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SWITCH MECHANISM FOR ALTERNATELY ENERGIZING BRANCH CIRCUITS

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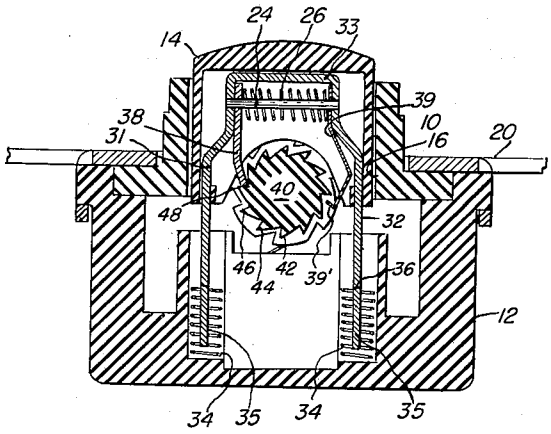


FIG. 1

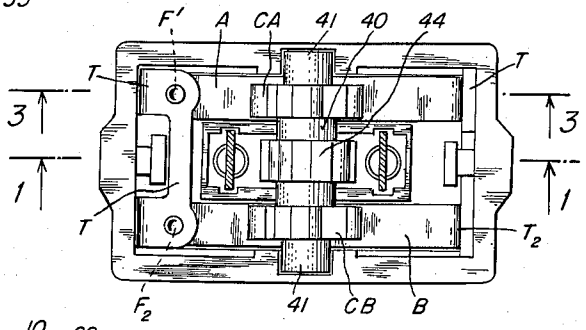


FIG. 2

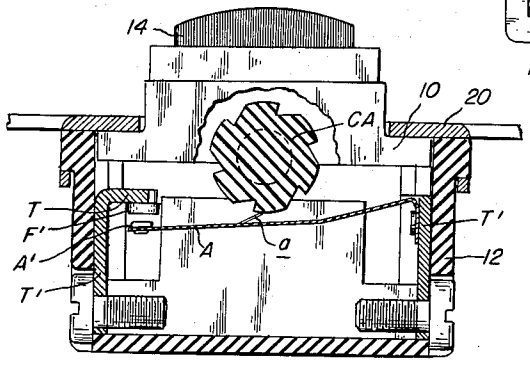


FIG. 3

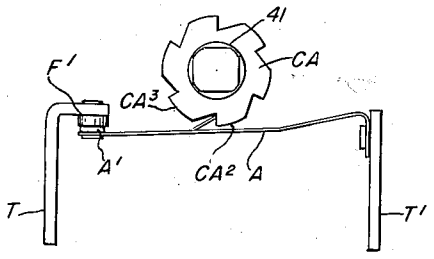


FIG. 4

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SWITCH MECHANISM FOR ALTERNATELY ENERGIZING BRANCH CIRCUITS

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This invention relates to electric switches and more particularly to electric switches having two pairs of button contacts adapted to be engaged and disengaged alternately by alternate depression of a push button.

In low voltage home lighting systems and under certain other conditions and in some other circuits, it is desirable to be able to cause pairs of contacts in two branches of the same circuit to close and open in alternation such as for momentary energization of a coil and subsequent deenergization by momentary engagement of the second pair of contacts.

Therefore, it is an object of this invention to provide a push button actuated switch in which a first depression of a button will cause engagement of a pair of contacts, and rising of the button thereafter will cause separation of the contacts, and in which a second depression will cause engagement of the second pair of contacts and rising of the button will separate them, the first pair remaining separated while the second closes, and vice versa.

Another object is to provide a switch in which the single operating button rotates a single actuating means to cause the aforesaid operation.

A related object is to provide such a switch in which the fixed contacts of the pairs are mounted on a common terminal support so that the engagement and disengagement of the pairs occur in branch circuits.

Other objects and advantages of the invention will appear as it is described in connection with the accompanying drawing.

In the drawing:

Fig. 1 is a side elevation view, partly broken away and in section, of a switch embodying the invention, the section being taken along line 1—1 of Fig. 2.

Fig. 2 is a plan view of the switch with the cover, actuating button and supporting bridge removed.

Fig. 3 is a side elevation view of the switch, partly broken away and in section, the section being taken along line 3—3 of Fig. 2.

Fig. 4 is a diagrammatic view showing the operating cam and one pair of contacts when the button is depressed.

