

Oct. 16, 1962

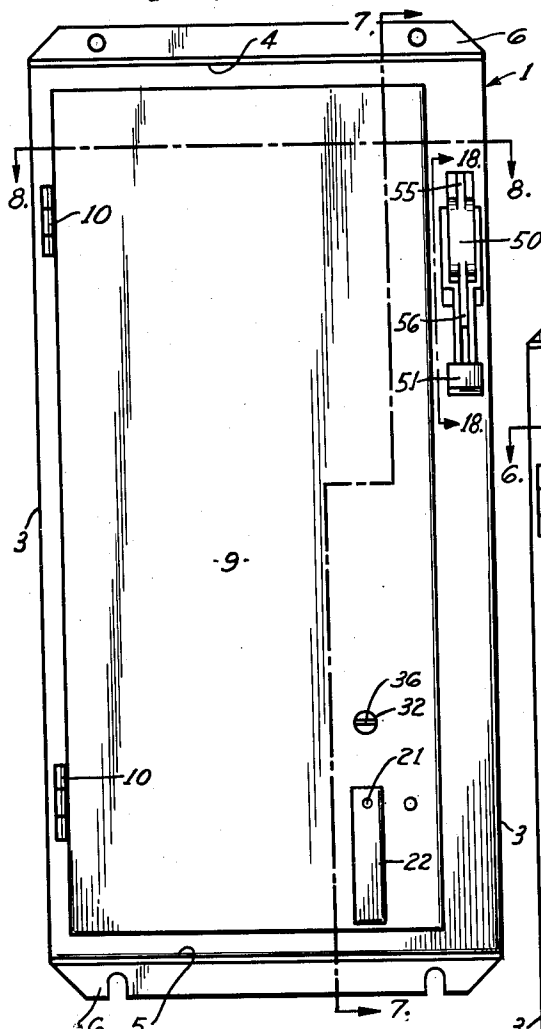
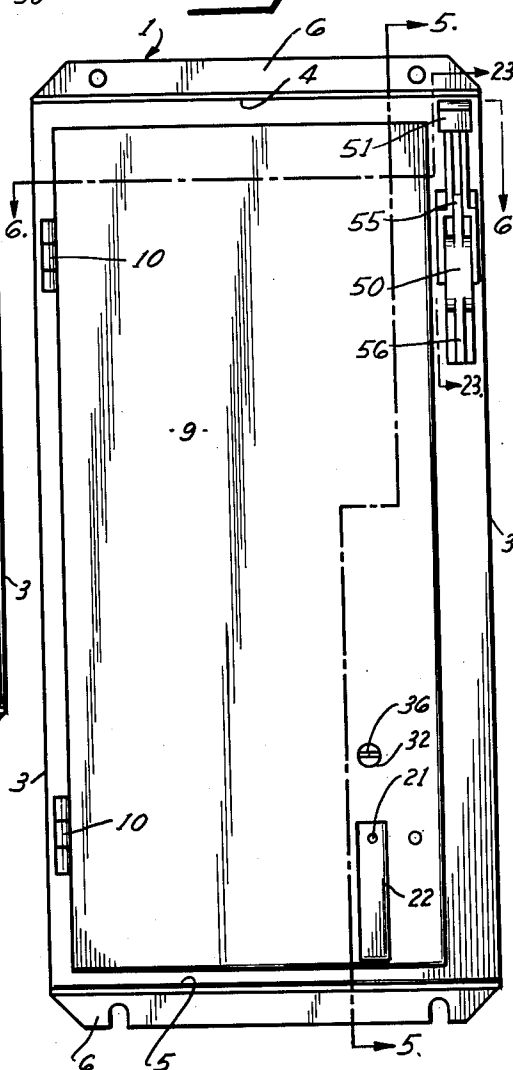
E. F. MEKELBURG ETAL

