

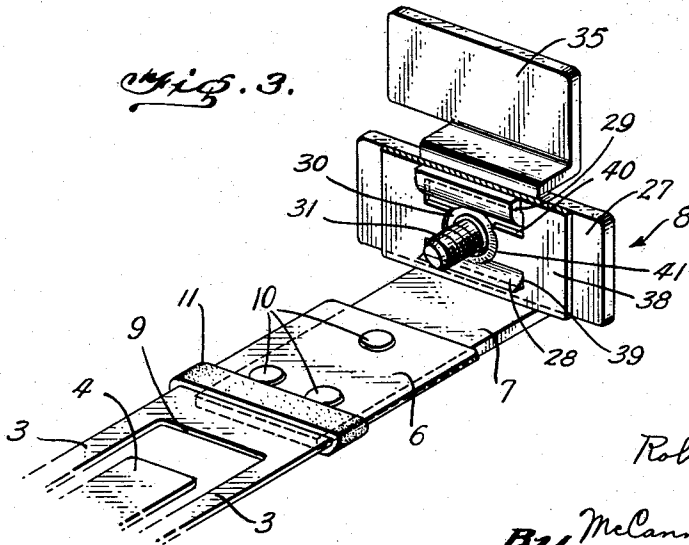
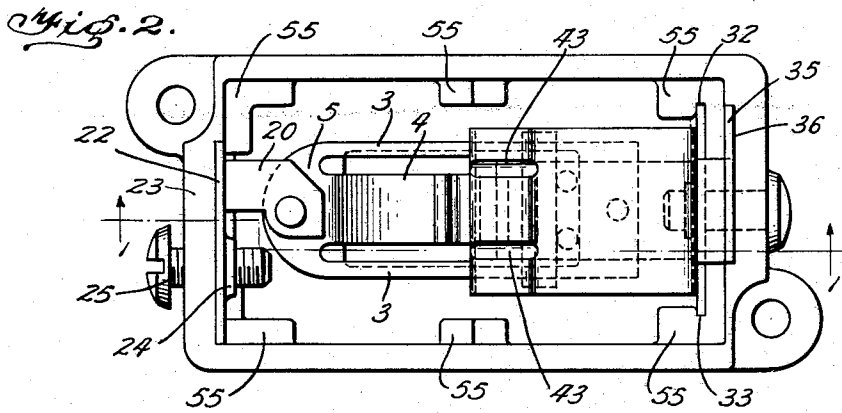
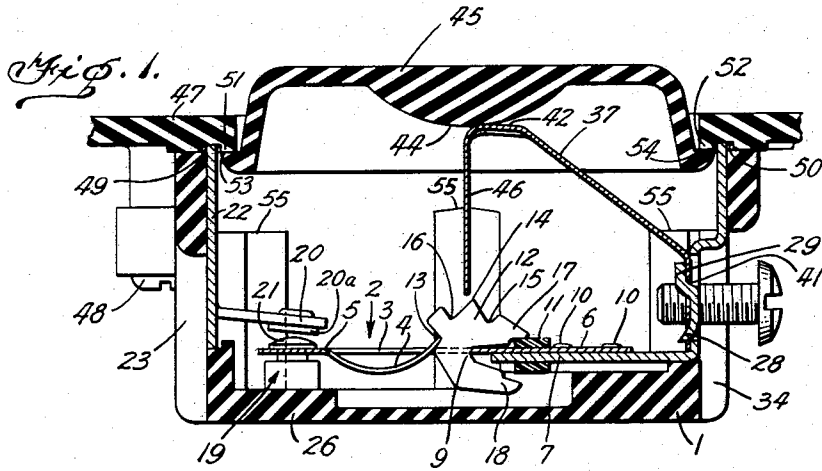
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ALTERNATE ACTION MECHANISM

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ALTERNATE ACTION MECHANISM

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This invention relates to an alternate action mechanism and to a novel operating means therefor.

It is an object of this invention to provide a cantilevered flexible, resilient lever for controlling the operation of an alternate action mechanism.

