

Aug. 11, 1953

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2,648,731

QUIET SNAP SWITCH

Filed May 29, 1950

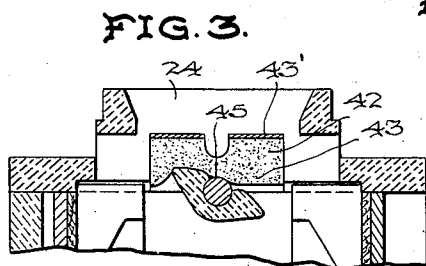
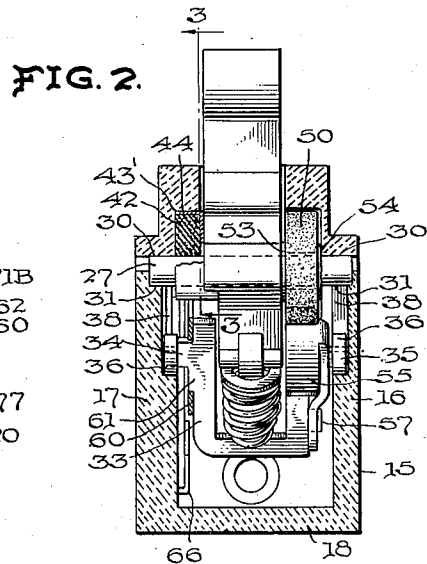
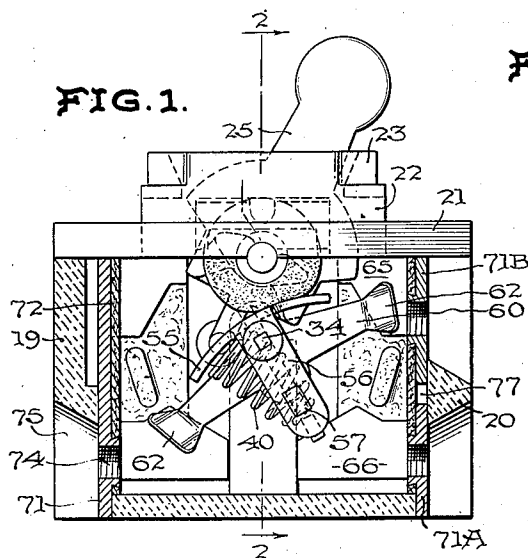


FIG. 8.

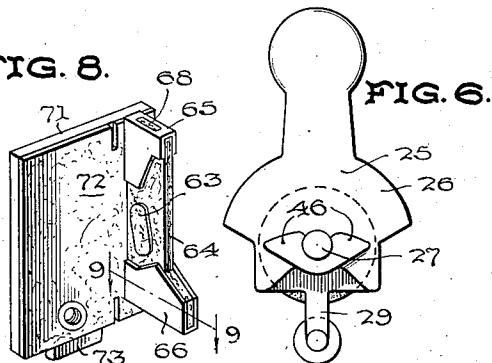


FIG. 6.

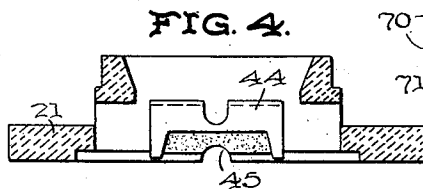


FIG. 7.

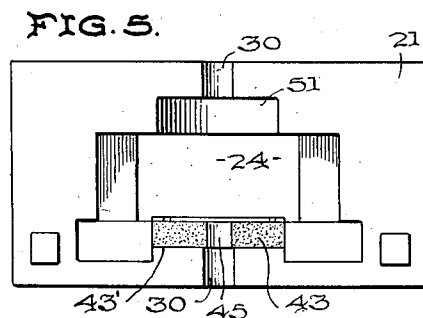


FIG. 10.

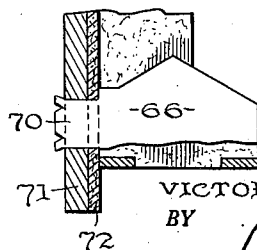
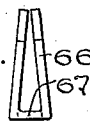


FIG. 11.



