June 25, 1940. A. W. KRIEGER 2,205,483

ELECTRIC SNAP SWITCH

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Fig. 1

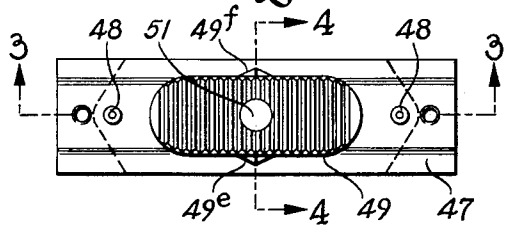


Fig. 2

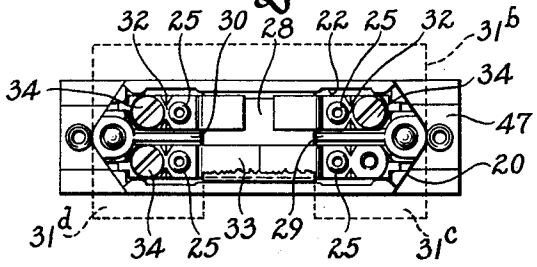


Fig. 3

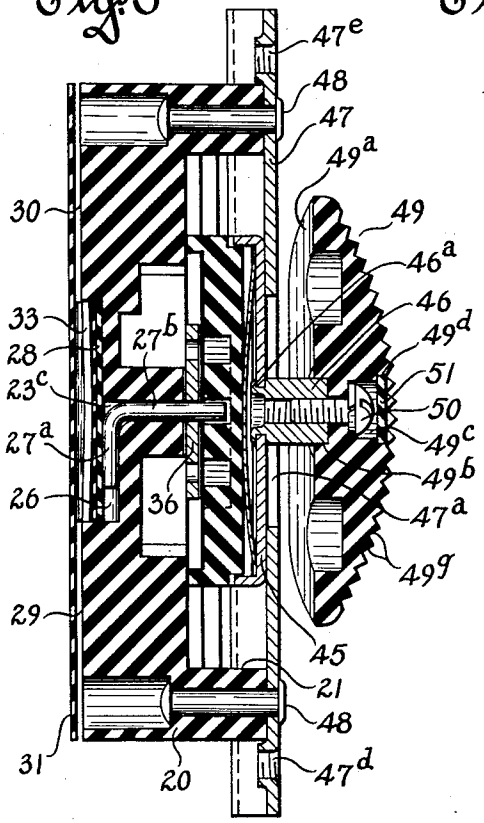


Fig. 4

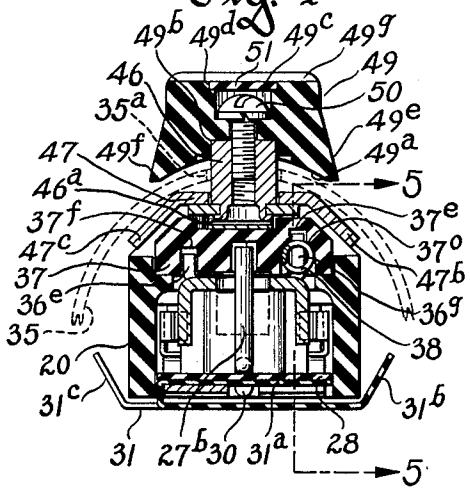
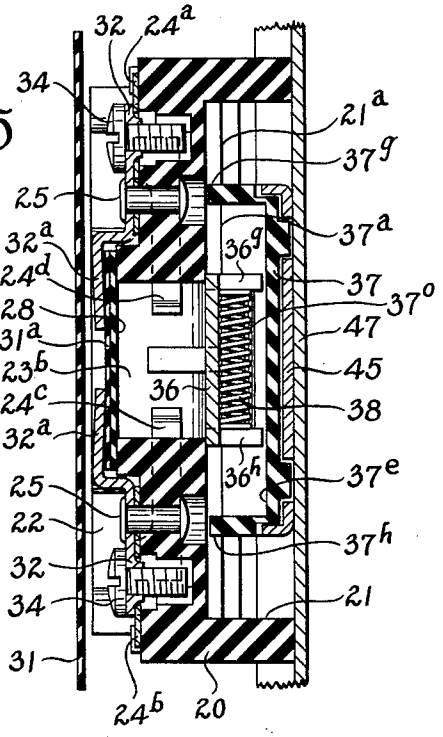


Fig. 5



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ELECTRIC SNAP SWITCH

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Fig. 6

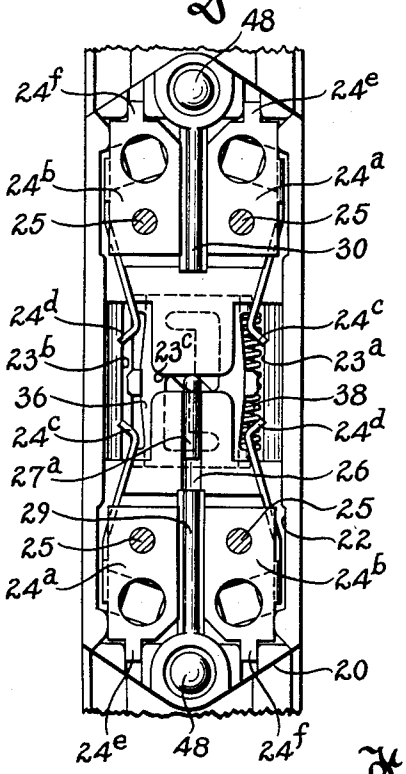


Fig. 7

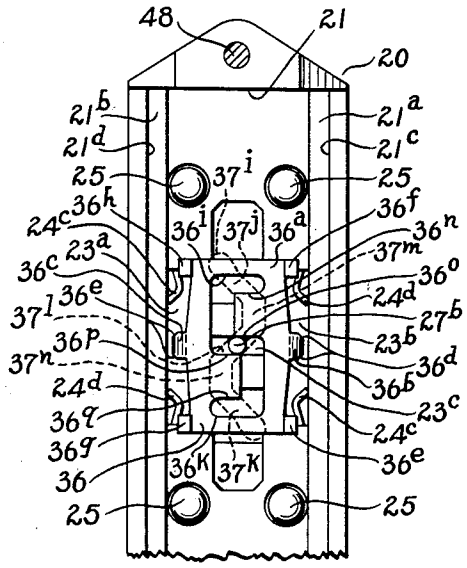


Fig. 8

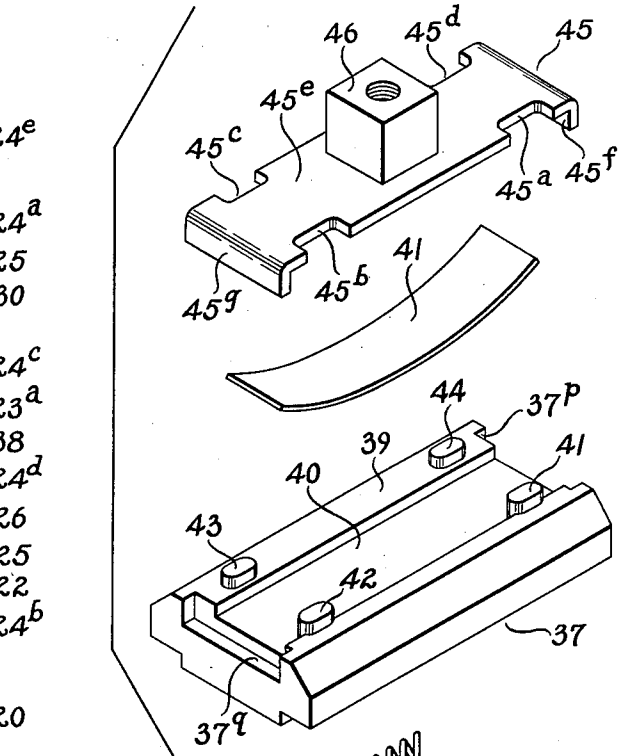
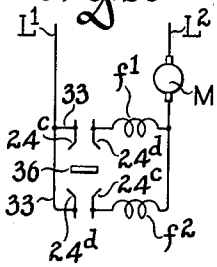


