Feb. 28, 1939. H. WERMEILLE 2,149,036

MOTOR OPERATED SWITCH

Filed Aug. 1, 1935

Fig. 1.

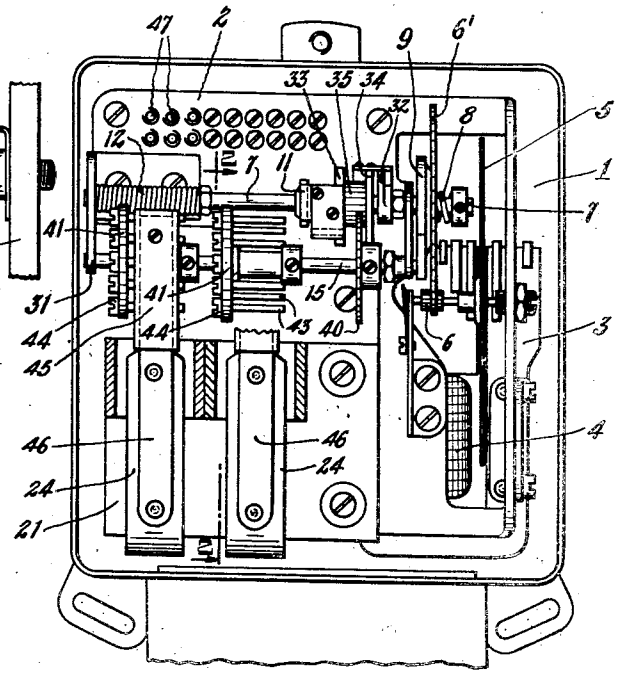


Fig. 4.

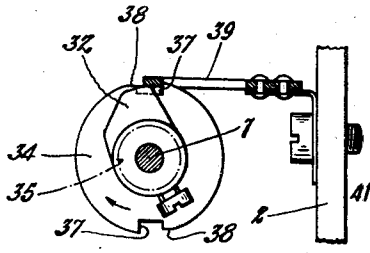


Fig. 2.

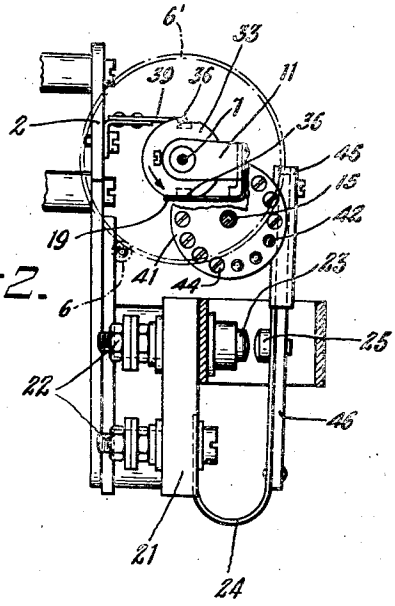
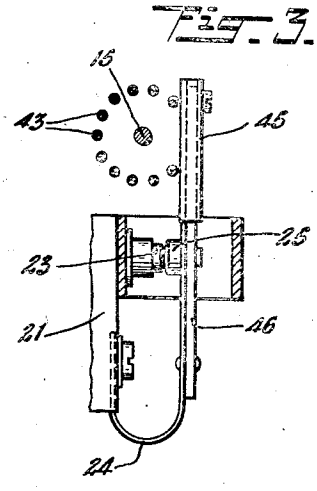


Fig. 3.



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UNITED STATES PATENT OFFICE

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MOTOR OPERATED SWITCH

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In Switzerland September 20, 1934

2 Claims. (Cl. 200—92)

The invention relates to motor-operated electric switches and more particularly to a novel and improved switch of this type adapted for use at a distance from the operator.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawing, referred to herein and constituting a part hereof, illustrates one embodiment of the invention, and together with the description, serves to explain the principles of the invention.

Of the drawing:

Fig. 1 is a front elevation of an illustrative embodiment of the invention with the front cover removed;

Fig. 2 is a transverse section on line 2—2 of Fig. 1;

Fig. 3 is a partially diagrammatic detail of the contact actuating mechanism; and

Fig. 4 is a detail in side elevation of part of the one-way clutch mechanism.

The invention has for its object the provision of a novel and useful improvement in motor-operated switches wherein the motor is returned to its initial position after each operation and wherein the switch setting is not disturbed during the return and de-energization of the motor. Such switches are useful for the remote control of various circuits, such as street lighting circuits. Such a switch is shown and described in the copending application of Willi Beusch Serial No. 743,223 filed September 8, 1934, which became Patent No. 2,083,425 on June 8, 1937, and the present invention is primarily an improvement on certain features of said Beusch switch.