A particular object of this invention is to provide a toggle-actuated, snap-acting spring in combination with a cantilevered leaf spring lever controlling the operation of the toggle.

Another general object of this invention is to provide an alternate action mechanism of low cost, which is reliable in its operation, and which may readily be assembled by unskilled labor with a minimum of tooling required.

Another object of this invention is to provide a novel operator controlling an alternate action mechanism, wherein the operator is of simple and rugged construction which facilitates its ready assembly and which insures that its operation shall be reliable.

Another object of this invention is to provide a novel fixed cantilever mounting for an operator for an alternate action mechanism which is extremely simple in its constructional aspects.

Other and further objects and advantages of the invention will be apparent from the following description of a snap-acting switch incorporating a preferred embodiment of the present invention.

In the drawing:

Figure 1 is a longitudinal section through a switch incorporating the present invention;

Fig. 2 is a top view of the Fig. 1 construction with the top of the switch housing and the operating button removed; and

Fig. 3 is a fragmentary perspective view showing the mounted end of the toggle-actuating leaf spring lever of the present invention.

The switch which incorporates the present invention is enclosed in a housing 1 of insulating material. The snap spring system employed in the switch, and generally indicated at 2, comprises parallel spaced elongated tension members 3 and a leaf spring compression member 4 interconnected at end 5, which is free to move, and a mounted end 6 at which the other ends of the tension members are joined. The spring 5 is cantilevered at its mounted end 6 on a flat portion 7 of a mounting bracket 8 in a manner such that the inner straight edge 9 of the mounted end of the spring extends beyond the end of the flat portion 7 of the mounting bracket. The mounting bracket 8 is carried fixedly by the housing 1 in a manner which will appear hereinafter. The snap spring 2 is mounted in the described manner on the flat portion 7 of bracket 8 by means of rivets 10.

A deformable cushioning member 11, preferably in the form of a resilient rubber band, extends above and below the attached assembly of mounting bracket portion 7 and the mounted portion 6 of the snap spring in spaced relation from the inner edge 9 of the latter.

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An alternator in the form of a toggle 12 is pivoted on the edge 9 and is also formed with a groove 13 at its opposite side, which is pivotally interconnected with the free end of compression member 4 to stress the latter in compression. The toggle is formed with an upper ridge 14 which extends parallel to the pivot edge 9 and which separates two valleys 15, 16 formed in the top of the toggle. The ridge 14 forms the intersection of the inclined surfaces which extend upward from the valleys 15 and 16. Projections 17 and 18 on the toggle are engageable with opposite sides of the cushioning member 11 to limit toggle movement in either direction about its pivotal axis at 9.

In moving from one extreme position to the other, the toggle moves the compression member 4 through an axis of maximum stress, or position of unstable equilibrium, to snap the free end 5 of the snap spring system between positions of stable equilibrium determined by spaced stops 19 and 20. Fixed contact 20a is mounted integral with the respective stop member 20. A mobile contact 21 is mounted on the free end 5 of the snap spring system to alternately engage the stationary stops 19 and 20, depending upon the position of toggle 12. Stationary contact 20a is carried by a bracket 22, which is snugly received in a channeled portion of the end wall 23 of the switch housing. Bracket 22 is provided with a drawn and tapped terminal 24 which threadedly receives a terminal screw 25 for connection to the external electrical circuit. The other stationary stop 19 is fixedly mounted on the bottom wall 26 of the switch housing.

The mounting bracket 8 also includes an upstanding lower flat wall portion 27 formed with a lower forwardly extending transverse protrusion 28 and a forwardly offset ear 29 in spaced relation thereabove. A portion of the flat wall portion 27 is drawn and tapped at 30 to form a terminal threadedly receiving the terminal screw 31. The bracket is formed of electrically conductive metal to interconnect the mobile switch contact 21 with the external circuit connected to the terminal screw 31. The lower flat wall portion 27 is snugly received within upwardly extending slots 32, 33 formed in the housing to be seated against the end wall 34 of the housing. An upper upstanding flat wall portion 35 of the bracket 8 is offset rearwardly from the flat wall portion 27 integral therewith and is snugly received within a recess 36 in the end wall 34 of the housing.

