

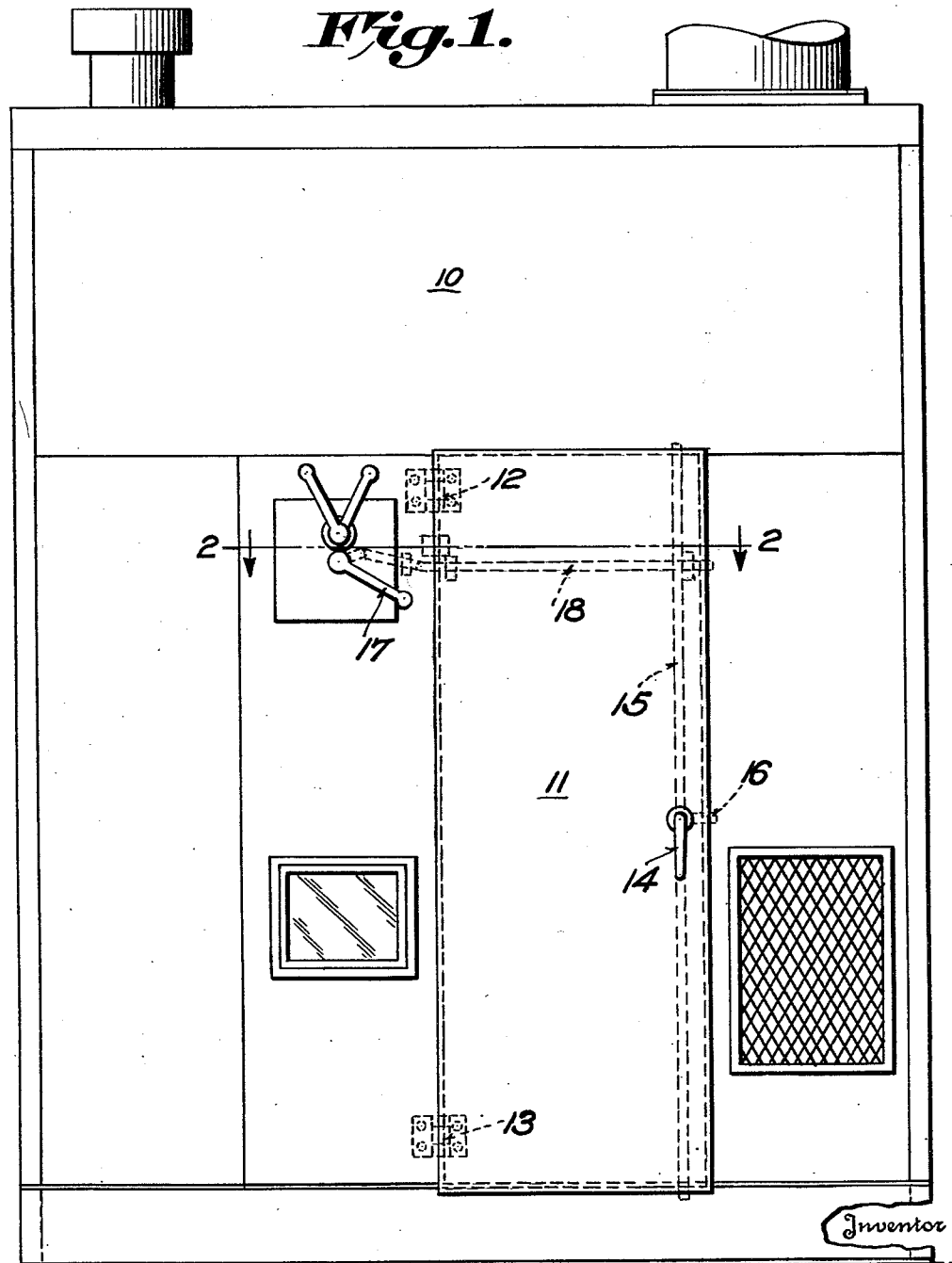
April 29, 1952

L. F. SANTANGELO
INTERLOCKING SWITCH AND DOOR

2,595,102

Filed Feb. 6, 1950

3 Sheets-Sheet 1



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By

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ATTORNEYS