Fig. 16



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Fig. 9

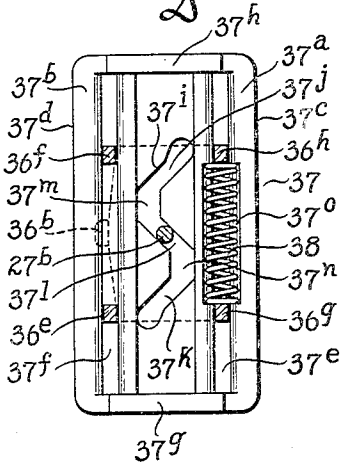


Fig. 10

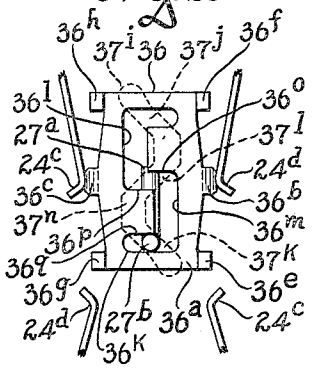


Fig. 11

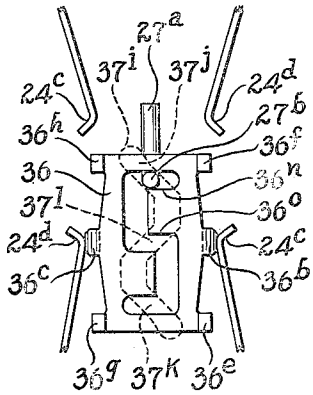


Fig. 17

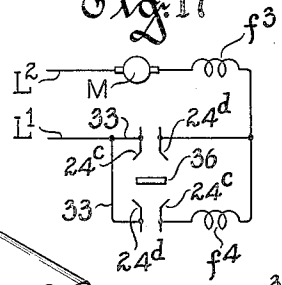


Fig. 12

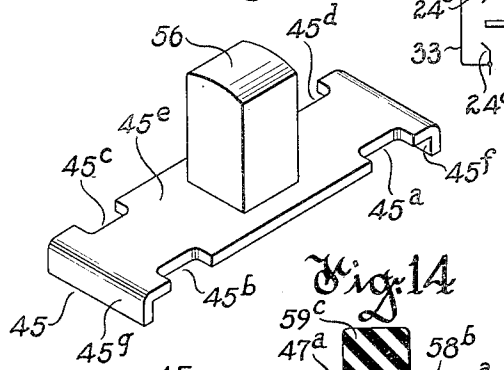


Fig. 13

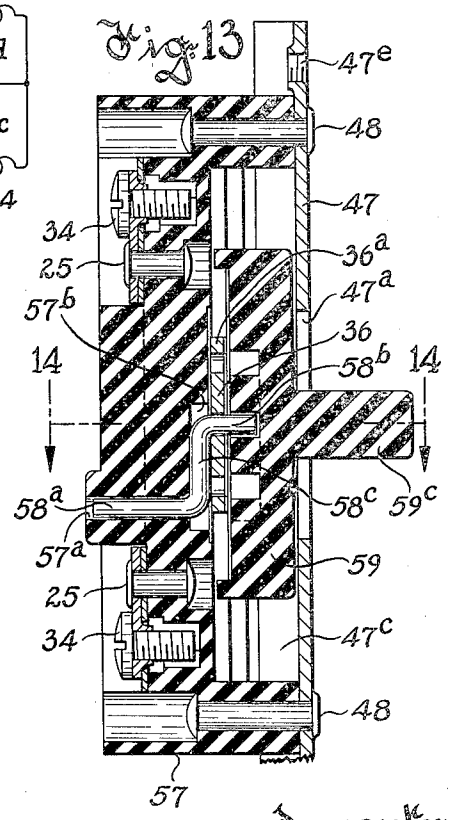


Fig. 14

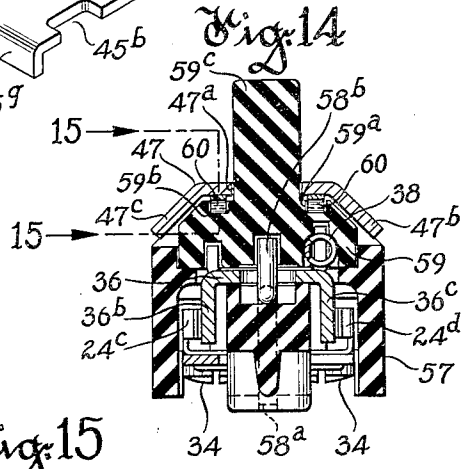
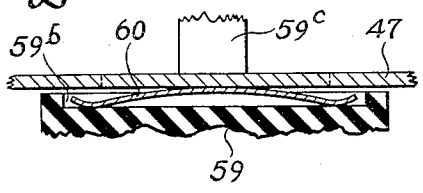


Fig. 15



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Patented June 25, 1940 2,205,483

UNITED STATES PATENT OFFICE

2,205,483

ELECTRIC SNAP SWITCH

Alvin W. Krieger, Milwaukee, Wis., assignor to Cutler-Hammer, Inc., Milwaukee, Wis., a corporation of Delaware

Application February 24, 1939, Serial No. 258,237

23 Claims. (Cl. 200—78)

This invention relates to improvements in electric snap switches, and more particularly to such switches of the slide button operated type.

A primary object of the invention is to improve and simplify the structural details and the operating characteristics of switches of the aforementioned character.

Another object is to provide a switch mechanism which is particularly adaptable for use for multiple-circuit control.

Another object is to provide a novel mechanical movement for insuring snap actuation of the bridging contactor in a step-by-step manner upon rectilinear movement of the operating member in one direction or the other.

Another object is to provide for the snap switch a bridging contactor of novel form.

Another object is to provide an insulating actuating slide button of novel form.

Another object is to provide a novel cooperative arrangement of the insulating actuating slide button, the bridging contactor, and a latch pin oscillatably supported by the switch base.

Another object is to provide a novel interlocking arrangement of the movable parts of the switch, whereby the number of fastening elements required to maintain the same in assembled relation to the base is minimized.

Another object is to provide novel means for attaching the switch mechanism to and for insulating the same from a hollow metal tube or similar support.

Another and more specific object is to provide a novel form of snap switch mechanism for control of a two-speed vacuum cleaner motor or the like.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate certain embodiments of the invention which will now be described, it being understood that the invention is susceptible of embodiment in other forms without departing from the spirit and scope of the appended claims.

In the drawings, Figure 1 is a top plan view (normal size) of a slide button operated snap switch, as constructed in accordance with my invention, the insulating cover member for the wiring terminal elements being omitted.

Fig. 2 is a bottom plan view of the switch shown in Fig. 1, the arrangement of the insulating cover member for the wiring terminal elements being shown by dotted lines.

Fig. 3 is an enlarged central longitudinal section, on the line 3—3 of Fig. 1, with all of the switch parts, including the aforementioned cover member for the terminals, in assembled relation.

Fig. 4 is a transverse section, on the line 4—4 of Fig. 1, with the cover member for the terminals in position, a fragment of the tube to which the switch may be attached being shown in dotted lines.

Fig. 5 is a sectional view, on the line 5—5 of Fig. 4, the coiled compression spring being shown in elevation.

Fig. 6 is an enlarged view similar to Fig. 2, but with certain of the insulating members and the combined wiring terminal and clamping members omitted for purposes of illustration, the opposite ends of the metal supporting and cover member being broken away.

Fig. 7 is a fragmentary top plan view of the switch, with the several parts above the contactor omitted, the contour of the recess or groove of substantially zigzag form in the insulating slide button being shown in dotted lines.

Fig. 8 is a detail perspective view, in separated relation, of certain of the movable parts of the switch.

Fig. 9 is a bottom plan view of the insulating actuating slide button, the coiled compression spring being shown in position, portions of the contactor and the pin being shown in cross section and other portions of the contactor being shown in dotted lines, to illustrate the relative positions of these parts in the intermediate or "off" position of the contactor.

Fig. 10 is a fragmentary view illustrating the positions of the contactor, the pin and the insulating slide button relatively to each other and to the sets of resilient stationary contacts in one "on" position of the contactor, the insulating slide button being represented by the dotted line showing of the aforementioned groove.

Fig. 11 is a view similar to Fig. 10, but illustrating the relative positions of the parts in the other "on" position of the contactor.

Fig. 12 is a perspective view of the sheet metal operating member shown in Figs. 3, 4, 5 and 8, but modified by the substitution of a relatively high metal knob or projection for the metal stud and removable insulating thumb or finger piece shown in Figs. 3 and 4.

Fig. 13 is a central longitudinal section through another form of switch, showing a modified form of insulating base, latch pin and insulating actuating slide button, the latter being provided with an integral insulating operating knob or thumb piece.

Fig. 14 is a sectional view, on the line 14—14 of Fig. 13.

Fig. 15 is a fragmentary sectional view, on the line 15—15 of Fig. 14.

Fig. 16 illustrates diagrammatically one form of circuit for a two-speed motor to be controlled by the switch, and

Fig. 17 illustrates diagrammatically another form of circuit for a two-speed motor to be controlled by the switch.