Referring to Figs. 1 and 2, the parts are mounted within an insulating casing comprising cover and base portions 10, 12. The base is hollowed out to receive the various parts hereinafter described. The cover portion fits within the top of the base. The cover and the base are conventionally secured together and to a metallic mounting strap or bridge 20 which lies upon the cover. A hole is formed in the center of the bridge for the neck of the cover to extend through. The neck is hollow to permit the button to reciprocate through it. Four shoulders (not shown) are formed at the inner corners of the button and project laterally outward from the sides thereof, so as to engage with the under or inner surface of the cover when the button is spring-pressed outwardly to the maximum of its travel. The shoulders thus limit the movement of the button in an outward direction.

The button is hollowed out to receive a U-shaped guide member stamped from sheet metal having legs 31, 32 extending inwardly into the casing. The transverse portion 33 of the guide member is lodged adjacent the ceiling of the button. Coiled compression springs 34 each have one end seated on the bottom of parallel spaced bores running from front to back in the base 12. Their other ends are around fingers 35 extending from the lower or inner ends of the legs 31, 32 and engage shoulders 36 between the fingers and legs to push the guide member and push button up until stopped by shoulders (not shown) on the button engaging the cover.

Mounted upon a rod 24 within the button 14 and parallel to the transverse portion of the guide member is a coiled compression spring 26, one end of which presses against an oblique-angled stamped sheet metal pawl member 38 while the other end presses against a J-shaped pawl member 39 stamped from flexible sheet metal. In this fashion, the pawls are resiliently held upon the rod by the spring. The apertures through the tops of the pawls through which the rod passes are large enough to permit the pawls to tilt on the rod 24 as the button is depressed.

The lower end of the pawl 38 is inclined inwardly and is adapted to engage a radial face on one or another of a series of peripheral extensions in the form of ratchet teeth 42, 44, 46, 48, around the periphery of an insulating rotor 40 or contact-actuating member. The rotor is preferably a molded insulation member. As viewed in Fig. 2, this member, in addition to the ratchet portion, includes journal portions 41 at opposite ends adapted to fit in bearings molded in the top edges at opposite sides of the base.

In the form illustrated, there are twelve ratchet teeth located at the center of the rotor and spaced 30° apart, each comprising a flat surface extending approximately radially and an arcuate surface curving from the outer edge of the radial surface toward the periphery of the rotor body. As the button 14 is depressed, the pawl 38 engages with the flat radial surface of a tooth, causing rotation of the rotor approximately 15°. As the button reaches the lower end of its permitted travel, the inner end of the pawl is required by the body of the rotor to move radially outward slightly. This outward movement or tilting of the pawl 38 is permitted by reason of the spring mounting of the upper end of the pawl upon the rod, as hereinbefore described.

The inner or lower end of the second pawl 39 is bent toward the rotor providing a hook-like finger 39′ which is adapted to slide over the back of a ratchet tooth when the button is depressed until it snaps under the radial face of the tooth. As the U-member and button rise, the hook 39′ engaging a ratchet tooth causes the rotor to be turned through an additional angle necessary to complete the operations hereinafter described.

Within the base 12 are two movable contact members A and B each of which consists of a flexible strip of thin sheet metal extending lengthwise of the casing, being anchored at one end by attachment to terminal plates T′, T^2, respectively, which are conventionally held in slots running from front to back of the casing. The other or free end of each contact strip has contact buttons A′, B′ on its top surface for engagement with fixed contact buttons F′, F^2, respectively, on a common terminal plate F also fitted in slots in the casing. The terminal F has an arm at its upper end extending transversely across the casing to support at its end on its underside the fixed contact button F^2.

Now, referring to Fig. 1, when the operating button is depressed, the pawl 38 engaging a ratchet tooth will rotate the rotor 15°, more or less, before being stopped. As manual pressure on the button is removed, the button

and U-member 31—33 rise by force of the biasing springs 34. During this rise, the rotor is moved another 15°, more or less.

For operating the movable contacts, two operating cams CA, CM of molded insulation are mounted on the shaft of the rotor, one at each end, to turn with the shaft and ratchet of the rotor. These cams are located over the flexible contact strips A and B, respectively. Each flexible contact strip has struck up from the surface a finger (*a*, *b*, respectively,) facing in the direction opposite to the tooth on the operating cam and in position to ride on the surface of the cam as it is rotated. These fingers may each be conveniently formed by intersecting transverse and longitudinal cuts inwardly from one edge and then toward the free end of the flexible contact members, the tooth formed thereby being then bent up at an angle of about 20° to about 30° approximately.

