Nov. 24, 1953 A. J. VAKSVIK 2,660,633

SNAP SWITCH

Filed Jan. 4, 1951 4 Sheets-Sheet 1

Fig. 1.

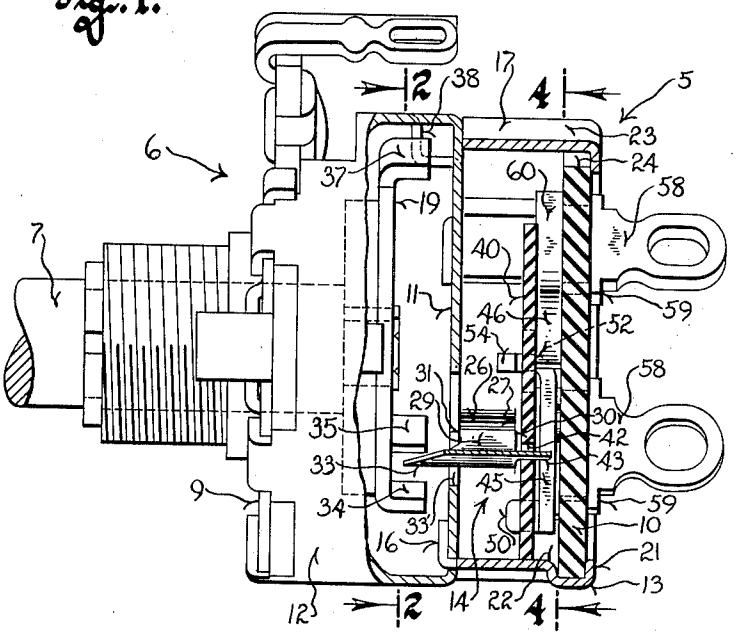


Fig. 2.

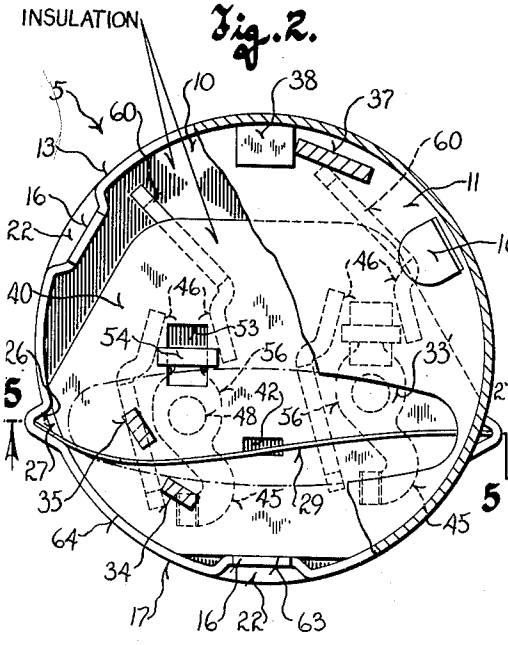
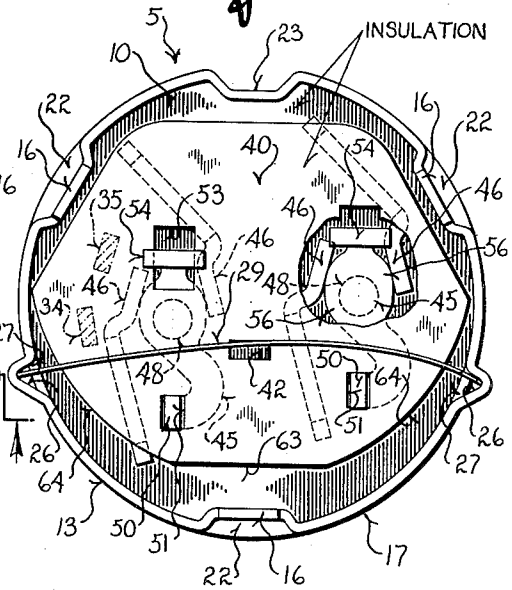


Fig. 3.



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Fig. 4.

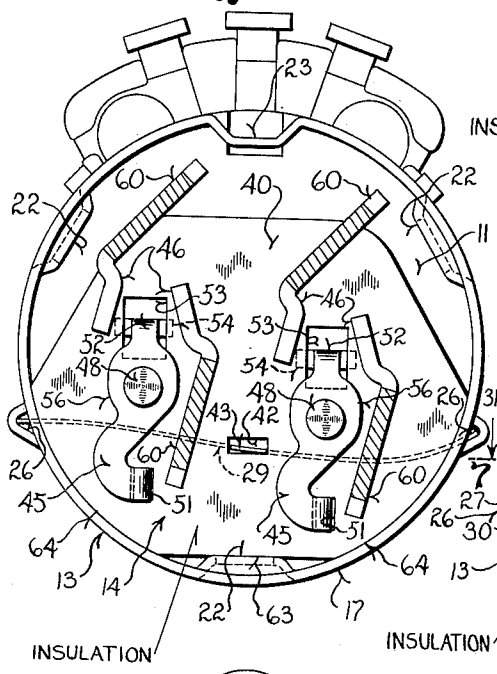


Fig. 5.

