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POWER OR LINE SWITCHES FOR CONTROLS

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Fig. 1

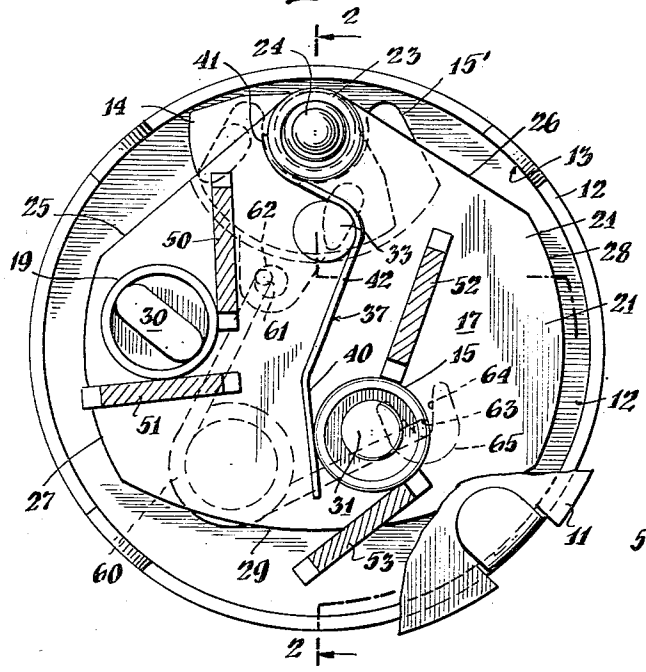


Fig. 2

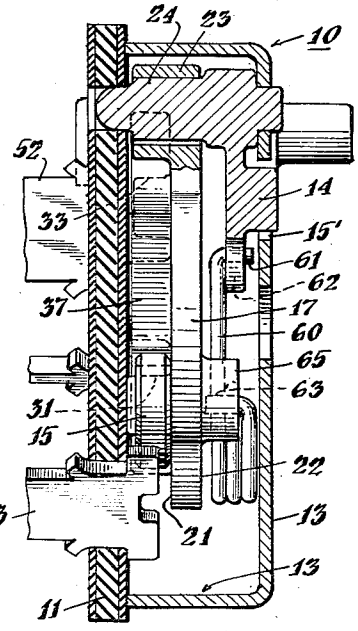
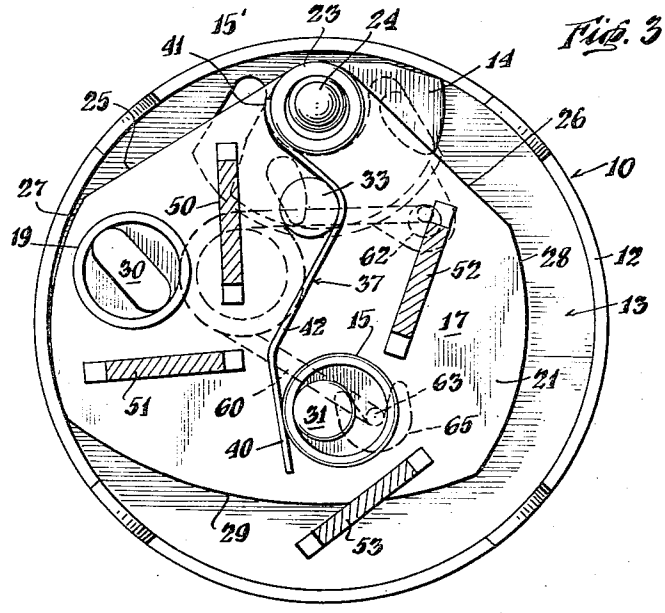


Fig. 3



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POWER OR LINE SWITCHES FOR CONTROLS

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10 Claims. (Cl. 200—67)

This invention relates to electric switches and refers more particularly to snap switches including those of the type mounted on the back of volume controls and which are designed to switch fairly heavy currents used in radio and television circuits and sets.