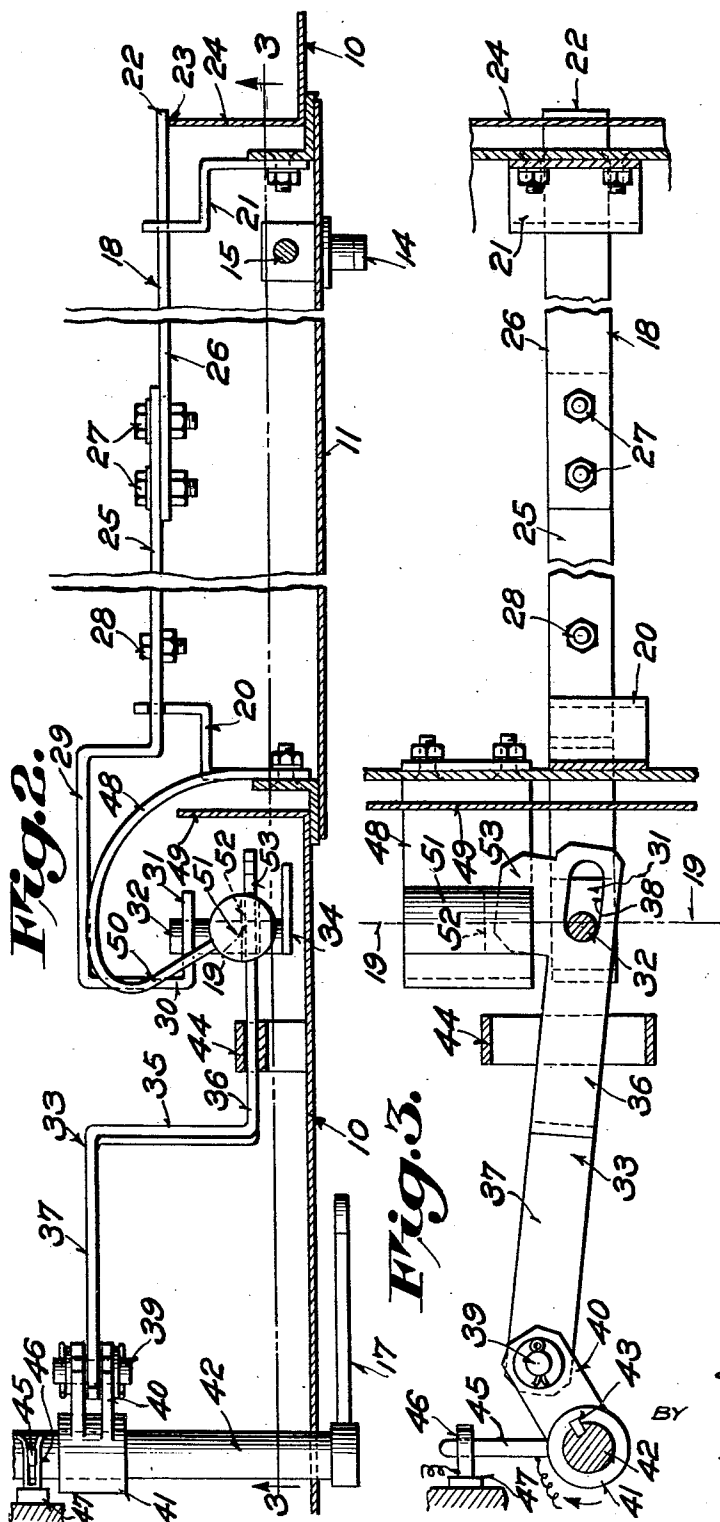
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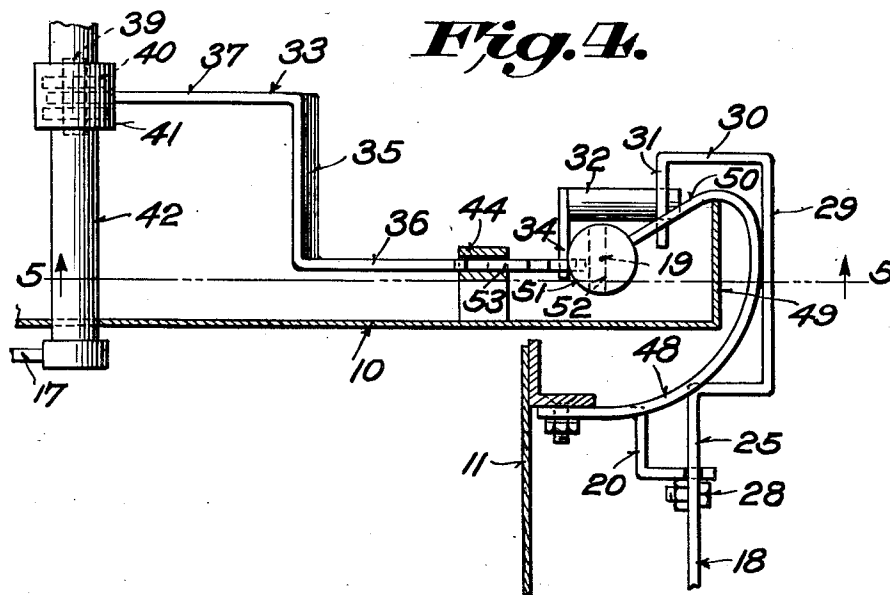
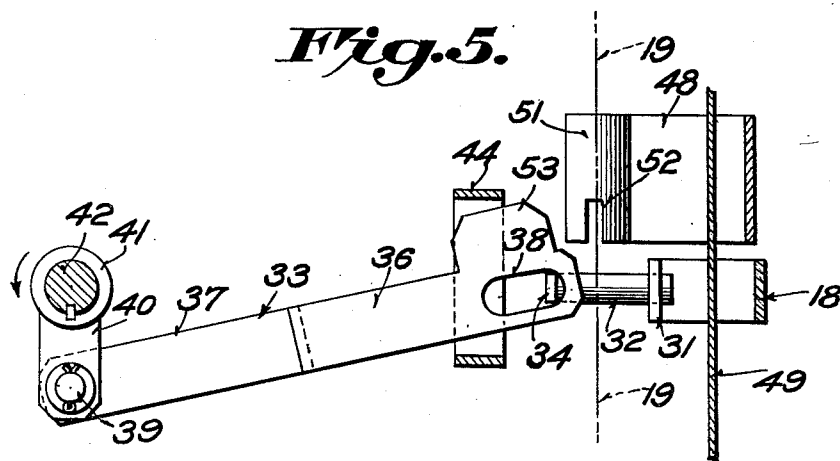
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2,595,102