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2,648,731

QUIET SNAP SWITCH

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Application May 29, 1950, Serial No. 165,005

11 Claims. (Cl. 200—67)

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This invention relates to electric switches, and more particularly to snap switches of the type used in dwellings, offices and the like, generally referred to as wall switches, and is especially directed to the construction of such switches to reduce materially the noise accompanying the snap action required to properly actuate the contacts and prevent them from being destroyed by burning.

It is a general object of the present invention to provide a novel and improved snap switch constructed in a manner to substantially reduce the usual noise resulting from engagement of the rapidly moving parts of the snap action with the stroke-limiting stops.

More particularly it is an object of the invention to provide in a snap switch of the toggle or lever actuated type novel means for promptly and positively stopping the motion of the operating handle under the control of resilient or cushioning material to eliminate the noise of this part.

An important object of the invention consists in the provision of novel means for quietly stopping the movement of the yoke-contact assembly.

An additional object resides in the construction of the movable and stationary switch contacts and associated parts whereby arcing is curbed principally as a result of damping the action of the movable contact parts to eliminate chatter at the time of contact closing.

An important feature of the invention resides in the mounting of the handle and yoke cushioning means adjacent the handle pivots and in arranging these elements to cooperate with parts on the moving elements whereby progressive engagement takes place more and more remote from the axis of rotation of the parts to bring them to a stop quickly and quietly.

Other and further objects and features of the invention and novel constructional details thereof will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specification wherein is disclosed a single exemplary embodiment of the invention, with the understanding that such changes and modifications may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention.

In said drawings:

Fig. 1 is a side elevation partly in longitudinal, vertical, central section on line 1—1 of Fig. 2 of a snap switch constructed in accordance with the present invention;

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Fig. 2 is a transverse, vertical, central section taken on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary section like that of Fig. 1 but taken on the plane of line 3—3 of Fig. 2;

Fig. 4 is a vertical, central, longitudinal section through the cover showing the operating lever cushion with its metal sheathing;

Fig. 5 is a bottom plan view of the cover;

Fig. 6 is a side elevation of the handle-operating lever looking from its cushion side;

Fig. 7 is a top plan view of the lever showing the yoke cushion mounted on one of the trunnions thereof;

Fig. 8 is a perspective view of one of the contacts, terminal and snuffer assemblies;

Fig. 9 is a section taken on line 9—9 of Fig. 8 through the lower contact on the assembly;

Fig. 10 is a fragmentary section, partly in elevation of a contact, terminal and snuffer assembly; and

Fig. 11 is an end elevation of one of the contacts before assembly.

Wall switches of the snap action variety used in dwellings, offices and the like have always made considerable noise, as the result of rapidly stopping the parts which move at high speed during the snap action necessary to eliminate burning or pitting of the contacts by the current during "make" and "break." With increasing use of light and accessories and the advent of gas filled lamps, fluorescents and the like, the electrical stressing of the switch contacts is materially increased, and to avoid contact damage the snap actions have been modified to produce more rapid "make" and "break." This is necessitated stronger springs and heavier parts, with a consequent material increase in noise output. In many cases this is objectionable, particularly in nurseries, bedrooms and the like, where light sleepers are often awakened. A considerable demand for quiet switches has grown up which has been only partially satisfied by mercury switches, for their high cost, low current capacity and lack of any snap action or sound to indicate their operation has caused them to be considered as not the entire answer to the problem.

In accordance with the present invention a switch not substantially different from the conventional switches of the wall type is offered. It is more or less conventional in that it has a snap action on "make" and "break" and is operated by a tilting or toggle lever in the customary manner. However, by adequate cushioning of the moving parts and careful design

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of the contact elements a greater portion of the noise has been eliminated so that while the switch may not be properly termed "silent" it warrants the term "quiet" and can be used in most situations where normal switches produce excess noise. It has the feel of the conventional snap switch and produces just sufficient sound to indicate to the user that it has functioned.

