, and also prevent the short-circuiting of the battery each time it is reversed.

The reversing switch herein shown is simple in construction mechanically, reliable in its operation and easy to inspect and repair. It is also waterproof in every particular, and the felt gasket 48 inserted between the casing 32 and cover 33 insures it being dust proof, the only opening in the casing being through one of the bearings through which shaft 24 passes. To inspect the working mechanism, it is simply necessary to release springs 49 attached to the case 32 by screws 21'', and remove lid 33, exposing thereby all working parts to view. If, for any reason, it is desired to remove the rotating member, curved strips 9 and 9' are removed by loosening screws 10 and 10', then knocking out taper pin 5', and withdrawing shaft 4. This leaves lever 6 and its attachments and the rotating member loose

within the casing, which may then be removed for inspection, repairs and replacement.

It is intended that the wires carrying current to and from the reversing switch shall be well insulated by a standard covering of rubber and impregnated cotton braid. These wires will be protected from mechanical injury and the elements by means of conduit 52 shown in Fig. 2, which screws into place in casing 32 in a reinforced opening 51. A so-called conduit type of bushing, to protect the insulation of the conductors from abrasion where they leave the conduit, is cast integral with the casing, as indicated by numeral 50. The location of conduit 52 is shown in Fig. 1 by means of dotted circles. In Figs. 6 and 7 it is shown how conduit 52 makes connection with the horizontally disposed conduit 54 by means of a suitable condulet 53. Conduit 54 is suitably secured to the under side of the track rail 55 and contains the wires that make connection between the semaphore and battery stations of the signal system.

Obviously, changes in the details of construction can be made within the scope of the following claims.

What I claim as new, and desire to protect by Letters Patent, is:—

1. The combination with a reversing switch of the class described comprising a shaft provided with an actuating lever, a sleeve rotatably disposed upon said shaft provided with a plurality of disks of insulation, contact-segments mounted on said disks opposite to each other and connected in pairs, the pairs of segments of each of said disks adapted to be connected with a source of electrical supply and means mounted between each of said segment disks to insulate the contact-segments, of means operatively connected to said shaft engageable with means connected to said sleeve for effecting a predetermined rotary movement thereof with each deflection of the actuating lever when impelled in either direction thereby effecting a complete reversing of the current from a source of electrical supply.

2. A reversing switch of the class described comprising in combination with a shaft provided with an actuating lever, a sleeve rotatably disposed upon said shaft provided with a plurality of disks of insulation, contact-segments mounted on said disks opposite to each other and connected in pairs, the pairs of segments of each of said disks adapted to be connected electrically, of fingers connected to a source of electrical supply contacting with said disks, means mounted between said disks to insure connection of each finger with one set only of contact segments, means operatively connected to said shaft engageable with means connected to said sleeve for effecting a predetermined rotary movement thereof with each deflection of the actuating lever when impelled in either direction, thereby effecting a complete reversal of the current from a source of electrical supply.

3. A reversing switch of the class described comprising in combination with a shaft provided with an actuating lever, a sleeve rotatably disposed upon said shaft provided with disks of insulation, contact-segments mounted on said disks opposite to each other and connected in pairs, the pairs of segments of each of said disks adapted to be connected electrically and to a source of electrical energy by means of fingers, means mounted between said disks to insure connection of each finger with one set only of contact-segments, of means operatively connected to said shaft engageable with means connected to said sleeve for effecting a predetermined rotary movement thereof of each deflection of the actuating lever when impelled in either direction, and means provided between said contact-segments to prevent short-circuiting of said source of energy each time the current flow is reversed.

Signed by me at Seattle, Washington, this 29th day of May, 1918.

ROBERT L. ROCKWELL.

Witnesses:
R. J. Cook,
D. C. Kuhns.