Referring first to the switch shown in Figs. 1 to 11, inclusive, the numeral 20 designates a relatively long base of substantially rectangular contour, which may be produced by a straight line molding operation from any suitable insulating material, such as "Bakelite." Base 20 is recessed from the upper surface thereof, as indicated in general at 21, and the same is likewise recessed from the lower surface thereof, as indicated in general at 22. As best illustrated in Fig. 6, base 20 has formed therein a substantially H-shaped passage which communicates with the aforementioned upper and lower recesses; the parallel arm portions of said passage being designated by numerals 23^a and 23^b and the connecting portion of the H being designated by numeral 23^c.

Seated upon four ledges (Fig. 6) forming part of the recess 22 are the flat portions 24^a, 24^b of a corresponding number of resilient stationary contact members the tips 24^c and 24^d of which are arranged in transversely spaced pairs, one tip of each pair being located within one arm portion 23^a of said H-shaped passage and the other tip of each pair being located within the other arm portion 23^b of said passage; and said pairs of tips are spaced from each other a predetermined distance longitudinally of base 20. In practice said resilient contact members may be formed from blanks of identical form, two of the four blanks being merely bent to right-hand form and the others being bent to left-hand form.

The flat portions 24^a and 24^b of said contact members are provided with nibs or projections 24^e and 24^f, respectively, which fit within corresponding pairs of grooves at opposite ends of base 20 (Fig. 6) to assist in restraining said flat portions against movement after the same are secured to base 20 by the rivets 25. The bottom wall of the lower recess 22 is provided with a groove 26 (Figs. 3 and 6) which is adapted to provide a bearing for the short arm 27^a of a substantially L-shaped latching or locking pin, the long arm 27^b of which is adapted for oscillatory movement within the aforementioned connecting portion 23^c of said H-shaped passage. As shown in Figs. 3 and 4 said arm 27^b extends upwardly a substantial distance beyond the bottom wall of the upper recess 21, for a purpose hereinafter described. After positioning of pin 27^a, 27^b as shown, a relatively thin substantially rectangular plate 28 of fiber or similar tough but rather rigid insulating material is placed thereunder. Plate 28 is adapted to fit rather snugly between the side walls of the intermediate portion of the lower recess 22 (Fig. 2) and between the spaced ends of the barriers 29 and 30 formed integrally with base 20 and extending to a plane substantially flush with the lower surface of the latter.

In practice I prefer to place under plate 28 the tongue 31^a which is formed integrally with and partially sheared from a plate or sheet 31 of relatively thin and rather flexible fiber or similar insulating material. Thereupon the like individual wiring terminal members 32 and the combined common wiring terminal and bus member 33 are secured to base 20 and to the aforementioned stationary contact members 24^a and 24^b by the rivets 25. Members 32 are provided with tapped openings to accommodate the usual binding screws 34, and member 33 is provided with a tapped opening at each end thereof, only one of which tapped openings is utilized for accommodation of the shank of a binding screw 34 in a switch adapted to function in the manner herein contemplated. As best illustrated in Figs. 5 and 6 the flat portions 24^a and 24^b of the stationary contact members are provided with relatively large openings to accommodate the shanks of binding screws 34 and the extrusions surrounding the tapped openings in said terminal and bus members, and base 20 is provided in its lower surface with supplemental recesses to accommodate said screw shanks.

As best illustrated in Fig. 5, terminal members 32 are provided with portions 32^a extending toward but substantially spaced endwise from each other, and said portions 32^a are initially bent to a slight degree toward the bottom wall of the lower recess, whereby the same when attached to base 20 are adapted to clamp the aforementioned plate 28 and tongue 31^a in position. Similarly the intermediate portion of bus member 33 is bent inwardly, as shown in Fig. 3, for a like purpose. As shown in Fig. 3, plate 28 acts to retain the aforementioned arm 27^a of the pin within groove 26, and said plate further acts as a closure for the lower end of the H-shaped passage (see Fig. 2). When the parts are thus attached to the lower surface of base 20 the insulating sheet 31 may be reflexed with respect to the tongue 31^a thereof to substantially completely underlie the lower surface of said base, as best shown in Fig. 4, whereby the bared ends of the terminal wires (not shown) and the wiring terminals will be properly insulated from the wall of a metal tube, shown in dotted lines at 35 in Fig. 4, within which the switch may be mounted.

Slidably seated upon the bottom wall of the upper recess 21 in base 20 is a punched and stamped sheet metal contactor 36 (Fig. 7), the form of which is shown in greater detail in Fig. 8. Thus said contactor comprises a flat main body portion 36^a of substantially oblong contour, but the opposite end portions of which are preferably of slightly less width than the mid-portion thereof. Formed integrally with the opposite sides of main body portion 36^a at the mid-length thereof are a pair of relatively long lugs 36^b and 36^c, which are bent downwardly at substantially right angles to said main body portion to provide for joint movement thereof into or out of bridging engagement with one or the other of the transversely alined pairs of contact tips 24^c, 24^d selectively. The outer corners of the lugs 36^b and 36^c are preferably beveled, as shown at 36^d, 36^e (Fig. 7) to facilitate such bridging engagement.

Formed integrally with said main body portion 36^a at the four corners of the latter and bent upwardly at substantially right angles thereto are lugs 36^e, 36^f, 36^g and 36^h, the longitudinally alined pair of lugs 36^g, 36^h being substantially longer or higher than the longitudinally alined pair of lugs 36^e, 36^f.

Said main body portion 36^a is provided with an opening or slot of substantially S-shape, as viewed from above (Figs. 7 and 8), said slot including alined transversely extending upper, in-

termediate and lower sections 36^i, 36^j and 36^k, and a pair of longitudinally extending transversely offset sections 36^l and 36^m arranged in parallel planes, whereby section 36^l connects one end of intermediate section 36^j with the corresponding end of section 36^i, and section 36^m connects the other end of intermediate section 36^j with the corresponding end of section 36^k. Each section of said slot is thus arranged in a plane at a right angle to its adjacent section or sections, whereby said main body portion is provided with four transversely extending shoulders 36^n, 36^o, 36^p and 36^q.

The upper recess 21 in base 20 (Fig. 7) includes a pair of ledges 21^a, 21^b extending inwardly at right angles to the respective side walls 21^c and 21^d, said ledges and walls being adapted to cooperate with the bottom surface portions 37^a, 37^b and the vertical side portions 37^c, 37^d of a molded insulating actuating slide button 37 of relatively long substantially rectangular contour (see Fig. 9), whereby button 37 is guided for straight line sliding movement longitudinally of base 20. Button 37 is provided in its lower surface adjacent to opposite longitudinal sides thereof with straight parallel channel-shaped grooves 37^e and 37^f, which are respectively adapted to receive and guide the aforementioned longitudinally alined pairs of lugs 36^g, 36^h and 36^e, 36^i upon the contactor 36. Button 37 is provided at opposite ends thereof with integral downwardly extending projections 37^g, 37^h (see Fig. 5) offset inwardly from the respective longitudinal sides thereof, which projections cooperate with the respective opposite ends of contactor 36 to positively limit the degree of longitudinal movement of said parts relatively to each other.

Button 37 is provided in its lower surface, between the grooves 37^e, 37^f with a groove or recess 37^i of substantially zigzag form. Groove 37^i when viewed from below (Fig. 9) somewhat resembles the letter S in shape, and comprises essentially opposite end portions 37^j and 37^k arranged in planes substantially parallel to each other and at angles of approximately forty-five degrees to the longitudinal center line of said button, a mid-portion 37^l likewise arranged at an angle of approximately forty-five degrees to said longitudinal center line and at substantially right angles to the respective end portions 37^j and 37^k. Said intermediate portion 37^l is connected with said end portions by means of straight or enlarged portions 37^m and 37^n.

As best illustrated in Fig. 4 the aforementioned groove 37^e in the lower surface of button 37 is relatively deeper than the groove 37^f, to accommodate the relatively longer upstanding lugs 36^g and 36^h on contactor 36. Also as shown in Figs. 4 and 9 the mid-length of groove 37^e is enlarged throughout a part of its depth, as shown at 37^o to accommodate, under a predetermined degree of compression, the coiled spring 38, in a relation offset upwardly to a slight degree from the lower surface of button 37. The end shoulders formed by the enlarged portion 37^o of groove 37^e thus positively limit the spreading movement of the opposite ends of spring 38. Also as shown in Figs. 4, 5 and 9 the lugs 36^g, 36^h on contactor 36 are adapted to straddle the length of spring 38 and to respectively diametrically abut the opposite ends of the latter. By this arrangement spring 38 acts to normally yieldably maintain contactor 36 in a substantially longitudinally centered relation to button 37, while permitting longitudinal movement of said parts under given conditions now to be described.