By the very nature of their use, the size of these switches is important since relatively small dimensions are characteristic of the specifications and dimensions set forth in these circuits. They are thus generally housed in casings of small diameter and shallow depth wherein the requisite spring action or movement range becomes exceedingly difficult to obtain. This is the more so when it is understood that for efficient operation of the switch it is desirable that efficient contact make-and-break be afforded. Moreover, at the same time it is desirable to achieve desirable contact mating action between the contacts and, in substance, obtain prolonged life therebetween as a result of the efficient, self-cleaning and non-arcing characteristics built into the switch. These features are the desiderata of such switches and determine the efficiency, stability, durability and economy of the switch. Heretofore, these characteristics were difficult to attain and required complex and multiple components for the switches, which added to the cost of fabrication thereof.

The present invention now provides a simple, economical and efficient snap switch wherein all the above desired features are obtained at a minimum of cost as to labor and material, and wherein a small, compact, highly efficient structure is obtained having optimum calibration and alignment characteristics.

It is therefore an object of the present invention to provide an improved snap switch for operating under heavy current conditions, said switch being exceedingly simple in construction and efficient in resultant operation.

It is another object of the present invention to provide a power or line switch for volume controls wherein said switch is constructed with floating contacts held in a loose fashion on a rotor of insulating material so that a desirable self-aligning feature is accomplished in the operation of the switch, resulting in long life and optimum current carrying conditions therein as a result of the non-arcing and positive contact make-and-break characteristics thereof.

Still another object of the present invention is to provide a new and novel snap switch having free moving contacts centered on elongated moulded bosses and which are adapted upon rotation of the cooperating moulded rotor to make contact with stationary termini in a manner such that said contacts are adapted to rotate about said bosses to achieve a self-aligning characteristic and thus make for a more efficient contact engagement with the terminals of said switch.

Another object of the present invention is to provide a small, heavy current type of snap action switch utilizing a spring for motivating a rotor moulded of insulator material having extruded bosses upon which are mounted free moving contact rings adapted to cooperate with

stationary termini in a manner such that said switch has improved characteristics of make-and-break between the contacts and the termini and a longer life, inasmuch as said contacts are adapted to give a self-aligning effect in the make-and-break operations of the switch.

An added object of the present invention is to provide a switch construction wherein substantially no current is allowed to pass through a spring which would cause high temperatures to be generated and cause annealing and consequent loss of contact pressures.

It is another object of the present invention to provide a simple, economical and efficient snap action switch having desired characteristics of quick make-and-break, long life and positive mating atcion and wherein its ring type contacts are such as to make for a more efficient transmittal of current between the same and its associated termini of the switch.

Still another object of the present invention is to provide a new type of switch whose contacts on the snap action of the rotor are rotatable about moulded bosses integrally formed on said rotor and wherein said contacts are rings adapted to move about a dimension of the bosses on said rotor so as to obtain new contact make-and-break with the termini upon repeated utilization of the switch so as to prolong the life thereof and to give better operating characteristics thereto.

Another object of the present invention is to provide a new and improved snap action switch having novel contact elements consisting of rings mounted on extruded bosses of a moulded rotor which is adapted to be motivated by a compression spring element so as to move said elements in and out of engagement with fixed termini in a positive manner and to give more efficient operation and durablity thereto.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in a novel construction combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the invention here disclosed may be made as come within the scope of the claims.

The invention in another of its aspects relates to the novel features of the instrumentalities described herein for teaching the principal objects of the invention and to the principles embodied in these instrumentalities, whether or not these features and principles may be used in the said objects and/or in similar fields.

