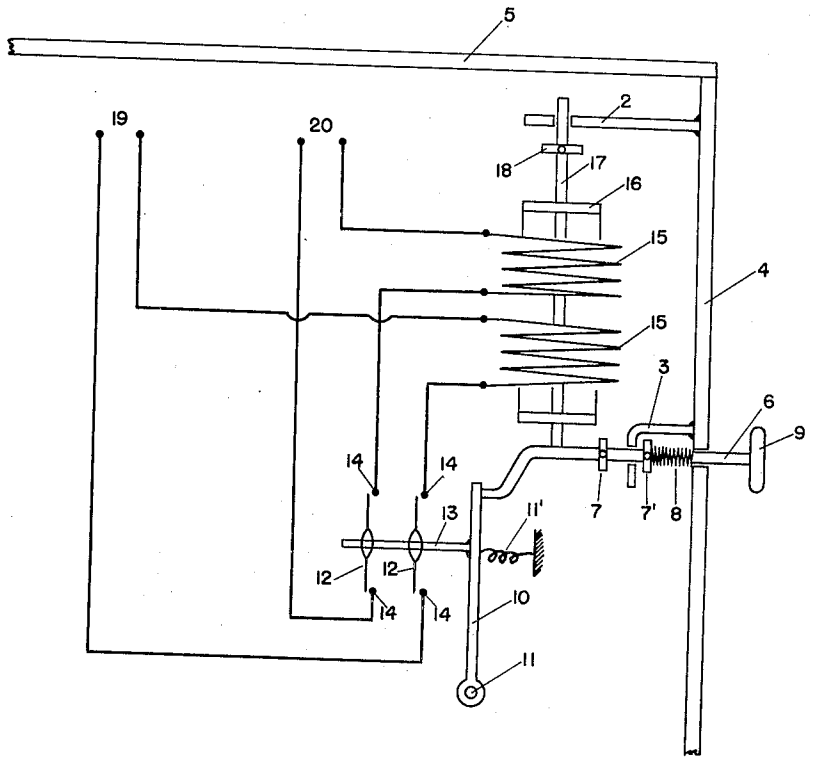
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ELECTRIC DOOR LOCK

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## ELECTRIC DOOR LOCK

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This invention relates generally to protective systems and particularly to an improved protective system for use in connection with high voltage electrical apparatus to prevent a person from obtaining access to such apparatus as long as it is subject to high voltage conditions.

It is frequently desirable to surround electrical apparatus subjected to high voltage with a protective enclosure with suitable access openings therein for inspection, adjustment or repair, such access openings provided with doors or covers. Protective devices to prevent persons from obtaining access to such apparatus through the access openings in their protective enclosures are of two types: first, those devices which effect interruption of the circuits supplying the dangerous voltage in the event the access door is opened; second, those devices which prevent the access door from being opened as long as the apparatus within is subjected to the high voltage. An object of my invention is to provide an improved device which falls within the latter class.

With the above and other objects in view, the invention consists in the construction, combination and arrangement of parts as will be hereinafter more fully described.

My invention will be described in connection with the accompanying drawing, Fig. 1, which is a side elevation view showing my device applied to an access door of such a protective enclosure.

Referring to the drawing, a latch 2 and a handle guide and stop 3 are rigidly attached by welding or otherwise to swinging door 4 of protective enclosure 5. Door 4 is shown in its fully closed position. Door operating handle 6 extends horizontally through door 4 and is slidably supported and guided thereby and by handle guide and stop 3. The inner end of door operating handle 6 is curved downward and terminates in an integral short horizontal extension. Two stop collars 7 and 7' are rigidly attached to door operating handle 6, one on either side of handle guide and stop 3, to limit the horizontal travel of the door operating handle.

A spiral spring 8 is held in place around door operating handle 6 between stop collar 7' and door 4 and acts to hold stop collar 7' against handle guide and stop 3 and door operating handle 6 in its innermost position. A knob 9 is rigidly attached to door operating handle 6 at its outer end.

An interlock lever 10 is rotatably pivoted at 11 on an extension from enclosure 5 and is held by spring 11' against the inner end of door operating handle 6. A horizontal extension 13 from interlock lever 10 supports one or more bridging contacts 12, one for each individual high voltage circuit to the apparatus (not shown) contained within the enclosure 5. A pair of fixed contacts 14 for each individual high voltage circuit is disposed adjacent to each bridging contact 5 such that when door 4 is fully closed and door operating handle 6 released (as in Fig. 1) the circuit between the contacts 14 is open; but when door operating handle 6 is pulled outward through a part of its horizontal travel, or when door 4 is not fully closed, each bridging contact 12 closes the circuit between its pair of contacts 14. Each pair of contacts 14 is connected in series with a solenoid coil 15 and across one of the high voltage circuits 19, 20 to the electrical apparatus within the enclosure. All solenoid coils 15 are wound on the same solenoid frame and plunger guide 16. A solenoid locking plunger 17 is disposed within the core of solenoid frame and plunger guide 16 and its lower end rests upon door operating handle 6 when door 4 is fully closed. A collar 18 is rigidly secured to solenoid locking plunger 17 to limit its downward travel. Latch 2 is drilled to receive the upper end of solenoid locking plunger 17. Solenoid frame and plunger guide 16 is rigidly secured to enclosure 5.