INTERLOCKING SWITCH AND DOOR

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7 Claims. (Cl. 200—50)

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This invention relates to interlocking switch and door constructions. Such constructions are particularly adapted for use on cabinets that house electrical equipment including a switch and having a door giving access thereto.

An object of the invention is to provide an interlocking switch and door construction that requires the switch to be thrown to a safe position before the door can be opened and that prevents the switch from being thrown to an unsafe position unless the door is closed.

Another object is to provide an interlocking switch and door construction whereby when the switch is in an unsafe position the door is latched and when the door latch is moved to permit opening of the door, the switch is simultaneously thrown to safe position. When the door is open, the switch cannot be thrown to unsafe position.

These and other objects of the invention are typically realized in an interlocking switch and door construction including a cabinet having a doorway, a door swingingly hung in the doorway, a switch, means for operating the switch between open and closed positions, a latch bar, means mounting the latch bar on the door for sliding movement between latched and unlatched positions, and mechanical linkage means operatively connecting the latch bar to the switch operating means to move the latch bar to latched position when the switch is thrown to one of the switch positions and to move the latch bar to unlatched position when the switch is thrown to the other of the switch positions, the mechanical linkage means including a pivotal joint coaxial with the hinge axis of the door when the latch bar is in unlatched position. The apparatus of the invention preferably also includes a stop member carried by the linkage means and a cooperating stop member carried by the door, the cooperating stop member being positioned for interposition in the path of the first stop member when the door is open and for removal from the path of the first stop member when the door is closed.

