United States Patent

Wolniak et al.

[15] **3,639,708**

[45] **Feb. 1, 1972**

[54] ROTARY SWITCH LOCK

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[52] **U.S. Cl.** **200/44,** 200/166, 200/11

[51] **Int. Cl.** **H01h 27/00**

[58] **Field of Search**.....200/67 A, 166 BB, 11 A, 11, 200/11 C, 63, 65, 66, 166 BC, 166 BH, 155, 44, 42

[56] **References Cited**

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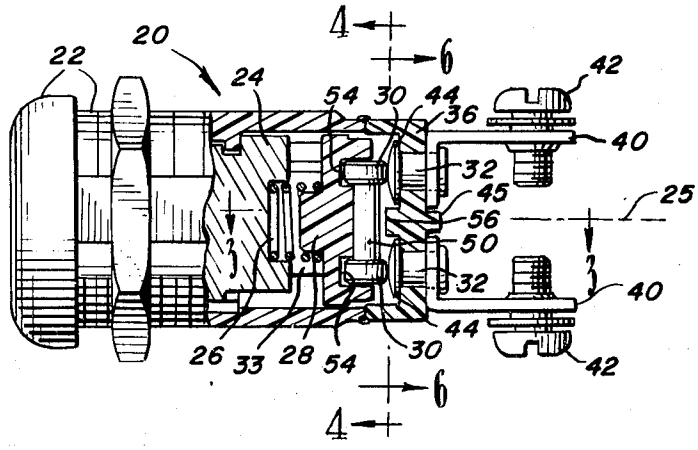
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[57] **ABSTRACT**

A key-operated rotary switch lock having movable roller contacts which roll along the surface of terminal contacts upon making contact therewith. The terminal contacts are mounted to, and project outwardly from, an insulator surface. The roller contacts comprise annular discs rotatably mounted on an elongated shaft which in turn is mounted for rotation about an axis normal to both the shaft axis and the insulator surface for translating the roller contacts to and away from the terminal contacts. A spacer member projects outwardly from the insulator surface along the axis of switch rotation to maintain a clearance between the roller contacts and the insulator surface.