The improvements of the present invention are chiefly directed to the motor-operated means for timing and actuating the cycles of making and breaking contact in the switch. More particularly, the invention comprises a novel construction for readily, and easily modifying the switching cycle or cycles through a wide range and without disturbing the switch-driving and controlling mechanism or motor connections in the slightest. In switches of the type disclosed in said Beusch application, a movable switch contact is controlled in its movements towards and away from another contact by rotatable cams mounted on a shaft driven from the motor, and the chief object of the present invention is to provide switch operating cams or the equivalent which can be widely modified in their relation to the switching cycle without the setting or movement of any parts along or about the rotating shaft carrying said cam means.

Referring now in detail to the illustrative embodiment of the invention as shown in the accompanying drawing, the apparatus is supported within a casing and may be mounted upon the rear wall or base 1 thereof, the cover not being shown. The iron frame 3 of the switch-actuating motor of the Ferraris type is supported on a base plate 2 seated within the casing, said motor also comprising the coil 4 and the disc-shaped rotor 5.

The switch to be actuated by said motor means comprises one or more fixed contacts 23 rigidly secured to an insulating plate by bolts 22, the ends of which serve as circuit terminals. Movable contacts 25 for cooperating with the fixed contacts 23 are connected to the insulating plate 21 by flat conductor springs 24 and other bolts 22, the effect of springs 24 being to normally hold the contacts in circuit closing position.

Referring now to the embodied means for effecting opening and closing of the switch contacts by the motor, a counter shaft 7 is driven from the motor through suitable reduction gearing such as the gears 6 on the rotor shaft which meshes with gear wheel 6' on the countershaft 7. Said gear wheel 6' is preferably frictionally connected to the countershaft by means of a spring 8 which forces the face of the wheel against a flat arm 9 projecting from the shaft.

The embodied means for effecting return movement of the motor to its initial position after de-energization comprises a coil spring 12 which is fixed at one end to the countershaft 7 and at the other end to the bearing 31 of said countershaft.

A one-way clutch mechanism is provided for transmitting movement of the countershaft in one direction to the switch-actuating means, while preventing slip or return movement thereof during the returning movement of the motor itself. As embodied, an arm 11 is fixed to the countershaft 7 at an intermediate point. Spaced from said arm and also fixed to the countershaft is a cam 32 between which and the arm 11 is loosely mounted a spur gear 35. Said spur gear is provided with a disc flange 33 on the side adjacent the arm 11 and with a similar disc

flange 34 adjacent the cam 32. Means are provided for imparting motion in one direction from the arm 11 to the wheel 35 through the disc 33, said means comprising a spring pawl 19 fixed to the end of arm 11 and adapted to engage projections 36 on the periphery of the disc 33, whereby arm 11 will impart movement to the disc in a direction indicated by the arrow.

Means for preventing reverse rotation of the spur gear 35 comprises a detent pawl 39 which is fixed to the base plate 2 and overlies the flange disc 34. Said disc 34 is provided with two diametrically opposite notches 37 with which a flat portion 38 communicates on one side. As shown in Fig. 4 the pawl 39 lies against both the periphery of the disc 34 and the cam 32 so that the disc 34 is prevented from turning in one direction by the high edge of the notch 37, but in the postiion of rest shown in Fig. 4, the pawl 39 is held out of the bottom of the notch by the cam 32 so that the disc can be rotated in the reverse direction.

The operation of the foregoing mechanism is as follows:

If the circuit, in which the coil 4 of the motor, 3, 4, 5 is connected, is closed to energize the motor, the rotor 5 turns the countershaft 7 and the spring pawl 19 by means of the disc flange 33 takes with it the gear wheel 35. The detent pawl 39 does not prevent this rotation, since in such motion it is conducted by the flat portion 38 on to the periphery of the disc flange 34. After the countershaft 7 has made a half revolution, the flat arm 9 abuts against a fixed stop, not shown in the drawing, so that either the frictional drive between the gear wheel of the gear 6 mounted on the countershaft and the flat arm 9 allows slip to take place, or when the frictional resistance to relative movement of the parts is greater than the turning moment of the rotor 5, the rotor is braked until it comes to rest. Shortly before the completion of the half revolution of the countershaft 7, the detent pawl 39 snaps into one of the recesses 37 and by this means prevents any possible advance movement of the rotary member 33, 34, 35 beyond the half revolution of the countershaft 7. If the circuit of the motor is again interrupted, the countershaft 7, together with the spring pawl 19, the gear 6 and the rotor 5, returns to its original position under the action of the returning spring 12. The rotary member 33, 34, 35 cannot follow this return motion by reason of the action of the detent pawl 39. However, shortly before the countershaft 7 has returned to its position of rest, the detent pawl 39 is raised by the lifting cam 32 to the height of the flat 38, whereby the rotary member 33, 34, 35 is released for rotation in the next operative movement of the countershaft 7.