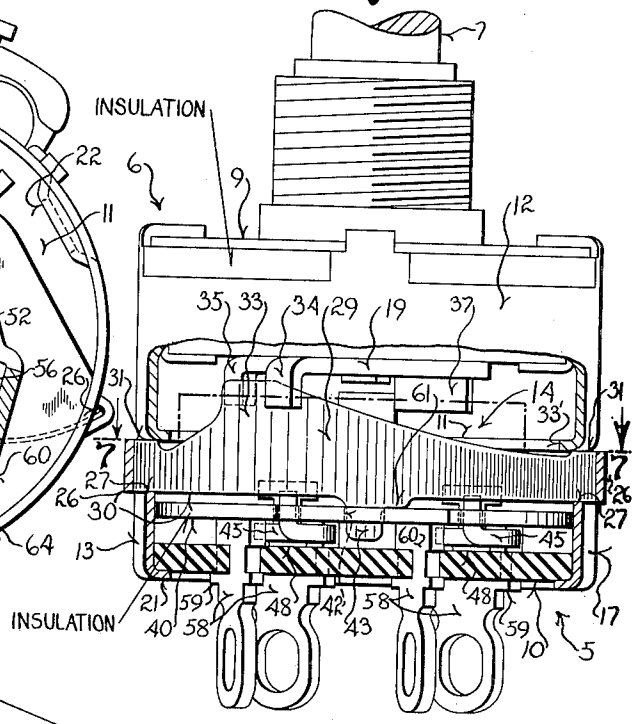
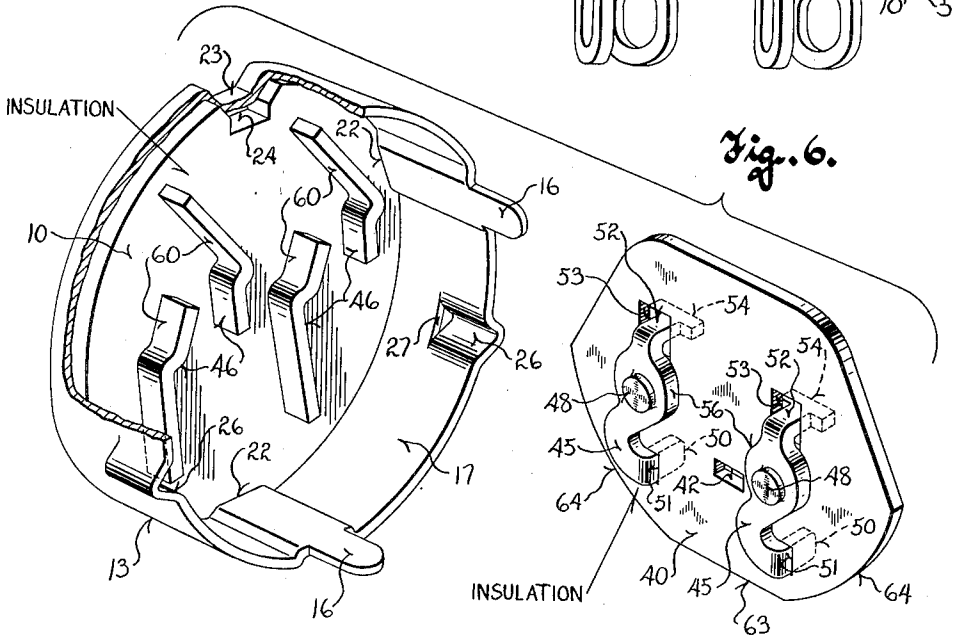


Fig. 6.



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SNAP SWITCH

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Fig. 7.

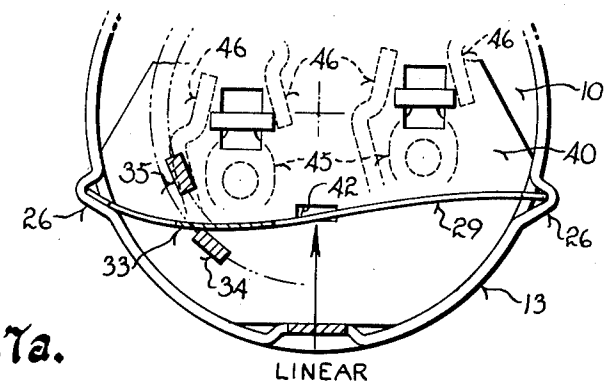


Fig. 7a.

LINEAR
CLOSING MOTION

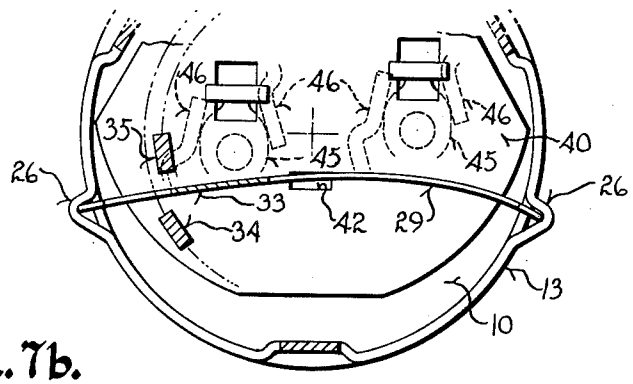
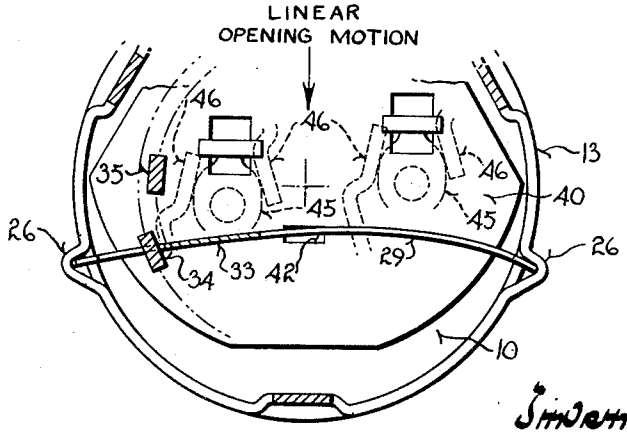


Fig. 7b.

LINEAR
OPENING MOTION



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SNAP SWITCH

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Fig. 8.

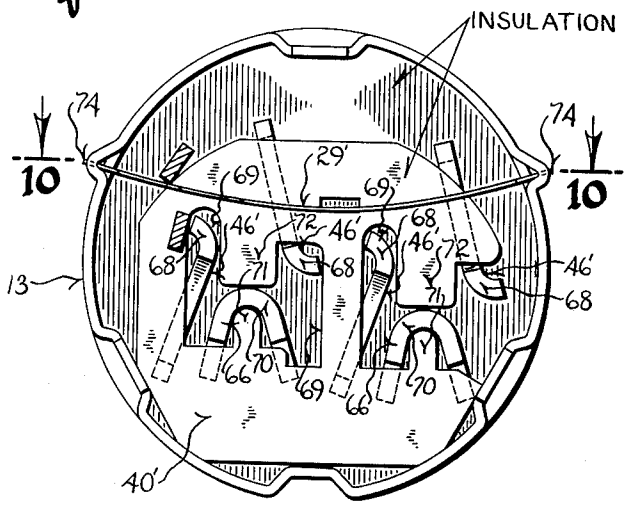


Fig. 9.

