United States Patent

Meermans

[15] **3,655,926**

[45] **Apr. 11, 1972**

[54] SAFETY MECHANISM FOR HIGH VOLTAGE CABINETS

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[22] Filed: **Mar. 29, 1971**

[21] Appl. No.: **129,046**

[52] **U.S. Cl.** .....**200/50 A,** 200/61.62, 219/10.55

[51] **Int. Cl.** **H01h 9/20**

[58] **Field of Search**.....200/50 AA, 50 R, 50 A, 50 B, 200/50 C, 61.62; 219/10.55

[56] **References Cited**

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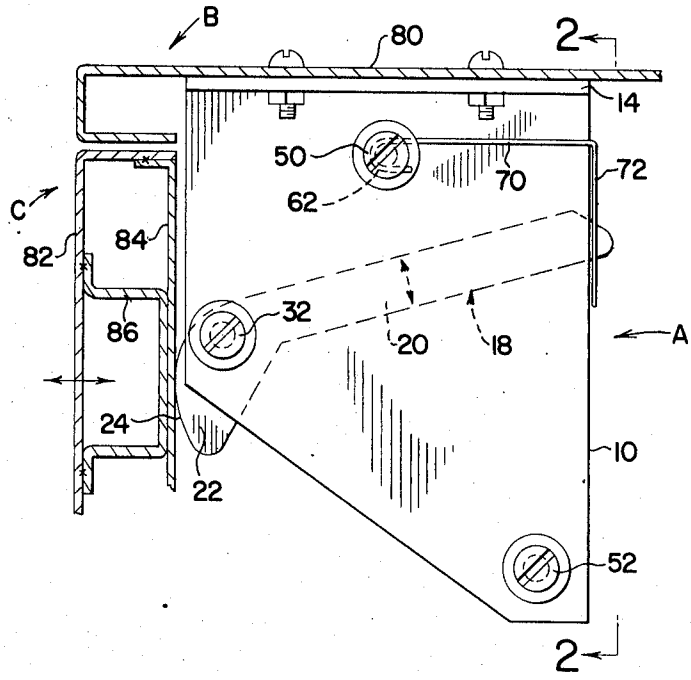
868,348 10/1907 Kramer.....200/61.62

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Assistant Examiner—M. Ginsburg
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[57] **ABSTRACT**

A safety mechanism for a high voltage source cabinet wherein the mechanism has a first position which renders the high voltage source inoperative when a cabinet access door is open and a second position which renders the high voltage source operative when the access door is closed. The mechanism further includes a third position which permits the high voltage source to be manually placed in an operative condition when the access door is open. The latch includes retaining means which are automatically released when the access door is again closed.

