Aug. 23, 1932. A. S. ANFINNSEN ET AL 1,873,527

ELECTRICAL SWITCH

Filed Nov. 4, 1930

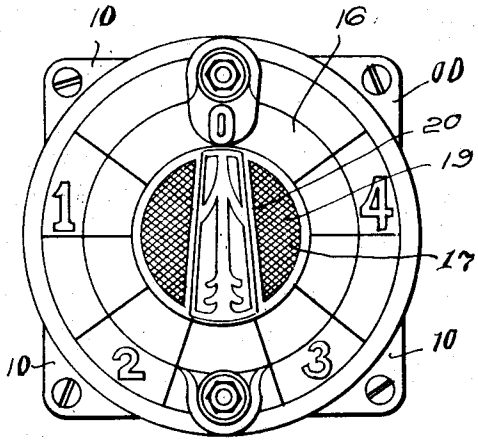


Fig. 1.

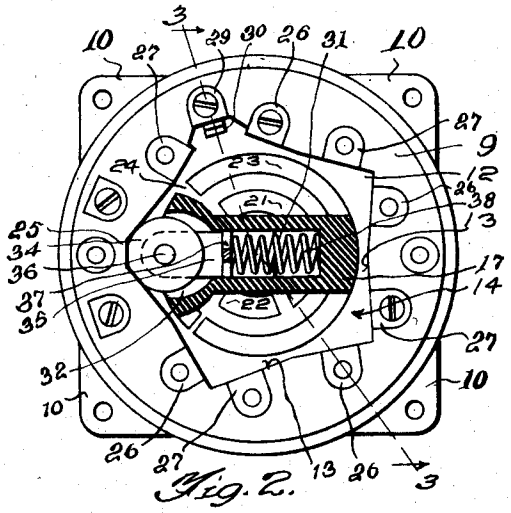


Fig. 2.

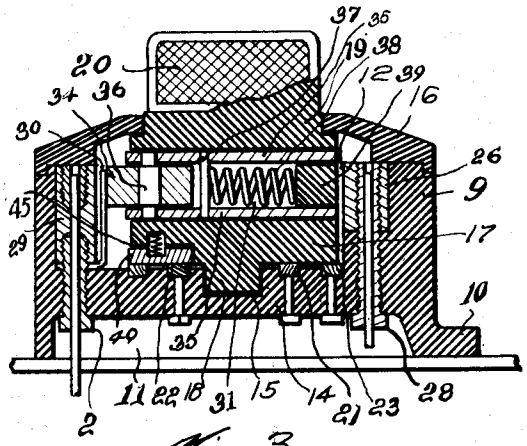


Fig. 3.

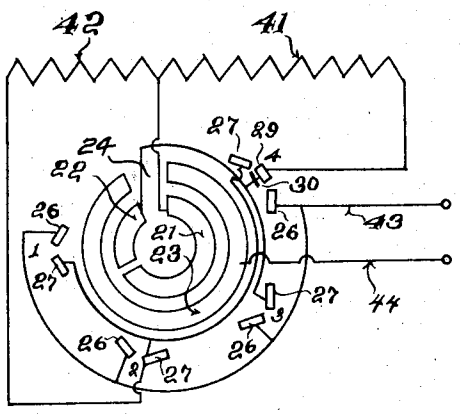


Fig. 5.

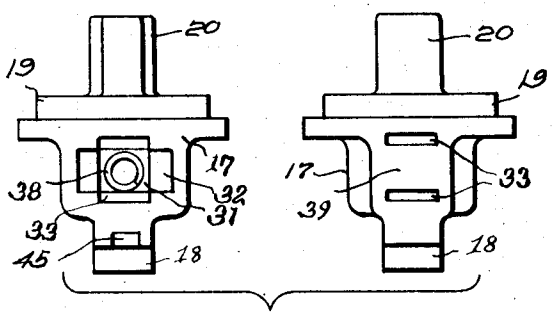


Fig. 4.

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UNITED STATES PATENT OFFICE

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ELECTRICAL SWITCH

Application filed November 4, 1930, Serial No. 493,422, and in Norway November 5, 1929.