The invention will be described with greater particularity and other of its aims, objects and advantages will be in part apparent and in part pointed out in the following detailed description of one embodiment thereof as shown in the accompanying drawings in which:

Fig. 1 is a front elevational view of an electrical cabinet embodying an interlocking switch and door construction in accordance with the invention;

Fig. 2 is an enlarged sectional view taken along

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the line 2—2 of Fig. 1 with the cabinet door closed and latched;

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

Fig. 4 is a view similar to Fig. 2 but showing the cabinet door unlatched and open; and

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 4.

Referring to the drawings, particularly to Fig. 1, there is shown a cabinet 10 that houses electrical equipment such, for example, as that shown and described in copending application Serial No. 106,599, filed July 25, 1949, now Patent No. 2,552,069, dated May 8, 1951, by Rudolph G. Streuber, for "System for Energizing Electrical Precipitators."

The cabinet 10 has a door 11 hung on hinges 12 and 13. The hinges are inside the cabinet and the door swings outwardly to open position.

A convenient manual door latching arrangement forming no part of the present invention may be provided. As shown, this includes a door handle 14 operating a conventional vertical latch bar 15 and a swinging latch member 16.

A handle 17 on the front face of the cabinet operates a switch within the cabinet, as will be described in greater detail hereinafter. This handle also operates a latch bar 18. As will appear hereinafter, when the handle 17 is rotated to move the latch bar 18 to unlatched position permitting opening of the door 11, the switch is simultaneously thrown to a safe position allowing an operator to enter the cabinet without exposing himself to danger. Also, as will appear, when the door is open, the handle 17 cannot be rotated to unground the electrical equipment and render it dangerous.

Referring to Figs. 2 and 3, the vertical hinge line of the door 11 is designated by the reference numeral 19. The latch bar 18 is supported for horizontal sliding movement on the inside of the door by a pair of brackets 20 and 21. The door 11 is shown in closed and latched position, the end 22 of the latch bar projecting behind and engaging the inner edge 23 of intumed cabinet wall section 24. With the latch bar in the illustrated position, door 11 cannot be opened.

Latch bar 18 consists of two overlapping sections 25 and 26 fastened together by nut and bolt assemblies 27, the shanks of the bolts extending through horizontally elongated holes in the bar sections permitting limited adjustment of the length of the bar and proper fitting thereof during assembly. A stop member, in the form of a nut and bolt assembly 28, is attached to the latch

bar to limit by engagement with the bracket 20 the leftward unlatching movement of the latching bar.

To the left of the bracket 20, the latch bar 18 has a rearwardly offset portion 29 and a return bend 30 providing a terminal flange 31. A latch bar operating pin 32 is fixed to the flange and extends forwardly therefrom as seen in Fig. 2 or in a direction at right angles to the direction of movement of the sliding latch bar 18. The pin 32 provides a point of attachment for a latch bar operating member 33. On the forward end of the pin 32 an extension member 34 is affixed at right angles to the pin and projects horizontally to the right as seen in Fig. 2 or in a direction substantially parallel to the direction of movement of the latch bar. The pin and extension member form a hooked or L-shaped element attached to the terminal flange 31 of the latch bar.

Latch bar operating member 33 takes the form of a link having a central section 35 and laterally offset right angle end sections 36 and 37. The end section 36 has an elongated hole 38 formed near one end through which the latch bar pin 32 passes. The other end of the link is pivoted by means of a pin 39 to a crank arm 40 carried by a collar 41 fixed to a shaft 42 by a key 43. The shaft 42 extends through the wall of the cabinet 10 and mounts the handle 17 at its outer end. A bracket 44 holds the link towards the cabinet wall while permitting lateral movement thereof.

It will be seen that the hooked member, including the pin 32 and extension 34, carried by the latch bar cooperates with the link bar 33 to provide a pivotal joint coaxial with the hinge line of the door when the latch bar is in unlatched position. Other pivotal joint means that perform the function of transmitting motion from the link bar to the latch bar and permit opening of the door will serve as well; a ball-and-socket joint or simple hinge joint between the latch bar and the link bar are satisfactory if so constructed that the axis of the joint coincides with the hinge line of the door when the latch is in unlatched position.