The operator for initiating the toggle movement is in the form of a generally U-shaped resilient leaf spring lever 37. At its rear leg 38 the leaf spring lever is formed with a recess 39 through which the lower protrusion 28 on the mounting bracket extends. Protrusion 28 engages snugly within the recess 39 to prevent either lateral or longitudinal movement of the leaf spring lever 37 relative to the mounting bracket. Another aperture 40 is formed in the rear leg of the leaf spring lever 37 to receive the offset ear 29 formed on the bracket. The rear leg 38 of the leaf spring lever is of a thickness to be snugly received between the ear 29 and the upstanding bracket wall portion 27 from which the ear 29 is offset, so that the leaf spring lever is thereby held from displacement perpendicular to the bracket. Thus the ear 29 and protrusion 28 on the mounting bracket seat in the respective apertures to prevent displacement of the rear mounted end 38 of the leaf spring lever in any direction relative to the mounting bracket. A circular aperture 41 in the leaf spring lever 37 receives the terminal 30.

The mounting bracket 8, snap spring system 2, toggle 12, and lever 37 constitute a sub-assembly in assembling the switch.

The leaf spring lever 37 extends upwardly at an angle away from its cantilever mounting on bracket 8 and is

formed with a flat upper portion 42, which is reinforced by longitudinal ribs 43. This portion of the leaf spring lever is positioned directly beneath the rounded internal head 44 of reciprocable operating button 45 of insulating material. A reciprocable depending arm 46 on the leaf spring member extends from its flat outer portion 42 directly inward toward the toggle 12 in line with the pivotal axis 9 of the latter.

A mounting or cover plate 47 of insulating material, retained on the switch housing by screws 48, is formed with grooves 49 and 50 for receiving the upper ends of brackets 22 and 8, respectively, to retain the latter in place within the switch housing. In addition, the mounting plate is formed with depending shoulders 51 and 52 adjacent the respective grooves 49 and 50 for limiting outward movement of operating button 45 by being interposed in the path of movement of flanges 53 and 54 formed thereon. Internal transverse shoulders 55 molded integral with the switch housing limit inward movement of operating button 45.

In the operation of the switch, normally the operating button 45 is in its outer position defined by its abutment against shoulders 51 and 52. Leaf spring lever 37 has a bias which urges its flat portion 42 into engagement with the operating button to position the inner end of lever arm 46 away from engagement with the toggle 12 and to bias the operating button to its outer position. The toggle at this time is positioned with its projection 17 engaging the resilient cushioning band 11 and stresses the compression member 4 so that the snap spring 2 assumes a position of stable equilibrium with its free end, carrying the mobile contact, resting against stop 19.

When operating button 45 is depressed the lever arm 46 is pushed inward to engage the inclined surface on the toggle between the ridge 14 and the valley 16. The free end of lever arm 46 rides along this surface into the valley 16 where it engages the groove formed thereat to pivot the toggle (counterclockwise in Fig. 1) about its pivot 9. This pivotal movement of the toggle moves the free end of the compression member 4 downward to move the compression member through an axis of maximum stress, causing the free end 5 of the snap spring to move with a snap action from a stable position defined by stop 19 through a position of unstable equilibrium to another stable position defined by stop 20. This toggle movement also moves its projection 18 into engagement with the lower side of resilient band 11, defining the other extreme limit of movement of the toggle. In addition, this movement of the toggle causes its ridge 14 to be displaced to the other side of the line of free travel of the free end of lever arm 46. When the inward force on operating button 45 is released the leaf spring lever 37 is free to return its inwardly extending lever arm 46 to its normal position, the leaf spring lever also urging the operating button to its outer free position.

