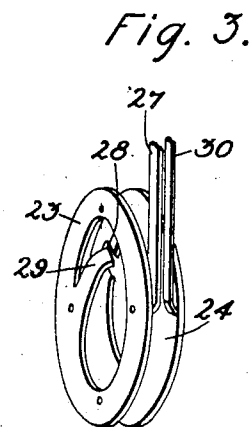
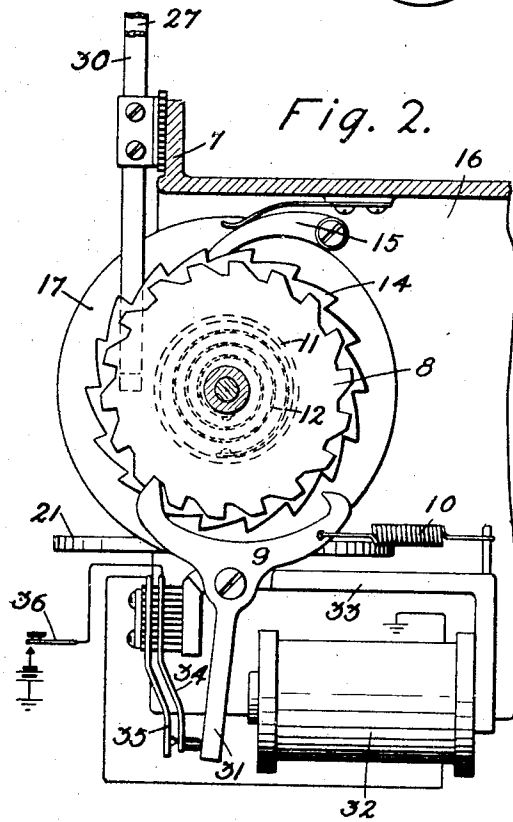


1,324,401.



by

J. G. Roberts
Att'y.

UNITED STATES PATENT OFFICE.

ARTHUR C. MAGRATH, OF BROOKLYN, NEW YORK, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ELECTRIC CONTROLLING-SWITCH.

1,324,401.

Specification of Letters Patent.

Patented Dec. 9, 1919.

Application filed June 29, 1916. Serial No. 106,621.

To all whom it may concern:

Be it known that I, ARTHUR C. MAGRATH, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Electric Controlling-Switches, of which the following is a full, clear, concise, and exact description.

This invention relates to electric controlling switches and more particularly to auxiliary switches commonly called sequence switches, of the type used in automatic and semi-automatic telephone systems.

One object of this invention is to mechanically effect the proper positioning of the contacts of the sequence switch on each movement thereof. Another object is to provide a mechanical motor in cooperation with a mechanical escapement to effect uniform movements of the switch. A further object is to provide a switch capable of usage in systems wherein movement of the sequence switch is accomplished by impulses transmitted thereto. Another object is to provide switches so constructed that two or more may operate in synchronism. In power driven sequence switches having electromagnetic clutches, it has been found difficult to operate two or more in synchronism, as one would tend to pull up and move before the other, due, for example, to greater magnetic flux between one magnet and its clutch plate than between the other magnet and its plate. Then again, slipping of one or the other clutch would result in the contacts not being properly positioned. To insure proper positioning it has heretofore been necessary to provide additional means and keep the clutch magnet energized until the contacts have been placed in proper position. The present invention overcomes these difficulties and dispenses with the provision of additional positioning means if two or more switches are connected to work in synchronism, both escape magnets would be energized, and energization of these would operate them to escape the switch the exact amount predetermined by their mechanical stops.

Referring now to the drawings disclosing one embodiment of the present invention, Figure 1 is a side view of the switch shown partly in section; Fig. 2 is a cross section of the switch on the lines 2—2 of Fig. 1;

and Fig. 3 is a detail view of the commutator contacts and brushes of the switch.

The switch has a shaft 1, on which are mounted a plurality of rotatable contact pieces 3—3, cooperating with contact brush sets 4 and 5 mounted in insulation 6 and secured to a flange 7 of the switch frame, which flange extends parallel to the axis of the shaft 1. The particular type of contacts and the rotatable means to effect connection between them is not a material feature of this invention. Contacts of the type shown in the U. S. Patent 1,127,808 of February 9, 1915, to J. N. Reynolds and C. F. Baldwin are illustrated in the drawings, though a contact arrangement such as shown in U. S. Patent 1,105,811 of August 4, 1914, to F. R. McBerty could be used, as could also a variety of other contact arrangements.