13 Claims, 9 Drawing Figures



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2 Sheets-Sheet 1

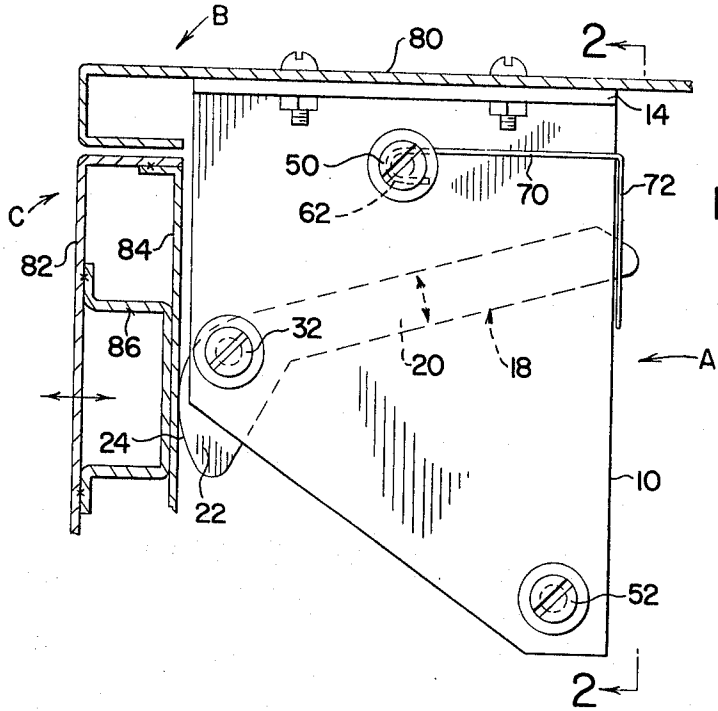


FIG. 1

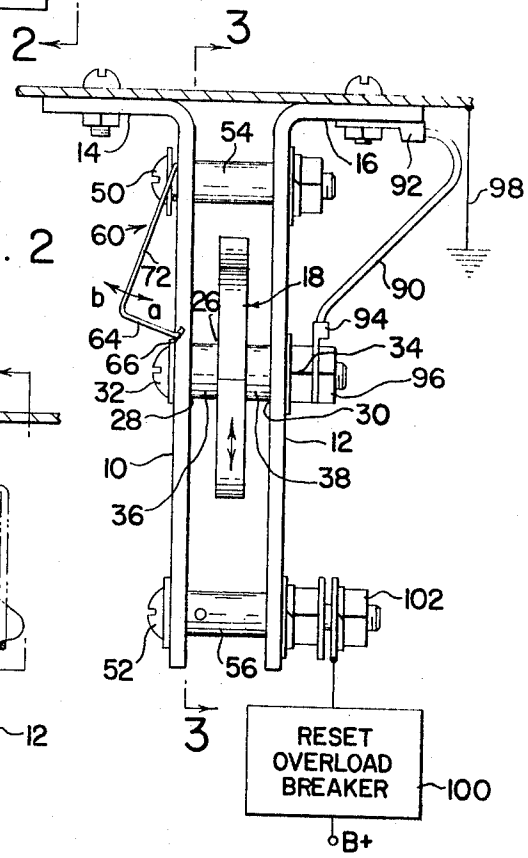


FIG. 2

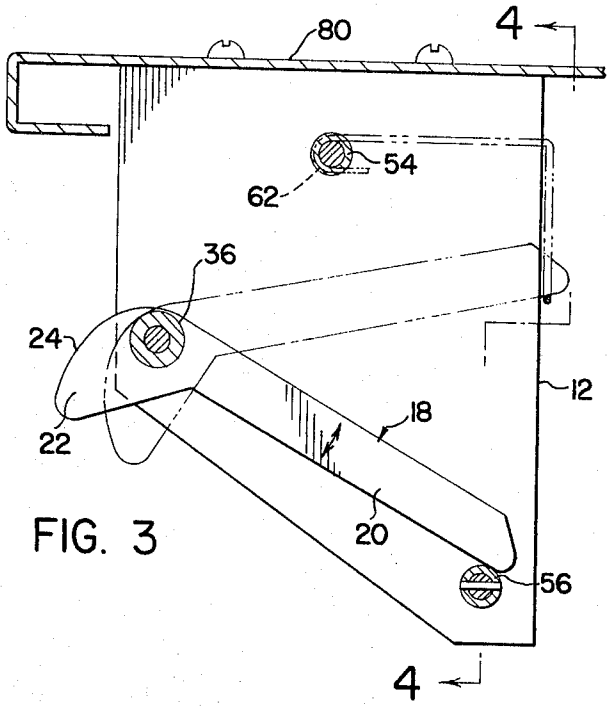


FIG. 3

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FIG. 4

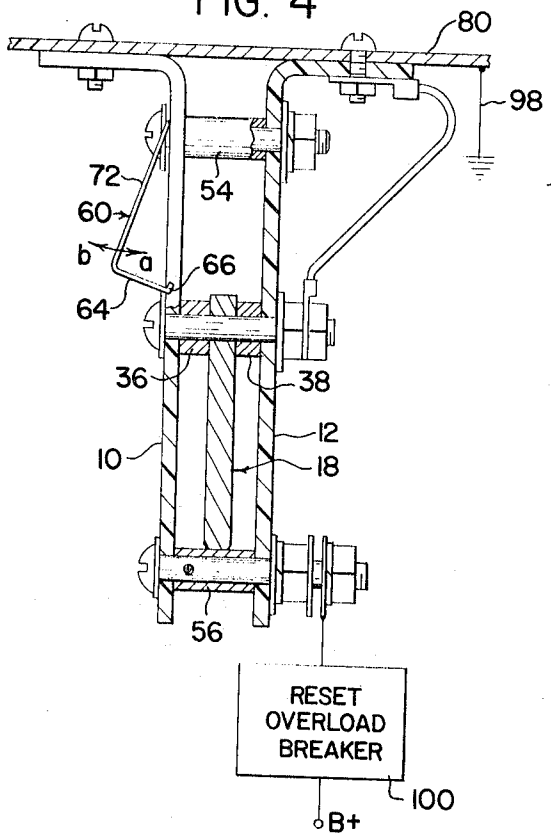


FIG. 5

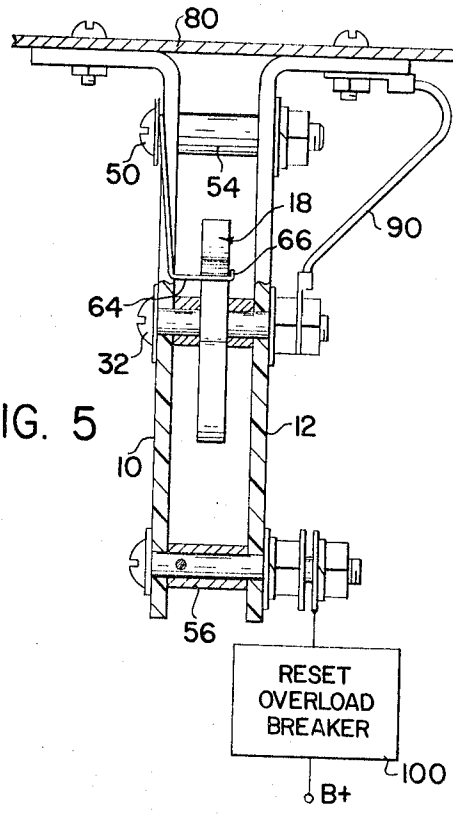


FIG. 6

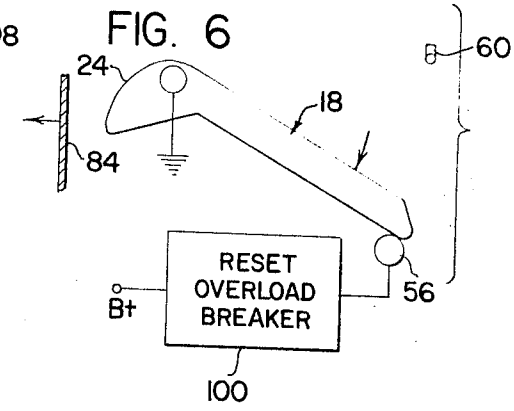


FIG. 7

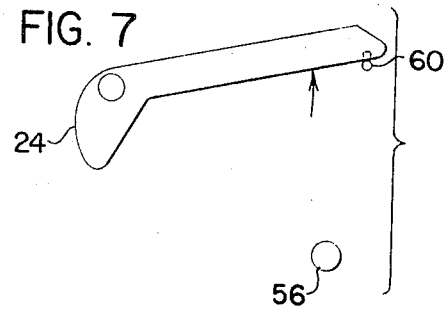


FIG. 8

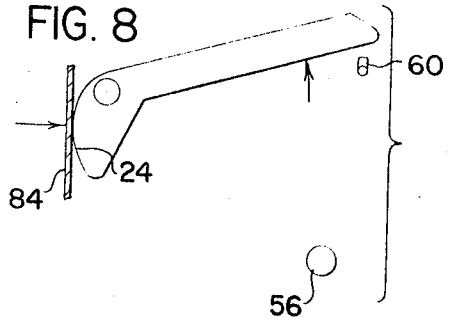
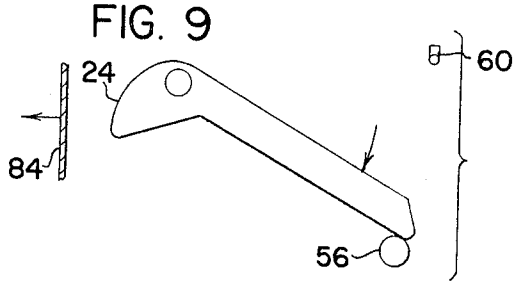


FIG. 9



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SAFETY MECHANISM FOR HIGH VOLTAGE CABINETS

This application pertains to the art of safety devices for high voltage sources and more particularly to a new safety mechanism for high voltage source cabinets.

The invention is particularly applicable for use on the enclosing cabinet of a high voltage oscillator of the type used in induction heating installations, and will be described with particular reference thereto; however, it will be appreciated that the invention has broader applications and may be used in other cabinets where it is desirous of maintaining a particular operative condition for a piece of equipment enclosed in the cabinet.