Thus, with reference to Fig. 7, in which the slide button 37 (represented by the dotted line showing of the zigzag groove 37^i thereof) and contact 36 are in relative positions to provide for intermediate or "off" position of the contactor. If it is desired to move the contactor 36 upwardly into bridging engagement with the upper pair of resilient contact tips 24^c and 24^d, the button 37 is initially moved upwardly. Such upward movement of the button causes the walls of the intermediate section 37^l of the zigzag groove 37^i to swing or oscillate portion 27^b of the pin toward the left, whereby the same positively engages the shoulder 36^p to restrain the contactor 36 against movement along with button 37 under the bias of spring 38. Such upward movement of button 37 (see Fig. 9) carries the lower end of spring 38 away from lug 36^g on contactor 36 toward the lug 36^h on the latter to effect storage of energy in said spring.

Upon continued upward movement of button 37 the straight portion 37^n of groove 37^i cooperates with portion 27^b of the pin to retain the same in engagement with said shoulder 36^p on contactor 36 during storage of an additional amount of energy in spring 38. During such continued movement the portion 37^k will act upon portion 27^b of the pin to swing the same toward the right, until the lower end of portion 37^k causes said portion 27^b of the pin to clear the shoulder 36^p. When this occurs the contactor 36 is freed to move with a snap action under the impulse of the energy stored in spring 38 by such movement of button 37. During such snap movement of contactor 36 the section 36^m of the S-shaped slot therein affords clearance for portion 27^b of the pin until the lower edge of the section 36^k of said slot abuts against the pin. Under the operating conditions just described, the contactor will have moved to the position shown in Fig. 10, wherein lug 36^b engages contact tip 24^d and lug 36^c engages contact tip 24^c for completing circuit through said upper pair of stationary contacts.

As aforedescribed, the snap movement of contactor 36 was effected only after the lower end of the portion 37^k of the zigzag groove in button 37 was engaged with portion 27^b of the pin to insure the clearance between the latter and contactor 36 afforded by the section 36^m of the S-shaped slot. Inasmuch as in Fig. 10 the contactor 36 is restrained against further upward movement by reason of the engagement between the lower edge of section 36^k with pin portion 27^b, it follows that, due to the action of spring 38 (Fig. 9) in centering button 37 and contactor 36 longitudinally with respect to each other, the button will be constrained to move downwardly to a slight extent, as indicated in Fig. 10. Such automatic downward movement of button 37 under the bias of spring 38 acts, through the portion 37^k of the zigzag groove therein, to swing pin portion 27^b again toward the left (to the position thereof shown in Fig. 10), thus locking or latching both the contactor 36 and the button 37 against accidental displacement from the positions thereof illustrated.

If it is desired to return the contactor 36 to its intermediate or "off" position this is accomplished simply by a predetermined degree of downward movement of the button 37, with exactly the reverse effect from that aforedescribed. That is to say, the initial downward movement

of the button 37 (with reference to Fig. 10) results in swinging of pin portion 27^b further toward the left by the action of the walls of portion 37^k of the zigzag groove to positively restrain downward movement of the contactor. Pin portion 27^b is retained in its left-hand position during movement of the straight portion 37^n of said groove therealong, and thereafter the portion 37^l of said groove acts to swing pin portion 27^b toward the right until the same clears the transverse shoulder 36^q (energy being stored in spring 38 to bias contactor 36 downwardly during all of the aforementioned downward movement of button 37). Under these conditions the section 36^m of the S-shaped slot will afford clearance for pin portion 27^b to permit downward snap movement of contactor 36 until shoulder 36^o abuts against said pin portion. Inasmuch as in Fig. 10 engagement of the right-hand end of portion 37^l of groove 37^i of the slide button is necessary to effect the required degree of movement of pin portion 27^b toward the right, it follows that when shoulder 36^o abuts against said pin portion 27^b the spring 38 will (through its biasing effect to longitudinally center the button 37 and contactor 36) cause button 37 to automatically move upwardly to a slight degree, with resultant action of the portion 37^l of the groove against pin portion 27^b to move the same to the centered position thereof shown in Fig. 7, wherein said pin portion cooperates with the aforementioned transverse shoulders 36^o and 36^p to prevent accidental displacement in either direction of the contactor 36 and the button 37.

If it is desired to move contactor 36 downwardly from the intermediate "off" position thereof shown in Fig. 7, button 37 is slid downwardly, with resultant initial swinging of pin portion 27^b toward the right, for positive restraint thereof by shoulder 36^o, said pin portion being retained in restraining position relatively to said shoulders during downward passage therealong of the straight portion 37^m and most of the portion 37^j of the groove 37^i, the portion 37^j of said groove effecting movement of pin portion 27^b toward the left until the same clears said shoulder 36^o, whereupon contactor 36 moves downwardly with a snap action under the impulse of the energy thus stored in spring 38, until the upper edge of portion 36i of said slot engages pin portion 27^b. The contactor will then be in the position shown in Fig. 11, wherein lug 36^b engages contact tip 24^c and lug 36^c engages contact tip 24^d to complete circuit therebetween. As aforeindicated, a slightly greater amount of downward movement of button 37 is required than is contemplated for contactor 36, and accordingly spring 38 acts automatically to move button 37 upwardly to a slight extent to longitudinally center the same with respect to contactor 36. As a result, the portion 37^j of the groove acts to swing pin portion 27^b toward the right to the position thereof shown in Fig. 11, whereby accidental downward displacement of the contactor and the button is prevented.

The manner in which contactor 36 may be returned to its intermediate "off" position from the "on" position thereof shown in Fig. 11 is believed to be obvious from the description of the similar operation referred to in connection with Fig. 10.

It will be obvious to those skilled in the art that the number of linearly spaced positions to and from which the contactor 36 may be moved may be increased or decreased if desired, it being only necessary to provide a slide button having a greater or lesser number of angularly related groove portions properly associated in the manner herein illustrated, and a contactor having a greater or lesser number of slot sections properly associated in the manner herein illustrated.

The insulating actuating slide button 37 (see Fig. 8) is provided in its upper surface 39 with an open-ended groove 40 which is adapted to accommodate a strip 41 of resilient metal which is bent to arcuate form whereby the opposite ends thereof tend to project a substantial distance above said surface 39. Button 37 is further provided with a plurality of symmetrically arranged integral studs 41, 42, 43 and 44 which are adapted for cooperative engagement with the walls of notches 45^a, 45^b, 45^c and 45^d in the flat portion 45^e of a sheet metal member 45. Member 45 is provided with end portions 45^f and 45^g bent downwardly at substantially right angles to said flat portion 45^e, the button 37 being provided in its upper surface with opposite end recesses 37^p and 37^q to accommodate said end portions of member 45. By the means just described relative lateral and longitudinal displacement of member 45 and button 37 is prevented.

Member 45 is provided with a centrally located opening (see Figs. 3 and 4) to receive the reduced hollow end portion of a metal member 46 of square (as shown) or other desired polygonal form in horizontal cross section, said hollow end being upset over the inner surface of member 45, as shown at 46^a, to rigidly and non-rotatably secure said parts to each other. A metal supporting and cover plate 47 is attached to base 20, as by means of rivets 48, said plate being superimposed upon but adapted to permit relative sliding movement of member 45. Plate 47 is provided with a relatively long opening 47^a of rectangular contour to accommodate and to guide the opposed parallel sides of member 46. A molded insulating operating thumb piece or button 49, having an inner surface 49^a of arc-shape in transverse cross section, is provided with a recess 49^b to non-rotatably fit upon the upper end portion of member 46.

Button 49 is provided in its upper surface with a cylindrical countersink 49^c to accommodate the head of a screw 50, the shank of which penetrates an opening in said button and cooperatively engages the walls of a tapped opening in member 46. A split lock-washer of usual form (Figs. 3 and 4) preferably underlies the head of screw 50 to prevent accidental loosening thereof. Countersink 49^c is preferably surrounded at its upper end by a countersink 49^d of relatively larger diameter to accommodate with a press fit a relatively thin disk or plate 51 of insulating material. Disk 51 may be of a color corresponding to or contrasting with the color of button 49; and the same serves to conceal the head of screw 50, to provide a more finished upper surface and appearance of said button. Button 49 is preferably provided on opposite sides at the mid-length thereof with pointed projections 49^e and 49^f for cooperation with suitable legends or indicia (not shown) carried by the hollow tube 35 (Fig. 4) to indicate the respective circuit controlling positions of the switch parts. The curved upper surface of button 49 is provided with transversely extending alternate grooves and ridges (49^g, Figs. 3 and 4), or the same may be otherwise roughened to afford a proper thumb or finger grip thereon.