Secured to the shaft 1 and controlling the movement of the rotatable contacts 3—3 is a toothed escapement wheel 8 normally held against movement by a pivoted escapement pawl 9. This pawl is held in engagement with the wheel 8 by a coil spring 10 secured in any suitable manner to the switch frame. The wheel 8 has an annular housing 11 on the inner side thereof, which serves to house a spiral spring 12. One end of the spring 12 is secured to the housing 11 and the other end is secured to the hub 13 of another toothed wheel 14 rotatably mounted on the same shaft 1 as the escapement wheel 8. The teeth on the wheel 14 are pitched in a reverse direction to those on the escapement wheel 8 and are engaged by a spring-pressed holding pawl 15 secured to the switch frame 16. A clutch plate 17 loosely surrounding the shaft 1 and secured to the wheel 14 by a leaf spring 18 serves to rotate the wheel 14 to rewind the spring 12. A clutch magnet 19 is mounted on the switch frame 16 and has a yoke 20 of magnetic material secured to its core to provide a low reluctance magnetic path to increase the magnetic flux tending to attract the clutch plate 17 upon energization of the magnet. A circular disk 21 extends through an opening in the frame 16 and is arranged at right angles to the clutch plate 17 for engagement thereby. The disk 21 is securely mounted on a power driven shaft 22 which is in constant rotation.

To insure that the spring be fully wound

the following arrangement is provided for keeping the clutch magnet energized until the spring is fully rewound, and to de-energize the magnet when this has been accomplished. Annular contact pieces 23 and 24 are provided and mounted on insulating strips 25 and 26, respectively, which are located on the adjacent faces of the wheels 14 and 8, respectively. The contact pieces are in the relative positions shown in Fig. 3 when the spring is rewound. The contact piece 23 has a projection 29 which, in the position shown in Fig. 3 is located in a notch 28 on the other contact piece and out of engagement with said contact piece. In any other position projection 29 engages the contact piece 24. Brushes 27 and 30 engage the contact pieces 23 and 24, respectively, and form part of an energizing circuit for the clutch magnet 19, this circuit extending from grounded battery, spring brush 30, contact piece 24, projection 29, contact piece 23, spring brush 27 to clutch magnet 19, and ground. This circuit is broken as soon as the projection 29 drops into the notch 28.

Escapement and consequent movement of the switch contacts is accomplished by the following mechanism. The escapement pawl 9 has an extension 31 which is the armature of an escapement magnet 32 secured to a magnetic frame piece 33, in which the armature 31 is also pivoted. This frame tends to increase the effectiveness of the magnet in operating its armature 31. As shown the armature may control engagement of contacts 34 and 35 secured to frame 33 and through which an energizing circuit for the escape magnet 32 may extend. This circuit would be closed by a switching means, a key 36 being represented, though, in practice, it might be any other circuit interrupting means. As shown in Fig. 2, the springs 34 and 35 are included in the circuit of the magnet 32 so that operation of the magnet would result in interrupting its own circuit and moving the escapement wheel 8 until the key 36 was released. If it be desired, the springs 34 and 35 can be omitted and energization and deenergization of the magnet 32 controlled directly by any suitable interrupting means here represented by the key 36.

In operation, the parts being initially in the relative positions shown in the drawing with the disk 21 in motion, the circuit of the escape magnet 32 will be closed at the key 36, and energize the escape magnet 32 to pull up its armature 31 and thus withdraw the escape pawl 9 from the escapement wheel 8. The spring 12 will rotate the wheel 8 with the circuit controlling contacts 3 to establish and interrupt circuits controlled by the contact brush sets 4 and 5 of the switch. The right end detent of the pawl 9 will engage the escapement wheel