3,059,072

DUST PROOF SWITCH ENCLOSURE WITH SWITCH AND DOOR INTERLOCK

Filed Aug. 17, 1960

10 Sheets-Sheet 1



Oct. 16, 1962

E. F. MEKELBURG ETAL

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DUST PROOF SWITCH ENCLOSURE WITH SWITCH AND DOOR INTERLOCK

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10 Sheets-Sheet 2

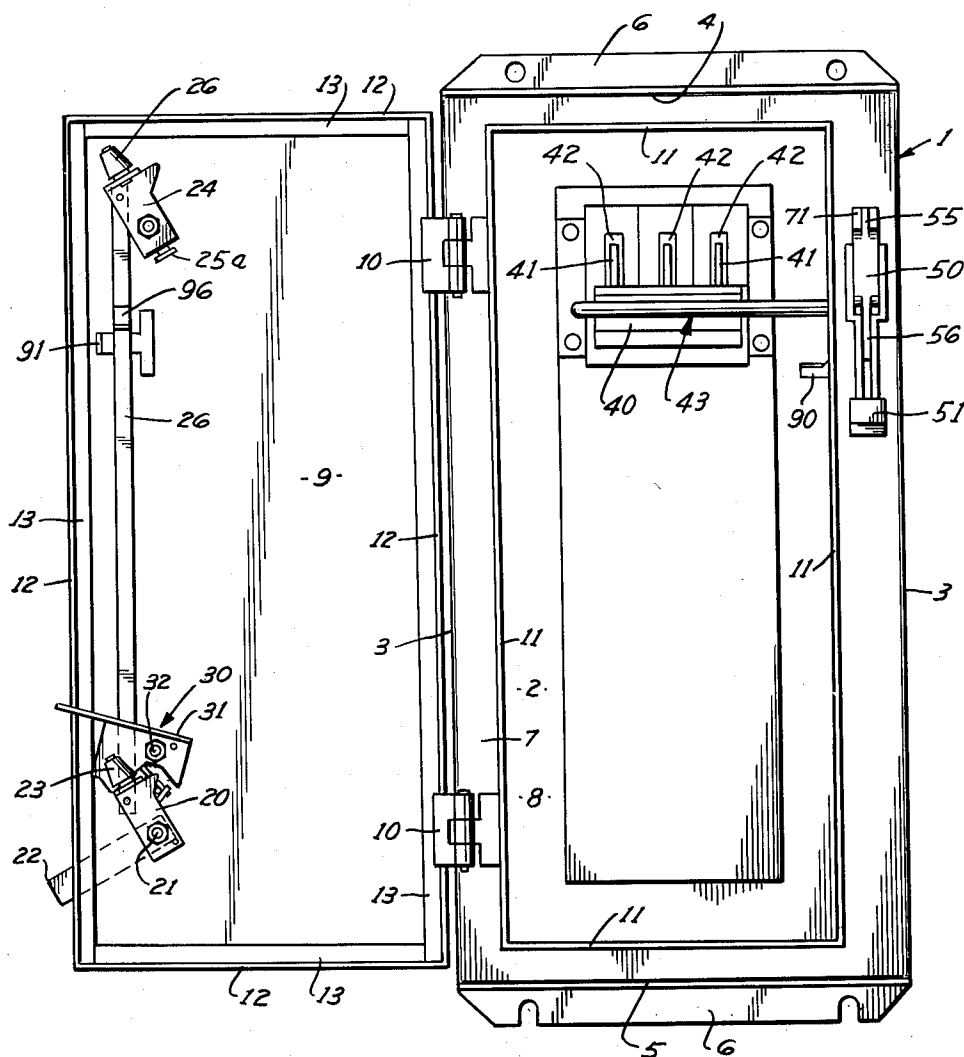


Fig. 3.

INVENTORS.

Earl F. Mekelburg,
Otto Frey

BY *John H. Leonard*,
their ATTORNEY.