The invention is applicable in many forms to various types of switches, but is here shown as applied to such small switches as have achieved the name "Despard" or "interchangeable" where as many as three may be used in the space normally occupied by a single switch. The switch mechanism is contained in a molded plastic housing 15 having rectangular sides 16 and 17, rectangular bottom 18 and rectangular ends 19 and 20. The housing is open at the top and adapted to be closed by a cover or lid 21 also of molded insulating material and held in position by any conventional means, not shown.

The cover 21 is provided centrally with a projecting neck 22 adapted to be received in a mounting strap or bridge and having a portion 23 of reduced area adapted to pass through the wall or cover plate. This neck is provided with a through passage 24 providing for movement of the operating handle 25.

The operating handle is a portion of a combined handle-lever unit, preferably molded of suitable plastic material to the form shown in Fig. 6, including the handle portion, the arcuate parts 26 on the outer surface of which "off" and "on" legends may be marked if desired, the integral trunnions 27 and 28 and the spring actuating arm 29. The trunnions need not necessarily be integral but those shown represent a convenient means for mounting the handle-lever for oscillation within the housing, the trunnions being received in cooperating half cylindrical recesses 30 in the cover and 31 in the upper edge of the housing. When the cover is in place these form close bearings for the trunnions.

The actuating yoke 33 is a metal stamping of generally U-shape with pivot projections 34 and 35 at its two sides near the tops of the legs. They preferably mount fiber discs 36, journaled at the bottoms of the channels 38 extending down from the upper edges of the side walls of the housing. A conventional over-center spring 40 compressed between the arm 29 on the handle-lever and a suitable lug on the cross member of the yoke provides the snap action in a manner well known.

It is customary in switches of this character to provide plastic or metal stops to limit the stroke of both the handle-lever and the yoke, but in this structure these are entirely eliminated and in their place highly resilient cushions are provided, one serving each part and acting at both ends of its stroke. For the handle-lever part a resilient block of rubber or the like 42 is mounted adjacent one trunnion and either above or below it as required by the switch structure. As shown in the present switch this cushion is recessed at 43' in one wall of the neck passage of the cover.

Any convenient shape may be imparted to this material, but it is here shown as substantially rectangular, having a flat horizontal lower edge 43 just slightly above and parallel to a horizontal diameter through the axis of the trunnions. If desired this block 42 may be shrouded on its upper surface and part of its inner face, by a sheet metal facing 44, so that engagement

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with the face of the handle does not slow the motion of this latter or scuff the buffer block. A slight notch 45 in the lower edge 43 accommodates the trunnion and permits a certain amount of pressure from the resilient block to be applied thereto to prevent it from rattling in its bearings as the result of the snap action.

As seen in Fig. 6 the handle-lever has a pair of wings 46 extending laterally from the trunnion 27 and having curved upper faces extending somewhat above the horizontal line through the axis of the trunnions. These wings are in the plane of the cushion 42 and are adapted to selectively cooperate with the lower edge 43. With the handle in the mid-position they both make only slight contact with this edge, but when the handle is moved to one side or the other the block is compressed by one of the wings as shown at the left in Fig. 3. Because of the curved form of the upper edge of each wing contact is progressively made farther and farther toward the end thereof as motion progresses and the resistance of the resilient block to movement of the handle becomes increasingly greater until finally the force of the spring is balanced and the handle stops before it hits the wall of the recess through which it passes. This progressively retarding action brings it to a stop without making any noise. The cushion block 42 being well confined between the face of the handle and the walls of the recess 43' is prevented from distorting or moving out of place and must exert its maximum effort to retard the motion of the handle.

Movement of the yoke member in each direction of movement is terminated by a circular cushion disc 50 surrounding the trunnion 28 at the opposite face of the handle. This too is separated from the handle and the wall of the recess 51 in the cover accommodating it by small metal washers 53 and 54 for the reasons pointed out in connection with the other cushion and also to insure that it rotates freely on the trunnion where it has a relatively loose fit.

