United States Patent

Hoehn et al.

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[54] **TAP SWITCH**

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[21] Appl. No.: **75,205**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 826,339, May 21, 1969.

[52] **U.S. Cl.** .....**200/67 A**, 200/167 A

[51] **Int. Cl.** **H01h 13/28**

[58] **Field of Search** .....200/67 G, 67 A, 68, 167 A, 200/167 B

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[57] **ABSTRACT**

A simplified tap switch having a snap action includes a rocker adapted to be pivoted by a tap handle, which is demountably secured to the rocker, with the underportion of the rocker engaging a movable contact arm which rests in a cradle of a link, the link being pivotally secured to a stationary terminal of the switch. A coil spring biases the movable contact arm into the cradle of the link and is arranged on protruding elements so that the pivotal movement of the rocker causes an over-center snap action which moves the movable contact arm between two stable positions.

4 Claims, 7 Drawing Figures

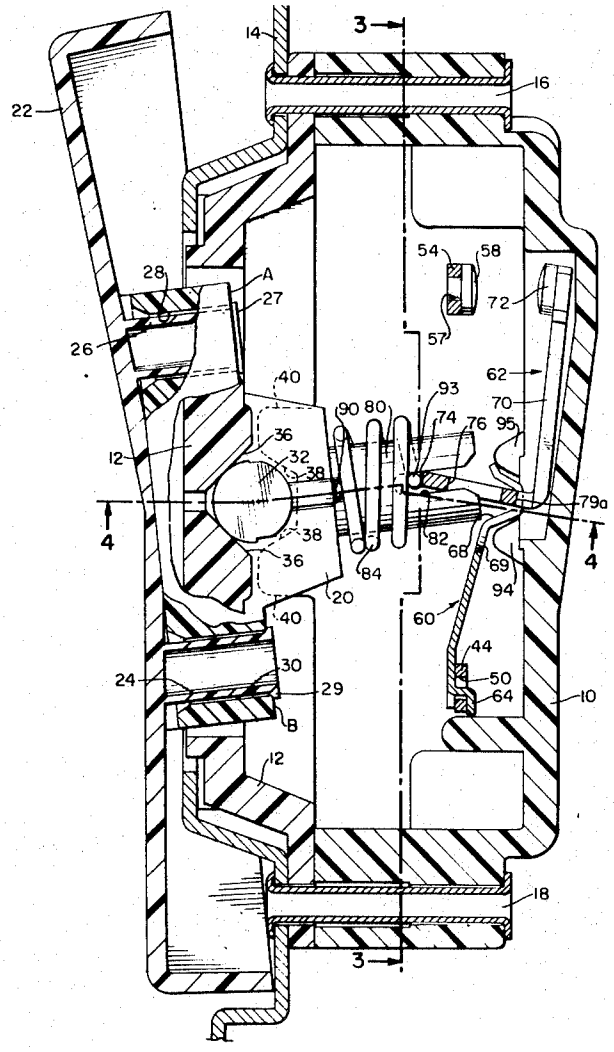


FIG. 2

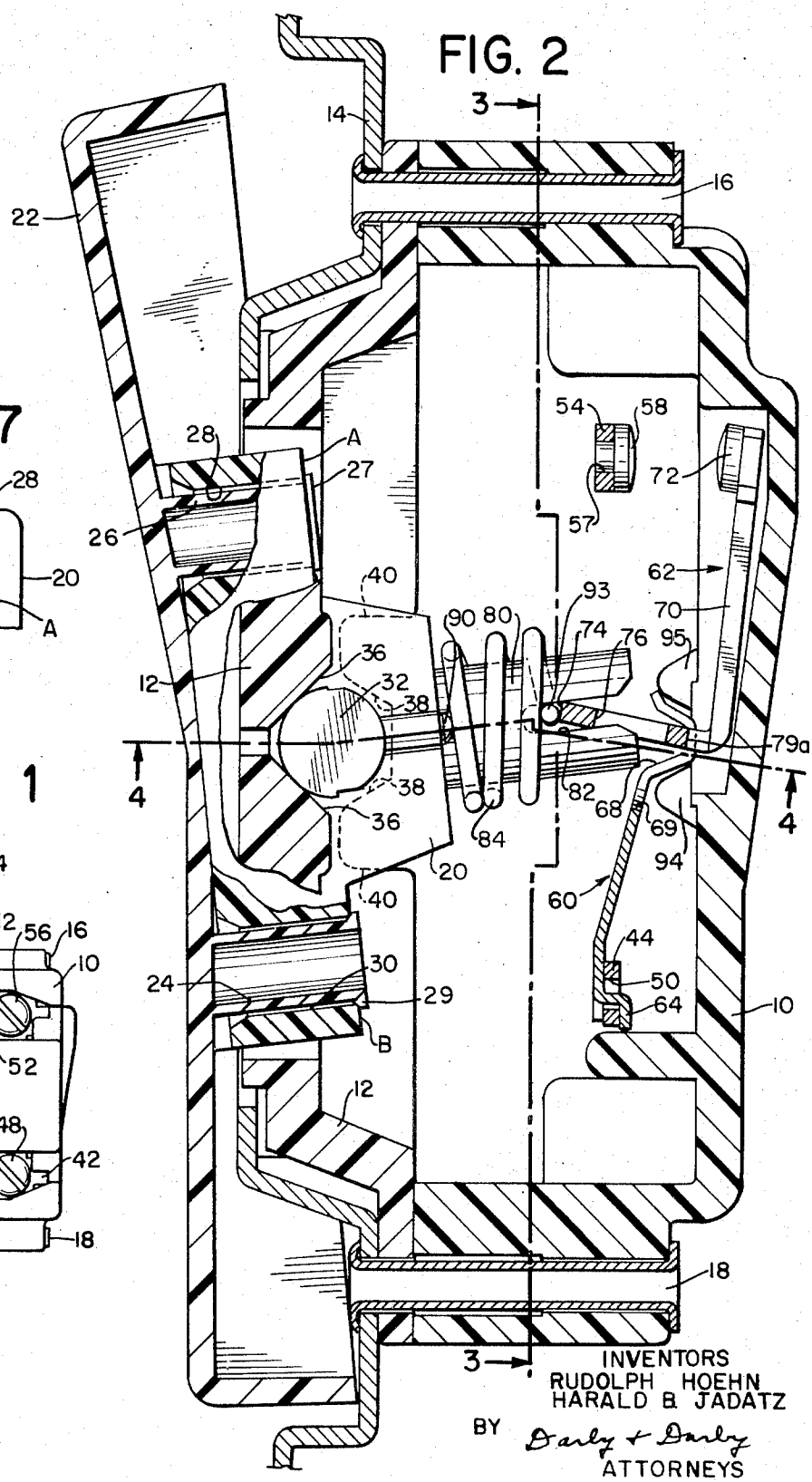


FIG. 7

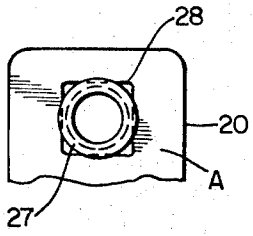
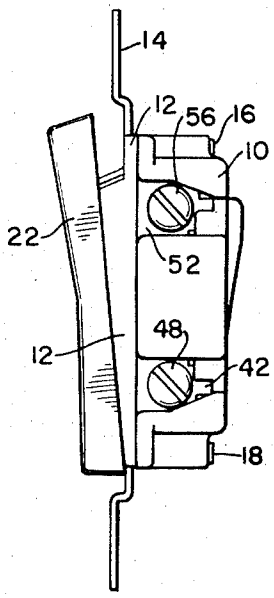