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E. F. MEKELBURG ETAL

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DUST PROOF SWITCH ENCLOSURE WITH SWITCH AND DOOR INTERLOCK

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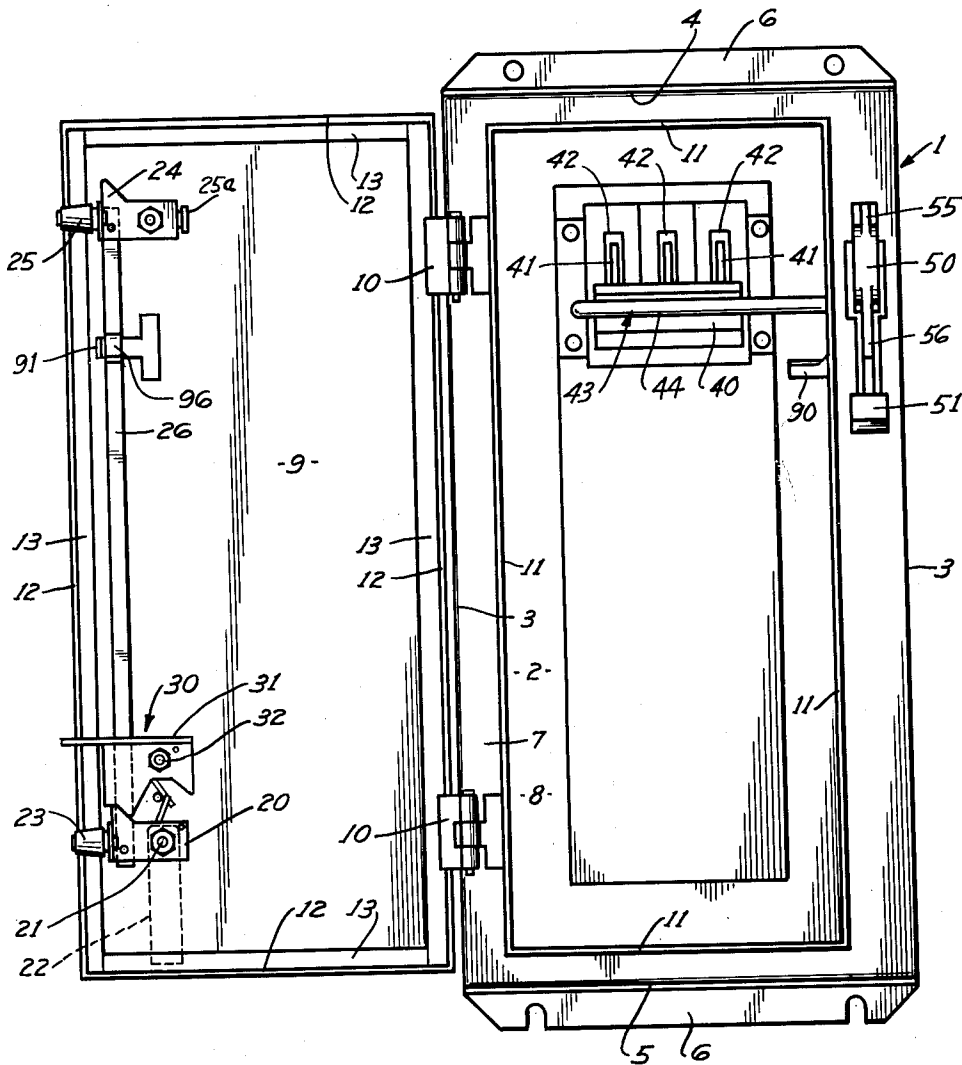


Fig. 4

INVENTORS.
Earl F. Mekelburg,
Otto Frey
BY *John W. Leonard*,
their ATTORNEY.