The accompanying figures of the drawing illustrate both a double pole version and a single pole version of the new and novel ring contact snap action switch, as illustrated by the physical embodiment of the invention constructed in accordance with the best mode so far devised for the practical application of the principles thereof and in which:

Fig. 1 is a longitudinal sectional view showing a double pole embodiment of the switch as illustrating the present invention and as adapted to be mounted on the back of a volume control, said switch being in the closed position;

Fig. 2 is a cross sectional view taken through Fig. 1 on the plane of the line 2—2 and looking into the switch; and

Fig. 3 is a top view of an embodiment of the switch as adapted to illustrate the open position of the ring contact elements loosely held on the bosses of the moulded rotor of a double pole switch.

Generally speaking the switch is basically in its single pole embodiment, a contact ring carried and driven by an elongated boss on a rotor of insulating material into contact or bridging position between two terminals. The elongated boss has its longest center-line coincident.

or very nearly so, with the line of force into the contacts. This boss shape gives very little play in the driving direction and at the same time provides a great deal of latitude for centering at ninety degrees to the line of force. Driving force is imparted to the rotor in the direction desired by the over-center action of a toggle spring, and motion of the rotor is limited by the cup in the "off" position and by the contacts in the "on" position.

The double pole version of the switch is smiliar to the above construction with, however, several other structures incorporated therein. As stated, in the single pole version one pair of contacts limit the motion of the rotor in the "on" position. Therefore, it will be readily seen that an additional pole requires a contact having compliance in order to mechanically seat two contact rings at four points. The bridging ring and the terminals used for the second pole are parts identical to those used in the single pole with the terminals set at optimum angles for good, reliable contact. In addition, a pressure spring is used to drive the second ring into contact engagement. A substantially round boss on the rotor, which is approximately centered in the ring when contact is made, is the means for driving the second ring to the "off" position.

It has been found during tests conducted on the contacts that in both cases the ring turns and presents new contact surfaces to the stationary terminals. The ring driven by the elongated boss is adapted to vibrate around the boss while the switch is in the "off" position or during the "snap on" or "snap off" operation. In the second case of the spring loaded ring the rotation thereof comes from the operation of approaching one terminal a split second earlier and rolling on the pressure spring until contact is made with the other terminal.

Referring now particularly to the accompanying drawing, in which like numerals indicate similar parts, Fig. 1 is a plan view of the switch **10** as illustrating a double pole, single throw, A. C.-D. C., heavy current switch. Reference numeral **11** designates the base of the switch which consists of a circular disc of suitable insulating material and serves to close one end of a cylindrical metal cup or shell **12**. The shell and cup thus constitute a substantially cup-shaped switch housing **13**.

As has been stated, the switch is adapted to be mounted on the back of devices such as volume controls or the like and, accordingly, the switch is cooperatively engaged with the control shaft to be actuated on the rotation thereof by means of a coupler or cam, which is adapted to move the actuator **14** of the switch. Inasmuch as this invention is more directly concerned with the switch, per se, it is sufficient to point out that the cam is adapted to swing between defined limits as determined by a crescent-shaped, cut-out portion **15** formed the bottom side of the switch casing.

Actuator **14** comprises a unitarily formed metal structure having a pivot post **24** formed on one side thereof and an arc-like platform on the other side thereof, said platform having two vertical dependencies extending down therefrom for cooperating with the driver coupler of the volume control portion of the assembly for turning the actuator. Across from the pivot post **24** of the actuator and connected to the side thereof is a lateral extension having an aperture cut therethrough which is adapted to accept one end of a toggle spring as hereinafter described.

In this fashion, actuator **14** will be adapted to move a rotor base **17** which supports free moving contact rings **15** and **19** thereupon as seated on bosses **30** and **31** integrally formed and connected to one side of the rotor. Rotor **17** is of a thin, cross-sectional, moulded construction having upper and lower surfaces **21** and **22** defining a predetermined configuration. As seen from the drawings, the rotor is of substantially thin cross-section having a hollow bore or collar **23** adapted to accept and confine pivot post **24** of the actuator **14**. From the apex formed by collar **23**, two sides **25** and **26** of the rotor extend angularly to meet with sides **27** and **28** placed substantially at right angles thereto. These latter sides are joined with an end wall **29**, to give the entire rotor a tapered head construction, with the mid-portion thereof having a somewhat rectangular construction with three sides thereof being somewhat bowed.