FIG. 1



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FIG. 3

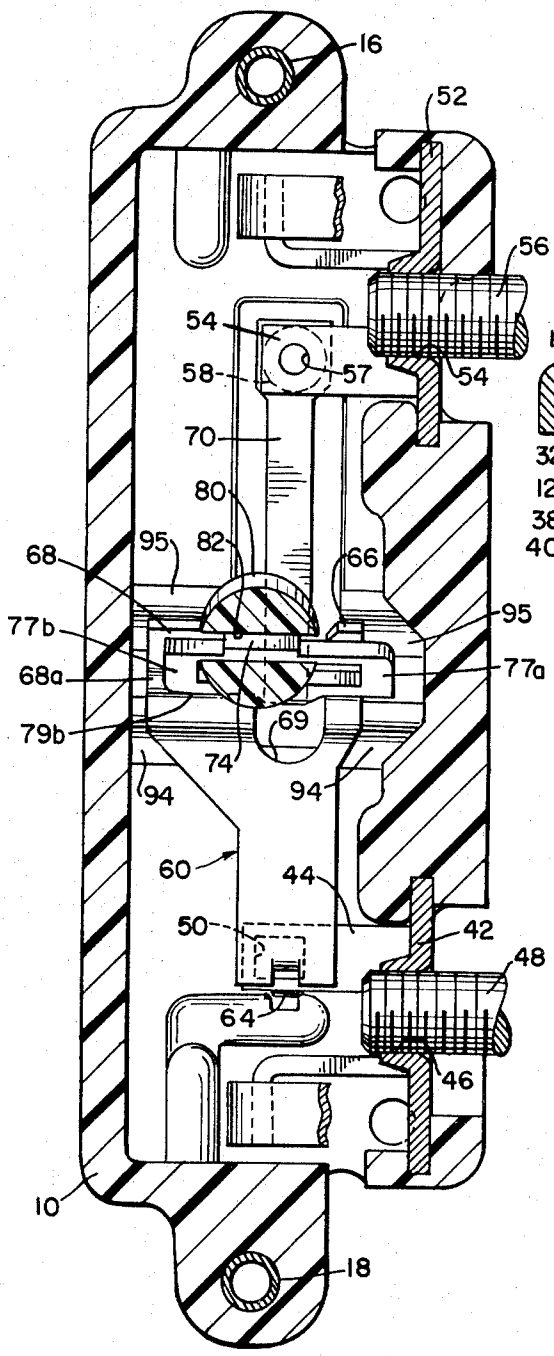
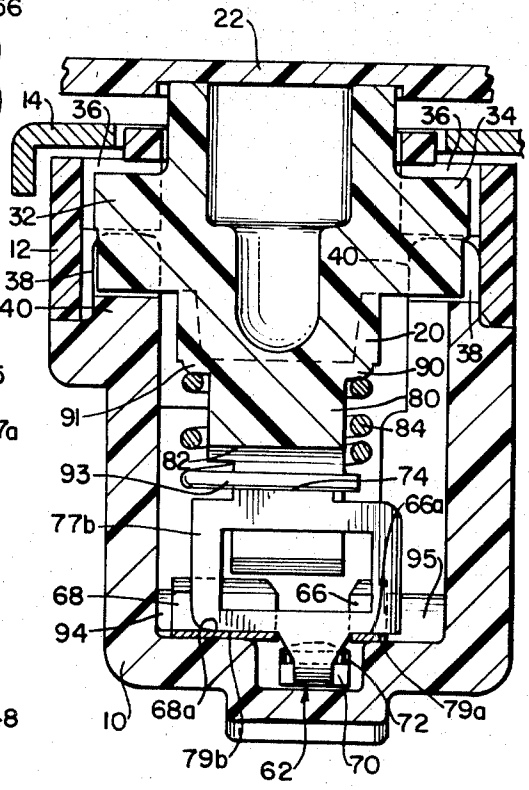