Previously used safety devices for high voltage induction heating oscillators have primarily comprised a limit switch which was located adjacent a cabinet access door and actuated thereby. When the access door was closed, the switch was activated so as to permit the oscillator to be placed in an operative condition. When the access door to the oscillator was opened, the switch head was moved to a second position whereby the oscillator was placed in an inoperative condition. Oftentimes, however, it was advantageous to gain access to the oscillator through the access door in order to perform maintenance work thereon and yet have the oscillator remain in the operative condition. As the previously used limit switches had only two positions, it was necessary for maintenance personnel to temporarily place the switch in a position so that the oscillator could become operative when the access door was opened. This necessitated, for example, taping the switch head in the desired position or temporarily wedging the switch head to the desired position. Following the maintenance work, it was then necessary to remove the tape or wedge to again place the switch in a condition whereby it could again properly perform its function. This process necessarily added inconvenience to any required maintenance work and, further, if the maintenance personnel inadvertently forgot to remove the tape or wedge, the switch would be rendered useless for its intended purpose.

The present invention contemplates a new and improved mechanical door safety mechanism for high voltage source cabinets which overcomes all of the above referred problems and others and provides safety mechanism which is simple to use and economical to manufacture.

In accordance with the present invention, there is provided a mechanical safety mechanism for a source of high voltage enclosed in a cabinet having at least one access door movable between a first closed position and a second opened position for access to the source of high voltage. The mechanism includes a member automatically movable between a first position when the access door is in the closed position and a second position when the access door is in the opened position. When in the second position, the member engages means for activating de-energizing means for the source of high voltage, which then merely must be reset when the safety member is moved to the first position as the access door is again closed. The safety mechanism also includes releasable means for providing a third position for the member to permit the source of high voltage to be energized when the access door is in the opened position.

In accordance with a limited aspect of the present invention, the releasable means are automatically moved to a non-engaging position relative to the member when the member is moved by the access door from the third position towards the first or second position.

The principal object of the present invention is the provision of a new and improved safety mechanism for a high voltage source cabinet which automatically places the high voltage source in an inoperative condition when the cabinet door is opened.

Another object of the present invention is the provision of a new and improved safety mechanism for a high voltage source cabinet which permits the high voltage source to be temporarily placed in an operative condition after the cabinet door is opened.

Another object of the present invention is the provision of a new and improved safety mechanism for a high voltage source cabinet which is automatically released from a position wherein the high voltage source is placed in an operative condition with the cabinet door open to its normal operative position when the cabinet door is closed.

Another object of the present invention is the provision of a new and improved safety mechanism for a high voltage source cabinet which is simple to use and economical to manufacture.

The invention may take physical form in certain parts and arrangements of parts, a preferred embodiment of which will be described in detail in this specification and illustrated in the accompanying drawings which form a part hereof and wherein:

FIG. **1** is a side elevation view of the safety mechanism of the subject invention;

FIG. **2** is an end view of the safety mechanism in FIG. **1** in the direction of lines **2—2**;

FIG. **3** is a cross sectional view of the safety mechanism shown in FIG. **2** taken along lines **3—3**;

FIG. **4** is a cross sectional view of the safety mechanism shown in FIG. **3** taken along lines **4—4** with the arm member shown in its normal position when the cabinet access door is open;

FIG. **5** is a cross sectional view identical to that in FIG. **4** showing the arm member in its third position;

FIG. **6** is a schematic view of the normal position of the arm member when the cabinet access door is opened;

FIG. **7** is a schematic view of the arm member when placed in its third position;

FIG. **8** is a schematic view of the normal position of the arm member when the cabinet access door is closed; and,

FIG. **9** is a schematic view showing the arm member returning to its initial normal position when the cabinet access door is again opened.

Referring now to the drawings wherein the showings are for the purposes of illustrating the preferred embodiments of the invention only and not for purposes of limiting same, the FIGURES show safety mechanism A mounted on the inside of a cabinet structure B in a working relationship with a cabinet access door C.

Referring specifically to FIGS. **1** and **2**, safety mechanism A is comprised of two parallel spaced apart side plates **10**, **12** having outwardly extending flange areas **14,16** respectively. An arm member generally designated **18** constructed from an electrically conductive material includes a body portion **20**, cam end portion **22** and cam surface **24**. The arm member includes a mount hole **26** extending transversely therethrough and side plates **10,12** include mounting holes **28,30** respectively therethrough. Holes **26,28** and **30** may comprise for example drilled holes. An elongated bolt **32** extending through these holes locate the arm member relative to side plates **10,12** for pivotal movement relative thereto. A nut **34** is threadably received on bolt **32** to retain the components in position. Further, a spacer element **36** is received on the body portion of bolt **32** and is spaced between arm member **18** and the inside of plate **10**. Similarly positioned between the inside wall of plate **12** and arm member **18** is spacer element **38**. These spacers may be made from any material suitable for such spacer use and could for example comprise nylon sleeves.