The invention relates to switches adapted to connect a plurality of electrical elements of different effects in a circuit, so that they may be either singly connected in the circuit, or two connected in series, or in multiple or parallel or shunted. The switch is particularly valuable as a regulating switch.

It is an aim to reduce the burning of contacts and other parts. A further aim is to present a switch attaining the desired functions which will be simple in construction and easily connected in electrical circuits and apparatus.

It is an aim to present a switch which is in effect a two-pole switch in which the sliding brush contact may be employed on one side and a roller contact on the other. In this particular it is an important aim to arrange the parts and their function so that the on and off movement of the sliding brush contact will occur during an off position of the roller.

It is a further aim to present a switch of this type which will be easily accessible for inspection and repair or replacement of elements. It is also an object to present a construction which will be liable in a minimum degree to derangement incident to wear and which will not require great dexterity or training in order to open it for inspection or replacement of contacts.

Additional objects, advantages and features of invention will appear from the construction, arrangement and combination of parts involved in the embodiment of the invention, one example of which is illustrated in the accompanying drawing, wherein

Figure 1 is a top view of the switch.

Figure 2 is a similar view with the cover removed and the switch member shown in section.

Figure 3 is a sectional view on the line 3—3 of Fig. 2, with the switch member moved to multiple position at point 4.

Figure 4 shows side elevations of the switch member from the left and right of Figures 2 and 3.

Figure 5 is a plan of the bottom switch contact plates and diagram of a circuit in which the switch may be utilized.

There is illustrated a switch comprising a case 9 adapted to be formed of a moulded insulating material. The upper body portion of the case is exteriorly cylindrical, an integral rectangular base being formed thereon, the corners 10 of which are apertured to receive mounting screws or bolts. The case is recessed as at 11 at the bottom side to afford room for terminal connections therein. A five-sided chamber 12 is formed in the upper part of the case, the walls 13 of which are convex so that a greater convergence between the mutually adjacent wall portions is produced than would be the case with a simple regular pentagon. The bottom 14 of the chamber is formed with a central step bearing recess 15, and a cover 16 is provided having a flange to fit a corresponding peripheral rabbet on the top of the case.

A revoluble switch piece 17 adapted to be moulded of insulating material is mounted in the case, having a bottom trunnion 18 fitted in the bearing 15, while its upper part is formed with a boss 19 fitted in a large circular bearing opening in the cover. A key 20 is formed integrally on top of the boss, having an arrow or other pointer, while the cover is formed with indices spaced circumferentially to indicate by the position of the arrow a zero or neutral or open position, and closed circuit points 1, 2, 3, and 4. The cover is bolted removably to the case as indicated, and when removed the switch assembly may be lifted out as a unit while at any position in the case.

In the upper side of the bottom 14 within the chamber 12 there are fixed inner concentric long and short contact ring sectors 21 and 22 of the same radius, while spaced outwardly of these there is a single concentric ring sector 23 in the bottom of the case, including an arc stopping short of a complete circle sufficiently to leave an opening 24 between the ends for a brush to clear the ring. The sectors 21 and 22 at their mutually adjacent ends are spaced close together, but at their opposite ends are radially alined with the adjacent ends of the longer sector 23.

Each ring sector is provided with a binding post extending through the bottom 14, and adapted for connection of leads there-

to, or other circuit forming practice followed.

It should be noted that the opening 24 between the ends of the ring sectors is adjacent one angle 25 formed by two sides of the chamber 12, and this angle 25 is also alined with the zero position indicated on the cover 16.

In the upper part of the walls of the chamber 12 on each side of and spaced slightly from each corner angle in the side of the chamber except the angle 25 above mentioned, there are fixed contacts 26 and 27, thus providing a pair of closely spaced contacts in four corners of the chamber. The faces of these contacts aline with the wall surfaces thereadjacent. Each contact is set in a recess opening on the top of the wall as well as on the inner face of the wall and is of irregular form. The contacts 26—27 may be positioned in the mold when the case is formed so that their fixture and forming of the case may be accomplished in one operation. They are retained against upward movement by bolts 28 extended downwardly in the wall of the chamber and through the bottom of the case into the recess 11, where suitable leads may be connected to form the circuits desired.