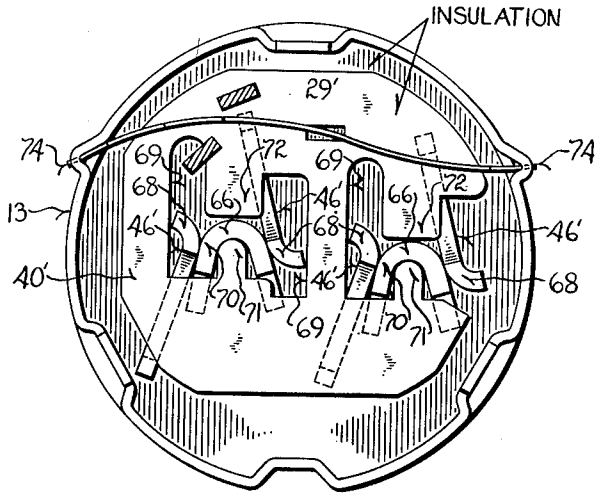
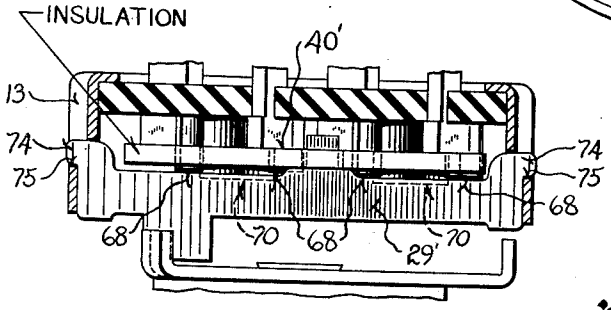


Fig. 10.



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Patented Nov. 24, 1953

2,660,633

UNITED STATES PATENT OFFICE

2,660,633

SNAP SWITCH

Adrian J. Vaksvik, Elkhart, Ind., assignor to Chicago Telephone Supply Corporation, Elkhart, Ind., a corporation of Indiana

Application January 4, 1951, Serial No. 204,329

16 Claims. (Cl. 200—76)

1

This invention relates to electrical control devices such as combined switches and rheostats, and refers more particularly to improvements in switch mechanisms for such devices.

While combination electrical controls of this nature have many uses, their compactness makes them particularly well suited for use in small radio receivers for controlling both the power supply and volume from a single operating shaft.

One of the main objectives of this invention, however, is to provide a control instrumentality of the character described with a switch especially designed for use with automobile radio receivers. These receivers are supplied with power from the storage battery of the automobile, which provides a low voltage source capable of accommodating heavy power loads; and the power switches for such receivers thus must be built for low voltage, high current service.

Conditions peculiar to such service are that the power switch can be easily subjected to heavy overload current by a momentary short across the storage battery during installation or servicing.

Consequently, the switch of this invention is provided with heavy low resistance contacts capable of withstanding heavy overloads; and it is another objective of this invention to provide the switch with operating mechanism by which substantially uniform low resistance contact pressure of a high order is maintained whenever the switch is closed.

Since more and more of the later model automobiles are being equipped with instruments having lights controlled by a rheostat to enable regulation of the brightness of the instrument lights, it is also an object to provide the switch of this invention with a second set of cooperating stationary and movable contacts for governing operation of the pilot light of the radio receiver, to enable the pilot light to be connected in the circuit controlled by the rheostat for the other instrument lights. This, of course, introduces other problems which chiefly concern the maintenance of constant low resistance across two sets of stationary contacts in the switch in its closed position, and it is a further object of this invention to provide an improved double pole single throw switch mechanism particularly suited for use with small automobile radio receivers, and which assures an adequate balanced contact pressure between the movable contacts and their cooperating stationary contacts in the closed position of the switch, to thus achieve minimum resistance in the two switch circuits at all times.

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Still another object of this invention resides in the provision of a simplified snap switch having a contact carrier substantially loosely received in the switch casing and self-aligning with respect to the stationary switch contacts.

Another object of this invention resides in the provision of an improved single throw double pole snap switch of the character described wherein the contact carrier has its movable contacts connected thereto at opposite sides of the driving connection between the carrier and the means for snapping the same to its switch closed position so as to assure equalization of pressure between the movable contacts and their cooperating stationary contacts in the switch-closed position.

A further object of this invention resides in the provision of an improved and simplified manner of snapping the contact carrier to and from its switch-closing position.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction 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 hereinafter disclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiments of the invention constructed in accordance with the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a view partly in side elevation and partly in section illustrating a combined switch and rheostat embodying one form of this invention;

Figure 2 is a cross sectional view taken through Figure 1 along the plane of the line 2—2 with portions of the rheostat housing broken away to show the mechanism inside the switch housing, and with the switch in open position;

Figure 3 is a view similar to Figure 2 looking into the open end of the switch housing but showing no part of the rheostat housing, and illustrating the switch in closed position;

Figure 4 is a cross sectional view through Figure 1 taken along the plane of the line 4—4 and showing the switch mechanism from the closed end of the switch housing, with the switch in open position;

Figure 5 is a cross sectional view taken through Figure 2 along the plane of the line 5—5;

Figure 6 is a group perspective view showing the contact carrier and contacts thereon, and the switch casing, but with these parts separated; portions of the side wall of the switch casing being broken away to illustrate the arrangement of stationary switch contacts;

Figures 7, 7a and 7b are somewhat diagrammatical sectional views taken along the line 7—7 of Figure 5 and showing the manner in which the switch is operated;

Figures 8 and 9 are views similar to Figures 2 and 3 but showing switch-open and switch-closed positions respectively in a slightly modified form of the switch; and

Figure 10 is a cross sectional view taken through Figure 7 along the plane of the line 10—10.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts, and especially to that form of the invention illustrated in Figures 1 to 6, inclusive, the numerals 5 and 6 designate the switch and rheostat components respectively of a combined switch and volume control instrumentality such as is particularly suited for use with small radio receivers, and especially automobile receivers. Both the switch and the volume control are operated by a common shaft 7.