To further locate plates **10,12** relative to each other and provide stability for the mechanism, bolts **50,52**, similar to bolt **32**, are utilized. Similarly, spacers **54,56**, received on bolts **50,52** respectively, extend between the inside walls of plates **10,12**. Again, standard nuts may be threadably received on bolts **50,52** in order to retain them in position. It should be here noted that sleeve **56** is to be constructed from an electrically conductive material for reasons which will hereinafter become apparent.

A latch spring element generally designated **60** is mounted relative to the safety mechanism by use of mounting area **62**

received between the head of bolt **50** and the outside of plate **10**. Latch spring element **60** may be comprised of any resilient material which may be shaped to provide the required spring action, and in the preferred embodiment, is formed from a resilient spring steel. Mounting area **62** comprises a generally semi-circular area of sufficient dimension so as to be received around the body portion of bolt **50**. The latch spring element includes a safety arm engaging portion **64** and a safety latch arm engaging tip **66** as best shown in FIG. **2**. Also, and as best shown in FIG. **1**, the latch spring element includes a leg **70** extending generally outwardly from mounting area **62** and a leg **72** extending generally downwardly along the end of the safety mechanism and outwardly from side plate **10** to arm engaging portion **64**. FIGS. **2** and **4** best show latch spring element **60** in its normal non-engaging position.

The above described safety mechanism may be mounted by any convenient means to, for example, an inside wall **80** of cabinet structure C. In the preferred embodiment, standard nuts and bolts are utilized which merely pass through wall **80** and flange areas **14,16** in a known fashion. It will be appreciated by those skilled in the art that elongated slots could also be provided in flange areas **14,16** to permit adjustment of the safety device relative to wall **80** for the proper desired engagement with cabinet access door C. Cabinet access door C includes outer door **82**, inner door **84** and reinforcement member **86**, it being understood that this arrangement is merely exemplary of one type of door design which may be encountered in cabinets which are used to house high voltage sources.

A ground wire **90** is maintained by a clip **92** in engagement with the connecting means between flange **16** and wall **80** and by clip **94** between nut **34** and a second nut **96** received on bolt **32**. Wall **80** is then electrically grounded as generally designated **98**. A reset overload breaker generally designated **100** is electrically connected to bolt **52** and secured relative thereto between the first standard nut and a second nut **102**. Reset overload breaker **100** may be one of several known types which will de-energize an electrical circuit when the circuit is shorted out. In the preferred embodiment, the reset overload breaker is also manually resettable.

Assuming for illustrative purposes only, that the safety device of the subject application has been installed on the inside of a high voltage oscillator, the operation of the mechanism may now be explained. In FIG. **1**, and with cabinet access door C in the closed position, inner door **84** coacts with cam surface **24** of cam end portion **22** to pivotally raise body portion **20** of arm member **18** from contact with spacer **56**. In this position, the oscillator circuit is in an operative condition so that the oscillator is permitted to operate in its normal fashion. Again, in this position, latch spring element **60** is in the non-engaging position best shown in FIGS. **2** and **4** disposed outwardly from side plate **10**. As cabinet access door C is moved to the opened position, inner door **84** is removed from its coaction with cam surface **24** such that arm member **18** is permitted to pivot downwardly by its own weight until body portion **20** rests against spacer **56**. In this position, arm member **18**, through its contact with the spacer shorts out the oscillator circuit through reset overload breaker **100** so that the oscillator is thus rendered inoperative. This action effectively prevents bodily harm or electrocution to anyone entering the cabinet while it is in an operative condition. This is extremely desirous in that the high voltage oscillator for which the subject safety mechanism is particularly employed ranges anywhere from 0 to 18,000 volts. With cabinet access door C in the opened position, maintenance personnel may often be desirous of performing various maintenance operations on the oscillator where it is required that the oscillator be temporarily placed in an operative condition. Without reclosing the door, or in the alternative, without temporarily moving and holding arm member **18** from contact with spacer **56**, it is impossible to place the oscillator in an operative condition. With the subject safety mechanism, however, this problem is overcome by manually raising arm member **18** to such a height that latch arm spring element **60** may be moved in the direction *a* of FIGS. **2** and **4** until arm engaging portion **64** and arm engaging tip **66** are in the engaging position as best shown in FIG. **5**. Arm member **18** may then be lowered so that tip **66** prevents latch arm spring element **60** from returning to its initial position. The above described two steps are schematically shown in FIGS. **6** and **7**. With the arm member in the position shown in FIG. **7**, reset overload breaker **100** may be manually reset in order that the oscillator may be placed in an operative condition while maintenance work is being performed.