Cover plate 47 has opposite longitudinal side portions 47^b and 47^c angled downwardly, as shown

in Fig. 4, to provide for substantial closure of the upper surface of base 20. Plate 47 is provided at opposite ends thereof with tapped openings 47d and 47e to accommodate the shanks of securing screws (not shown) passing downwardly through the upper wall of the tube 35, Fig. 4. In practice the switch, prior to attachment of button or thumb piece 49, is slid longitudinally of tube 35 (Fig. 4) to a position enabling attachment of said parts to each other, tube 35 having an opening 35a of relatively long substantially rectangular contour formed therein to provide adequate clearance for member 46 which projects therethrough. As shown in dotted lines in Fig. 2 and in full lines in Fig. 4, the aforementioned insulating sheet 31 is provided on one side thereof with an upwardly bent wing 31b extending throughout the length of base 20, and on the other side with wing sections 31c and 31d, whereby the switch is readily insertable within tube 35, and the wiring terminal elements are properly insulated from said tube, as aforementioned.

In Fig. 16 I have shown diagrammatically one circuit arrangement with which my three-position switch is adapted to be employed, the contactor 36 thereof being shown in its intermediate or "off" position; the same being adapted upon movement thereof into bridging engagement with the upper set of stationary contacts 24c, 24d to provide for operation of motor M at a given speed. The circuit thus provided may be traced from line L^1 by bus 33 through contact 24c, contactor 36, contact 24d, through field winding f^1 and through the armature of motor M to line L^2. Upon movement of contactor 36 from the position illustrated into bridging engagement with the lower set of stationary contacts, a circuit is completed for effecting operation of motor M at a different speed, said circuit extending from line L^1 by bus 33 through contact 24d, contactor 36, contact 24c, through field winding f^2 and through the armature of motor M to line L^2.

In Fig. 17 I have shown diagrammatically an alternative circuit arrangement with which the switch may be employed, the motor M being provided with a tapped field winding comprising field sections f^3 and f^4. Thus upon bridging engagement of the contactor with the upper set of contacts a circuit is completed which may be traced from line L^1 by bus 33 through contact 24c, contactor 36, contact 24d through the section f^3 of the field winding, and thence through the armature of motor M to line L^2, to provide for operation of the motor at a given speed. Upon bridging engagement of the contactor with the lower set of contacts an alternative circuit is provided which may be traced from line L^1 by bus 33 through contact 24d, contactor 36, contact 24c through both sections f^4 and f^3 of the field winding, and thence through the motor armature to line L^2, to provide for operation of the motor at a different speed.

In Fig. 12 I have shown attached to the flat portion 45e of member 45 a relatively high metal stud 56, which is utilized as the thumb piece or operating button of the switch. Stud 56 may be rigidly and permanently attached to member 45, as by providing thereon an integral hollow projection (not shown) which is upset over the inner surface of flat portion 45e, as described in connection with member 46 in Figs. 3, 4 and 8. When an operating member like that shown in Fig. 12 is employed, it is of course necessary that the metal tube 35 (Fig. 4) be of sufficiently large diameter to slidably accommodate the switch with the operating member 56 in assembled position.

In the modified form of switch shown in Figs. 13, 14 and 15 certain parts identical with corresponding parts shown in Figs. 1 to 11 may be employed, and the same have been given like numerals of reference. In Figs. 13 to 15 the molded insulating base 57 is formed to accommodate and carry the two longitudinally spaced sets of stationary contacts 24c, 24d and their associated terminal elements (the insulating-plate clamping portions of the latter being omitted) in the manner aforedescribed, the contactor 36 being identical with that shown in the switch of Figs. 1 to 11 and adapted to function in the aforedescribed manner. Base 57 is provided with a cylindrical recess or passage 57a (Fig. 13) to pivotally receive from the upper surface thereof the relatively long arm 58a of a locking or latching pin of substantially crank form, the relatively short arm 58b of said pin projecting upward through the aforedescribed S-shaped slot in contactor 36 and into the zigzag groove (like that aforedescribed) in the lower surface of an actuating slide button 59. The connecting portion 58c of the latching pin is accommodated for oscillatory movement thereof within a recess 57b provided in the upper surface of base 57 to provide for the required degree of oscillatory movement of the arm 58b of said pin.

Button 59 is grooved and otherwise formed upon its lower surface in exactly the same manner as described in connection with the switch of Figs. 1 to 11, to accommodate the parallel sets of upstanding lugs upon contactor 36, and to accommodate the coiled compression spring 38. In Figs. 13 to 15, however, the button 59 is made sufficiently thick or deep to substantially fill the space between the upper surface of base 57 and the metal cover plate 47, while affording slidable clearance of said button with respect to said parts. In order to maintain button 59 in proper operative relationship to contactor 36 and arm 58b of the latch pin, and to prevent looseness or rattling of said button when in use, I prefer to provide in the upper surface of the latter a pair of longitudinally extending parallel rectangular recesses 59a and 59b which are respectively adapted to accommodate a pair of like resilient metal strips or springs 60 which are bowed upwardly beyond the upper surface of base 59 intermediate the ends of said springs and also bowed upwardly to a slight degree at the respective ends thereof, as best illustrated in Fig. 15. Button 59 is also preferably provided with an integral upwardly projecting thumb piece 59c which is accommodated for sliding clearance within the relatively long rectangular opening 47a in metal top plate 47.

What I claim as new and desire to secure by Letters Patent is:

1. In an electric snap switch, in combination, an insulating base, a set of stationary contacts carried by said base in insulated relationship to each other, a contactor movable relatively to said base into and out of bridging engagement with said set of contacts, means for effecting such movements of said contactor with a snap action, said means comprising an insulating member slidably movable relatively to said base, said insulating member and said contactor having engaging parts adapted to restrict the same to straight line sliding movements relatively to each other, spring means interposed between said insulating member and said contactor and normally

biasing the latter to a given position relatively to the former, said insulating member and said contactor having cooperating slots of predetermined irregular shapes formed therein, a pin oscillatably supported by said base and engaging the walls of the respective slots, said pin cooperating with the walls of the slot in said contactor to positively restrain movement of the latter pending a given degree of movement of said insulating member relatively thereto, to thereby provide for storage of a predetermined degree of energy in said spring means, and the walls of the slot in said insulating member acting to move said pin to effect release of said contactor, whereupon the latter is free to move with a snap action under the bias of said spring means to its normal position relative to said insulating member.

2. In an electric snap switch, in combination, an insulating base, a set of stationary contacts carried by said base in insulated relationship to each other, a contactor movable relatively to said base into and out of bridging engagement with said set of contacts, means for effecting such movements of said contactor with a snap action, said means comprising an insulating member slidably movable relatively to said base, said insulating member and said contactor having interengaging parts adapted to restrict the same to straight line sliding movements relatively to each other, spring means interposed between said insulating member and said contactor and normally biasing the latter to a given position relatively to the former, said insulating member and said contactor having cooperating slots of predetermined irregular shapes formed therein, a pin oscillatably supported by said base and engaging the walls of the respective slots, said pin cooperating with the walls of the slot in said contactor to positively restrain movement of the latter pending a given degree of movement of said insulating member in one direction relatively thereto, to thereby provide for storage of a predetermined degree of energy in said spring means, the walls of the slot in said insulating member acting to move said pin to effect release of said contactor, whereupon the latter is free to move with a snap action under the bias of said spring means to its normal position relative to said insulating member, and said pin and the walls of said slots cooperating in a like manner upon movement of said insulating member in the other direction.

3. In an electric snap switch, in combination, a molded insulating base, a pair of stationary contacts supported by said base in spaced relationship to each other, a sheet metal contactor movable relatively to said base into and out of bridging engagement with said contacts, means for effecting such movements of said contactor with a snap action, said means comprising an insulating member slidably movable relatively to said base, a pin carried by said base and having a straight portion oscillatable with respect thereto, said contactor having an opening and said insulating member having a recess formed therein to accommodate said portion of the pin, the walls of the recess in said insulating member in each normal position of the latter relatively to said base cooperating with said portion of the pin to retain the latter in its intermediate position, said pin in its intermediate position cooperating with the walls of the opening in said contactor to positively restrain the latter against posed between said insulating member and said contactor to resiliently bias said parts to given positions relatively to each other, and the walls of the recess in said insulating member also acting upon a predetermined degree of movement of the latter relatively to said contactor to effect lateral movement of said pin in a predetermined direction, whereby said contactor is freed from restraint by said pin for snap movement to its normal position relative to said insulating member.