Shaft 42 has affixed to it the blade member 45 of an electric switch, for example, a switch that deenergizes or otherwise renders harmless the electrical equipment in the cabinet when the switch is opened. A cooperating switch element comprises opposed spring fingers 46 mounted on a fixed base 47.

A bracket 48 is mounted on the inner face of the door 11 slightly above the level of the latch bar 18. The bracket curves inwardly around the inturned cabinet wall flange 49 and has a return bend portion 50 mounting a vertical cylindrical keyway and stop block 51, the axis of which preferably coincides with the hinge axis of the door 11. The cylindrical block has a vertical slot or keyway 52 cut in its lower face. The slot is open at the bottom and side faces of the block and extends vertically into the block for a substantial distance.

As best seen in Fig. 3, the link 33 has an upstanding key portion 53 that is engaged in the keyway 52 when the parts are in the position shown in Figs. 2 and 3.

In operation, the starting position will be considered as that shown in Figs. 2 and 3, the door being closed and latched and the switch being in closed position to energize the electrical equipment in the cabinet. It is desired to enter the

cabinet. The handle 17 is grasped and rotated to rotate the shaft 42 in a clockwise direction, as shown by the arrow in Fig. 3, to the position shown in Fig. 5. It will be observed that in the first approximately 30° of rotation, the link bar is pushed slightly to the right, the latch bar 18 moving therewith because of pressure exerted thereagainst by the left face of the hole 38 acting against the pin 32. During the last approximately 90° of shaft rotation the link bar moves to the left. In the first part of this increment of link bar movement, the link bar hole 38 slides along the pin 32 without moving the pin or the latch bar. When the right hand face of the hole 38 abuts the pin, the pin and latch bar are drawn to the left to disengage the end 22 of the latch bar from the cooperating cabinet wall edge 23, thus unlatching the door. Movement of the link bar to the position shown in Figs. 4 and 5 also effects withdrawal of the key 53 from the keyway 52.

The door is now swung open to the position shown in Figs. 4 and 5. During the door opening movement, the L-shaped assembly, consisting of pin 32, and pin extension 34, that is carried by the latch bar 18, is swung through the hole 38 in the link bar to the position shown in Figs. 4 and 5.

It will be noted that the free end of the pin extension 34 is still engaged in the link bar hole 38 when the door is in fully opened position, thus supporting the link bar. It will also be seen that the keyway 52 is rotated out of alignment with the key 53 and that reverse movement of the link bar 33 shaft 42, handle 17 and the closing of the switch 45-46 is prevented when the door is open by engagement of the key 53 with a solid portion of the stop block 51. Since the switch cannot be thrown to an unsafe position when the door is open, protection is thereby afforded an operator working in the cabinet.

When the door 11 is swung to closed position, the keyway 52 is rotated into alignment with the key 53 and the latch bar operating pin 32 is swung back into the hole 38 of the link bar. The handle 17 may now be rotated in the reverse direction to the position shown in Figs. 2 and 3. The link bar is permitted to move to the right as the key 53 slides in the slot or keyway 52. The left hand face of the hole 38 engages the pin 32 and pushes the latch bar 18 to latched position. Reverse movement of the handle also closes the switch and reenergizes the electrical equipment.

It will be understood that various equivalents of the apparatus members shown and described by way of illustration may be substituted without departing from the invention. The electrical switch shown is merely illustrative and it will be understood that the switch may be arranged in relation to the shaft movement to render the electrical equipment safe either when the switch is open, as shown in the drawings, or when the switch is closed, as shown and described in the aforementioned Streuber application.

I claim:

1. An interlocking switch and door construction comprising a cabinet having a doorway, a door swingingly hung in said doorway, a switch mounted in said cabinet, handle means extending through a fixed wall of said cabinet for operating said switch between open and closed positions, a latch bar, means mounting said latch bar on said door for movement between latched and unlatched positions, and mechanical linkage means operatively connecting said latch bar to said handle means to move said latch bar to latched posi-

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tion when said switch is thrown to one of said switch positions and to move said latch bar to unlatched position when said switch is thrown to the other of said switch positions, said mechanical linkage means including a pair of pivotally pointed bar members, means mounting said bar members for longitudinal movement substantially across the hinge line of said door, the pivotal joint of said bar members being coaxial with the hinge axis of the door when said latch bar is in unlatched position.

