United States Patent [19]

Ellsworth et al.

[11] **3,760,132**

[45] **Sept. 18, 1973**

[54] **ENCLOSED SWITCH DEVICE WITH COVER INTERLOCK**

[75] Inventors: **James P. Ellsworth; James B. Wallace,** both of Beaver, Pa.

[73] Assignee: **Westinghouse Electric Corporation,** Pittsburgh, Pa.

[22] Filed: **Apr. 19, 1972**

[21] Appl. No.: **245,456**

[52] **U.S. Cl.** ..... **200/50 A**

[51] **Int. Cl.** **H01h 9/20,** H01h 33/46

[58] **Field of Search** ..... 200/50 A

[56] **References Cited**

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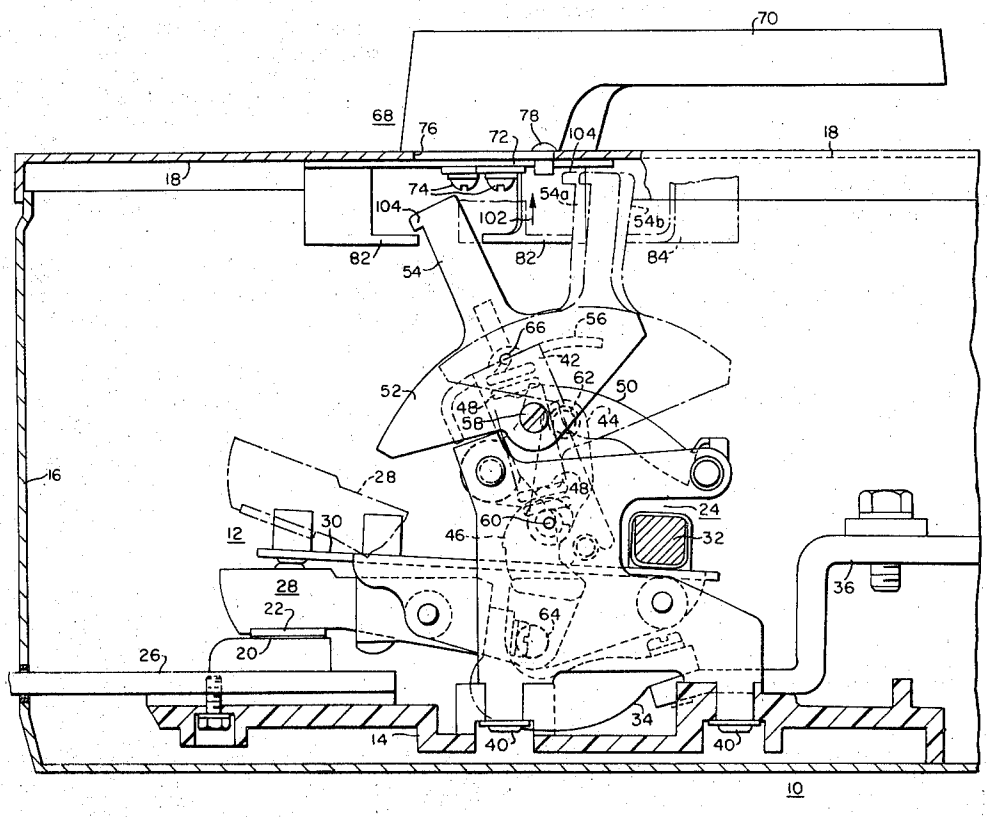
Primary Examiner—J. R. Scott

Attorney—A. T. Stratton et al.

[57] **ABSTRACT**

A switch device characterized by a switch structure within an enclosure having an openable cover and having interlock means between the switch structure and a handle on the cover for preventing opening of the cover if the contacts of the switch structure are welded in the closed-circuit position.