Oct. 16, 1962

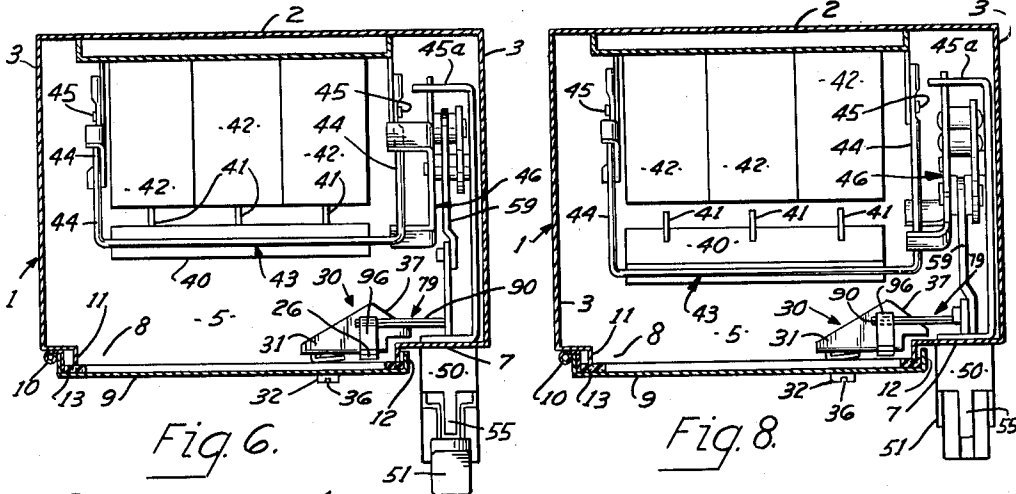
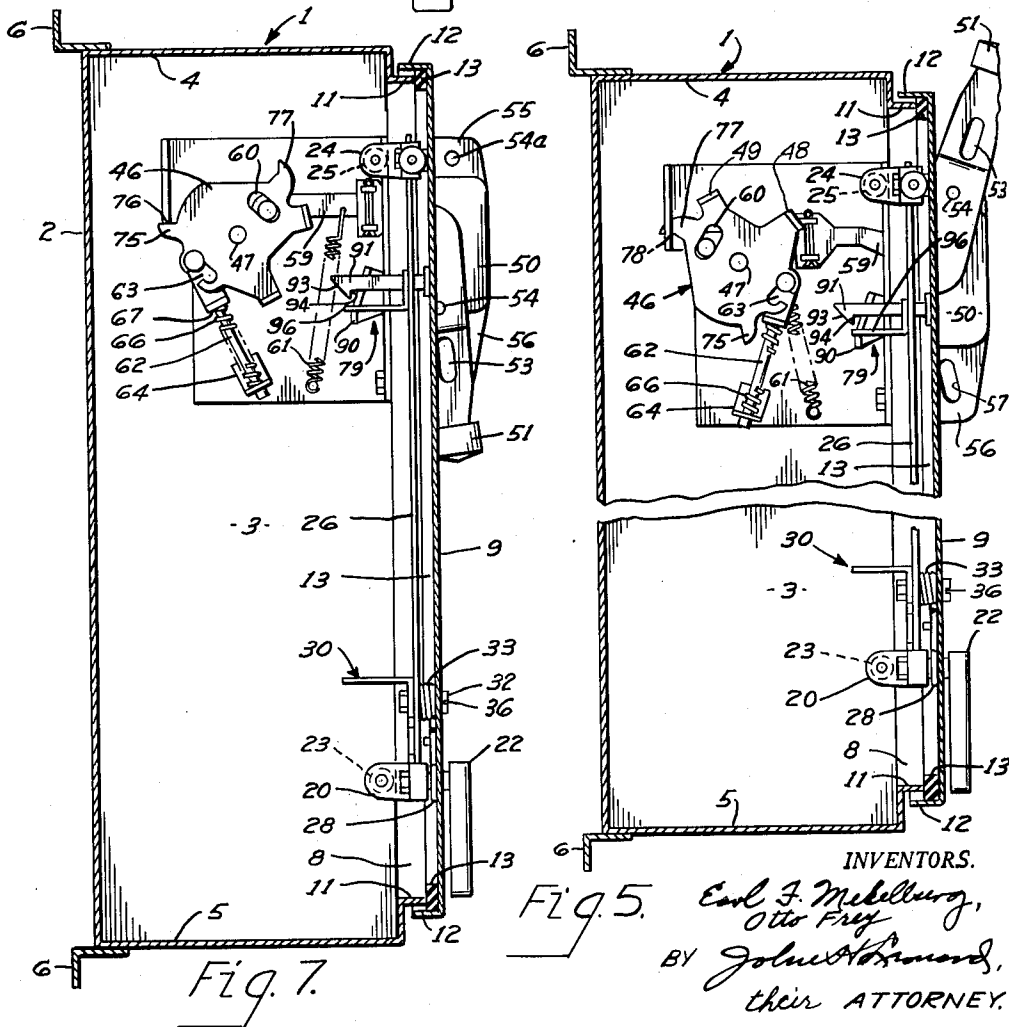
E. F. MEKELBURG ETAL

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DUST PROOF SWITCH ENCLOSURE WITH SWITCH AND DOOR INTERLOCK

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10 Sheets-Sheet 4



INVENTORS.

Fig. 5. *Earl F. Mekelburg,*
Otto Frey
BY *John H. Leonard,*
their ATTORNEY.