The embodied means for transmitting the desired motion from the countershaft 7 to the movable contacts 25 comprises a reducing gear 40 meshing with gear 35 and mounted on the operating shaft 15. A cam-like actuating device for each switch contact is rotatably connected with shaft 15 and comprises discs 41 fixed to the shaft and provided with a plurality of screw threaded holes 42 arranged in a circle near the periphery of the disc. A plurality of pins 43 are screwed into said holes, said pins being provided with screw-threaded shafts adjacent the slotted head 44 and a smooth cylindrical portion remote from the head. When the pins are properly seated in the disc 41 it will be clear that their projecting portions form an annular or substantial cylindrical group of rods about the shaft 15 and lying against the upper end of the movable contact spring, which is preferably covered with an insulating sleeve 45. As the shaft 15 rotates, it will be clear that member 45 will slide over the cylindrical surface formed by the projecting pins.

The operation of the switch contacts by the pin-camming mechanism described above is as follows:

The operative movement of the countershaft 7 is transmitted by means of the gear wheel 35 of the rotary member 33, 34, 35 at a reduced rate to the operating shaft 15 through the spur wheel 40. In this operation the insulating pieces 45 on the carrier strips 46 of the movable contacts 25 slide over the cylindrical surface formed by the projecting parts of the pins 43. If the ring of pins 43 is uninterrupted, the insulating pieces 45 with the contacts 25 are held in a position which prevents contact being made between 23 and 25, i. e. any movement of the part 41, 43 producing an elevation does not take place (position shown in Fig. 2). If on the other hand several adjacent pins 43 are removed from the discs 41, i. e., there is a gap in the ring of pins, when this gap passes the insulating piece 45, the latter sinks into this gap and a momentary closure of the circuit between 23 and 25 is obtained (Figure 3), until the next pin 43 after the gap exerts a lifting action on the insulating piece 45 and by this means the contacts 23, 25 are again moved apart from one another.

It will be seen that on one rotation of the operating shaft 15, a plurality of closures of the circuit can be produced on different angular movements of the operating shaft, for which purpose there is only necessary a corresponding distribution of the pins 43 in the disc 41.

By reason of the operating shaft being connected to the countershaft through reduction gearing, the number of cycles of operations possible with the arrangement shown in said Beusch application can be considerably increased. For example, the circuit of the motor mechanism 3, 4, 5 can be closed seven times, before the operating shaft 5 has made on revolution. The conditions can be altered by suitable selection of the relative sizes of the wheels 35 and 40, and can be so fixed as to obtain a still larger number of cycles. In order to have a free hand in this respect, the wheels 35, 40 can be made so as to be easily interchangeable.

In the example of construction shown it is assumed that two circuits are to be controlled. There can however be fewer or more; in the latter case a corresponding number of discs 41 are arranged on the operating shaft 15.

Since the lifting device required for the closing and opening of each circuit comprises a disc and removable pins arranged in a circle therein, any alteration in the cycles of switching operations can be obtained without its being necessary to make any adjustment of the lifting device relatively to the operating shaft, i. e. the pins can be simply inserted in the disc in the manner desired.

The arrangement that the detent pawl 39 by falling into a recess 37 prevents an advance movement of the rotary member 33, 34, 35 beyond the angular stroke of the spring pawl 19, or in other words, beyond a half-revolution of the countershaft 7, is important in the case where the pins 43 are so arranged in a plurality of discs 41 that in these discs a gap in each ring of pins comes into operative relation at the same time.

with the insulating piece 45 and by this means the springs 24 of these insulating pieces together exert a sudden turning moment on the operating shaft 15.

Instead of being arranged parallel to the operating shaft 15 the pins 43 can be arranged radially relatively thereto. In this case the screw-threaded holes for the screwing in of the pins would be arranged in the peripheral surface of the disc 41 and the free ends of the pins would form the sliding track for the contact carrier. The pins 43 must then be provided at their inner ends with screw-threads serving for screwing them in and the formation thereof into a head 44 would preferably be dispensed with. Screw threaded holes 47 may be provided in the base 2 for holding spare pins.

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 claims without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:

1. In a motor-actuated electric switch in combination a movable contact, a second contact, means for moving the movable contact relatively to the second contact comprising a motor of the Ferraris type and rotary cam means actuated thereby for moving the movable contact, the actuating surface of said cam being comprised of a plurality of spaced apart rods disposed in a substantially cylindrical relation, said rods being removable to vary the peripheral action of said cylindrical surface.

2. In a motor-actuated electric switch in combination a movable contact, a second contact, means for moving the movable contact relatively to the second contact comprising a motor of the Ferraris type and rotary cam means actuated thereby for moving the movable contact, the actuating surface of said cam being comprised of a plurality of spaced apart rods disposed in a substantially cylindrical relation with the movable contact tangential to the cam surface, said rods being removable and interchangeable to vary the peripheral action of said cylindrical surface.

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