7 Claims, 3 Drawing Figures



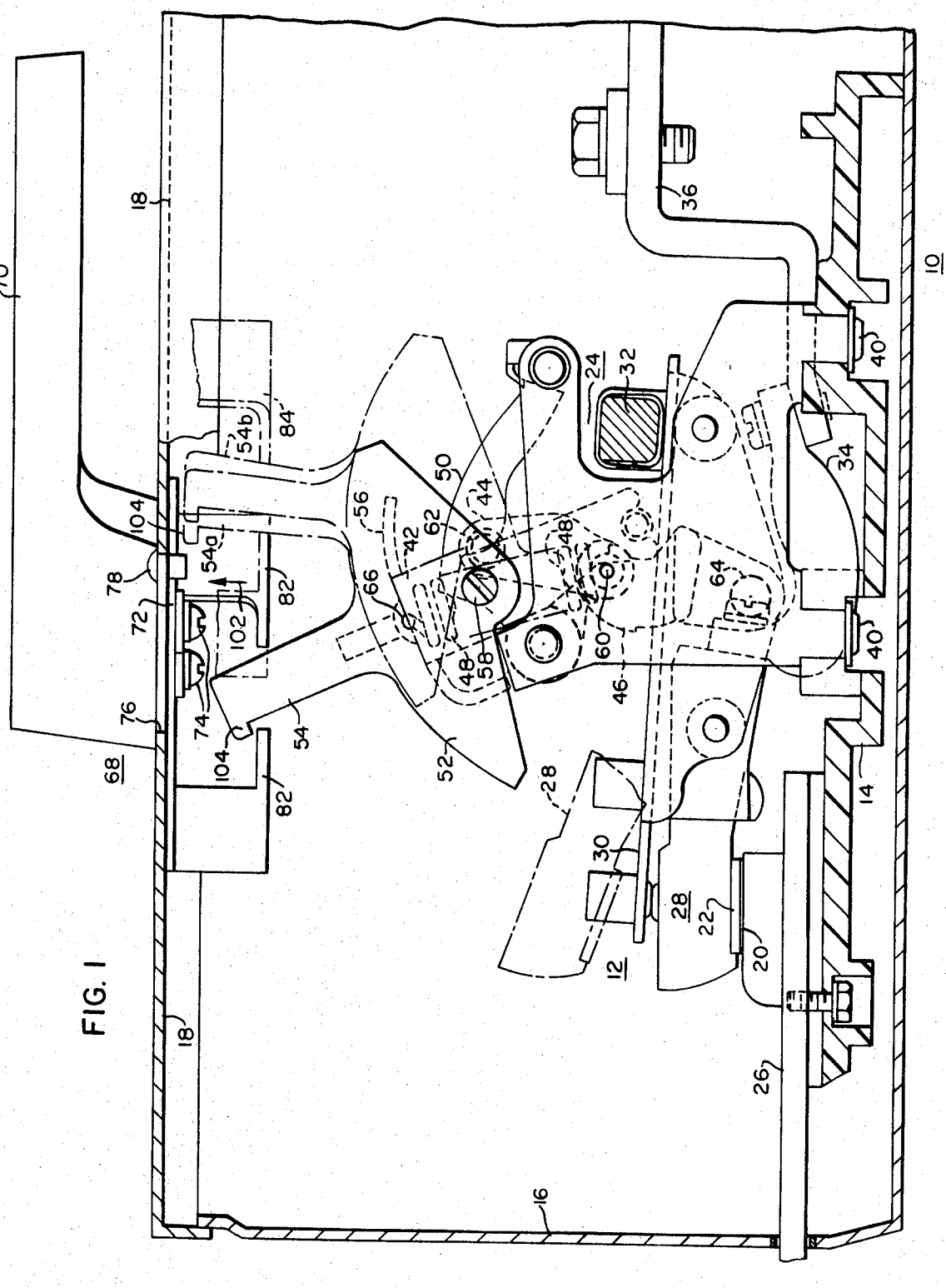