Assuming now that the maintenance work has been completed and it is desirous to place the safety mechanism in its normal operative condition, it is merely necessary to reclose cabinet access door C so that inner door **84** again coacts with cam surface **24**. As best shown in FIG. **8**, this coaction causes arm member **18** to move in an upwardly direction away from engagement with arm engaging portion **64** and arm engaging tip **66**. As latch arm spring element **60** is biased to return to its initial or non-engaging position when arm member **18** is raised, spring element **60** will automatically move in direction *b* as shown in FIGS. **2** and **4**. In this condition, the safety mechanism again allows the oscillator to be placed in an operative condition. Should cabinet access door C again be opened as schematically shown in FIG. **9**, inner door **84** will be removed from coaction with cam surface **24** such that arm member **18** is permitted to again contact spacer **56** so that reset overload breaker **100** will place the oscillator in an inoperative condition.

The above process may be repeated as often as it is required to gain access to the oscillator and have it remain operative. Further, it will also be understood that a number of the above described safety mechanisms may be employed such that each access door of the cabinet may be protected in the manner hereinabove described.

The invention has been described with reference to a preferred embodiment. Obviously, modifications and alterations will occur to others upon the reading and understanding of this specification. It is my intention to include all such modification and alterations insofar as they come within the scope of the appended claims or the equivalents thereof.

Having thus described my invention, I now claim:

1. A mechanical safety mechanism for a supply of high voltage enclosed in a cabinet having at least one access door member movable between a first closed position and a second opened position for access to said supply of high voltage, said safety mechanism comprising:

a safety member movable between a first position for permitting said supply of high voltage to be placed in an operative condition and a second position for permitting said supply of high voltage to be placed in an inoperative condition;

means for moving said safety member between said first and second positions;

releasable means for establishing and releasably maintaining said safety member in a third position for permitting said supply of high voltage to be placed in an operative condition when said safety mechanism is in said cabinet with said access door member in said second position; and,

means including said safety member for de-energizing said supply of high voltage when said safety member is in said second position.

2. The safety mechanism as defined in claim **1** wherein said safety member includes a surface for engagement with said access door member.

3. The safety mechanism as defined in claim **1** wherein said releasable means includes means for engaging said member, said releasable means having a first non-engaging position and a second engaging position relative to said member when said member is in said third position.

4. The safety mechanism as defined in claim **3** wherein said releasable means includes a releasable member and means for automatically moving said releasable member to said first non-engaging position from said second engaging position when

said safety member is moved from said third position towards said first position.

5. The safety mechanism as defined in claim 4 wherein said releasable means comprises a spring latch member normally biased toward said first non-engaging position, said engaging means comprising a tip portion of said said spring latch member.

6. The safety mechanism as defined in claim 1 wherein said third position of said member is disposed intermediate said first and second positions.

7. The safety mechanism as defined in claim 2 wherein said member comprises an arm member pivotally mounted for arcuate movement between said first, second and third positions.

8. The safety mechanism as defined in claim 7 wherein said surface comprises a cam surface disposed on one end of said arm member.

9. The safety mechanism as defined in claim 8 wherein said safety mechanism is adapted to be connected to a manual reset overload breaker to thereby complete a circuit with said breaker when said arm is in said second position.

10. In a device having a cabinet, a de-energizable supply of high voltage, and an access door movable between opened-closed positions, the improvement comprising:

a member movable in response to movements of said door between a first position when said door is closed and a second position when said door is opened;

means including said member for de-energizing said high voltage supply when said door is opened and energizing said high voltage supply when said door is closed;

said member being biased into said second position; and,

latch means for selectively maintaining said member in a third position between said first and said second positions, and means whereby said latch means is released when said door is closed.

11. The improvement as defined in claim 10 wherein said member comprises an arm member pivotally mounted for arcuate movement between said first, second and third positions.

12. The improvement as defined in claim 10 wherein said latch means includes a first normally non-engaging position and a second engaging position relative to said member when said member is in said third position, means whereby said latch means is automatically moved to said first non-engaging position when said member is moved from said third position toward said first position.

13. The improvement as defined in claim 12 wherein said latch means comprises a spring latch continuously biased toward said first non-engaging position.

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