The housing means for the combined instrumentality includes front and back walls 9 and 10 respectively and an intermediate wall 11 spaced substantially midway between the front and back walls and which acts as a partition wall to separate the housing means into a front housing section 12 in which the volume control mechanism (not shown) is received, and a rear housing section 13 in which the switch mechanism 14 of this invention is contained. Actually the housing means is comprised of two cup-shaped casings, one for the volume control and one for the switch mechanism, with the open end of the switch housing abutting the partition wall 11 provided by the bottom of the volume control housing, so that the switch is carried on the back of the volume control. Since the side walls of the two housing sections substantially align, they form, in effect, a continuous cylindrical wall enclosing the two instruments.

The manner in which the rear housing section is secured to the front housing section is more or less conventional in that it comprises a plurality of ears 16 projecting forwardly from the side wall 17 at the open end of the switch housing and passing through perforations in the back wall 11 of the volume control housing, the ears 16 being turned over against the front face of the wall 11 to secure the switch housing to the volume control housing with the rim at the open end of the switch housing tightly engaged against the back side of the wall 11.

This manner of connecting the two housing sections together mechanically also serves to connect them electrically; while the partition wall 11 acts as an electrical shield between the volume control and switch mechanisms.

As is customary in instrumentalities of this nature the operating shaft is rotatably carried by the front wall 9 of the housing means and projects coaxially therethrough into the interior of the front housing section containing the volume control mechanism to operate the same. As will appear in greater detail hereinafter, the inner end of the operating shaft terminates short of the partition wall 11 and has a driver 19 fixed thereto for operating the switch mechanism.

The end wall 10 provided by the bottom of the switch casing or rear housing section comprises a flat disc of insulating material and serves as the terminal head of the switch. It is fixed in position on the switch casing by being confined between a flange 21, turned inwardly from the rear end of the side wall 17 of the switch casing, and a series of indentations 22 in the side wall in line with the ears 16 and which overlie the inner or front face of the terminal head. Another indentation 23 in the side wall at its extreme rear enters a notch 24 in the edge of the terminal head to hold the same against rotation.

At its open end, which is closed by the partition wall 11 upon attachment of the switch casing to the back of the volume control housing, the side wall 17 of the switch casing is indented outwardly to provide opposed sockets 26 which open inwardly toward one another along a line extending across the switch housing a short distance to one side of the center of the housing. These sockets are more or less V-shaped and their apexes extend longitudinally from the extreme front or rim of the side wall 17 rearwardly to a point intermediate the rim and terminal head 10; and at these points the indentations are sheared from the side wall to provide shoulders or abutments 27 on the side wall facing the open end of the switch casing and radially inwardly of the apexes of the V-shaped notches.

These sockets or notches 26 pivotally receive the opposite ends of a spring actuating blade 29 to hold the blade edgewise with respect to the terminal head 10 and in a position extending transversely across the switch housing. At the ends of the blade, its bottom edge 30 seats on the shoulders 27 at the inner ends of the sockets to hold the blade spaced from the terminal head.

The partition wall 11 afforded by the back of the volume control housing extends across the outer ends of the sockets to overlie the upper edges 31 of the extremities of the spring blade to thus cooperate with the shoulders 27 in maintaining the blade in its proper position in the switch housing.

The bottoms of the sockets 26 in which the extremities of the blade seat are spaced apart from one another a distance less than the length of the spring blade so that the blade is yieldingly held with its intermediate portion bowed flatwise to one side or the other and away from the straight line which joins the apexes of the sockets, as seen in Figures 2 and 3. The resiliency of the blade, however, allows the intermediate portion thereof to be deflected out of either bowed attitude toward the line joining the apexes of the sockets and beyond a critical position adjacent to said line from which the intermediate portion of the spring blade snaps to its oppositely bowed position.

In Figure 2 the intermediate portion of the blade is shown bowed outwardly away from the the center of the switch casing and the line joining the apexes of the sockets. When force is applied to the intermediate portion of the blade to move the same inwardly, tending to straighten the blade, it passes a critical position close to the line joining the apexes of the sockets at which the force built up in the blade is suddenly released, causing the intermediate portion of the blade to snap to its oppositely bowed attitude, toward the center of the switch casing as seen in Figure 3.

The same snap action takes place upon the

application of radially outward force to the intermediate portion of the blade to reverse its bowed position shown in Figure 3 and return it to the bowed position seen in Figure 2.

Motion is imparted to the intermediate portion of the spring blade to carry it beyond its critical position from either of its bowed attitudes by the driver 19 on the inner end of the operating shaft 7. For this purpose the spring blade has an extension 33 on its front side edge which projects through an aperture 33' in the partition wall 11, elongated in the direction of the length of the spring blade, with the extension projecting into the interior of the volume control housing adjacent to the driver 19.

Driving lugs 34 and 35 on the driver, projecting rearwardly therefrom, provide for moving the intermediate portion of the blade from either of its bowed attitudes toward and beyond the critical position at which it snaps to the opposite bowed attitude. These driving lugs are spaced circumferentially, and the lug 34 travels in an orbital path located farther from the axis of rotation of the operating shaft than that of the lug 35. The actuating blade 29 is so mounted relative to the paths of travel of the lugs 34 and 35 that the extension 33 on the blade lies in the path of the lug 35 in either bowed attitude of the blade, while the extension 33 is moved into and out of the path of travel of the lug 34 when the blade is snapped respectively to and from its outwardly bowed position seen in Figures 2 and 7. Consequently during rotation of the shaft, the lug 34 passes radially outwardly of the extension 33 to clear the same when the intermediate portion of the blade is bowed inwardly toward the center of the switch housing, as seen in Figures 3 and 7b.

When the blade 29 is in its inwardly bowed attitude (Figures 3 and 7b) the lug 35 is brought into engagement with the extension 33 by counterclockwise rotation of the shaft to flex the intermediate portion of the actuating blade outwardly toward the line joining the apexes of the blade sockets and beyond the critical position adjacent to said line at which it snaps away from the lug 35 to its outwardly bowed attitude seen in Figures 2 and 7.