On surface **21** there is formed integrally joined bosses **30** and **31**. Bosses **30** and **31** are moulded to surface **21**, with boss **30** being moulded as a rectangular support of narrow cross-section about which contact ring **19** is adapted to fit and is loosely held thereon. Boss **31** is formed as a round post extending from surface **21**.

In the modification exemplified for the double pole, single throw switch shown in Figs. 1–3 a pressure spring post **33** is also formed and moulded to the surface **21**. This post **33**, in conjunction with collar **23**, is adapted to contain pressure spring **37** so that contact ring **15** is motivated thereby on its boss **31** under pressure of a portion of the spring. Spring **37** is a thin leaf spring having end portions **40** and **41** interconnected to a mid-portion **42**. Portions **40** and **41** extend out from the mid-portion **42** so that each lies flat, first, against contact ring **15** on post **31** to restrain it thereon, and, next, on collar **23**. The mid-portion of the spring is placed about post **33** in a manner such that the entire spring takes on a sinuated form with the necessary constraint being applied against boss **31** and collar **23**. The other contact ring **19** is loosely mounted on boss **30**, which is rectangular in configuration and is maintained thereby on the rotor.

In the assembly of the switch, each of the contact rings, loosely held or free floating in construction, is adapted to mate with sets of terminals, i. e., either **50** and **51** or **52** and **53**. These terminals are adapted to penetrate a terminal base **11** to be staked therein with the ends thereof retained thereby to form solder lugs. Terminals **50** and **51** are directed toward each other at angles adapted to form a V, while the other set of terminals **52** and **53** are placed in the base in a manner such as to contain the contact ring situated on the round boss. These latter terminals, in conjunction with the pressure spring, are adapted to loosely hold the said ring on its cooperating boss.

In order to move the contact rings "in" and "out" of contact with their cooperating terminals, a toggle spring **60** is adapted to be connected to the rotor to move the same upon movement of actuator **14**. This is accomplished by connecting spring **60** to the actuator by means of an end **61** of the spring fitting within aperture **62** of the actuator. Correspondingly, an end **63** of the spring is adapted to fit within a slot **64** formed in a U-shaped retainer **65** moulded to the underside of the rotor. Thus, by movement of the actuator **14** rotor **17** is adapted to move the contacts "in" and "out" of engagement with their corresponding terminals.

In the single pole version of the switch embodying the principle of the free floating contact ring, it is necessary to have only two terminals **50** and **51** and one circular contact ring **19** held on a rectangular boss **30**. In this construction there is no pressure spring and the free floating ring contact moves in and out of engagement with its terminals by movement of the actuator which has a toggle spring interconnecting it and the rotor via moulded retainer **65** in a manner substantially as described above. It is noted, therefore, that all parts for single pole switches are identical to double pole parts except that terminal plate **11** has two holes eliminated from it and several parts are omitted.

The free floating characteristics of the contact rings loosely held on their bosses achieve greater contact efficiency, inasmuch as by their movements about their bosses more chance of contact making new surfaces are offered between the rings and their terminals, thus mak-

ing for an efficient, self-aligning type of contact engagement. The switch action is thus more positive in nature and provides self-aligning characteristics. The life of the switch is greatly prolonged and a much more efficient switch is provided. This switch, constructed according to the specifications herein described, has thus provided a great advance in the art.

From the foregoing description, taken in connection with the accompanying figures of the drawing, it will be readily apparent to those skilled in the art that this invention provides a new and improved switch, the features of which may be applied to other arts and devices. Accordingly, it is contemplated that the scope of the invention is to be determined from the claims herein.