Oct. 16, 1962

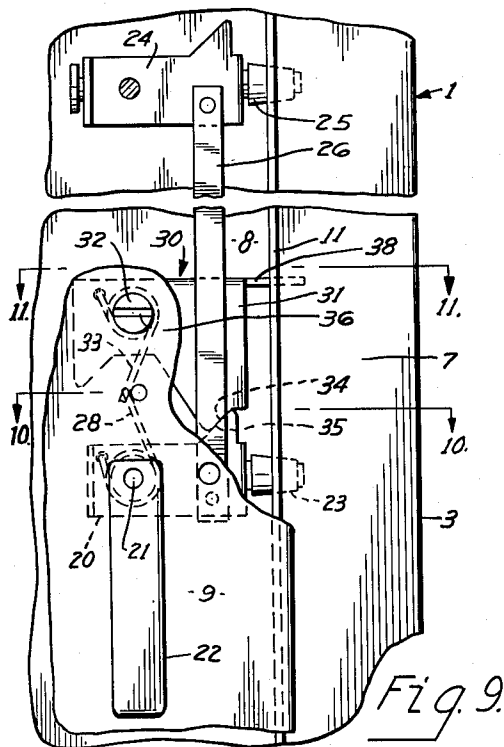
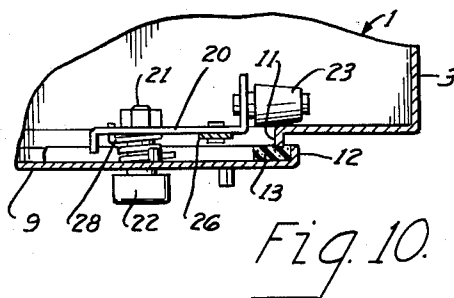
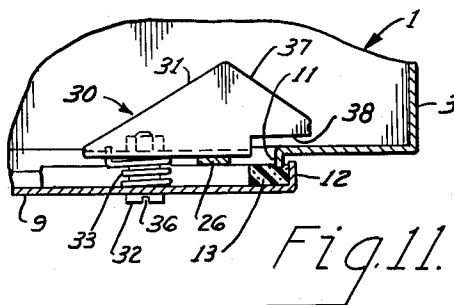
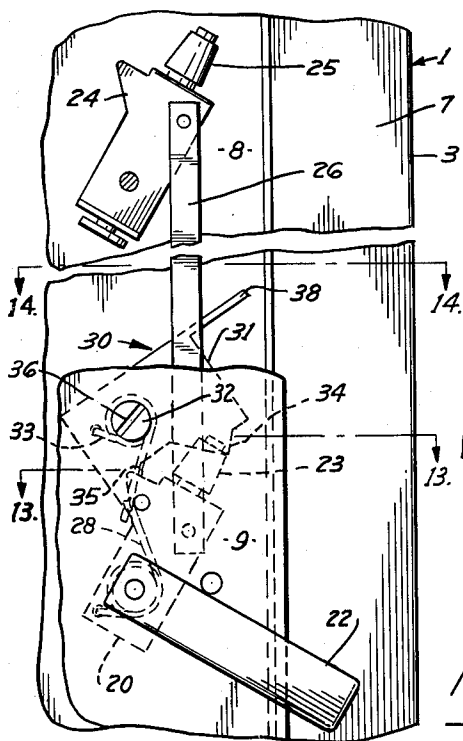
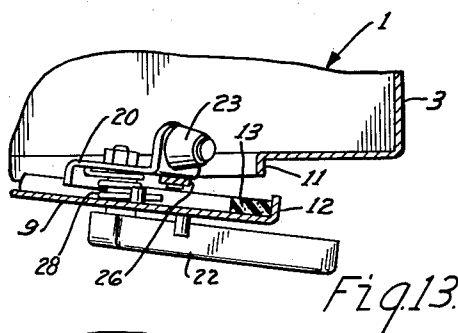
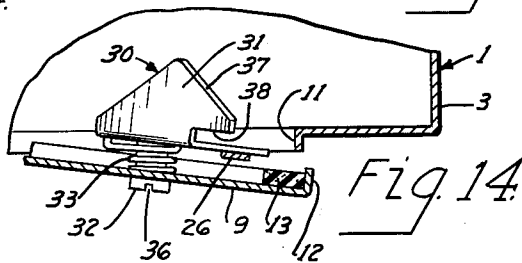
E. F. MEKELBURG ETAL

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DUST PROOF SWITCH ENCLOSURE WITH SWITCH AND DOOR INTERLOCK

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10 Sheets-Sheet 5



INVENTORS

Earl F. Mekelburg,
Otto Frey

BY *John H. Howard*
their ATTORNEY.