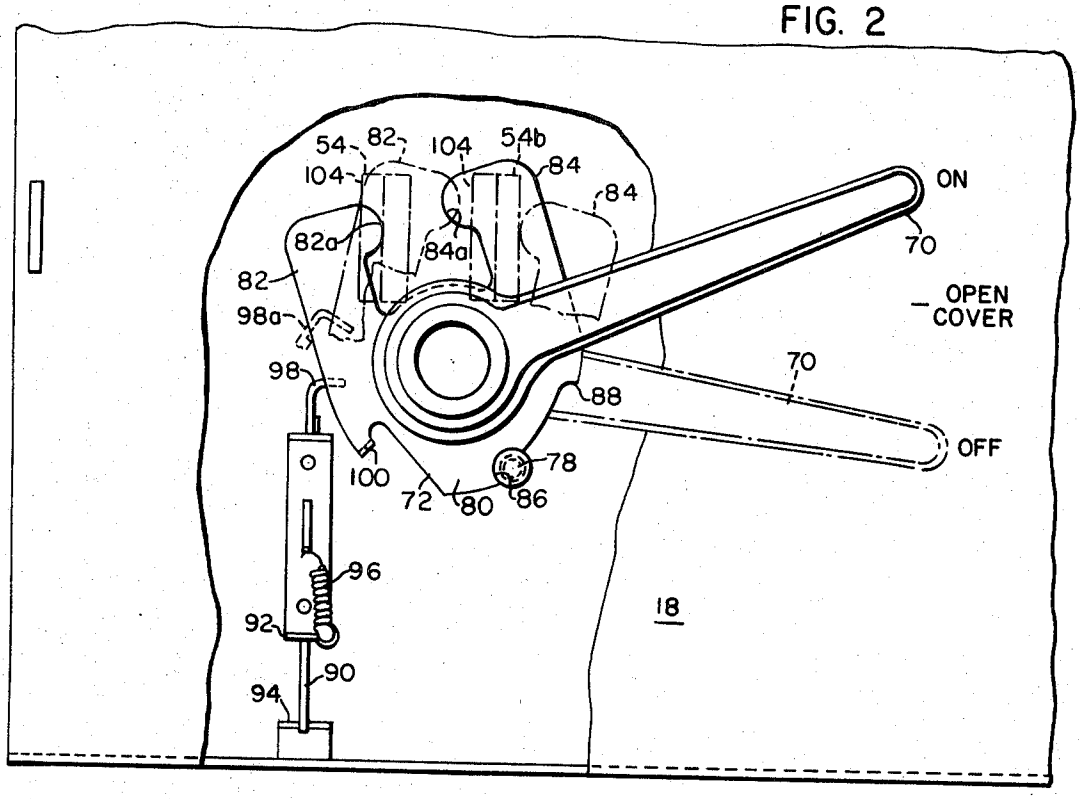