We claim:

1. An electric switch comprising a metal casing having an open end, a flat base of insulating material placed in said open end to close the same, unitarily constructed electric terminals having soldering lugs attached thereto inserted in said base, said terminals being predeterminedly angularly disposed therein, an actuator for said switch, said actuator including a pivot post, means in said casing for limiting the movement of said actuator, a rotor connected to said actuator to be moved thereby, said rotor including a hollow bore fittable over said pivot post of said actuator to move thereabout and to position said rotor in said casing, a pair of sides of said rotor extending at an angle from said bore to form a tapered area thereby, another portion of said rotor joined to said tapered area to complete the extent of the rotor, said latter area being somewhat rectangular in shape, said rotor further having a plurality of bosses formed on a surface thereof, and individual ring contact means adapted to fit over individual bosses of said rotor, means bearing against said bore, a contact ring, and a boss thereof with said ring contact means being free moving about said boss on said rotor to cooperate with said predetermined spaced terminals to afford positive contact action and improved current transfer characteristics for the said switch.

2. An electric comprising a metal casing having an open end, a flat base of insulating material placed in said open end to close the same, unitarily constructed electric terminals having soldering lugs attached thereto inserted in said base, said terminals being predeterminedly angularly disposed therein, an actuator for said switch, said actuator including a pivot post, means in said casing for limiting the movement of said actuator, a toggle spring, a rotor connected to said actuator by said toggle spring to be moved thereby, said rotor being of thin cross-section between its upper and lower surfaces, including a hollow bore fittable over said pivot post of said actuator to move thereabout and to position said rotor in said casing, a pair of sides of said rotor extending at an angle from said bore to form a tapered area thereby, another portion of said rotor joined to said tapered area to complete the extent of the rotor, said latter area being somewhat rectangular in shape, said rotor further having a plurality of dissimilarly shaped bosses formed on its upper surface, individual annular contact means adapted to fit over individual bosses of said rotor, and pressure means bearing against said base, said annular contact means and boss with said annular contact means being free moving about the boss on said rotor to cooperate with said predetermined spaced terminals to afford positive contact action and improved current transfer characteristics for the said switch.

3. An electric switch comprising a metal casing having an open end, a flat base of insulating material placed in said open end to close the same, unitarily constructed electric terminals having soldering lugs attached thereto inserted in said base, said terminals being predeterminedly angularly disposed therein, an actuator for said switch, said actuator including a pivot post and an aperture

formed therethrough at a point opposite said post, means in said casing for limiting the movement of said actuator, a rotor of thin cross-section between its upper and lower surfaces, said lower surface having a moulded slot, an over center toggle spring connected to said aperture of said actuator and said slot of said rotor, said rotor thus being moved by said actuator and spring, said rotor further including a hollow bore fittable over said pivot post of said actuator to move thereabout and to position said rotor in said casing, a pair of sides of said rotor extending at an angle from said bore to form a tapered area thereby, another portion of said rotor joined to said tapered area to complete the extent of the rotor, said latter area being somewhat rectangular in shape, said rotor further having a plurality of differently dimensioned bosses formed on its upper surface thereof, ring contact means adapted to fit over the individual bosses of said rotor, and resilient bearing means placed against said ring contact means, said ring contact means being free moving about each boss on said rotor to cooperate with said predetermined spaced terminals to afford positive contact action and improved current transfer characteristics for the said switch.

4. An electric switch comprising a metal cup having an open end, a flat base of insulating material placed in said open end to close the same, unitarily constructed electric terminals having soldering lugs attached thereto inserted in said base, said terminals being predeterminedly angularly disposed therein, a metal actuator for said switch, said actuator including a pivot post and an aperture formed therethrough at a point opposite said post, means on said actuator and in said casing for limiting the movement of said actuator, a moulded rotor connected to said actuator by a loaded toggle spring to be moved thereby, said rotor including a moulded collar fittable over said pivot post of said actuator to move thereabout and to position said rotor in said cup, a pair of sides of said rotor extending at an angle from said bore to form a tapered area thereby, another portion of said rotor joined to said tapered area to complete the extent of the rotor, said latter area being somewhat rectangular in shape, said rotor further having a plurality of bosses formed on a surface thereof, individual ring contact means adapted to fit over some of said bosses of said rotor, said ring contact means being free moving about the bosses on said rotor to cooperate with said predetermined spaced terminals, and a pressure spring bearing against a contact ring on one boss, said spring also bearing against another moulded boss and said collar on said rotor to aid in the positioning of said latter contact ring with respect to its terminals and whereby positive contact action and improved current transfer characteristics are obtained for said switch.