Oct. 16, 1962

E. F. MEKELBURG ETAL

3,059,072

DUST PROOF SWITCH ENCLOSURE WITH SWITCH AND DOOR INTERLOCK

Filed Aug. 17, 1960

10 Sheets-Sheet 6

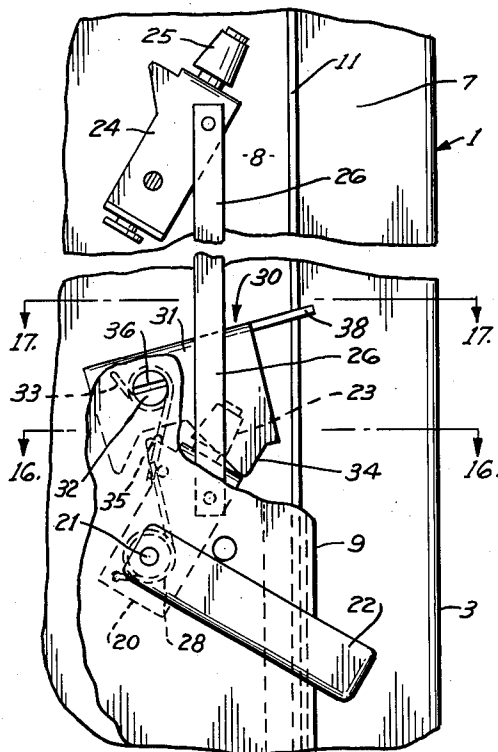


Fig. 15.

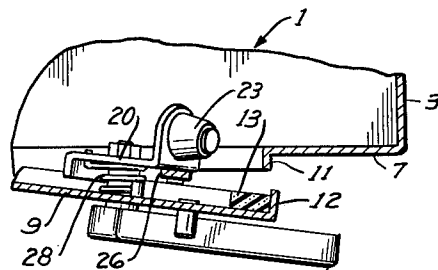


Fig. 16.

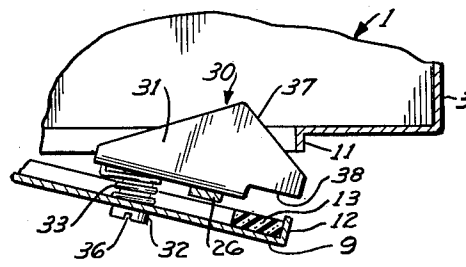


Fig. 17.

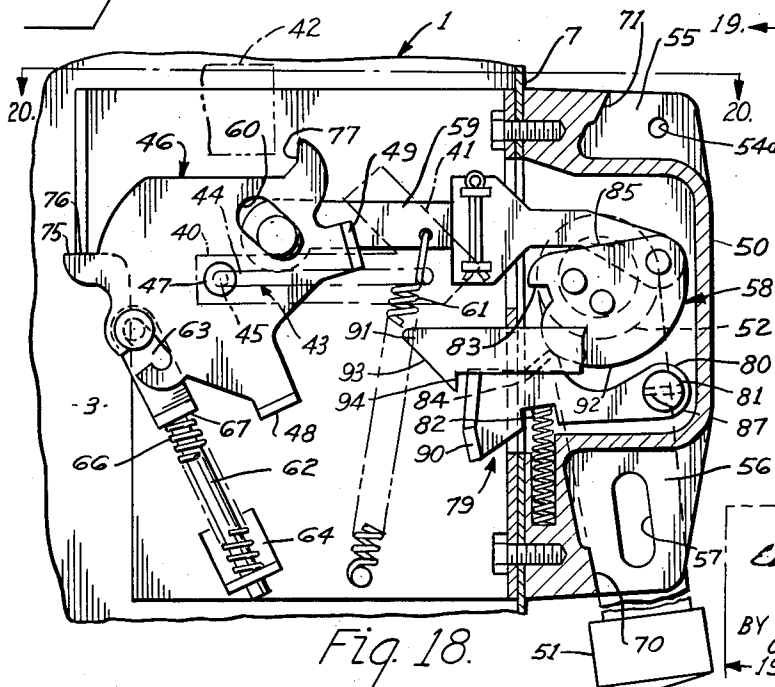


Fig. 18.