Such counterclockwise rotation of the operating shaft, of course, is limited to preclude reengagement of the driving lug 35 with the extension 33 after the blade has snapped to its Figures 2 and 7 positions, and this is accomplished by the engagement of a stop lug 37 on the driver with one side of a stop 38 provided by an indentation in the rear portion of the volume control housing. At the time of such engagement of the stops, the driving lugs 34 and 35 lie on opposite sides of the extension 33 on the spring blade, with the lug 34 adjacent to the outer convex face of the blade and in position to be brought into engagement with the extension 33 by clockwise rotation of the operating shaft bring the lugs to a position seen in Figure 7.

Consequently, clockwise rotation of the operating shaft from the position shown in Figure 7 will cause the intermediate portion of the blade to be flexed inwardly toward the center of the switch housing by the lug 34, and the intermediate portion of the blade will snap to its inwardly bowed position seen in Figures 3 and 7a after it passes a critical position adjacent to the line joining the apexes of the blade sockets. In Figures 3 and 7b the extension 33 on the blade has been carried to a position inside the path of

movement of the driving lug 34 to allow further clockwise rotation of the operating shaft for volume controlling purposes. The stop 38, of course, allows nearly full rotation of the shaft and stop clockwise rotation thereof when its opposite side is engaged by the stop lug 37 on the driver.

This back and forth snap action of the spring blade 29 between its oppositely bowed attitudes is utilized to snap the contact carrier 40 of the switch back and forth between switch-open and switch-closed positions in a manner now about to be described.

The contact carrier 40 is a flat disc of insulating material and has a somewhat hexagonal shape. It is loosely received in the bottom portion of the switch casing in the space between the terminal head and the rear edge of the switch actuating blade 29. Slightly off its center, the carrier is provided with a rectangular hole 42, elongated in the direction of the length of the actuating blade, and into which a lug or driver 43 on the rear edge of the blade loosely projects to provide a motion transmitting connection between the blade and the contact carrier located medially of the ends of the blade. The dimensions of the hole 42 with respect to the driver 43 are such that there is only enough clearance between the opposite ends of the hole and the adjacent side edges of the driver as to afford a degree of edgewise rotational motion of the contact carrier about the driver, while substantially precluding back and forth edgewise motion of the carrier in the direction of the length of the actuating blade. For this reason also there is clearance between the long side edges of the hole 42 and the opposite side faces of the driver.

Hence, it will be apparent that as the intermediate portion of the blade snaps back and forth between its oppositely bowed attitudes seen in Figures 2 and 3 it will snap the contact carrier along with it; while the back and forth motion imparted to the contact carrier by the blade is substantially a translating motion crosswise of the length of the actuating blade.

The carrier 40 has a pair of elongated movable contact members 45 connected therewith to be carried thereby into and out of bridging engagement with pairs of stationary contacts 46 mounted on the terminal head 10. The contact members 45 are confined in the space between the underside of the contact carrier and the inner face of the terminal head and each has a pad 48 on its medial portion which slidingly engages the inner face of the terminal head to localize the contact therewith.

The contact members are connected with the carrier to be located at opposite sides of the driving connection between the blade and the carrier, with the contact members extending lengthwise in the direction of switch-opening and switch-closing motion of the carrier. The connections between each contact member and the carrier includes a tail 50 bent forwardly from one end of the contact member, away from the terminal head, and loosely received in an aperture 51 in the carrier adjacent to the outer side of the actuating blade 29, so that the opposite end of the contact member may swing about the pivot provided by the tail 50, back and forth across the underside of the contact carrier substantially in the direction of the length of the spring blade 29.

Such pivotal motion of the contact members is limited, however, since each has a for-

wardly bent neck 52 on its outer extremity projecting loosely through a hole 53 in the carrier. On their outer or forward ends, each of the necks 52 has a head 54 formed thereon, and these heads have a length greater than the width of the aperture 53 so that they overlie the front face of the contact carrier.

It will be understood, of course, that the holes 53 have a length such that the heads 54 may pass therethrough when the contact members are assembled with the carrier, which assembly is effected by holding the contact members in a position displaced 90° from their assembled positions.

The intermediate portion of each contact member surrounding its pad 48 is enlarged as at 56, and these enlargements provide the bridging portions of the contact members which engage between the bridge the stationary contacts 46 of the switch. As seen best in Figures 4 and 6 the bridging portions 56 are more or less round, while the portions of the stationary contacts bridged thereby are at an angle such as to provide a wedging action of the movable contacts between their stationary contacts as the switch is closed.

With the construction described, it will be apparent that not only are the movable contacts 45 pivotable about their trunnion forming ends 60 and consequently self-aligning with respect to their cooperating stationary contacts, but the carrier itself is also capable of a degree of edgewise pivotal motion about the driver 43 to enhance this self-centering feature. Also, since the driver on the actuating blade engages the contact carrier at a point substantially midway between the areas of engagement between the mobable contacts 45 and their stationary contacts, the force of the actuating blade holding the stationary contacts bridged is substantially equally divided between each set of movable and stationary contacts.

The stationary contacts 46 are on the order of those shown and described in Patent No. 2,529,716 issued to Adrian J. Vaksvik and Mervin B. Arisman November 14, 1950, and comprise the inner ends of the terminal posts 58 of the switch. These combined terminal posts and stationary contacts are stamped from flat stock and project through slits in the terminal head to have their terminal portions exposed at the back of the switch casing, being secured to the terminal head by swedged portions 59 which engage the rear or outer face of the terminal head and draw lateral extensions on the contact portions of the posts into firm engagement with the inner face of the terminal head.

In the present case also the inner ends 60 which provide the contact portions of the posts all lie in a common plane spaced from but parallel to the inner face of the terminal head and provide supporting surfaces with which the underside of the contact carrier engages. The contact carrier 40 is loosely held on the supporting surfaces provided by the stationary contacts by means of a relatively small foot 61 on the rear edge of the actuating blade 29, projecting therefrom directly alongside the driver 43.