4. In an electric snap switch, in combination, a molded insulating base, a pair of stationary contacts supported by said base in spaced relationship to each other, a sheet metal contactor movable relatively to said base into and out of bridging engagement with said contacts, means for effecting such movements of said contactor with a snap action, said means comprising an insulating member slidably movable relatively to said base, a pin carried by said base and having a straight portion oscillatable with respect thereto, said contactor having an opening the walls of which afford a plurality of longitudinally spaced transversely extending shoulders, said opening and said recess being adapted to accommodate said portion of the pin, said recess being of zigzag form, whereby in each normal position of the insulating member relatively to said base the walls of said recess cooperate with said portion of the pin to retain the latter in its intermediate position, said pin in its intermediate position cooperating with one of the shoulders formed by the opening in said contactor to positively restrain the latter against movement, a coiled compression spring interposed between said insulating member and said contactor to resiliently bias said parts to given positions relatively to each other, the walls of the recess in said insulating member also acting upon a predetermined degree of movement of the latter relatively to said contactor to effect lateral movement of said pin in a predetermined direction, whereby said contactor is freed from restraint by said pin for snap movement to its normal position relative to said insulating member, the recess in said insulating member including divergent portions extending laterally in one direction from a substantially common point at an angle to each other of substantially more than ninety degrees, and the opening in said contactor including an intermediate portion located in a plane parallel to the longitudinal center line of said base and portions extending laterally in the other direction from opposite ends of said intermediate portion at substantially right angles thereto, whereby said parts are adapted to function in the manner aforementioned upon movement of said insulating member in each direction.

5. In an electric snap switch, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, said base having a passage formed therein and communicating with the upper surface thereof and with said recess, a plurality of resilient stationary contacts located within said recess and having the tips thereof positioned within said passage, said contacts being insulated from each other, a contactor slidably movable longitudinally of said base at the upper surface of the latter into and out of bridging engagement with groups of said stationary contacts, said contactor in one position thereof be-

said contacts, means for effecting such movements of said contactor with a snap action, said means comprising a molded insulating member slidably movable longitudinally of said base at the upper surface of the latter, said insulating member and said contactor having cooperating parts adapted to provide for sliding movements thereof relatively to each other longitudinally of said base while restraining the same against lateral displacement relatively to each other, a pair of spaced opposed shoulders formed on said insulating member and a pair of substantially similarly spaced opposed shoulders formed on said contactor, a coiled compression spring interposed between the shoulders of the respective pairs to thereby normally bias the contactor to a given longitudinal position relatively to the insulating member, one shoulder of each of said pairs being temporarily rendered ineffective with respect to said spring during movement of said insulating member or said contactor in either direction relatively to each other, said insulating member having in the lower surface thereof a groove of zigzag form and said contactor having an opening formed therein, the walls of said opening being adapted to provide a multiplicity of spaced shoulders extending transversely of said contactor, a pin oscillatably supported by said base and engaging the walls of said groove and said opening, said pin cooperating with one or another of said shoulders in said opening to positively restrain movement of the contactor pending a given degree of movement of said insulating member relatively thereto, to thereby provide for storage of a predetermined degree of energy in said spring, and the walls of said zigzag groove acting to effect lateral movement of said pin to disengage the same from said shoulder upon said given degree of movement of said insulating member, whereby said contactor is free to move with a snap action under the bias of said spring to its normal position relative to said insulating member.

6. As an article of manufacture, a punched and stamped sheet metal contactor for electric snap switches of the slide button operated type, said contactor having a flat main body portion of substantially greater length than width, a pair of lugs formed integrally with said body portion adjacent opposite ends of the latter and bent upwardly at substantially right angles thereto, said lugs being adapted for abutting engagement with the respective opposite ends of a coiled compression spring, for the purpose set forth, said body portion having therein an opening, and the walls of said opening being formed to provide a plurality of right-angled shoulders extending transversely of said body portion and spaced from each other longitudinally of said body portion, said shoulders being respectively adapted for engagement with a movable restraining latch member of suitable form.

7. As an article of manufacture, a molded insulating actuating slide button of approximately rectangular contour and of substantially greater length than width, said button having a channel-shaped recess formed in the lower surface thereof, said recess extending throughout the major portion of the length of said button at one side of and parallel to the longitudinal center line thereof, the mid-portion of the length of said recess being enlarged throughout a part of its depth to accommodate a coiled spring under a predetermined degree of compression in a relation substantially flush with said lower surface, said button being provided in said lower surface at one side of said recess with a longitudinally extending groove of substantially zigzag form, the opposite ends of said groove being substantially equally spaced from opposite ends of said button, the walls of said groove being adapted for cooperative driving engagement with the oscillatable end of a latching pin of suitable form, and said button being formed at its upper surface to facilitate manual bodily sliding movement thereof in opposite directions with respect to a suitable support, for the purpose set forth.

8. In an electric snap switch, in combination, a molded insulating base having recesses formed thereon and respectively opening to the upper and lower surfaces thereof, said base having a substantially H-shaped passage formed therein and communicating with said recesses, a plurality of sets of stationary contacts positioned within the lower recess and accessible from the upper recess through said passage, said sets of contacts being spaced from each other longitudinally of said base and the contacts of each set being insulated from each other, a contactor having an intermediate off position and the same being movable longitudinally of said base into and out of bridging engagement with said sets of contacts selectively, means for effecting such movements of said contactor with a snap action, said means comprising an insulating member slidably movable longitudinally of said base, said insulating member and said contactor having engaging parts adapted to provide for sliding movements thereof relatively to each other longitudinally of said base while restraining the same against lateral displacement relatively to each other, a pair of substantially spaced opposed shoulders formed on said insulating member and a pair of substantially similarly spaced opposed shoulders formed on said contactor, said pairs of shoulders being movable jointly relatively to each other, a coiled compression spring interposed between the shoulders of the respective pairs to thereby normally bias the contactor to a given longitudinal position relatively to the insulating member, said insulating member having a zigzag groove formed therein and said contactor having a slot formed therein, the walls of said slot being adapted to provide a multiplicity of shoulders extending transversely of said contactor, a pin oscillatably supported by said base and engaging the walls of said groove and said slot, said pin cooperating with one or another of said shoulders in said slot to positively restrain movement of the contactor pending a given degree of movement of said insulating member relatively thereto, to thereby provide for storage of a predetermined degree of energy in said compression spring, and the walls of said zigzag groove in said insulating member acting to effect lateral movement of said pin to disengage the same from said shoulder, whereby said contactor is freed for movement with a snap action under the bias of said compression spring to its normal position relative to said insulating member.

9. In an electric snap switch, in combination, an insulating base, a plurality of sets of stationary contacts carried by said base, said sets of contacts being spaced from each other longitudinally of said base and the contacts of each set being insulated from each other, a contactor movable longitudinally of said base into and out of bridging engagement with said sets of contacts selectively, means for effecting such movements

of said contactor with a snap action, said means comprising an insulating member slidably movable longitudinally of said base, said insulating member and said contactor having engaging parts adapted to restrict the same to straight line sliding movements relatively to each other longitudinally of said base, spring means mutually engaging said insulating member and said contactor and adapted to normally bias the latter to a given position relatively to the former, said contactor having a substantially S-shaped slot formed therein, the walls of said slot including four shoulders arranged in parallel planes at right angles to the longitudinal center line of said base, two of said shoulders being located in spaced relation to each other at the mid-length of said slot and the other shoulders being located adjacent the respective ends of said slot, said insulating member having a relatively longer approximately S-shaped slot formed therein and adapted for positioning in reversed and overlapping relationship to said first mentioned slot, said second slot having end portions arranged in parallel planes at substantially less than a right angle to the longitudinal center line of said base, said second slot also having an intermediate portion arranged in a plane at substantially right angles to said parallel planes last mentioned, said intermediate portion being connected with said end portions by portions arranged in planes parallel to the longitudinal center line of said base, a pin oscillatably supported by said base and engaging the walls of the respective slots, said pin cooperating with the walls of the slot in said contactor to positively restrain movement of the latter pending a given degree of movement of said insulating member relatively thereto, to thereby provide for storage of a predetermined degree of energy in said spring means, and the walls of the slot in said insulating member acting to move said pin to effect release of said contactor, whereupon the latter is free to move with a snap action under the bias of said spring means to its normal position relative to said insulating member.

10. As an article of manufacture, a punched and stamped sheet metal contactor for electric snap switches of the slide button operated type, said contactor having a flat main body portion of approximately oblong form, but said body portion being relatively wider at the mid-length thereof than at its ends, a pair of relatively long lugs formed integrally with the respective sides of said body portion at the mid-length thereof and bent downwardly at substantially right angles thereto, the outer corners of the opposite side edges of said lugs being beveled to facilitate movement thereof into engagement with spaced resilient stationary contacts of suitable form, a pair of relatively shorter lugs formed integrally with each side of said body portion and located adjacent the respective ends of the latter, the lugs of said last mentioned pairs being bent upwardly at substantially right angles to said body portion and the alined lugs of said pairs being located in parallel planes offset inwardly from the planes of said pair of lugs first mentioned, and said body portion having therein a slot of substantially S-form, the adjacent portions of said slot being arranged at substantially a right angle to each other.