FIG. 4



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FIG. 5

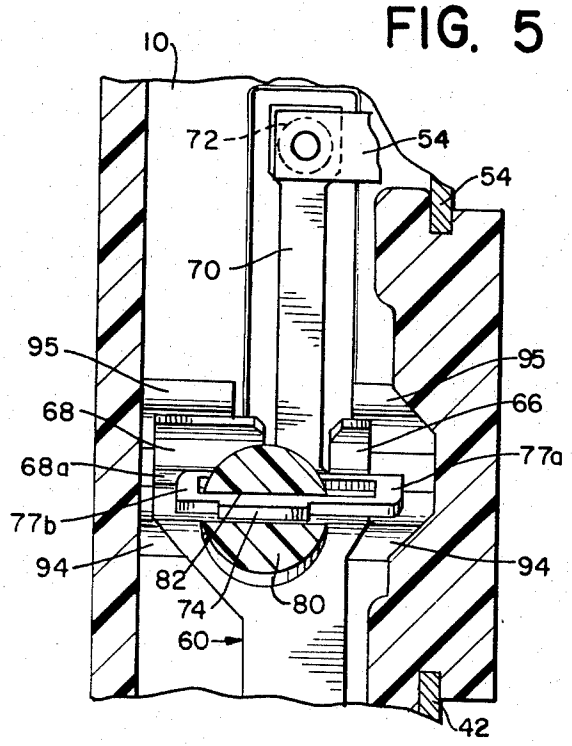
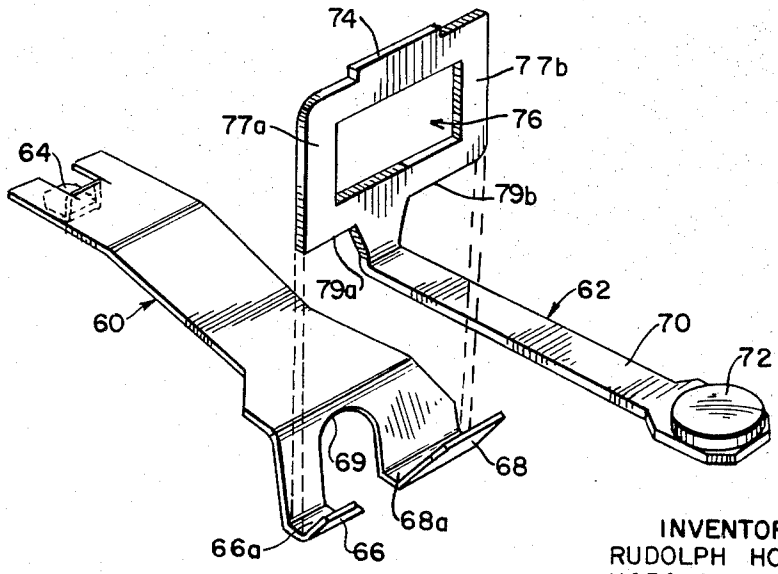


FIG. 6



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TAP SWITCH

This application is a continuation-in-part of our copending application Ser. No. 826,339 filed May 21, 1969.

The present invention relates to a tap switch, or touch switch, as such switches are sometimes called, which is a wall switch or the like intended to be mounted in a standard outlet box and which can be actuated by relatively slight movement, i.e., tapping.

A switch, constructed pursuant to the present invention, provides advantages with respect to simplity of construction, operational reliability, and reduced costs of manufacture. Additionally, the switch of the invention has a demountable tap handle which is a desirable commercial feature since it provides for simple interchange of tap handles of different color or design.

In the following description, reference to a "tap switch" is not intended to be limiting in any respects. Those skilled in the art will recognize that certain features and advantages of the invention are applicable to switches other than those generally referred to as tap or touch switches.

The invention is described in detail below with reference to the attached drawings, wherein:

FIG. 1 is a side elevational view of a preferred embodiment of the invention;

FIG. 2 is a side view, partially in section, of the preferred embodiment of the invention;

FIG. 3 is a sectional view along the line 3—3 of FIG. 2;

FIG. 4 is a sectional view along the line 4—4 of FIG. 2;

FIG. 5 is a detailed top view, partially in section, showing the means for operating the contacts;

FIG. 6 is an exploded perspective view showing the contact and support arrangement pursuant to the preferred embodiment of the invention; and

FIG. 7 is a top view showing the means for demountable attachment of the tap handle.

Referring to the drawings, the switch is contained in a two-part housing which includes a body portion **10** and cover **12**. As standard mounting bracket **14** is secured to cover **12** by left and right rivets, **16** and **18** respectively, the mounting bracket **14** provides a means to secure the switch within a standard outlet box so that the switch can be well-mounted. At this juncture, it is noted that the terms "left" and "right" are used only for purposes of explanation and are used with respect to FIGS. **2** and **3**. The terms "upper" and "lower" in the following description are used in the same sense and obviously are not intended to be limiting in any respect.