It will be noted also that the foot 61 has the additional function of holding the rear edge of the actuating blade spaced from the adjacent outer face of the contact carrier for substantially the entire length of the blade.

One of the limits of back and forth motion of the contact carrier, of course, is defined by the engagement of its movable contacts with their cooperating stationary contacts, as shown in Figure 3. The other limit of motion, or more particularly the switch-open position of the carrier, is defined by the engagement of one straight edge 63 thereof with the adjacent indented portion 22 of the switch casing, along with the engagement of opposite convex edges 64 of the carrier near the ends of the actuating blade 29 with the side wall of the switch housing.

As a result the contact carrier and the contactors thereon have a relatively long straight line travel despite the small size of the housing, and this is important since it determines the distance between each pair of stationary contacts and its bridging contactor.

The translatory or straight line motion of the contact carrier and the fact that the contact surfaces of the stationary contacts 46 are so located that a straight line normal to the path of travel of the contact carrier intersects all these contact surfaces assures maximum electrical clearance between the contacts and the contactors when the switch is open. In other words, by virtue of the disposition of the stationary contacts in a row normal to the plane contacting the axis of the housing and the connection 42 between the contact carrier and the spring blade 29, both contactors move away from all of the stationary contacts as the contact carrier travels toward its switch open position.

One of the most important features of the switch mechanism described is that the extension 33 of the actuating blade, with which the driving lugs 34 and 35 on the operating shaft transiently engage, is located substantially midway between one of the pivoted ends of the blade and the point at which the blade is drivingly connected with the contact carrier. This enables the intermediate portion of the blade to be flexed beyond the "snap over" point without imparting motion to the contact carrier, with the result that uniform contact pressure is maintained in the switch-closed position right up until the time the intermediate portion of the blade snaps to its outwardly bowed position to open the switch.

The snap switch illustrated in Figures 8, 9 and 10 embodies the same principles of the switch shown in Figures 1 to 7b inclusive, and differs therefrom chiefly in the construction of the contact carrier 40' and the manner of connecting the movable contacts 66 therewith. In this case also the stationary contacts 46' are located substantially in the same positions as the contacts 46 in the previous embodiment.

The switch blade 29' however has its ends pivotally received in sockets which hold the blade at the opposite side of the center of the switch housing, i. e. above the center rather than below with relation to Figure 2; although it snaps the contact carrier in the same direction (upwardly) to effect closure of the switch as it does in the Figure 2 embodiment.

The main feature of this modified switch resides in the fact that the contact engaging portions of the stationary contacts have forward extensions 68 thereon which loosely project through slots 69 in the carrier elongated in the direction of its switch-opening and closing motion to guide the carrier for such motion.

The movable contacts 66 are also of simpler design, being stamped and bent flatwise to substantially U-shape. The legs of the U-shaped movable contacts diverge slightly toward their outer ends, and are confined edgewise between

the underside of the carrier and the inner face of the terminal head.

At their closed end portions, each of the U-shaped movable contacts has an extension 70 which projects edgewise forwardly through an opening in the contact carrier and is engaged over the rounded outer end of a tongue 71 formed on the carrier to enable rocking of the movable contacts about the extremities of the tongues. Since the extensions 70 extend part way along the diverging ends of the legs of the contacts to lie opposite the side edges of the tongues 71, rocking movement of the contacts on their tongues is limited; while motion of the movable contacts off of the rounded ends of their tongues or pivot posts is limited by the engagement of the closed ends of the U-shaped contacts with abutments 72 on the carrier opposite the rounded extremities of the tongues and spaced therefrom a distance slightly greater than the thickness of the movable contacts.

Although the same desirable advantage of equalized and adequate contact pressure between the movable contacts and their stationary contacts is secured by this arrangement, it will be noted that the point at which the actuating blade is drivingly connected with the contact carrier leads the bridging portions of the movable contacts during switch-closing motion, while in the previous embodiment this point of connection trailed the enlarged bridging portions 56 of the movable contacts.

Also by reason of the disposition of the actuating blade 29', the blade springs to an outwardly bowed attitude to effect closure of the switch, and to an inwardly bowed attitude to effect opening of the switch.

Another feature of the switch shown in Figures 8, 9 and 10 is that the blade 29' has tongues 74 on its opposite ends which project beyond the extremities of the blade along the rear edge thereof and pass through openings 75 in the side wall of the switch housing to anchor the blade against edgewise motion forwardly, or away from the bottom wall of the switch housing. Consequently, the blade 29' will be positively held against disassembly from the switch housing prior to attachment of the switch housing to the back of the volume control housing.

From the foregoing description, together with the accompanying drawings, it will be apparent to those skilled in the art that this invention provides an improved double pole single throw snap switch, which though simplified in design by the suspension of the contact carrier from the actuating blade to eliminate pivot posts and the like for mounting the contact carrier, achieves such outstanding advantages as self-aligning of the movable contacts with respect to their stationary contacts, and equal division of contact pressure between the two sets of movable and stationary contacts.

What I claim as my invention is:

1. In an electrical control instrumentality of the character described: a substantially cup-shaped switch housing including a side wall and a bottom wall at one end of the switch housing; stationary contacts secured to said bottom wall; a substantially flat insulative contact carrier inside the bottom portion of the switch housing flatwise overlying the bottom wall of the housing and movable edgewise to and from switch-open and switch-closed positions; supporting means on said bottom wall for spacing the contact carrier therefrom and upon which the contact carrier slides during switch-opening and switch-closing movement; means on the side wall of the switch housing providing opposed sockets which open toward one another and to the outer edge of the housing side wall; a shoulder in each of said sockets spaced from the open end of the switch housing but facing the same; a cover engaged over the open end of the switch housing to close the same, said cover having an opening therein; an actuating blade for snapping said contact carrier to and from switch-open and switch-closed positions, said blade having its opposite ends pivotally received in said sockets and confined therein between said shoulders and the cover, said blade extending edgewise across the contact carrier between it and said cover; a motion transmitting connection between the intermediate portion of the spring blade and the contact carrier; a foot on the edge of the blade adjacent to the contact carrier and engaged therewith to cooperate with said supporting means for the contact carrier to substantially preclude flatwise motion of the contact carrier in the switch housing; and an extension on the opposite edge of the spring blade projecting through said opening in the cover to enable the switch actuating blade to be operated from outside the switch housing.