In Fig. 1, my invention is shown applied to the door of a protective enclosure containing electrical apparatus connected to two single phase high voltage sources 19 and 20. It is apparent that this invention is applicable to the door of a protective enclosure containing electrical apparatus connected to a plurality of multiphase circuits by the use of a suitable number of contacts 13, 14 and solenoid coils 15.

When door 4 of enclosure 5 is in its fully closed position, solenoid locking plunger 17 rests upon door operating handle 6 and the upper end engages the drilled opening in latch 2, attached to door 4. The inner end of door operating handle 6 bears against interlock lever 10 and thus holds bridging contacts 12 away from fixed contacts 14. Since solenoid frame and plunger guide 16 is rigidly secured to enclosure 5, door 4 is mechanically locked closed as long as solenoid locking plunger 17 engages latch 2.

When access is desired inside enclosure 5 through door 4, knob 9 at the outer end of door operating handle 6 is grasped and pulled. This causes door operating handle 6 to slidably move outward, compressing spring 8. Lever 10, actuated by spring 11', follows door operating handle

6 until each bridging contact 12 bridges its own pair of fixed contacts 14. This occurs when door operating handle 6 has moved through only a portion of its outward travel and while solenoid locking plunger is still in engagement with latch 2. When the circuit between each pair of contacts 14 is closed, solenoids 15 are energized, provided the high voltage circuits 19, 20 to the electrical apparatus within the enclosure are energized. If any one of these high voltage circuits 19, 20 is energized, the particular solenoid 15 connected therewith is energized and magnetically holds solenoid locking plunger in place in engagement with latch 2. As door operating handle 6 is pulled further outward, its inner downward curving portion is moved under solenoid locking plunger 17 and, provided none of the high voltage circuits 19, 20 to the electrical apparatus within the enclosure 5 is energized, solenoid operating plunger 17, actuated by gravity, follows the downward curving portion of door operating handle 6, until collar 18 bears against the upper edge of solenoid frame and plunger guide 16 when solenoid locking plunger 17 is disengaged from latch 2 and door 4 can be opened.

Door 4 can be pushed closed when access is no longer desired to the interior of enclosure 5 through it. As door 4 nears its fully closed position, the downward curving portion of door operating handle 6 engages the lower end of solenoid locking plunger 17 and forces it upward. But solenoid locking plunger cannot engage latch 2 until the opening in the latch is directly above it, so that upper end of solenoid locking plunger 17 rides against the lower edge of latch 2 as door 4 is pushed further toward its fully closed position, and its lower end, acting against the inclined, curved portion of door operating handle 6, forces the latter outward, compressing spring 8. When door 4 reaches its fully closed position, the opening in latch 2 is directly above solenoid locking plunger 17 which springs upward in the opening under the action of spring 8. This upward movement of solenoid locking plunger 17 permits spring 8 to return door operating handle 6 to its normal position where its inner end, acting against interlocking lever 10, forces the latter counter-clockwise, breaking the circuits at contact 14. Spring 8 is considerably stronger than spring 11', and is easily able to force locking plunger 17 in engagement with latch 2 when door 4 is closed.

It will be noted that if one or more of the high voltage circuits to the apparatus within enclosure 5 is energized, solenoid locking plunger will be held in engagement with latch 2, and door 4 cannot be opened. An important feature of this device is that solenoid coils 15 are normally not energized, and that a particular solenoid coil is energized only when an attempt is made to open the door 4 by pulling door operating handle 6 when power is on the high voltage circuit to the apparatus to which that particular solenoid coil is connected. This important feature has the advantages of preventing solenoid burnouts due to continuous use, eliminating hum and reducing power requirements to the solenoids.

It will be understood that the above description and accompanying drawing comprehend only the general and preferred embodiment of the invention, and that various other changes in the construction, proportion and arrangement of the parts may be made by those skilled in the art without departing from the nature and scope of the invention as defined in the appended claims.

The invention described herein may be manufactured and/or used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What I claim is:

1. In combination, an enclosure having a door therein, electrical apparatus subject to high voltage within said enclosure, a latch member for said door, a locking plunger member operable to lock said door in closed position by engagement with said latch member, an electrical retaining means operable to maintain said locking plunger member in engagement with said latch member, means including a switch means for energizing said retaining means from said high voltage, a door operating handle, said locking plunger member and said switch means being responsive to said door operating handle, said switch means being operable to close the circuit to said retaining means upon initial movement of said door operating handle toward unlocking position, whereby said door is held closed when an attempt is made to open said door by operating said door operating handle while said high voltage is applied to said apparatus.

2. In combination, an enclosure having a door therein, electrical apparatus subject to high voltage within said enclosure, a latch member for said door, a locking plunger member operable to lock said door in closed position by engagement with said latch member, an electrical retaining means operable to maintain said locking plunger member in engagement with said latch member, means including a switch means for energizing said retaining means from said high voltage, a door operating handle, said locking plunger member and said switch means being responsive to said door operating handle, said switch means being operable to close the circuit to said retaining means upon initial movement of said door operating handle toward unlocking position.