The cams which engage the tooth on the flexible contact strips A and B are preferably of identical form, but are located on the shaft of the rotor in different angular positions, one being 30° in advance of the other so that they do not identically operate the contacts simultaneously. Rather, it is intended that one pair of fixed and movable contacts shall engage while the other pair is held separated and, moreover, that the engaged pair shall only remain engaged momentarily while the button is held depressed. For that purpose, the cams are so formed that as the finger *a* of the contact strip A falls or snaps off the high portion of the cam tooth CA^2 and behind its radial surface the contact strip A will be allowed to bend. This causes its contact button A′ to engage the fixed contact button F′. However, the depressed or low portion of the cam is of very small extent so that as the button rises or is returned to elevated position, the rotation of the cam causes the finger *a* to ride up on the rather steep back of the next tooth CA^3 and disengage the fixed and movable contacts F′, A′ after only momentary engagement thereof.

The rotation of the cam through the full distance of one cam tooth to the next is arranged to require two depressions of the operating button 14. This will be approximately 60°.

The cams CA, CB are located on the rotor shaft so that the radial surface of a tooth on one cam or the other will be very close to the point on that cam where the finger (*a* or *b*, as the case may be) rests when the button is in its top or elevated position and the switch parts are at rest.

Assuming that at the first depression the finger *a* of contact A rested close to the radial surface of tooth CA2 and that the aforesaid action of finger *a* falling off on button-depression and riding up on CA^3 on button-rise has occurred, then on the next depression and rise of the button 14, the cam CA rotates, but the finger simply rides along the top of the tooth CA^3 and finally reaches the equivalent position on that tooth (very close to the edge) which it occupied on the preceding cam tooth CA^2 before the first depression of the button.

While the finger *a* was riding on the back of the tooth during the second depression and rise of the button, the finger *b* was also riding on the cam CB and the contact B was being operated. Because the cam CB is so located on the spindle relative to the angular position of the cam CA that on the first depression of the button, the cam CA will cause the finger *a* to fall off the first tooth while the finger *b* rides on the back of a tooth of the cam CB, the finger *b* falls off the cam tooth on the second depression.

Hence, each depression of the button causes movement of one contact strip and maintains engagement of one pair of contacts (for example, F′, A′) while the other pair of contacts (for example, F^2, B^2) remain separated; but a given pair is only engaged on alternate depressions of the button. During the rise of the button on all occasions, the movable contacts are always separated from the fixed contacts.

Since the fixed contact F′, F^2 are mounted on a common terminal T, the movable contacts A and B can control branches of the same circuit to perform whatever functions are desired.

Many modifications within the scope of the invention will occur to those skilled in the art. Therefore, the invention is not limited to the specific embodiments illustrated and described.

What is claimed is:

1. In an electric switch, movable contact members, fixed contact members engageable and disengageable by said movable contact members, an operating push button, means biasing said button into retracted position, double pawl means movable with said button, ratchet means engageable by one of said double pawl means on depression of said button and by the other of said double pawl means on retraction of said button, cam means movable with said ratchet means and having lobes and recesses to cause engagement of one movable with one fixed contact member on a first depression of said button and separation of said movable and said fixed contact both on retraction and on a second depression and second retraction of said button, a second cam means movable with said ratchet means and having lobes and recesses to maintain a second movable contact member separated from a fixed contact member during said first depression and first retraction of the button and on said second retraction of the button and to cause engagement of the second movable and fixed contact members on said second depression of the button.

2. In an electric switch, movable contact members, fixed contact members engageable and disengageable by said movable contact members, an operating push button, means biasing said button into retracted position, double pawl means movable with said button, ratchet means engageable by one of said double pawl means on depression of said button and by the other of said double pawl means on retraction of said button, cam means movable with said ratchet means and having lobes and recesses to cause engagement of one movable with one fixed contact member on movement of said button in one direction and separation of said movable and said fixed contact both on movement in the opposite direction and on a sequential second movement in the first direction and a sequential second movement in the opposite direction, a second cam means movable with said ratchet means and having lobes and recesses to maintain a second movable contact member separated from a fixed contact member during said first movement of said button in said first and said opposite directions and on said sequential second movement in said opposite direction of said button and to cause engagement of the second movable and fixed contact members on said second sequential movement of the button in said first direction.

3. An electric switch as claimed in claim 1 wherein the movable contacts are each formed with a bent tongue adapted to seat in a recess in the cam means with which they cooperate in the first and second depresed positions respectively, and wherein the tongues rest on said cam lobes in the first and second retracted positions.

4. An electric switch as claimed in claim 2 wherein the movable contact members are each formed with a bent tongue adapted to seat in recesses in the cam members with which they cooperate upon completion of said first and said sequential movement in said one direction respectively, and wherein the tongues rest on said cam lobes during and upon completion of the first and said sequential movement in said opposite direction.

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