2. An interlocking switch and door construction comprising a cabinet having a doorway, a door swingingly hung in said doorway, a switch mounted in said cabinet, handle means extending through a fixed wall of said cabinet for operating said switch between open and closed positions, a latch bar, means mounting said latch bar on said door for movement between latched and unlatched positions, mechanical linkage means operatively connecting said latch bar to said handle means to move said latch bar to latched position when said switch is thrown to one of said switch positions and to move said latch bar to unlatched position when said switch is thrown to the other of said switch positions, said mechanical linkage means including a pair of pivotally jointed bar members, means mounting said bar members for longitudinal movement substantially across the hinge line of said door, the pivoted joint of said bar members being coaxial with the hinge axis of the door when said latch bar is in unlatched position, a stop member carried by said linkage means, and a cooperating stop member carried by said door, said cooperating stop member being positioned for interposition in the path of said first stop member when said door is open and for removal from the path of said first stop member when said door is closed.

3. An interlocking switch and door construction comprising a cabinet having a doorway, a door swingingly hung in said doorway, a switch, means for operating said switch between open and closed positions, a latch bar, means mounting said latch bar on said door for sliding movement between latched and unlatched positions, and mechanical linkage means operatively connecting said latch bar to said switch operating means to move said latch bar to latched position when said switch is thrown to one of said switch positions and to move said latch bar to unlatched position when said switch is thrown to the other of said switch positions, said mechanical linkage means including a pivotal joint coaxial with the hinge axis of the door when said latch bar is in unlatched position, said pivotal joint comprising a hooked member carried by said latch bar slidably engaging a member of said linkage means throughout the opening and closing movements of said door.

4. An interlocking switch and door construction comprising a cabinet having a doorway, a door swingingly hung in said doorway, a switch, means for operating said switch between open and closed positions, a latch bar, means mounting said latch bar on said door for sliding movement between latched and unlatched positions, and

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mechanical linkage means operatively connecting said latch bar to said switch operating means to move said latch bar to latched position when said switch is thrown to one of said switch positions and to move said latch bar to unlatched position when said switch is thrown to the other of said switch positions, said mechanical linkage means including a link bar reciprocable substantially in the direction of movement of the latch bar when the door is closed and having a hole adjacent the hinge line of the door and a hooked member carried by said latch bar slidably engaged in the hole of said link bar throughout the opening and closing movements of said door.

5. An interlocking switch and door construction comprising a cabinet having a doorway, a door swingingly hung in said doorway, a switch, means for operating said switch between open and closed positions, a latch bar, means mounting said latch bar on said door for sliding movement between latched and unlatched positions, mechanical linkage means operatively connecting said latch bar to said switch operating means to move said latch bar to latched position when said switch is thrown to one of said switch positions and to move said latch bar to unlatched position when said switch is thrown to the other of said switch positions, said mechanical linkage means including a pivotal joint coaxial with the hinge axis of the door when said latch bar is in unlatched position, a stop member carried by said linkage means, and a cooperating stop member carried by said door, said cooperating stop member being positioned for interposition in the path of said first stop member when said door is open and for removal from the path of said first stop member when said door is closed.

6. An interlocking switch and door construction comprising a cabinet having a doorway, a door swingingly hung in said doorway, a switch, means for operating said switch, a latch member carried by said door, and mechanical linkage means operatively connecting said latch member to said switch operating means, said mechanical linkage means including a pair of pivotally jointed bar members, means mounting said bar members for longitudinal movement substantially across the hinge line of said door, the pivotal joint of said bar members being coaxial with the hinge axis of the door when said latch bar is in unlatched position.

7. An interlocking switch and door construction as defined in claim 6 comprising cooperating stop members on said door and on said linkage means preventing movement of said linkage means when the door is open.

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The following references are of record in the file of this patent:

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