3. In combination, an enclosure having a door therein, electrical apparatus subject to high voltage within said enclosure, a latch member for said door, a locking plunger member operable to lock said door in closed position by engagement with said latch member, a normally de-energized electrical retaining means operable to maintain said locking plunger member in engagement with said latch member, means including a switch means for energizing said retaining means from said high voltage, a door operating handle, said locking plunger member and said switch means being responsive to said door operating handle, said switch means being operable to close the circuit to said retaining means upon initial movement of said door operating handle toward unlocking position, whereby said door is held closed when an attempt is made to open said door by operating said door operating handle while said high voltage is applied to said apparatus.

4. In combination, an enclosure having a door therein, electrical apparatus subject to high voltage within said enclosure, means for locking said door in closed position, an electrical retaintain means operable to maintain said locking means in locking position, means including a switch means for energizing said retaining means from said high voltage, and a door operating

handle, said locking means and said switch means being responsive to said door operating handle, said switch means being operable to close the circuit to said retaining means upon initial movement of said door operating handle toward unlocking position, whereby said door is held closed when an attempt is made to open said door by operating said door operating handle while said high voltage is applied to said apparatus.

5. In combination, an enclosure having a door therein, electrical apparatus subject to high voltage within said enclosure, means for locking said door in closed position, an electrical retaining means operable to maintain said locking means in locking position, means including a switch means for energizing said retaining means from said high voltage, and a door operating handle, said locking means and said switch means being responsive to said door operating handle, said switch means being operable to close the circuit to said retaining means upon initial movement of said door operating handle toward unlocking position.

6. In combination, an enclosure having a door therein, electrical apparatus subject to high voltage within said enclosure, means for locking said door in closed position, a normally de-energized electrical retaining means operable to maintain said locking means in locking position, means including a switch means for energizing said retaining means from said high voltage, and a door operating handle, said locking means and said switch means being responsive to said door operating handle, said switch means being operable to close the circuit to said retaining means upon initial movement of said door operating handle toward unlocking position, whereby said door is held closed when an attempt is made to open said door by operating said door operating handle while said high voltage is applied to said apparatus.

7. In combination, an enclosure having a door therein, electrical apparatus subject to high voltage within said enclosure, means for locking said door in closed position, a normally de-energized electrical retaining means responsive to said high voltage for holding said door locking means in locking position and said door locked closed when an attempt is made to open said door by initial movement of said locking means toward unlocking position while said high voltage is applied to said apparatus.

8. In combination, an enclosure having a door therein, electrical apparatus subject to high voltage within said enclosure, means for locking said door in closed position, an electrical retaining means responsive to said high voltage for holding said door locking means in locking position and said door locked closed when an attempt is made to open said door by initial movement of said locking means toward unlocking position while said high voltage is applied to said apparatus.

9. In combination, an enclosure having a door therein, electrical apparatus subject to high voltage within said enclosure, means including a door operating means for locking said door in closed position, electrical retaining means for maintaining said locking means in locking position, and means responsive to movement of said door operating means for energizing said retaining means from said high voltage, whereby said door is held locked closed when an attempt is made to open said door by moving said locking means toward unlocking position while said high voltage is applied to said apparatus.

10. In combination, an enclosure having a door therein, electrical apparatus subject to high voltage within said enclosure, means including a door operating means for locking said door in closed position, a normally de-energized electrical retaining means for maintaining said locking means in locking position, and means responsive to movement of said door operating means for energizing said retaining means from said high voltage, whereby said door is held locked closed when an attempt is made to open said door by moving said locking means toward unlocking position while said high voltage is applied to said apparatus.

11. In combination, an enclosure having a door therein, electrical apparatus contained within said enclosure, said electrical apparatus generally having a high voltage applied thereto, a locking means including a door operating means for said door, an electro-magnetic retaining means for keeping said locking means engaged and said door lock closed, and means including a switch means for energizing said retaining means from said high voltage, said switch means being closed and said retaining means being energized only when an attempt is made to open said door by initial movement of said door operating means toward unlocking position while said high voltage is applied to said apparatus.

12. In combination, an enclosure having a door therein, electrical apparatus contained within said enclosure, said electrical apparatus generally having a high voltage applied thereto, a locking means for said door, an electro-magnetic retaining means for keeping said locking means engaged and said door lock closed, and means including a switch means for energizing said retaining means from said high voltage, said switch means being closed and said retaining means being energized only when an attempt is made to open said door by initial movement of said locking means toward unlocking position while said high voltage is applied to said apparatus.

13. In combination, an enclosure having a door therein, electrical apparatus contained within said enclosure, said electrical apparatus generally having a high voltage applied thereto, an electro-magnetic means for keeping said door lock closed while said high voltage is applied to said apparatus, and means including a switch means for energizing said electro-magnetic means from said high voltage, said switch means being closed and said electro-magnetic means being energized only when an attempt is made to open said door while said high voltage is applied to said apparatus.

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