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16
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18
20
22
24
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28
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34
36
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42
44
46
48
48
50
52
54
54a
54b
56
58
60
62
64
66
68
70
72
74
76
78
82
82
84
102
104
104

FIG. 1

FIG. 2


54
82
104
54b
104
84
84
ON
70
82a
84a
82
98a
OPEN
COVER
98
70
88
OFF
78
100
72
80
86
96
18
92
90
94

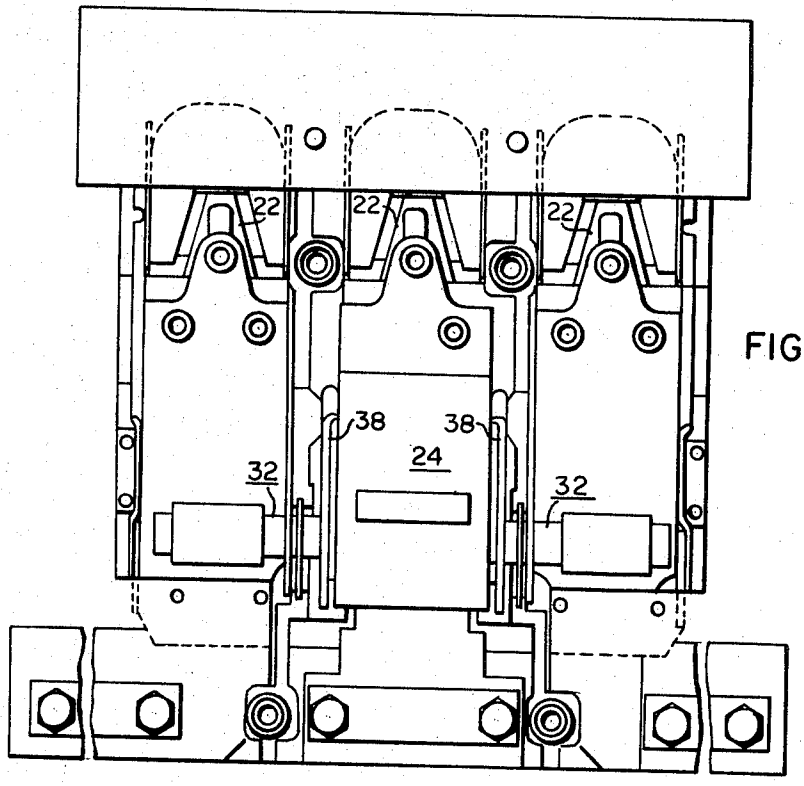

22
22
22
38
38
24
32
32

FIG. 3

ENCLOSED SWITCH DEVICE WITH COVER INTERLOCK

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an interlock device for preventing opening of a cover of an enclosure for a switch or circuit breaker, and more particularly it pertains to an interlock for preventing opening of the cover when the contacts of the switch are welded in the "closed circuit" position.

2. Description of the Prior Art:

Switch devices of various types such as circuit breakers have been contained within enclosures in a manner well known in the art. The enclosures are normally provided with openable covers having handles which more recently have been operatively connected to the enclosed switch for actuating the switch to the "open" position when the cover is to be opened. A disadvantage with some devices of the foregoing type is that in the event that the contacts of the circuit breaker are welded in the "closed" circuit position the handles for the covers have nevertheless been operable to open the cover notwithstanding the closed circuit condition of the breaker, thereby creating an unsafe condition.

SUMMARY OF THE INVENTION

In accordance with this invention it has been found that the foregoing problem may be overcome by providing an electrical switch device having a switch structure and an enclosure therefore, the switch structure comprising stationary and movable contacts, a movable switch arm having the movable contact thereon, operating mechanism for the switch arm and comprising an operating lever and a switch handle thereon for manually moving the operating lever, an overcenter toggle operable by the operating lever to effect movement of the switch arm to open and closed circuit positions, the enclosure comprising an openable cover, a second handle on the external side of the cover and having first means engaging and operating the switch handle, said means disengaging the switch handle when the cover is opened, the switch handle being movable between "on" and "off" positions to operate the contacts between closed and opened positions, the first means comprising a rotatable member having opposed strike surfaces forming an aperture, the switch handle extending into the aperture when the cover is closed, the switch handle including a projection facing the "on" position, the handle being biased to the "on" position if the contacts fail to open when the second handle is moved to the "off" position, and the projection being located in a path of movement of the strike surface on the "on" side of the handle when the cover is opened.

The advantage of the switch device of this invention is the inability to open the cover if the stationary and movable contacts are welded in a closed circuit position, thereby providing a safety feature for the switch device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view of a switch device constructed in accordance with the principles of this invention;

FIG. 2 is a plan view of the handle with a portion of the cover brokenaway; and

FIG. 3 is a plan view of a circuit breaker with the cover removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 of the drawings a switch device or circuit breaker is generally indicated at **10**. It comprises a switch structure **12** which is mounted on a molded base **14** of electrically insulating material, an enclosure **16**, and a removable cover **18** which is preferably hingedly mounted on the enclosure.

The switch device or circuit breaker **10** is of the multi-pole type and the mechanism may be of the general type disclosed in U.S. Pat. No. 2,508,178, issued May 16, 1950 to T. Lindstrom et al., and assigned to the assignee of the present invention. The device **10** includes a stationary contact **20** and a movable contact **22** for each pole of the device. A common operating mechanism, generally indicated at **24** (FIG. 1), is provided for simultaneously actuating three movable contacts **22** (FIG. 3) to open and closed circuit positions.

The stationary contacts **20** is rigidly mounted on the inner end of a conducting strip **26** which extends out of the end of the enclosure **16** and is connected to a line terminal (not shown). The movable contact **22** for each pole is rigidly mounted on a contact arm **28** supported on a switch arm **30** which is rigidly secured on the end of a tie bar **32** that extends across all of the poles (FIG. 3) of the breaker for movement together to opened and closed circuit positions. The contact arm **28** is connected by a flexible conductor **34** to a terminal **36** which is secured to the base **14** in a suitable manner such as by a screw (not shown).

The operating mechanism **24** for the switch structure **12** is disposed in the center compartment of the housing and is supported on a pair of frames **38** (only one being shown in FIG. 1) which are secured to the base **14** by suitable means such as screws **40**. The operating mechanism comprises a forked operating lever **42**, a toggle comprising links **44** and **46**, overcenter springs **48**, and a pivoted releasable cradle **50**. An arcuate insulating shield **52** is mounted over the operating end of the operating lever **42** and is provided with an integral switch handle **54**. The shield **52** is mounted on an intermediate portion **56** of the operating lever **42** and is secured in place by suitable means such as screws **58** attached to the levers **42**, only one of which is shown in FIG. 1.