When next the operating button is again depressed, the free end of lever arm 46 engages the inclined toggle surface between ridge 14 and the valley 15, since the previous depression of the operating button caused the ridge 14 to be moved to the other side of the line of free movement of lever arm 46. The free end of lever arm 46 rides down along this inclined surface into the valley 15 where it engages the groove formed thereat to pivot the toggle (clockwise in Fig. 1) about its pivot 9. This pivotal movement moves the compression member 4 again through the axis of maximum stress of the snap spring 2 to snap the free end thereof away from stop 20 back into engagement with stop 19. This return toggle movement causes its ridge 14 to return to the other side of the line of free movement of lever arm 46 and also brings its projection 17 again into engagement with the upper side of band 11. When the operating button is released, the parts of the snap spring system are again in the positions shown in Fig. 1.

While the foregoing discussion and the illustrated

embodiment of the invention have been restricted to a snap-acting switch mechanism, it is to be understood that the invention is not to be construed as being limited to such switch mechanisms but may be employed in other alternate action mechanisms without departing from the spirit and scope of the present invention. Also, it is to be realized that other modifications and variations in the specific described form of the present device may be resorted to without departing from the principles of the invention.

I claim:

1. In combination, a pivoted toggle, a bracket supporting the pivotal mounting for said toggle, and an elongated spring lever mounted in cantilever fashion at one of its ends on said bracket and formed at its other free end with an arm extending inwardly toward the toggle in alignment with the pivotal mounting thereof, said spring lever being biased to urge its free end in one direction away from engagement with the toggle and said free end of the spring lever being movable in the opposite direction against the spring bias toward the toggle to engage the toggle and displace the same about its pivotal axis.

2. A snap-acting, alternate action mechanism comprising a snap spring system having an end free to move between opposed positions, a pivoted toggle interconnected with the snap spring system and movable in opposite directions between extreme limits of movement to effect said movement of the free end of the snap spring system, and an elongated spring lever mounted in cantilever fashion and having a reciprocable free end extending toward said toggle and normally biased away from engagement therewith, said free end of the lever being movable against its bias into engagement with the toggle for moving the same between its extreme limits of movement.

3. A snap-acting, alternate action mechanism comprising a snap spring system having an end free to move between opposed positions, a bracket supporting the mounted end of the snap spring system, a pivotally mounted toggle interconnected with the snap spring system to effect snap action movement of the free end thereof upon pivotal toggle movement between its extreme limits of movement, and an elongated spring lever mounted in cantilever fashion at one of its ends on said bracket and formed at its other free end with an arm extending inwardly toward the toggle in alignment with the pivotal axis thereof, said spring lever being biased to urge its free end in one direction away from engagement with the toggle and said free end of the spring lever being movable in the opposite direction against the spring bias the toggle to engage the toggle and move the latter between its extreme limits of movement.

4. In combination, an elongated spring lever mounted at one end in cantilever fashion and having a reciprocable free end, and a pivoted toggle having its pivotal axis aligned with the path of reciprocation of said free end of the spring lever, said toggle being formed with two intersecting surfaces alternately interposed between the toggle pivot and the spring lever in the path of reciprocation of the free end of the spring lever, each said surface when so interposed extending in a direction offset from the direction of reciprocation of the free end of the spring lever for deflecting said free end of the spring lever upon engagement thereby, said reciprocable free end of the spring lever being biased in one direction away from engagement with the toggle and being movable in the opposite direction into engagement with the toggle, said toggle being movable about its pivotal axis after engagement of one of said surfaces by the free end of the spring lever to a position where the other of said intersecting toggle surfaces is interposed in the path of reciprocation of the free end of the spring lever.

5. In combination, a mounting bracket formed with a flat wall portion, an ear displaced outward from said

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flat wall portion to extend in spaced relation parallel thereto, a protrusion extending outward from said flat wall portion in spaced relation from said ear, and an elongated spring member formed with a first aperture receiving said ear, said spring member being snugly received between said ear and said flat wall portion on the bracket to prevent displacement of the spring member perpendicular to the flat wall bracket portion, said spring member also being formed with a second aperture snugly receiving said protrusion extending outward from the flat wall portion of the bracket to prevent displacement of the spring member longitudinally and laterally along the flat wall bracket portion.