16 Claims, 6 Drawing Figures



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Fig. 1

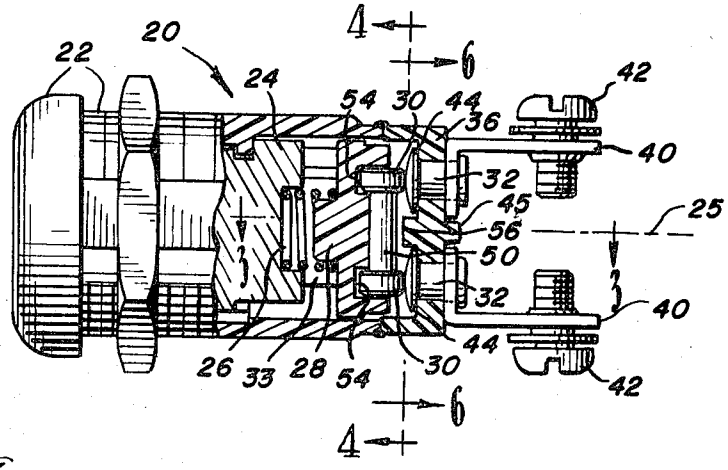


Fig. 3

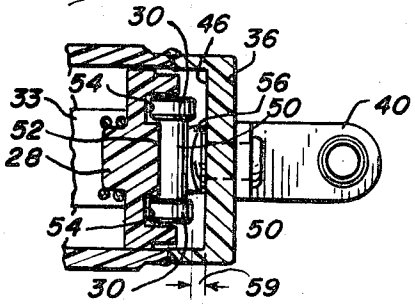


Fig. 2

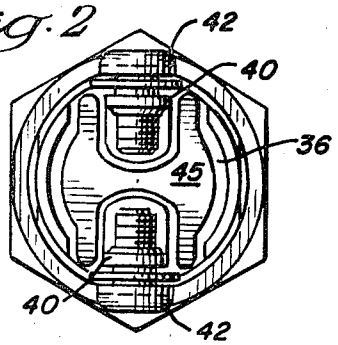


Fig. 4

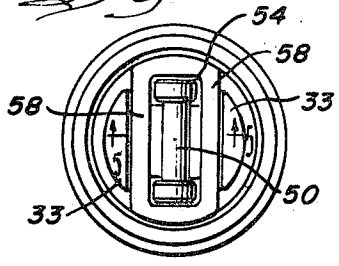


Fig. 6

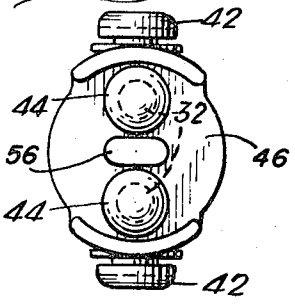
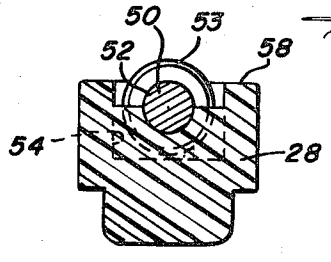


Fig. 5



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ROTARY SWITCH LOCK

BACKGROUND OF THE INVENTION

This invention is generally concerned with a rotary switch and particularly concerned with an improved key-operated lock switch wherein only relative rolling motion exists between the electrical contacts thereof.

Previous switches have always made electrical contact by sliding or dragging a movable contact over the surface of a terminal contact. Usually the movable contact is resiliently biased against the terminal contact such that the sliding action results in the contacting surfaces being worn away.

Another problem often encountered with previous switches is degradation of the contact surfaces caused by carbon and material being tracked onto the terminal contact by the movable contact. Typically, the terminal contacts are mounted to, and project outwardly from, the insulator surface, and the movable contact slides along the insulator surface, making the initial contact at the edge of the terminal contact contiguous with the insulator surface. Initial contact often results in electrical arcing which may burn or heat the insulator surface, and the sliding action of the terminal contact along the insulator surface tracks the carbon formed by the electrical arcing onto the terminal contact.

SUMMARY OF THE INVENTION

The improved rotary switch of the present invention overcomes the disadvantages of the switches noted above in a novel and simple manner. The problem of the contacting surfaces becoming worn by contact sliding action is eliminated by providing a means whereby only rolling motions exist between contacting surfaces. The burning of the insulator surface and carbon and material tracking is eliminated by providing a means to maintain a clearance between the movable contact and the insulator surface so that the movable contact makes initial contact away from the edge of the terminal contacts.

Thus, an important feature of this invention is the provision of an improved switch having a movable contact that rolls along the terminal contact upon making electrical contact therewith.

Another feature of this invention is the provision of an improved rotary switch having movable roller contacts rotatably mounted on an elongated shaft and a retainer member formed to provide both a support for the elongated shaft and a clearance under the roller contacts to permit free roller action along the terminal contact surfaces.

A further feature of this invention is the provision of an improved rotary switch having a spacer projecting outwardly from the surface of a terminal contact mounting member along the axis of switch rotation which limits the amount that a movable contact member can be pushed toward the terminal contact mounting surface to maintain a clearance between the mounting surface and the movable contact member.

BRIEF DESCRIPTION OF THE DRAWINGS

Further features and advantages of the invention will be apparent from the following descriptions taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a side view, partially in section, of a rotary switch lock embodying the invention with the switch in a closed position;

FIG. 2 is an end view looking from the right of FIG. 1;

FIG. 3 is a fragmentary sectional view taken along line 3—3 of FIG. 1 but with the switch in an open position;

FIG. 4 is a sectional view taken along line 4—4 of FIG. 1 showing the retainer and roller contact members;

FIG. 5 is an enlarged sectional view of the retainer taken along line 5—5 of FIG. 4; and

FIG. 6 is a sectional view taken along line 6—6 of FIG. 1 showing the insulator member, fixed contact and the spacer.

DETAILED DESCRIPTION

The invention as illustrated herein is embodied in a rotary switch lock but may be utilized in other types of switches.