The toggle links **44** and **46** are pivotally connected together by a knee pivot pin **60**. The toggle link **44** is pivotally connected by a pivot pin **62** to the cradle **50** and the toggle link **46** is pivotally connected to the switch arm **30** for the center pole by a pivot pin **64**. The overcenter springs **48** are connected under tension between the knee pivot pin **60** and the outer end of the operating lever **42** at pivot pins **66**.

The switch structure for circuit breaker **12** is operated to the open position by manipulation of the handle **54** in a clockwise direction to the "off" position, actuating the overcenter springs **48** to cause collapse of the toggle links **44** and **46** and opening movement of the switch arms **30** for all of the poles of the switch in a well known manner.

As set forth above the switch structure **12** is mounted within an enclosure **16** having an openable cover **18**. In order to manually operate the switch structure **12** while the cover is closed, an external handle mechanism, gen-

erally indicated at **68**, is provided and comprises a handle **70** and a switch actuator **72**. The handle **70** is secured to the switch actuator **72** by a pair of spaced screws **74** which extend through an opening **76** in the cover **18**. The handle is rotatable between "on" and "off" positions of the switch and a stop pin **78** limits movement of the handle between those positions.

As shown in FIGS. **1** and **2**, the actuator **72** comprises a planar portion **80** and a pair of integral arms **82** and **84** which arms are spaced inwardly toward the switch from the planar portion **80**. The planar portion **80** includes a pair of similar spaced notches **86** and **88** which cooperate with the stop pin **78** for limiting clockwise and counterclockwise rotation of the handle **70**. As viewed in FIG. **2** clockwise rotation of the handle **70** from the "on" to the "off" position rotates the switch actuator **72** in the same direction. During this movement of the actuator **72** the left arm **82** engages and moves the switch handle **54** in a clockwise direction from the switch "on" to the switch "off" position to effect opening of the switch contact. Conversely, movement of the handle **70** (FIG. **2**) counterclockwise from the "off" to the "on" position reverses the direction of movement of the parts just described and moves the actuator **72** toward the left to the "on" position. This causes the right arm **82** to engage and move the switch handle **54** counterclockwise to the "on" position to close the switch contacts **20** and **22**.

Locking means may be provided to prevent opening of the cover **18** in all positions of the handle **70** except when the handle is moved from the "off" position to the "open cover" position. An "open cover" position is located between the "on" and "off" positions. To effect opening of the cover the handle is normally moved from the "on" to the "off" position in order to open the contacts after which the handle **70** is moved to the "open cover" position. The locking means comprises a bar **90** which is slidably mounted in a U-shaped mounting bracket **92** which is attached in a suitable manner to the inner surface of the cover **18**. As viewed in FIG. **2** the lower end of the bar **90** is adapted to engage under a locking bracket **94** which is secured to the inside wall of the enclosure **16**. A coil spring **96** is disposed between the mounting bracket **92** and the bar **90** to hold the bar normally in the position of engagement with the bracket **94**. The upper end of the bar **90** includes an in-turned end portion **98** which is positioned below the switch actuator **72** so that when the actuator is rotated clockwise a down-turned member **100** of the actuator engages and moves the end portion **98** upwardly to a broken-line position **98*a***, thereby disengaging the lower end portion of the bar **90** from locking engagement with the bracket **94**. When a handle **70** is subsequently rotated counterclockwise, the spring **96** returns the bar **90** to the lock position as shown in FIG. **2**.

If an excessive overcurrent or a short-circuit current occurs while the switch is standing closed, the contacts **20** and **22** may stick or weld closed. In that situation movement of the switch handle **54** by the handle **70** to the "open cover" or "off" positions is resisted by the overcenter springs **48** and upon its release the handle **70** is spring-biased to the "on" position. More particularly, movement of the handle **54** to the "off" position causes the overcenter springs **48** to move the toggle **44 – 46** only slightly overcenter in the opening direction but collapse of the toggle is prevented by the pivot pin **64** being held in the position shown in FIG. **1** by the welded contacts. As a result the handle **54** is spring-biased in a counterclockwise direction and is therefore held against the left arm **82** as shown by the dashed line positions **54*a*** of the handle in FIG. **1**.