5. An electric switch comprising a metal casing of cup-like configuration having an open end, a thin, flat base of insulating material placed in said open end to close the same, unitarily constructed electric terminals having integrally formed soldering lugs attached thereto inserted in said base, said terminals being predeterminedly angularly disposed therein, a metal actuator for said switch, said actuator including a pivot post and an aperture formed therethrough at a point opposite said post, dependent means on said actuator and means in said casing for limiting the movement of said actuator, a moulded rotor having a slot connected to said actuator by a loaded toggle spring connected to said aperture of said actuator and said slot of said rotor to be moved thereby, said rotor also including a hollow bore fittable over said pivot post of said actuator to move thereabout and to position said rotor in said casing, a pair of sides of said rotor extending at an angle from said bore to form a tapered area thereby, another portion of said rotor joined to said tapered area to complete the extent of the rotor, said latter area being somewhat rectangular in shape, said rotor further having a plurality of bosses

formed on a surface thereof, individual ring contact means adapted to fit over individual bosses of said rotor, and a pressure spring bearing against said boss, a contact ring and said hollow bore, said latter contact ring thus being free moving about its boss on said rotor to cooperate with its terminals to afford positive contact action and improved current transfer characteristics for the said switch.

6. An electric switch comprising a metal casing having a cup configuration, a flat insulating base closing said casing, fixed electrical terminal means for said switch carried on said base, an actuator having a pivot post for said switch, and a moulded rotor adapted to be moved by said actuator, said rotor having a collar fitting over said pivot post and having a plurality of integrally formed bosses of differing diametric configuration placed thereon adapted for carrying loose ring contacts in and out of engagement with said terminals so as to allow current to pass thereby, said ring contacts having resilient bearing means placed thereagainst to allow for positive contact action and optimum transfer characteristics.

7. An electric switch comprising a metal casing, a flat base of insulating material closing said casing, electrical terminal means for said switch mounted on said base, an actuator for said switch, a rotor adapted to be moved by a toggle spring connected to said actuator, said rotor having a plurality of moulded bosses formed thereon, a pair of said bosses adapted for carrying free moving contacts, and a pressure spring placed against another of said bosses on said rotor, said spring adapted to aid in maintaining one of said free moving contacts on its bosses so that proper engagement is had therebetween and the terminals of said switch.

8. An electric switch comprising a casing, electrical terminal means on a flat insulating base for closing said

casing of said switch, an actuator for said switch, and a rotor having differently configured bosses thereon adapted to be moved by said actuator, one of said rotor bosses having bearing means applied thereagainst for carrying a loose ring contact in and out of engagement with said terminals so as to allow current to pass thereby.

9. An electric switch comprising a metal casing, fixed electrical terminal means mounted on a flat insulating base for said switch, said base closing said casing of said switch, an actuator for said switch, and a rotor adapted to be moved in a plane parallel to said metal casing by a toggle spring connected to said actuator, said rotor having dissimilar shaped bosses and spring means cooperating therewith for restrainedly carrying loose ring contacts in and out of engagement with said terminals so as to allow current to pass thereby.

10. An electric switch comprising a casing, electrical terminal means for said switch, an actuator for said switch, and a rotor having a plurality of bosses adapted to be moved by said actuator in a plane parallel to said casing, said rotor having spring means for aiding in carrying loose ring contacts placed around said bosses in and out of engagement with said terminals so as to allow current to pass thereby.

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