The edge of this disc is adapted to be engaged by a curved plate 55 secured to the yoke. This plate is best seen in profile in Fig. 1 and is integrally attached to the perforated tab 56 bent down at right angles thereto and received over bearing extension 34 and an additional lug 57 on one leg of the yoke. These parts are staked over to rigidly mount the plate on the yoke. The curved plate 55 is spaced over the axis of rotation of the yoke such a distance that it lightly engages the edge of the cushion disc when the yoke is in mid position. The radius of curvature of part 55 is much larger than its spacing from the yoke axis so as the yoke moves either way from central position the plate progressively engages and compresses the cushion disc and the center of contact between the two moves away from the yoke along the curved plate until the yoke is finally brought to a stop with substantially no noise. As the yoke is reversed in movement there is a tendency of the plate to roll the disc on its trunnion to reduce any friction in the movement of the yoke and blade assembly and allow an unhampered fast movement. This motion also prolongs the life of the disc.

A bridging contact arm 60 is mounted on the yoke and is formed of suitable resilient contact material, such as bronze, and given some transverse bowing permitting it to be stressed, as will later be pointed out. This contact arm is centrally perforated and fits over lug 61 on the yoke

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extending just beneath the pivot lug 34. The fit here is relatively loose so that the bridging arm may be self-centering but positively driven in either direction. The ends 62 of the contact arm are suitably contoured so that their center portions lie in a plane and their edges are drawn up for a purpose which will later appear.

Each of the ends 62 travels along a track lying in their plane of movement. Such a track is formed by spaced metal contact areas and a central area or land of insulation material. These three areas are elevated above their supports and slightly spaced to insure proper arc quenching.

Referring now to Fig. 8, it will be seen that the land 63 is preferably punched up from a sheet of insulating material 64 over whose ends are bent the sheet metal contacts 65 and 66, one of which is shown in edge detail in Fig. 11, and comprises a pair of arms and connecting center portion 67, which may be perforated as at 68 in Fig. 8 to receive a tongue on the insulation sheet for positioning it. The arms preferably are pinched together as seen in Fig. 11 before assembly to more tightly engage the enclosed insulation. As seen in enlarged form in Fig. 10, each arm of the parts 65 and 66 has an extension 70 which passes through an opening in a terminal plate 71 and is staked over, as shown, to secure the contacts in position, thus forming a rigid track of the three parts.

The track assembly extends at right angles to the face of an insulation sheet 72 covering the inner face of the terminal plate 71. The edges of parts 71 and 72 slip into a pair of grooves in opposite side walls of the housing against an end wall for accurate positioning and the track assembly rests against the side wall. The track-terminal units are held in place by engagement with the underside of the cover, and have extension tabs 73 passed through openings in the housing bottom. The part 72 is secured to 71 not only by the contacts 65 and 66 but by spinning over the metal extruded from the threaded opening 74 which receives the terminal screw whose head is accommodated in the end wall cutout 75.

In Fig. 1 two forms of terminal plates are shown, that at the left having a single part 71 while at the right the metal plate is divided into two sections 71a and 71b both secured to insulation sheet 72 but separated by gap 77 so that a terminal may be individually connected to each of the stationary contacts 65 and 66 whereby a three-way switch may be formed.

As seen in Figs. 1 and 8 the working or track surfaces of the contacts 65 and 66 are in the same plane as that of the land 63, from the ends of which they are separated by a gap of less width than that of the flattened portions of the bridging contact ends 62 whereby these ends, which are sprung into contact therewith readily pass across the gaps as the switch is snapped but cannot drag carbonized material from one part to the other nor draw an arc along the surface of the insulation. By being always in contact with material of one form or another the contact ends are continuously cooled. Since the contoured ends of the bridging arm are adequately preloaded by pressure from the yoke and since there is no striking of contacts the tendency for arcing resulting from chatter is eliminated.