A pivotal rocker **20** is mounted within the body **10** and connected to a tap handle **22** which is the actuator means for the switch. The tap handle **22** is generally rectangular and shaped in longitudinal cross-section (as shown in FIGS. **1** and **2**) to form a large oblique angle between its left and right halves. Left and right tubular protrusions **24** and **26**, bearing crowns **27** and **29** respectively, extend downwardly into left and right square prismatic recesses **28** and **30** within the rocker **20** to form a single unitary construction. Crowns **27** and **29** overlap the lower edges A and B of rocker **20** thereby fastening tap handle **22** firmly in place. The crowns are deformable and therefore tap handle **22** can be removed by pulling the handle body in a direction away from rocker **20**. The square prismatic recesses **28** and **30** are adapted to guide crowns **27** and **29** therein, thereby facilitating the interchange of tap handles. To replace a handle, tubular protrusions **24** and **26** bearing deformable crowns **27** and **29** are urged toward the lower edges A and B of rocker **20** until they emerge from the square prismatic recess and overlap lower edges A and B of rocker **20**. Two oppositely disposed axles **32** and **34** are integrally formed with rocker **20** and extend into fitted retention portions formed between cover **12** and body **10** by triangular recesses **36** in cover **12** and corresponding recesses **38** (FIGS. **2** and **3**) in a pair of mounting portions **40** which protrude upwardly from the sides of the body **10**.

The stationary terminals of the switch are shown most clearly in FIGS. **1** and **3**. The left terminal comprises a plate **42** which is accessible from the exterior of the switch body **10** and a transverse terminal extension **44** which extends inwardly into the body. A threaded aperture **46** is tapped into the plate **42** to receive a terminal screw **48** in order to connect the switch in a circuit. A square opening **50** is provided at the innermost extremity of extension **44** for purposes described in the following discussion. The right-hand terminal is similar and includes an external plate **52** from which a transverse extension **84** extends into the body portion **10**. A tapped hole **54** is provided in the plate **52** to receive the second terminal screw **56**. At the innermost extremity of extension **54**, a hole **56** is formed to receive the stem of a mushroom-shaped contact **58** (see also FIG. **2**).

The elements of the switch construction primarily responsible for the simplified construction are shown most clearly in FIG. **6**. These elements include a stationary link **60** and a movable contact arm **62**. The link **60** includes at its left end a downwardly bent ear **64** which in combination with the adjacent portions of the link secure the link to terminal **42** when the ear **64** is received within the square opening **50** of the left terminal extension **44**. The link **60** further includes a bifurcated cradle formed by first and second arms **66** and **68** respectively, separated by a cutout portion **69**. The arms **66** and **68** are generally U-shaped with their open end diverging from respective floor portions **66***a* and **68***a*.

The bifurcated cradle portion of link **60** longitudinally is located in body **10** by means of transverse ridges **94** and **95**.

The movable contact arm **62** includes an elongated extension member **70** at the free end of which a contact **72** is mounted. Integrally formed with member **70** is a transverse grasping portion **74** the central portion **76** of which is stamped out to provide a four-walled structure including vertical walls **77***a* and **77***b*. The bottom of grasping portion **74** terminates in shoulders **79***a* and **79***b* which correspond in width to arms **66** and **68**, respectively, and are adapted to be retained therein.

The link **60** is electrically and mechanically coupled to the left terminal extension **44** by inserting ear **64** through the opening **50**, with the cradle of link **60** extending toward the right side of the switch. The shoulders **79***a* and **79***b* of the grasping member **74** are nested within the cradle formed by the arms **66** and **68**. The upper portion of the grasping member **74** is received within a retaining slot **82** of a cylindrical extension **80** depending downwardly from the rocker body **20**. A coil

spring **84** coiled around the cylinder **80**, and pivotally seated in tilted attitude on projecting members **90** and **91**, is under compression, and urges the movable contact arm **62** away from the rocker **20**, thus serving as the compression member for an over-center snap action movement. Cross bar **93** on coil spring **84** oscillates diametrically from one side of slot **82** to the other as rocker **20** is pivoted back and forth and therefore it will be understood that coil spring **84** has a sufficient inside diameter to provide a loose fit around cylinder **80**.