At one corner corresponding to position No. 4 indicated on the cover, an additional or third contact 29 is set in the wall of the case between the two contacts 26—27 and set slightly back of the adjacent two walls for a purpose to be explained. Secured in place by and under the lower end of the contact 29 there is a contact leaf spring 30 extending upwardly before the contact 29, its upper part being in spaced relation to the front face of the contact 29 and stopping on or below the level of the top of the walls 13.

The switch member 17 is enlarged below the boss 19 to assure its retention by the cover, and on a level with the exposed inner faces of the contacts 26—27 a horizontal guide passage 31 is formed therethrough, rectangular in cross section and having one end horizontally enlarged as at 32. The opposite end 39 of the passage stops close to the opposite side of the member 17 and two small horizontal parallel slots 33 open from the passage on the outer face of the switch member at the top and bottom respectively of the passage 31. In the passage there is slidably mounted a contact roller 34 located in and projectable from the enlargement 32 of the passage. The mounting of this roller consists of two plates 35 slidably fitted in the upper and lower parts of the passage 31 and a pintle 36 engaged through the roller and fixed in the ends of the plates. The opposite ends of the plates are adapted to project slidably into the slots 33 when the roller is retracted. The plates are also connected by a cross piece 37 immediately inward of the roller, and a helical protractile spring 38 is loosely fitted between the plates and confined between the cross piece and the end wall 39 of the passage 31, so that the roller is pressed yieldingly outward to bear against the walls 13 and the contacts, as the switch member is rotated. Owing to the convexity of the walls 13, the pressure of the spring on the roller causes it to move toward the nearest corner of the chamber in the case whenever the switch member is free to move. The spring 38 is sufficiently strong to overbalance the stress of the spring contact 30 when the latter is engaged by the roller, so that the roller may come to rest at position 4 in full contact with the two fixed contacts 26 and 27, and also the spring contact 30.

In the bottom of the switch member 17 at one side there is mounted a spring-pressed vertically yieldable sliding contact brush 40 of sufficient radial extent and positioned to coengage the inner ring sectors 21 and 22 alternatively and the outer ring sector 23 at all positions except the neutral one at 0 when the roller is in the angle 25, where it does not engage any electrical contact. At this position the brush 40 lies in the opening 24 between the sectors, contacting only with the non-conducting material of the bottom 14.

As shown in Figure 5, high and low resistances 41 and 42 respectively are employed in the particular utilization of the switch disclosed. One end of each resistance is connected to the inner long ring sector 21, these ends being joined. The other outer end of the high resistance 41 is connected to the contact 29 at point 4, to contact 27 at point 3 and to the inner short ring sector 22. The other end of the low resistance 42 is connected to the three remaining contacts 27 at points 1, 2 and 4. All the contacts 26 are bridged and connected to a lead-in 43, while the other lead-in 44 is connected to the long outer ring sector 23. In the event that the resistance 41 and 42 are elements of an electrical heater, the lead-ins may be from an electrical source, and if the resistances are used in a motor control circuit, the lead-ins may be in the line to the motor.

In the operation of the switch, the key 20 may be manually operated to rotate the switch member 17, and assuming the switch to be in neutral position indicated by the arrow on the key pointing to zero on the cover dial, rotation of the switch member to the left or counter clockwise, will bring it to position 1, where the roller 34 will come to rest bearing upon the contacts 26 and 27. This connects one side 43 of the line with the outer end of the low resistance 42, through the roller. At the bottom of the switch the brush 40 connects the inner short sector 22 and the outer long sector 23, the first sector being connected to the outer end of the high resistance 41 and the other sector connected to the other side of the

line; the two resistances are thus placed in series in the circuit.

The switch being turned to point 2, the connection through the roller is the same as at point 1, but the brush 40 will have been moved from the short inner sector to the longer sector 21 having the effect of cutting out the resistance 41, but leaving low resistance 42 in the circuit.