2. In a snap switch: a substantially cup-shaped switch housing having stationary contacts exposed on the inner face of its bottom wall; a substantially flat insulative contact carrier loosely received in the bottom portion of said housing and movable edgewise in a plane substantially parallel to the bottom wall of the housing to and from positions carrying contact means thereon into and out of engagement with said stationary contacts; supporting means on the bottom wall of the housing engaging the underside of the carrier to guide the carrier for edgewise motion parallel to the bottom wall of the housing; a spring blade extending edgewise across the outer side of the carrier and crosswise of the direction of switch-opening and closing motion of the carrier; connections between the opposite ends of the spring blade and the side wall of the housing so spaced from one another with respect to the length of the blade as to impose a force on the blade tending to hold its intermediate portion bowed to one side or the other and away from a straight line joining the extremities of the blade so that the intermediate portion of the blade snaps from one bowed attitude to the other upon being deflected toward said line and beyond a critical position adjacent thereto; a motion transmitting connection between the intermediate portion of said blade and the contact carrier whereby the latter is snapped to switch-open and switch-closed positions in consequence to reversal of the bowed attitude of the blade; and a foot on the medial portion of the blade engaged with the outer side of the contact carrier to hold the major length of the blade spaced from the carrier, said foot cooperating with said supporting means on the bottom wall of the housing to constrain the contact carrier to edgewise motion parallel to said bottom wall of the housing.

3. In a snap switch: a switch casing including a substantially tubular side wall, and a terminal head extending across and closing one end of said tubular side wall; a substantially flat contact carrier loosely received in said casing and flatwise overlying the inner side of the terminal head; a spring blade connected at its opposite

ends with the side wall of the casing to lie edgewise adjacent to the outer side of said contact carrier and extending thereacross, the intermediate portion of said spring blade being normally bowed flatwise to one side or the other of a straight line joining its opposite extremities but being movable back and forth between said bowed positions with a snap action; a driving lug on the medial portion of said blade received in an aperture in the contact carrier so that the carrier is snapped back and forth between switch-open and switch-closed positions in consequence to reversal of the bowed attitude of the blade, said connection between the blade and the carrier affording limited edgewise turning motion of the carrier about said driving lug; a pair of contacts on said carrier, one at each side of its driving connection with the blade; and cooperating stationary contacts on the terminal head bridged by said contacts when the carrier is snapped in one direction by the blade, the location of the contacts on the carrier at each side of its driving connection with the blade and the limited turning motion of the carrier with respect to the blade providing for self-alignment of the carrier contacts with respect to their cooperating stationary contacts.

4. The switch set forth in claim 3 further characterized by the provision of connections between the contact carrier and its contacts which provide said contacts with a limited degree of motion relative to the carrier in the direction of the length of the spring blade to further facilitate centering of the movable contacts with their cooperating stationary contacts.

5. In a snap switch: a switch housing having a flat bottom wall and a cylindrical side wall; pivot forming means on opposite portions of the housing side wall, said pivot forming means being so located that the distance therebetween is less than the diameter of the housing and a line connecting them lies chordwise to one side of the center of the housing; a spring blade having its opposite ends connected to said pivot forming means and extending across the housing edgewise with respect to the bottom wall of the housing and spaced therefrom, said blade being longer than the distance between the pivot forming means so that the blade is always bowed to one side or the other of a straight line joining the pivot forming means and its intermediate portion is deflectible out of either bowed attitude toward said line and beyond a critical position adjacent to said line from which it snaps to its oppositely bowed attitude; a substantially flat disc-like contact carrier loosely received in the bottom portion of the housing and confined flatwise between the bottom wall of the housing and the adjacent edge of the spring blade; a motion transmitting connection between the contact carrier and said intermediate portion of the blade whereby the carrier is snapped back and forth between switch on and switch off positions with an edgewise translating motion along a path at right angles to a straight line joining the pivot forming means in consequence of reversal of the bowed attitude of the blade, said motion transmitting connection being so located on the contact carrier that when the blade is bowed away from the center of the housing the leading edge of the contact carrier comes to bear against the side wall of the housing; and cooperating contacts on the contact carrier and the bottom wall of the housing.

6. In a snap switch: a switch housing having a side wall and a bottom wall closing one end of the housing; spaced apart stationary contacts on the inner side of said bottom wall; a spring blade connected at its opposite ends to the housing side wall to extend across the switch housing edgewise to said bottom wall but spaced therefrom, said connections imposing a force on the blade tending to hold its intermediate portion bowed to one side or the other and away from a straight line joining the extremities of the blade, and said intermediate portion of the blade being deflectible out of either bowed attitude toward said line and beyond a critical position adjacent thereto from which it snaps to its oppositely bowed attitude; flat supporting surfaces on said stationary contacts lying in a common plane intermediate said spring blade and the bottom wall of the housing; a movable substantially flat contact carrier loosely received in the switch housing and flatwise confined between said supporting surfaces on the stationary contacts and said spring blade to be constrained thereby to edgewise motion on said supporting surfaces; a driving connection between said contact carrier and the spring blade at a point on the blade substantially medially of its ends, whereby the carrier is suspended from the blade to be snapped back and forth by the blade in consequence of reversal of the bowed attitude thereof and in a direction crosswise of the length of the blade, to carry contact means on the carrier into and out of bridging engagement with the stationary contacts, said driving connection allowing a degree of relative pivotal movement between the contact carrier and the spring blade; and cooperating means on said stationary contacts and the contact carrier guiding the carrier for substantially straight line back and forth motion with the spring blade.

7. The snap switch set forth in claim 6 wherein said cooperating means which guides the contact carrier for back and forth motion comprises spaced parallel slots in the carrier extending lengthwise in the direction of back and forth motion of the carrier, and extensions on the stationary contacts projecting through said slots and loosely fitting the same.