It will be seen that the switch presents a combination of features destined to produce maximum quietness of operation. The only sound produced by the switch is muffled and entirely unobjectionable and is believed to be caused by

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air disturbance resulting from the snapping of the yoke. The switch can be constructed and sold at a price commensurate with ordinary snap switches and is equally as effective in its current capacity and arc quenching capabilities.

I claim:

1. In a switch of the snap type in combination, a housing, a contact actuating yoke having pivots rockable in said housing, a handle-operator having trunnions journaled in said housing, a circular resilient cushion disc rotatably mounted on one of said trunnions and a rocker plate extending transversely on said yoke between the axes of the pivots and trunnions and arranged to progressively engage said disc toward each end of the yoke stroke to quietly stop its movement.

2. The switch of claim 1 in which said plate is curved convexly toward said cushion on a radius substantially greater than its displacement from the pivot axis.

3. The switch of claim 2 in which the radius of said cushion plus the displacement of the curved plate from its axis is substantially equal to the distance between said axes.

4. In a switch of the snap type in combination, a housing having a closed bottom, a removable cover for said housing, a contact actuating yoke having pivots rockably mounted in the housing, a handle-operator having two trunnions, means in the cover and housing journaled both said trunnions, a resilient disc of relatively large diameter freely mounted on one of said trunnions, a plate carried by said yoke in the plane of said disc and between the disc edge and said pivots, said plate just engaging the disc periphery in the central position of the yoke and being arranged to progressively compress the disc as the yoke moves to complete its stroke, whereby the stroke is stopped solely by the disc, and a snap spring connecting the yoke and handle operator.

5. The switch of claim 4 in which disc rotation is fostered comprising metal washers separating the disc faces from adjacent housing and handle parts.

6. In a snap switch of the lever actuated type, in combination, a housing having an open top, a cover for said top, a handle-lever assembly having elongated trunnions, cooperating half bearing notches in each the cover and housing for the outer portion of said trunnions, an opening in the cover above the trunnion axis for the through passage of the said handle, a recess in a side wall of said opening, cushion material in said recess having an exposed lower edge above the plane of the trunnion axis and having a continuation of one of the cover half bearing notches therein to engage over the inner portion of one of said trunnions to press it resiliently against the corresponding half bearing and wings extending from one side of the handle each having an upper surface substantially tangential to the inner portion of the corresponding trunnion for engagement with said lower edge of said cushion material.

7. The snap switch as defined in claim 6 in which said engaged trunnion is fitted with wings radiating therefrom and having surfaces tangential to the trunnion and positioned to alternately engage the free edge of the cushion material to limit and stop and throw of the handle-lever.

8. The switch as defined in claim 7 in which the surfaces of said wings facing said free edge of the cushion material are backwardly curved

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to progressively engage the same at greater distances from the trunnion as the lever approaches its stop position.

9. In a switch, in combination, a handle-lever having trunnions, an oscillatable yoke having pivots, an over-center spring connecting said lever and yoke, a two part housing providing spaced bearings for said trunnions and pivots, resilient material mounted in said housing to have an edge substantially diametrically arranged at one trunnion and wings on said trunnion each adapted to progressively engage the said edge farther from the trunnion when the handle is moved from the center position to impart a slow quiet stop to the handle-lever.

10. In a switch actuated by an oscillatable handle extending through the front wall of its housing, the combination of a mounting pivot for said handle, a wing on said handle extending substantially radially from said pivot, resilient material supported by said housing and having an edge extending substantially radially from said pivot and positioned to be gradually engaged by said wing to quietly stop the handle movement in one direction.

11. A snap switch of the type described including in combination, a housing, a yoke journaled for oscillation in said housing between two extreme positions, a movable contact arm driven by said yoke, a handle-lever extending

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through a wall of said housing and movable to opposite extreme positions, a pivot for said handle-lever having its axis parallel to that of the axis of oscillation of the yoke, a spring between said yoke and lever to provide snap action, a resilient cushion for limiting the movement of the yoke, a resilient cushion for limiting the movement of the handle-lever, said cushions engaging said pivot on opposite sides of the handle lever.

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