Movement of the switch to point 3 leaves the connection through the brush 40 the same as at point 2, but the contact 27 at this point is connected to the outer end of the high resistance element 41 instead of to the low resistance as at the last point and consequently the high resistance 41 is placed in the circuit two in series and the low resistance is incorporated in the circuit.

At point 4 the connection through brush 40 is the same as at the last two preceding points, while engagement of the roller with spring contact 30 and contact 26 is of the same effect as the roller connection at point 3, and in addition contact 27 at point 4 makes connection with the outer end of the low resistance, so that the two resistances are cut into the circuit in parallel making a shunt effect possible, if desired, and other uses, as will be understood.

It should be noted that the break between the sectors 22 and 21 at their inner ends is so located that the brush 40 will move from it when the roller 34 is out of connecting relation between the contacts 26 and 27.

The brush 40 is spring-pressed, as shown, being mounted in a small recess 45 open on the bottom of the body 17, the spring being confined over the brush.

The invention may be variously embodied within the scope of the appended claims, otherwise than as specifically described and illustrated.

I claim:

1. An electrical switch comprising first and second sets of contacts each comprising a plurality of contacts and including a neutral and four circuit points, first conductors in respective sets each common to respective contacts at all points in its set, a third conductor common to one point in one set and two points in the other, a third conductor common to the three points of said one set exclusive of the one last named, a fifth conductor common to three points in said other set, including one of the two to which the third conductor is common, and respective brush members for each set of contacts adapted and constructed to connect all contacts of a respective set at each point when located thereat, said brush members being insulated from each other.

2. A switch comprising a rotating member, a continuous surface around the axis of the member having ring sectors therein in two parallel series, a sliding brush commonly engaged with the two series over a limited arc, a spring-projected roller on the rotating member, and a set of contacts concentric with the said axis and arranged in pairs in the path of the roller, the contacts of each pair disposed in angular relation to each other whereby to receive the roller commonly engaged thereagainst and to yieldingly oppose movement of the roller out of such engaged positions.

3. A switch of the character described comprising a rotating switch member, a housing therearound having a bottom, concentric parallel series of contact sectors set in the bottom, a sliding brush in the switch member commonly engaging both series, a plurality of recesses in the lateral portions of the housing and respective groups of contact members in the recesses, each including spaced pairs of contacts at opposite sides of the recess, and a radially projectable spring-pressed roller movable with the rotating member upon the last named series of contacts.

4. The structure of claim 3 in which a third resiliently supported contact is interposed between those of one pair, yieldable to the roller.

5. A switch of the character described comprising a case having a polygonal chamber, a switch member rotatable therein, a radially projectable spring-pressed roller thereon and contacts at the angles of the chamber spaced and adapted to simultaneously coengage the roller under projection of the latter.

6. The structure of claim 5 in which two series of ring sectors are arranged concentrically with the axis of the switch member, and a sliding brush on the switch member mounted and adapted to simultaneously engage both series over a limited arc.

7. The structure of claim 5 in which two series of ring sectors and intervening insulating surfaces are arranged concentrically with the axis of the switch member, and a sliding brush on the switch member constructed to simultaneously engage over both series within a limited arc.

8. A switch of the character described comprising a case having a polygonal chamber, a rotating switch member mounted concentrically therein, contacts in respective sides adjacent the angles of the chamber walls, a radially spring pressed roller mounted on the switch member in line with the contacts and adapted to coengage those grouped adjacent respective angles, a removable cover for the case having a circular opening therein of less diameter than the switch member, a key on the switch member projected through said opening, and a trunnion on the bottom of the switch member having a step bearing in the bottom of the case.

9. The structure of claim 5 in which two series of ring contact sectors are mounted in the bottom of the case, and a spring pressed brush projectably mounted in the bottom of the switch member slidably coengaged across the two series of sectors.

10. The structure of claim 8 in which two series of ring contact sectors are mounted in the bottom of the case, and a spring pressed brush projectably mounted in the bottom of the switch member slidably coengaged across the two series of sectors.

In testimony whereof we affix our signatures.

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