8. The snap switch of claim 7 further characterized by the fact that the portion of the contact carrier which lies between the stationary contacts when the same are bridged is cut out to provide a pivot post facing in the direction in which the carrier travels to effect bridging of the stationary contacts; and a substantially U-shaped movable contact confined between the carrier and the bottom wall of the switch housing and having an extension at its closed end projecting through said cut out portion of the carrier and seating on the extremity of said pivot post, whereby the movable contact is tiltably connected with the carrier and is self-aligning with respect to said stationary contacts.

9. In a snap switch: a switch housing having a side wall, and a bottom wall closing one end of the housing; a spring blade in said housing extending thereacross edgewise with respect to said bottom wall and spaced therefrom; connections between the opposite ends of the spring blade and the housing side wall holding the blade with its intermediate portion bowed to one side or the other and away from a straight line passing through said connections, the intermediate portion of the blade being deflectible out of either bowed attitude toward said line and beyond a critical position adjacent thereto from which it snaps to its oppositely bowed attitude; a sub-

stantially flat contact carrier loosely received in said housing and flatwise overlying the bottom wall thereof, in said space between the bottom wall of the housing and the adjacent edge of the spring blade, so as to be constrained to edgewise movement in the housing; a motion transmitting connection between the contact carrier and said spring blade at a point on the latter substantially medially of its ends, said motion transmitting connection substantially suspending the carrier from the blade and constraining the carrier to edgewise substantially translatory back and forth motion with the medial portion of the blade so that the carrier may be snapped back and forth between switch on and switch off positions in consequence of reversal of the bowed attitude of the blade; and an integral extension on the edge of the blade remote from the contact carrier, substantially medially between one end of the blade and its connection with the carrier to enable switch operating force to be applied directly to the blade at a distance from its connection with the carrier.

10. The snap switch set forth in claim 9 wherein said connections between the opposite ends of the spring blade and the housing side wall comprise outwardly pressed portions on the side wall providing V-shaped sockets in which the extremities of the spring blade are pivotally received, and tongues on the ends of the blade extending beyond its extremities and through openings in the side wall of the switch housing to hold the blade against edgewise motion away from the bottom wall of the housing.

11. A double pole, single throw switch of the character described, comprising: a housing having a cylindrical side wall and a flat bottom wall; two pairs of stationary contacts on the inner face of the bottom wall electrically insulated from one another, said two pairs of stationary contacts being disposed symmetrically at opposite sides of a plane perpendicular to the bottom wall and containing the axis of the housing and having opposing contact surfaces spaced apart along a straight line normal to said plane; a movable contact carrier overlying the inner face of the bottom wall; means for driving the contact carrier across the bottom wall of the housing between switch closed and switch open position and with a substantially translatory motion along a path parallel to said plane, said means being connected to the carrier on said plane and including a spring reacting between the side wall of the housing and the carrier for urging the carrier toward its switch closed position; and a pair of contactors mounted on the carrier and spaced equidistances from said plane and from one another on a line normal to said plane with the distance between said contactors corresponding to the center-to-center distance between the two pairs of stationary contacts so that said contactors move into bridging engagement with their respective stationary contacts as the carrier assumes its switch closed position and move away from all of the stationary contacts as the carrier moves toward its switch open position.

12. The switch of claim 11 further characterized by the fact that the connection between the driving means and the movable contact carrier and also the connections between the contactors and the carrier have limited pivotal freedom about axes perpendicular to the bottom wall of the housing so that the contactors are self aligning as they are driven into bridging engagement with their respective stationary contacts.

13. The switch of claim 11 wherein the means for driving the carrier across the bottom wall of the housing between switch closed and switch open position comprises: a spring blade having its ends rockably supported on opposite portions of the housing side wall so located that a straight line joining the ends of the blade is normal to said plane and extends chordwise across the bottom wall of the housing between the stationary contacts and the side of the housing toward which the contact carrier moves in travelling toward its switch open position, said spring blade being disposed edgewise with respect to the bottom wall of the housing and lying above the contact carrier and being longer than the distance between the opposite portions of the side wall upon which its ends are supported so that the blade is always bowed to one side or the other of said straight line, and its intermediate portion is deflectible out of either bowed attitude toward said line and beyond a critical position adjacent to said line from which it snaps to its oppositely bowed attitude; and a connection between the blade and the movable contact carrier, said connection being located medially of the ends of the blade.

14. The switch of claim 13 further characterized by the provision of an integral extension on the edge of the blade remote from the contact carrier, substantially medially between one end of the blade and its connection with the carrier to enable switch operating force to be applied directly to the blade a distance from its connection with the carrier.

15. A double pole, single throw switch of the character described, comprising: a housing having a cylindrical side wall and a flat bottom wall of insulating material; two pairs of stationary contacts mounted on said bottom wall and disposed symmetrically at opposite sides of a plane perpendicular to the bottom wall and having contact surfaces spaced along a straight line normal to said plane; a flat substantially disc-like contact carrier slidable edgewise across the tops of the stationary contacts; means constraining the contact carrier to substantially translatory motion along a path parallel to said plane; a pair of contactors mounted on said contact carrier for coaction with the stationary contacts, said contactors being equispaced from said plane and spaced from one another on a line normal to said plane with the distance between the contactors corresponding to the center-to-center distance between the pairs of stationary contacts so that said contactors move into bridging engagement with their respective stationary contacts as the carrier assumes its switch closed position and move away from all of the stationary contacts as the carrier moves toward its switch open position; and means for sliding the contact carrier between its switch closed and switch open positions, including a spring biasing the contact carrier in a direction to hold the contactors in bridging engagement with the stationary contacts in the switch closed position of the contact carrier.

16. The electric switch of claim 15, further characterized by the fact that: the portion of the contact carrier which lies between the stationary contacts when the carrier is in its switch closed position has an opening therein one edge of which is shaped to provide a pivot post facing in the direction in which the carrier travels in moving toward its switch closed position; and by the fact

that the movable contactor is substantially U-shaped and is confined flatwise between the carrier and the base and has an extension on its bight projecting into said opening in the carrier and embracing the extremity of said pivot post, whereby the movable contactor is tiltably connected with the carrier and is self aligning with respect to the stationary contacts.

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