The arrangement of the spring **84**, link **60** and contact arm **62** is such that when the switch is in the position illustrated in FIG. **2**, the grasping member **74** is pivoted within the cradle formed by arms **66** and **68**. When the right-hand side of tap handle **22** is depressed, causing the rocker **20** to pivot clockwise (as viewed in FIG. **2**), the actuator construction will pass through an over-center position at which the force of the spring **84** will abruptly urge the grasping member **74** to the left causing the contact arm **62** to transfer to its other stable position in which contact **72** is in electrical contacting relationship with the stationary contact **58**. Incident to this operation, the balance of coil spring **84** on axially projecting members **90** and **91** is easily overcome when tap handle **22** is depressed, thus pivoting spring **84** from one fixed tilting position on rocker **20** to the opposing fixed tilting position. This movement aids in overcoming the inertia of rocker **20** and grasping member **74**, thereby reducing the tendency for the switch to stick in a central position, and making the operation smoother.

The invention has been described for use with a single-pole, single-throw switch. Obviously, the invention could be used with a double-throw switch by simply incorporating a second stationary contact (such as **58**) beneath the elongated extension member **70** of contact arm **62**, the second contact being adapted to engage, for example, an extension of movable contact **72**. It is further contemplated that the invention may be used as a three-way or four-way switch. In the latter case, two constructions as illustrated herein (modified for double-throw action) would be provided in a side-by-side relationship with a single rocker arm being used to actuate both of the corresponding switches simultaneously. Another embodiment of the invention includes a suitable neon lamp mounted behind tap handle **22** in a recessed portion of rocker **20** to provide a lighted handle tap switch. The lamp is mounted so that it will remain in place despite the rocker movement of tap handle **22**. The lamp is connected via a ballast resistor to the power source so that the tap handle **22** is illuminated when the tap switch is in the open circuit condition.

What is claimed is:

1. A snap action switch comprising an insulated structure,

a first stationary terminal structure including a transverse terminal extension plate, a conductive link member and cradle member,

said transverse terminal extension plate bearing a square aperture at its innermost extremity,

said conductive link member having a downwardly bent ear at one end thereof which is received within said square aperture located on said transverse terminal extension plate

said ear acting in combination with adjacent link surfaces to secure said conductive link to said first stationary terminal structure,

said conductive link member having a free end opposite to the secured end which terminates in said cradle member,

a movable contact arm including an elongated extension member and a transverse member joined to one end thereof, the transverse member being received for rocking movement in said cradle member with said extension member extending away from said cradle member, and a movable contact near the free end of the extension member,

a second stationary terminal structure having a fixed contact in the path of said movable contact,

a rocker pivotally mounted in said housing including a post portion extending toward said transverse member of said movable contact arm,

said post portion of said rocker terminating in a free end provided with an open slot-shaped recess adapted to freely receive a portion of said transverse member of said movable contact arm therein, and

a coil spring tiltably seated at one end on a pair of opposed projecting members provided on said rocker at the base of said post portion so as to extend circumferentially about said post portion in spaced relationship thereto and terminating at the other end in a cross member which extends through said slot-shaped recess adjacent and generally parallel to said transverse member of said movable contact arm, said coil spring thereby being compressed between said rocker projecting members and said movable arm transverse member,

whereby upon pivoting said rocker member said cross member of said coil spring oscillates diametrically between the sides of said slot-shaped recess to thereby urge said transverse member of said movable contact arm from one fixed tilted position to an opposed fixed tilted position.

2. A snap action switch as recited in claim **1**, including

a tap handle having means for demountable engagement with said rocker, and wherein

said rocker includes a pair of shaped recesses in coaxial alignment with and encompassing a portion of said transverse member of said movable contact arm, and

said means for demountable engagement of said tap handle with said rocker comprises a pair of tubular protrusions bearing deformable crowns,

said tubular protrusions extending downwardly from said tap handle and slidably mating with said shaped recesses until said deformable crowns overlap the lower edges of said rocker, thereby fixing said tap handle to said rocker.

3. A snap action switch as claimed in claim **1**, wherein the coil of said spring adjacent said cross member is axially spaced from the next preceding coil thereof.

4. A snap action switch as claimed in claim **1**, wherein

said cradle member is bifurcated so as to include two cradle arms, and

said transverse member includes top, bottom, and two side walls defining a central opening,

said bottom wall being received for rocking movement in said cradle member,

said top wall being received in said slot-shaped recess and bearing against said linear portion of said coil spring, and

said extension member secured to said bottom wall and extending between the arms of said bifurcated cradle member.

* * * * *