Referring now to the drawings and in particular to FIG. 1, a rotary switch lock, generally designated 20, is shown having a cylindrical barrel 22 with a plug 24 rotatably mounted therein. Insertion of a properly coded key into a key channel of plug 24 unlocks plug 24 from barrel 22, and rotary motion of the key is translated to rotate plug 24 relative to plug 22 about switch axis 25. A resilient means, such as coil spring 26 has one end secured to plug 24 and the other end secured to a movable contact mounting means, such as retainer member 28. Coil spring 26 is compressed between plug 24 and retainer member 28 and resiliently biases the movable contacts, such as roller contacts 30, against terminal contacts 32 to insure firm electrical contact therebetween.

Two fingers 33, integral to plug 24, project outwardly along opposite sides of plug 24 and straddle retainer member 28. Fingers 33 translate the rotary motion of plug 24 to retainer member 28 to move roller contacts 30 toward, and away from, terminal contacts 32 for respectively making and breaking electrical contact therewith.

Roller contacts 30 are electrically common, being rotatably mounted on either end of a conductive, elongated shaft 50, and, upon being rotated into the closed position as shown in FIG. 1, provide a conduction path through shaft 50 between terminal contacts 32. The arrangement shown in FIGS. 1 and 3 comprises a single-pole, single-throw switch, but it should be noted that many different switch combinations could be made using arrangements similar to that shown.

Terminal contacts 32 in the embodiment shown in FIG. 1 comprise rivets extending through an insulator 36 which is fixedly mounted to barrel 22. The deformed part 38 of the rivets secures L-shaped terminal brackets 40 to insulator member 36. Screws 42 are provided to secure leads to terminal brackets 40 for coupling external circuitry to switch 20. As seen in FIG. 2, a divider portion 45 projecting outwardly from the rearward surface of insulator member 36 partially surrounds deformed part 38 of the rivet 32 to prevent inadvertent shorting thereof. The rivet heads of terminal contacts 32 comprise terminal member-contacting surfaces 44 which project outwardly from rearwardly facing insulator surface 46 in order that contact may readily be made therewith. Terminal contacting surfaces 44 extend at an acute angle with respect to a plane perpendicular to the axis of rotation of said retainer member to facilitate roller action.

In FIG. 3 a fragmentary sectional view taken along line 3—3 of FIG. 1 with the movable contact members 30 rotated 90° to the open position is shown. Roller contacts 30 comprise annular discs mounted on either end of a conductive, elongated shaft 50, to rotate about an axis through the center thereof coincident with the major axis of the shaft. It should be appreciated that although a shaft is illustrated, any other suitable means for mounting the movable contact members 30 for rotation about an axis therethrough is comprehended by the invention. The important characteristic is that some provision is made to allow free rotation of contact members 30. Shaft 50 is supported by a shaft-receiving recess 52 within retainer member 28. A roller member receiving recess 54 is located at either end, and in communication with, shaft-receiving recess 52. Roller contacts 30 have circular contacting surfaces 53 projecting outwardly from backwardly facing retainer member surface 58 for rolling along terminal member-contacting surfaces 44. Roller contacts 30 also partially extend into roller member receiving recess 54 and freely rotate therein. The relative dimensions of recess 54, recess 52, roller contacts 30 and shaft 50, as shown in FIG. 5, are such that elongated shaft-receiving recess 52 supports the shaft 50, which in turn supports roller contact 30 away from the inner surfaces of roller member receiving recesses 54. This clearance maintained between roller contacts 30 and the inner surfaces of roller member receiving recess 54 allows roller contacts 30 to freely rotate therein.

As previously mentioned, an important feature of this invention is the provision of a spacer **56** shown in FIGS. **1**, **3** and **6**. Spacer **56** is located between rearwardly facing retainer surface **58** and forwardly facing insulator surface **46** for maintaining a clearance **59** between roller contact **30** and insulator surface **46**. As shown in FIG. **6** spacer **56** is integral to insulator **36** and projects generally along switch axis **25**. In the open position of the switch shown in FIG. **3**, spacer **56** supports shaft **50** away from insulator **46** to maintain clearance **59** between insulator surface **46** and roller contacts **30**. As retainer **28** is rotated, shaft **50**, supported by recess **52**, is pivoted about spacer **56**. Since the extent that terminal contacting surface **44** projects from insulator surface **46** is greater than clearance **59**, initial contact of roller contact **30** with terminal contacting surface **44** is made at a point distant from insulator surface **46**, thereby eliminating electrical arcing and burning of the insulator material.