8 and prevent movement in excess of a single step. However, in operating, the armature opened the circuit to escape magnet 32, which would let pawl 9 fall back under influence of the spring 10. In this position the springs 34 and 35 again engage, whereupon magnet 32 again pulls up and opens its own circuit escaping the wheel 8 an additional step at the same time. This takes place so long as the key 36 is held closed. As before explained, the springs 34 and 35 may be omitted, in which case, energization and deenergization of the escape magnet 32 would be accomplished directly by closing and opening the key 36. On the first movement of the escapement wheel 8, carrying the contact piece 24 with it, the notch 28 moves to a position in which the projection 29 no longer seats therein. Projection 29 then contacts with the contact piece 24, closing a circuit for the clutch magnet 19. The clutch magnet 19 would thus be energized and draw the clutch plate 17 into engagement with the rotating disk 21. This disk would then turn the clutch plate 17 together with its attached wheel 14 and rewind the spring 12. Rewinding would continue until the projection 29 on the contact piece 23 falls into the notch 28, whereupon the circuit for the clutch magnet 19 would be broken and the clutch plate 17 disengaged from the disk 21. The locking pawl 15 would permit movement of the wheel 14 to wind the spring but hold the wheel engaged to prevent reverse movement. Rewinding of the spring would take place even during the movement of the escapement wheel 8.

What is claimed is:

1. An electric switching system including a rotatable shaft, contacts secured to said shaft, springs engageable with said contacts, an escapement wheel secured to said shaft, means engaging said escapement wheel to control the movement thereof, an electromagnet for operating said controlling means, a toothed wheel rotatably mounted on said shaft, a spring connecting said escapement and toothed wheels for rotating said shaft to cause engagement of said contacts and springs, and means for continuously rotating said toothed wheel upon escapement to restore energy to said spring.

2. An electric switch including contacts, a shaft to which said contacts are secured, springs engageable with said contacts, means to effect cooperation of said contacts and springs, a spring to operate said means, a rotatable member to which said spring is secured, and means movable longitudinally of said shaft for continuously rotating said rotatable member upon operation of the first named means to restore energy to said spring.

3. An electric switching device compris-

ing a frame, a rotatable shaft supported by said frame, a plurality of contacts secured to said shaft, a plurality of springs mounted on said frame arranged to engage said
 5 contacts, an escapement wheel secured to said rotatable shaft, a pallet engaging said escapement wheel, an electromagnet mounted on said frame to move said pallet, a toothed wheel rotatably mounted on said
 10 shaft, a holding means secured to said frame to engage said toothed wheel, a spring flexibly connecting said escapement wheel and said toothed wheel, a clutch plate associated with said toothed wheel, and a clutch magnet secured to said frame.

4. In an electrical switching device comprising a frame, a rotatable shaft supported by said frame, an escapement wheel fixed to said shaft, a toothed wheel loosely mounted on said shaft, said escapement and
 20 toothed wheels having inner opposed faces, a spring flexibly connecting said toothed wheel and said escapement wheel, a power means, electric means to cause said toothed
 25 wheel to rotate to rewind said spring, an annular contact piece having a notch position therein on the inner opposed face of said escapement wheel, an annular contact piece having an extension thereon to engage
 30 said first contact piece in one position, said second mentioned contact piece being on the inner opposed face of said toothed wheel, brushes engaging said contact pieces, and a

circuit closed when said extension engages with said first mentioned contact piece to
 35 actuate said electric means to effect rewinding of said spring.

5. In an electrical switching device comprising a frame, a rotatable shaft supported by said frame, a plurality of contact making means secured to said shaft, a plurality
 40 of springs mounted on said frame and arranged to engage said contact means to cause circuit changes when said shaft is rotated, an escapement wheel secured to said shaft,
 45 a pallet engaging said escapement wheel, an electromagnet mounted on said frame operating said pallet, a toothed wheel rotatably mounted on said shaft, a spring flexibly connecting said escapement wheel and said
 50 toothed wheel, contact means on said escapement wheel and said toothed wheel to engage upon escapement, brushes secured to said frame and engaging said contact means, a
 55 power means, a clutch plate associated with said toothed wheel, a clutch magnet secured to said frame and arranged to cause said power means to rotate said clutch plate to rewind said spring, and a circuit for actuating said clutch magnet extending through
 60 said contact means and closed upon movement of said escapement wheel.

In witness whereof, I hereunto subscribe my name this 28th day of June, A. D. 1916.

ARTHUR C. MAGRATH.