INVENTORS.

Ernst F. Mekelburg,
Otto Frey

BY *John H. Arnold*

19. their ATTORNEY.

Oct. 16, 1962

E. F. MEKELBURG ETAL

3,059,072

DUST PROOF SWITCH ENCLOSURE WITH SWITCH AND DOOR INTERLOCK

Filed Aug. 17, 1960

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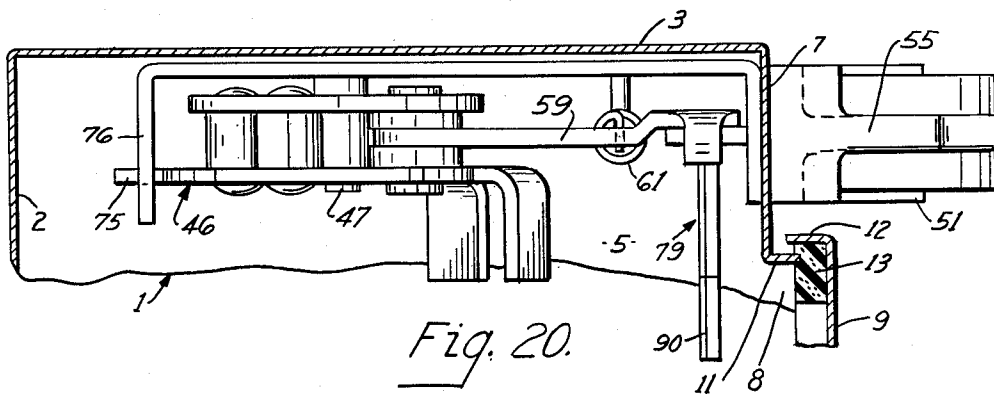


Fig. 20.

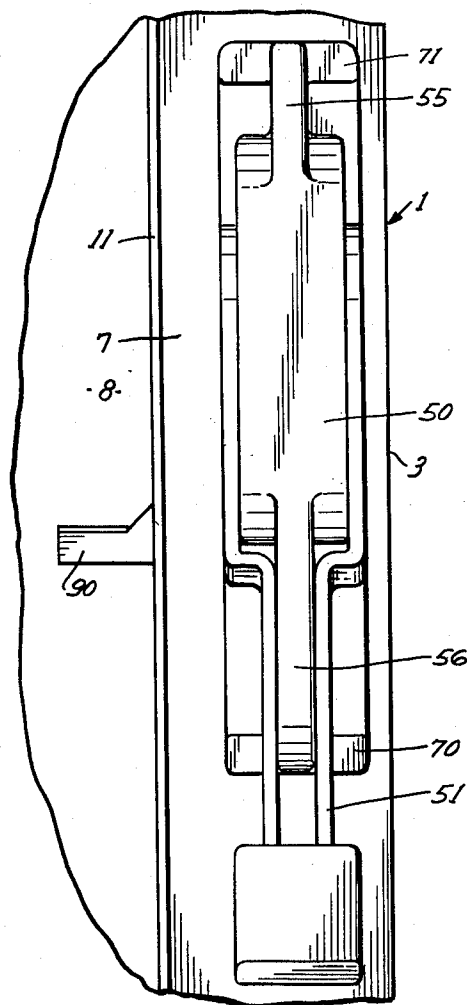


Fig. 19.

INVENTORS.
Earl F. Mekelburg,
Otto Frey
BY *John H. Howard*,
their ATTORNEY.