While we have shown and described certain embodiments of our invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention disclosed in the appended claims.

We claim:

1. An electrical switch comprising: a terminal contact member having a contacting surface; a movable contact member; means for mounting the movable contact member for rotation about an axis therethrough; and means for movably mounting said movable contact member mounting means to translate said movable contact member toward and away from said terminal contact member to respectively make and break electrical contact therewith, said movable contact member rotating about said axis to roll along the surface of said terminal contact member upon making contact therewith.

2. The electrical switch of claim **1** wherein said shaft-mounting means includes a retainer member for supporting said shaft, said retainer member being movably mounted to rotate said shaft for translating said movable contact member toward and away from said terminal contact member for making electrical contact therewith, said movable contact member having a circular contacting surface, part of said circular contacting surface projecting from said retainer member toward said terminal contact member for rolling along the contacting surface thereof.

3. The electrical switch of claim **2** including an insulator member having an insulator surface, said terminal contact member being mounted to said insulator member and having a contacting surface projecting from said insulator surface toward said movable contact.

4. The electrical switch of claim **3** including spacer means located between said retainer member and said insulator surface for maintaining a clearance between said insulator surface and said movable contact member.

5. The electrical switch of claim **3** wherein said insulator surface and said retainer surface lie in generally parallel planes, said retainer member being mounted for rotational movement about an axis generally perpendicular to said planes to translate said moving contact member into contact with said terminal member.

6. The electrical switch of claim **2** wherein said movable contact member comprises an annular shaped roller member mounted to said elongated shaft for rotation about the axis thereof,

said retainer member has a surface facing said insulator surface with a roller member receiving recess therein, said roller member extending from said retainer member surface and shaft toward said terminal contact member for rolling along the contacting surface thereof, and

said retainer member surface has an elongated recess therein communicating with said roller member receiving recess, said elongated recess supporting said shaft for maintaining a clearance between said roller member and inner surfaces of said roller member receiving recess.

7. The electrical switch of claim **6** including an insulator member having a surface facing said retainer member surface, said terminal contact member extending through said insulator member and having a contacting surface projecting from said insulator surface toward said movable contact member,

resilient means operating between said insulator member and said retainer member tending to force said roller member into contact with said insulator surface,

spacer means located between said retainer surface and said insulator surface for maintaining a clearance between said roller member and said insulator surface.

8. The electrical switch of claim **7** wherein said spacer member is integral to said insulator member and projects generally along the axis of rotation of said retainer member.

9. The electrical switch of claim **2** wherein said terminal-contacting surface extends at an acute angle with respect to a plane perpendicular to the axis of rotation of said retainer member.

10. In an electrical switch having a terminal contact mounted in an insulator with a surface of said terminal contact projecting from a surface of said insulator toward a movable contact member, means mounting said movable contact member for translational movement toward said terminal contact surface for making electrical contact therewith, and means tending to force said movable contact into engagement with said insulator surface, the improvement comprising:

a spacer member positioned between said insulator surface and said movable contact mounting means for resisting said force means to maintain a clearance between said insulator surface and movable contact surface.

11. The electrical switch of claim **10** wherein said movable contact mounting means is mounted for rotational motion about an axis perpendicular to said insulator surface and said spacer member projects generally along said axis for supporting said movable contact means away from said insulator surface.

12. The electrical switch of claim **11** wherein said spacer member is integral with said insulator member.

13. The electrical switch of claim **10** wherein said movable contact member makes initial contact with said terminal contact surface at a point distant from said insulator surface.

14. The electrical switch of claim **10** wherein the extent of terminal contact projection is greater than said clearance.

15. The electrical switch of claim **1** wherein said movable contact member mounting means comprises a shaft, said movable contact member being rotatably mounted thereon.

16. The electrical switch of claim **1** wherein said movable contact member mounting means is electrically conductive and electrically common with said movable contact member.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,639,708 Dated February 1, 1972

Inventor(s) Stanley C. Wolniak, Herbert J. Kincaid and Marshall A. Johnson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Cover Sheet, following"[21] Appl. No.: 63,559" insert --

Assignee: The Illinois Lock Company--.

Signed and sealed this 8th day of August 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

PO-1050
(5/69)

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