6. In combination, a pivoted toggle, a bracket supporting the pivotal mounting for said toggle, said bracket being formed with an upstanding flat wall portion, an ear displaced outward from said flat wall portion to extend in spaced parallel relation thereto, and a protrusion extending outward from said flat wall portion in spaced relation from said ear, and a leaf spring lever mounted in cantilever fashion at one of its ends at said flat wall bracket portion and formed with a free end reciprocable in alignment with the pivotal axis of the toggle, said mounted end of the leaf spring lever being formed with a first aperture receiving said ear and being snugly received between said ear and said flat wall bracket portion to prevent its displacement relative to said flat wall bracket portion, said mounted end of the leaf spring lever also being formed with a second aperture snugly receiving said protrusion extending outward from the flat wall bracket portion to prevent displacement of the mounted end of the leaf spring lever longitudinally and laterally relative to said flat wall bracket portion.

7. A snap-acting, alternate action mechanism comprising a snap spring system having an end free to move between opposed positions, a bracket supporting the mounted end of the snap spring system, a pivotally mounted toggle interconnected with the snap spring system to effect snap action movement thereof upon pivotal toggle movement between its extreme limits of movement, said bracket being formed with an upstanding flat wall portion, an ear displaced outward from said flat wall portion to extend in spaced relation parallel thereto, and a protrusion extending outward from said flat wall portion in spaced relation from said ear, and a leaf spring lever mounted in cantilever fashion at one of its ends at said flat wall bracket portion, said mounted end of the leaf spring lever being formed with a first aperture receiving said ear and being snugly received between said ear and said flat wall bracket portion to prevent displacement of the mounted end of the leaf spring lever relative to said flat wall bracket portion, said mounted end of the leaf spring lever also being formed with a second aperture snugly receiving said protrusion extending outward from the flat wall bracket portion to prevent displacement of the mounted end of the leaf spring lever relative to said flat wall bracket portion, said leaf spring at its other free end being formed with a reciprocable depending arm extending inwardly toward the toggle in alignment with the pivotal axis thereof and biased away from engagement with the toggle.

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8. In an alternate action mechanism, an alternator, and an elongated spring member fixedly mounted at one end thereof in cantilever fashion and having an integral resilient arm extending laterally of the other end thereof for reciprocation toward and away from said alternator, said spring member biasing said arm in one direction out of engagement with said alternator, said arm being movable in the opposite direction against the bias of the spring member to engage said alternator and displace the same.

9. In an alternate action mechanism, the combination of a toggle mounted for pivotal movement between opposite extreme positions, and an elongated spring lever fixedly mounted at one end thereof in cantilever fashion, said spring lever having an integral resilient arm extending laterally of the other free end thereof toward the toggle and biased away from engagement therewith by said spring lever, said arm on the spring lever being movable against the bias of the spring lever into engagement with said toggle to pivot the same in opposite directions upon successive reciprocations of the arm.

10. In an alternate action mechanism, in combination, a toggle, means mounting said toggle for pivotal movement between opposite extreme positions, a bracket supporting the pivotal mounting means for said toggle, an elongated spring lever mounted at one end thereof in cantilever fashion on said bracket, said spring lever having an integral resilient arm extending laterally of the other end thereof toward said toggle and biased from engagement therewith by said spring lever, said free arm on the spring lever being movable against the bias of the spring lever into engagement with said toggle to pivot the same in opposite directions upon successive reciprocations of the arm.

11. In combination, a pivoted alternator, and an elongated spring member mounted at one end in cantilever fashion, said spring member having a reciprocable arm extending laterally of the other end thereof toward said alternator in alignment with the pivotal axis thereof and resiliently biased by said spring member to be normally spaced away from engagement with the alternator, said arm on the spring member being movable against the bias of the spring member into engagement with the alternator to actuate the latter.

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