11. As an article of manufacture, a punched and stamped sheet metal contactor for electric snap switches of the slide button operated type, said contactor having a flat main body portion of approximately oblong form, said body portion having therein a slot of substantially S-form, said slot including alined opposite end and intermediate portions arranged in parallel planes transversely of said body portion, said slot also including portions arranged in parallel planes and extending from opposite ends of said intermediate portion to the respective end portions aforementioned, whereby four shoulders extending transversely of said body portion are provided intermediate the ends of said slot, for the purpose set forth, said contactor having integral upstanding lugs at the four corners of said main body portion to provide for guiding of said contactor by a grooved insulating actuating member of suitable form, one longitudinally alined pair of said lugs being relatively long to provide for cooperation thereof selectively with the respective opposite ends of a coiled compression spring of suitable form, and said contactor having integral lugs extending downwardly from opposite sides of said main body portion intermediate the ends of the latter, said last mentioned lugs being adapted for movement jointly into or out of engagement with a pair of stationary contacts of suitable form, for the purpose set forth.

12. In an electric snap switch, in combination, a punched and stamped sheet metal contactor, said contactor having a flat main body portion of approximately oblong form, a pair of relatively long lugs formed integrally with the respective sides of said body portion at the mid-length thereof and bent downwardly at substantially right angles thereto, a pair of relatively shorter lugs formed integrally with each side of said body portion and located adjacent the respective ends of the latter, the lugs of said last mentioned pairs being bent upwardly at substantially right angles to said body portion and the alined lugs of said pairs being located in parallel planes offset inwardly from the planes of said pair of lugs first mentioned, said body portion having therein a slot of substantially S-form, the adjacent portions of said slot being arranged at substantially a right angle to each other, a molded insulating actuating member of greater length than said body portion of the contactor, said insulating member having a pair of straight parallel grooves formed therein to receive and guide the respective pairs of lugs second mentioned, one of said grooves being enlarged at the mid-portion of the length thereof, a coiled compression spring seated lengthwise within the enlarged portion of said groove, and one of said second mentioned pairs of lugs being adapted to straddle said spring at the respective opposite ends of the latter, whereby said spring acts to resiliently bias said contactor to a predetermined position relatively to said insulating member.

13. In an electric snap switch, in combination, a punched and stamped sheet metal contactor, said contactor having a flat main body portion of approximately oblong form, a pair of relatively long lugs formed integrally with the respective sides of said body portion at the mid-length thereof and bent downwardly at substantially right angles thereto, a pair of relatively shorter lugs formed integrally with each side of said body portion and located adjacent the respective ends of the latter, the lugs of said last mentioned pairs being bent upwardly at substantially right angles to said body portion and the alined lugs of said pairs being located in parallel planes offset inwardly from the planes of said pair of lugs first mentioned, said body portion having therein a

slot of substantially S-form, the adjacent portions of said slot being arranged at substantially a right angle to each other, a molded insulating actuating member of greater length than said body portion of the contactor, said insulating member having a pair of straight parallel grooves formed therein to receive and guide the respective pairs of lugs second mentioned, one of said grooves being enlarged at the mid-portion of the length thereof, a coiled compression spring seated lengthwise within the enlarged portion of said groove, one of said second mentioned pairs of lugs being adapted to straddle said spring at the respective opposite ends of the latter, whereby said spring acts to resiliently bias said contactor to a predetermined position relatively to said insulating member, a pin having a portion penetrating the slot in said body portion and movable in a predetermined plane transversely of the latter, said portion of the pin when in its intermediate position cooperating with the walls of said slot to positively restrain said contactor against movement, said insulating member having a slot formed therein the walls of which normally cooperate with said portion of the pin to retain the latter in said intermediate position, and the walls of said last mentioned slot also acting upon a given degree of movement of said insulating member to effect transverse movement of said portion of the pin in a direction to effect clearance between the latter and said contactor, whereby the latter is free to move with a snap action under the bias of said compression spring to the normal position thereof relatively to said insulating member.

14. As an article of manufacture, a molded insulating actuating slide button for electric snap switches, said button being of oblong form and having a pair of channel-shaped recesses formed therein adjacent to the respective longitudinal sides thereof and opening to the lower surface thereof, said recesses extending in parallel relation throughout the major portion of the length of said button to jointly guide a contactor of suitable form, the mid-portion of one of said recesses being enlarged throughout a part of its depth to accommodate a coiled spring under a predetermined degree of compression in a relation substantially flush with said lower surface, said button being provided in said lower surface between said recesses with a longitudinally extending groove of substantially zigzag form, the opposite ends of said groove being substantially equally spaced from opposite ends of said button, the walls of said groove being adapted for cooperative driving engagement with the oscillatable end of a latching pin of suitable form, and said button being formed at its upper surface to provide for bodily sliding movement thereof manually in opposite directions with respect to a suitable support, for the purpose set forth.

15. In an electric snap switch, in combination, a molded insulating actuating slide button of substantially oblong form, said button having a pair of straight grooves formed in its lower surface and extending in parallel relation throughout the major portion of the length thereof, one of said grooves being relatively deeper than the other, a mid-length of said relatively deeper groove being enlarged throughout a portion of its depth, a coiled spring seated within said enlarged portion of said groove under a predetermined degree of compression and in a relation substantially flush with said lower surface, said button being provided in said lower surface between said parallel grooves with a longitudinally extending groove of substantially zigzag form, the opposite ends of said last mentioned groove being substantially equally spaced from opposite ends of said button, a contactor slidable relatively to said lower surface, said contactor having pairs of lugs located within the respective parallel grooves to restrain said contactor against displacement laterally of said button, one of said pairs of lugs being of sufficient length to embrace the full diameter of said spring at opposite ends of the latter, said spring cooperating with said last mentioned lugs to resiliently bias said contactor to a mid-position relatively to said button, said contactor having a pair of lugs respectively extending downwardly from opposite sides thereof for movement jointly into or out of bridging engagement with a set of stationary contacts of suitable form, said contactor having a slot formed therein consisting of reversely arranged substantially L-shaped sections, with the long arms of said sections offset from and opening to each other, whereby four transversely extending shoulders are provided between opposite ends of said slot, a support, a pin carried by said support and free to move laterally but restrained against movement longitudinally thereof, the free end of said pin projecting from said support and being accommodated by the walls of said slot and said zigzag groove, the shoulders formed by said slot respectively cooperating with said pin to restrain said contactor against movement pending a predetermined degree of movement of said button, whereby energy is stored in said spring, and said zigzag groove acting to effect lateral movement of said pin to thereafter release said contactor from restraint by said pin, whereby said contactor is free to move with a snap action under the bias of said spring to its normal position relative to said button.

16. In an electric snap switch for control of two-speed vacuum cleaner motors and the like, in combination, a molded insulating base of relatively long substantially rectangular contour, said base having upper and lower recesses and having a passage therethrough of substantially H-shape in transverse cross section communicating with said recesses, a pair of resilient stationary contact members secured to the lower surface of said base adjacent each end of the latter, the contact portions of said members being located within the parallel arms of said H-shaped passage and offset inwardly from the upper surface of said base, the contact portions within each arm of the H-shaped passage being substantially spaced from each other longitudinally of the base, a punched sheet metal contactor having a flat portion slidable over the bottom wall of said upper recess, said contactor having a pair of integral lugs extending downwardly into said arms of the passage, said lugs being adapted in the intermediate position of said contactor to disengage all of said resilient contact members and the same being movable jointly in either direction from said intermediate position into bridging engagement with the aforementioned pairs of stationary contacts selectively, a molded insulating button guided by the walls of said upper recess for straight-line movement longitudinally of the latter and in upwardly spaced relation to the flat portion of said contactor, said button having a pair of spaced parallel grooves formed therein and said contactor having integral upward projections cooperating with the walls of said grooves to re-

strain said contactor against relative lateral displacement while permitting movement thereof longitudinally of said base and said button, a pin positioned within the transverse portion of said H-shaped passage and projecting upwardly beyond the bottom wall of said upper recess, the flat portion of said contactor having a slot providing a multiplicity of longitudinally spaced transversely extending shoulders and said button having in the lower surface thereof a groove of zigzag form, said pin cooperatively engaging the walls of said slot and said groove to provide for initially retaining said contactor in a given position upon movement of said button in a given direction and for thereafter effecting transverse movement of said pin to provide clearance between the latter and said contactor, and spring means associated with said button and said contactor to normally bias the latter to a given position relatively to the former.