With prior-known constructions of the handle **54** it was possible to open the cover **18** notwithstanding the contacts **20** and **22** being welded together simply by rotating the handle to the "open cover" position and manually pulling the cover from its closed position on the enclosure **16** as shown in FIG. **1**, whereupon the arms **82** and **84** would move with the cover in the direction of the arrow **102** without resistance from the handle **54**. As shown in FIGS. **1** and **2** in accordance with this invention the handle **54** is provided with means for preventing opening of the cover which means include a knob or projection **104**. The projection **104** is on the side of the handle **54** facing the "on" position of the switch handle so that in the event that the cover **18** is manually opened when the contacts **20** and **22** are welded closed, movement of the left arm **82** of the actuator in the direction of the arrow **102** is prevented when the arm comes into contact with the projection due to the handle **54** being spring biased in the counterclockwise direction.

Where under ordinary conditions the contacts **20** and **22** are openable, the contact arm **28** moves to the broken-line position shown in FIG. **1** and the handle **54** is movable to the dot-dash position **54*b*** by manipulating the handle **70** to the "open cover" position, whereby the projection **104** is out of alignment with the arm **82** when the cover **18** is opened.

As shown in FIG. **2** the arms **82** and **84** are provided with oppositely disposed rounded portions **82*a*** and **84*a*** to minimize friction between the arms and the handle **54** when in contact with each other. More particularly, the rounded portions **82*a*** and **84*a*** provided for point contacts with opposite sides of the handle **54**, thereby minimizing friction between the arms and the handle. Manifestly, the spacing or clearance between the rounded portions **82*a*** and **84*a*** is slightly greater than the total width of the handle **54** and the projection **104**.

Accordingly, the cover interlock satisfied or overcomes problems inherent in some prior art structures of enclosed circuit breakers and provides a needed safety device in a simple and inexpensive manner.

What is claimed is:

1. A switch device for controlling an electric circuit comprising a switch structure and an enclosure therefor, said switch structure comprising a stationary contact and a movable contact, a movable switch arm having said movable contact thereon, operating mechanism for said switch arm and comprising an operating lever and a switch handle thereon for manually moving said operating lever, an over-center toggle operable by said operating lever to effect movement of said switch arm to opened and closed circuit positions, said enclosure comprising an openable cover, a second handle on the external side of said cover and having first means comprising a rotatable member for engaging and operating said switch handle, said means disengaging said switch handle when said cover is opened, said second handle being movable between "on" and "off" positions to operate said contacts between closed and opened positions, said second handle being biased to said "on" position by said over-center toggle if said contacts fail to open when said second handle is moved

to said "off" position, and said switch handle having second means comprising a projection engageable with said rotatable member for preventing opening of said cover if said contacts fail to open when said second handle is moved to said "off" position.

2. The switch device of claim 1 in which said projection is on said side of said switch handle facing said "on" position of said switch handle.

3. The switch device of claim 2 in which said rotatable member comprises a strike surface, said projection is disposed on the side of said switch handle adjacent to said strike surface and said projection is disposed in the path of movement of said strike surface when said cover is opened and when said contacts fail to open when said second handle is moved to said "off" position.

4. The switch device of claim 3 in which said rotatable member comprises aperture means through which said switch handle extends, and said strike surface defines one side of said aperture means.

5. The switch device of claim 4 in which said rotatable member also comprises a second strike surface engageable with said switch handle for moving said handle to said "on" position.

6. The switch device of claim 4 in which said rotatable member comprises two arm portions defining a notch into which said switch handle extends and in which one arm portion comprises said strike surface and said other arm portion comprises a second strike surface and said strike surfaces being engageable with opposite sides of said switch handle for moving said switch handle between said "on" and "off" positions.

7. The switch device of claim 1 in which said rotatable member has opposed strike surfaces forming an aperture, said switch handle extending into said aperture when said cover is closed, said switch handle including a projection facing said "on" position, said handle being biased to said "on" position if said contacts fail to open when said second handle is moved to said "off" position, and said projection being located in the path of movement of said strike surface on said "on" side of said handle when said cover is opened.

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