17. As an article of manufacture, a molded insulating base for electric snap switches of the slide button operated type, said base being of relatively long substantially rectangular contour and the same being recessed from the upper and lower surfaces thereof, said base having a substantially symmetrically arranged approximately H-shaped passage formed therein and communicating with said recesses, the bottom wall of the lower recess having a straight groove formed therein to pivotally receive one arm of a substantially L-shaped pin, the connecting portion of said H-shaped passage being adapted to accommodate the other arm of the pin for oscillatory movement in a plane at right angles to the longitudinal center line of said base, the parallel arms of said H-shaped passage being adapted to accommodate the tips of resilient contact members in a plane below the bottom wall of said upper recess, said parallel arms of the passage being also adapted to provide clearance for the integral lugs of a bridging contactor of suitable form, said base having a plurality of passages to accommodate means for rigidly attaching said contact members to the bottom wall of said lower recess, said lower recess being formed to accommodate an insulating member adapted to underlie the first mentioned arm of said pin, and said base having passages formed therein adjacent the respective ends thereof to accommodate means for rigidly attaching said base to a suitable support.

18. In an electric snap switch, in combination, an insulating base, a set of stationary contacts carried by said base in insulated relationship to each other, a contactor slidably movable relatively to said base into and out of bridging engagement with said set of contacts, means for effecting such movements of said contactor with a snap action, said means comprising a member slidably movable relatively to said base, spring means interposed between said member and said contactor and normally biasing the latter to a given position relatively to the former, certain of said parts including said contactor having cooperating slots of predetermined irregular shapes formed therein, a pin oscillatably supported by another of said parts and engaging the walls of the respective slots, said pin cooperating with the walls of the slot in said contactor to positively restrain movement of the latter pending a given degree of movement of said member relatively thereto, to thereby provide for storage of a predetermined degree of energy in said spring means, and the walls of said slot in the other of said certain of said parts acting to move said pin to effect release of said contactor, whereupon the latter is free to move with a snap action under the bias of said spring means to its normal position relative to said member.

19. In an electric snap switch, in combination, an insulating base, stationary contacts carried by said base in insulated relationship to each other, a contactor carried by and slidably movable relatively to said base into and out of bridging engagement with said contacts, means for effecting such movements of said contactor with a snap action, said means comprising an insulating member carried by and slidably movable relatively to said base in superimposed relation to said contactor, spring means interposed directly between said insulating member and said contactor and normally yieldably biasing the latter for movement jointly with the former in each direction, latch means including a pin oscillatably supported by said base, said contactor having a slot of irregular shape and said insulating member having a groove of irregular shape, said pin extending through said slot and into said groove whereby said pin is normally maintained in an intermediate position, said pin in said intermediate position thereof cooperating with the walls of said slot to provide for positive restraint of said contactor against movement pending a given degree of movement of said insulating member relatively thereto, to thereby provide for storage of a predetermined degree of energy in said spring, and the walls of said groove cooperating with said pin upon such degree of movement of said insulating member to effect oscillatory movement of said pin to release said contactor, whereby the latter is freed to move with a snap action to the normal position thereof relatively to said insulating member and into or out of bridging engagement with said contacts.

20. In an electric snap switch, in combination, an insulating base, stationary contacts carried by said base in insulated relationship to each other, a contactor carried by and slidably movable relatively to said base into and out of bridging engagement with said contacts, means for effecting such movements of said contactor with a snap action, said means comprising an insulating member carried by and slidably movable relatively to said base in superimposed relation to said contactor, spring means interposed directly between said insulating member and said contactor and normally yieldably biasing the latter for movement jointly with the former in each direction, latch means including a pin oscillatably supported by said base, said contactor having a slot of irregular shape and said insulating member having a groove of irregular shape, said pin extending through said slot and into said groove whereby said pin is normally maintained in an intermediate position, said pin in said intermediate position thereof cooperating with the walls of said slot to provide for positive restraint of said contactor against movement pending a given degree of movement of said insulating member relatively thereto, to thereby provide for storage of a predetermined degree of energy in said spring, the walls of said groove cooperating with said pin upon such degree of movement of said insulating member to effect oscillatory movement of said pin to release said contactor, whereby the latter is freed to move with a snap action to the normal position thereof relatively to said insulating member and into

or out of bridging engagement with said contacts, and said pin being so related to said base, said spring means and the walls of said slot and said groove as to insure resetting of said pin in its intermediate positive restraining position relatively to said contactor upon attainment of the normal position of the latter with respect to said insulating member in each instance.

21. In an electric snap switch, in combination, an insulating base, a plurality of sets of stationary contacts carried by said base in insulated relationship to each other, said sets of contacts being spaced from each other longitudinally of said base, a contactor carried by and slidably movable relatively to said base into bridging engagement with any one of said sets of contacts or out of engagement with all of the same, means for effecting such movements of said contactor with a snap action, said means comprising an insulating member carried by and slidably movable relatively to said base in superimposed relation to said contactor, spring means interposed directly between said insulating member and said contactor and normally yieldably biasing the latter for movement jointly with the former in each direction, latch means including a pin oscillatably supported by said base, said contactor having a slot of irregular shape and said insulating member having a groove of irregular shape, said pin extending through said slot and into said groove, the walls of said slot cooperating with said pin to normally hold the latter in its intermediate position wherein it cooperates with the walls of said slot to provide for positive restraint of said contactor against movement pending a given degree of movement of said insulating member relatively thereto, to thereby provide for storage of a predetermined degree of energy in said spring, and the walls of said groove cooperating with said pin, upon such degree of movement of said insulting member to effect oscillatory movement of said pin to release said contactor, whereby the latter is freed to move with a snap action to the normal position thereof relatively to said insulating member and into bridging engagement with one or another of said sets of contacts or out of engagement with all of the same.

22. In an electric snap switch, in combination, an insulating base, a plurality of sets of stationary contacts carried by said base in insulated relationship to each other, said sets of contacts being spaced from each other longitudinally of said base, a contactor carried by and slidably movable relatively to said base from an intermediate "off" position thereof in either direction into bridging engagement with one or the other of said sets of contacts and in the reverse direction to said intermediate "off" position thereof, means for effecting each of such movements of said contactor with a snap action, said means comprising an insulating member carried by and slidably movable relatively to said base in superimposed relation to said contactor, a coiled compression spring interposed directly between said insulating member and said contactor and normally yieldably biasing the latter for movement jointly with the former in each direction, latch means including a pin oscillatably supported by said base, said contactor having a slot of irregular shape and said insulating member having a groove of irregular shape, said pin extending through said slot into said groove, said pin being normally biased by the walls of said groove to an intermediate position thereof wherein it cooperates with the walls of said slot to provide for positive restraint of said contactor against movement pending a given degree of movement of said insulating member relatively thereto, to thereby provide for storage of a predetermined degree of energy in said spring, the walls of said groove cooperating with said pin upon such degree of movement of said insulating member to effect oscillatory movement of said pin to release said contactor, whereby the latter is freed to move with a snap action to the normal position thereof relatively to said insulating member and into bridging engagement with one or another of said sets of contacts or out of engagement with all of the same, and said pin being so related to said base, said spring and the walls of said slot and said groove as to insure resetting of said pin in its intermediate positive restraining position relatively to said contactor upon attainment of the normal position of the latter with respect to said insulating member in each instance.

23. In an electric snap switch, in combination, an insulating base, a plurality of sets of stationary contacts carried by said base in insulated relationship to each other, said sets of contacts being spaced from each other longitudinally of said base, a contactor carried by and slidably movable relatively to said base from an intermediate "off" position thereof in either direction into bridging engagement with one or the other of said sets of contacts and in the reverse direction to said intermediate "off" position thereof, means for effecting each of such movements of said contactor with a snap action, said means comprising an insulating member carried by and slidably movable relatively to said base in superimposed relation to said contactor, a coiled spring interposed directly between said insulating member and said contactor and normally yieldably biasing the latter for movement jointly with the former in each direction, latch means including a pin oscillatably supported by said base, said contactor having a slot and said insulating member having a groove, said pin extending through said slot into said groove, said pin normally cooperating with the walls of said groove and said slot to positively restrain said contactor against movement in either direction pending a given degree of movement of said insulating member relatively thereto, to thereby provide for storage of a predetermined degree of energy in said spring, and the walls of said groove cooperating with said pin to effect oscillatory movement of the latter for release of said contactor, whereby the latter is freed to move with a snap action from one position thereof to another.

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