Oct. 16, 1962

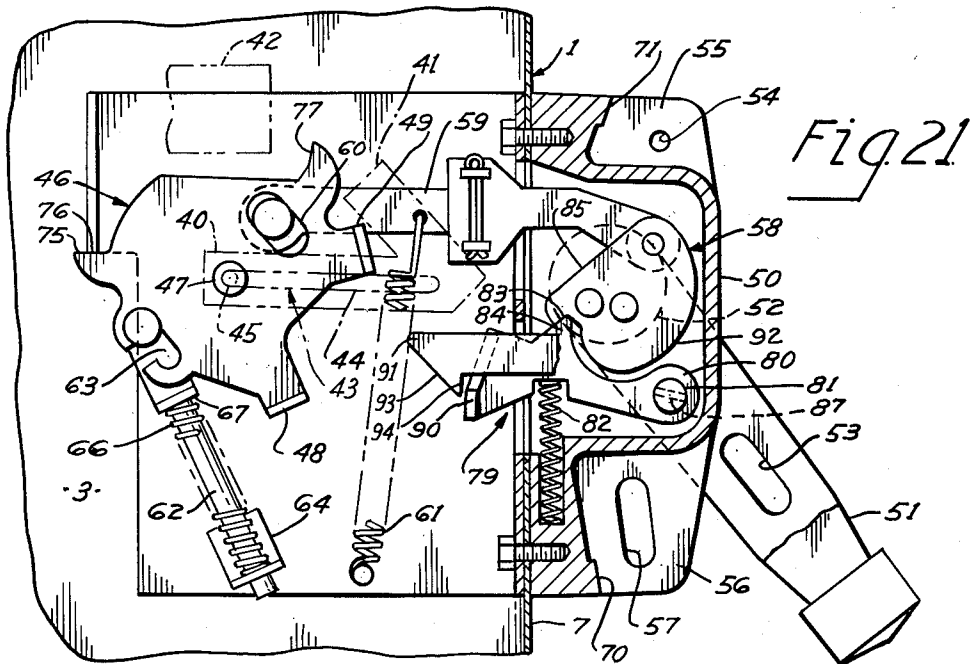
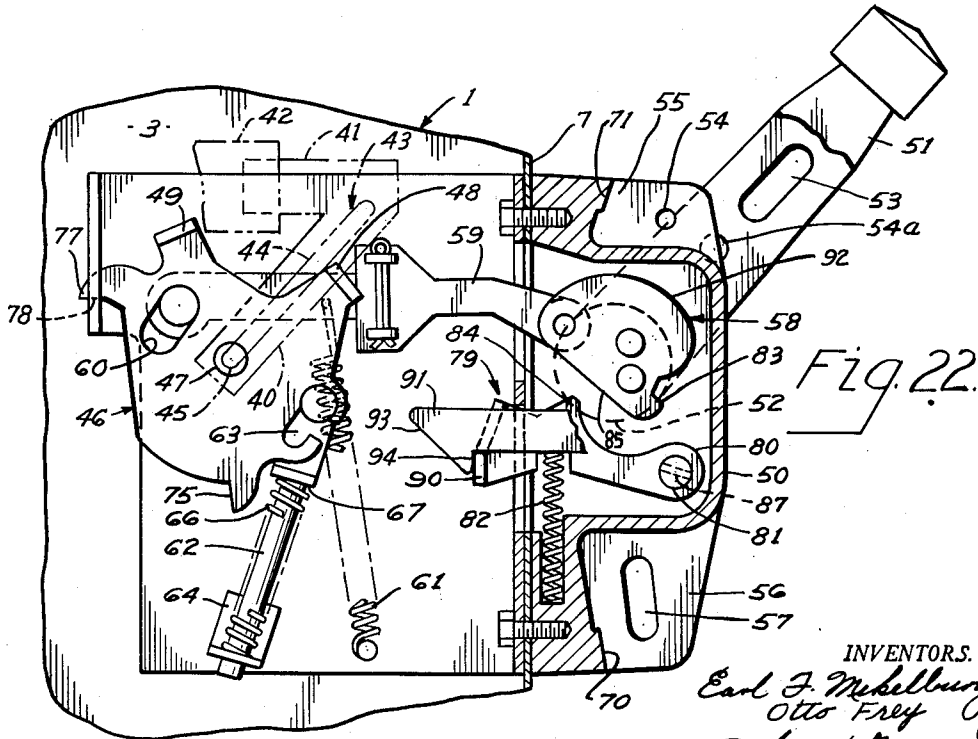
E. F. MEKELBURG ETAL

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DUST PROOF SWITCH ENCLOSURE WITH SWITCH AND DOOR INTERLOCK

Filed Aug. 17, 1960

10 Sheets-Sheet 8



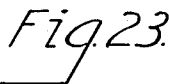
INVENTORS.
Earl F. Mekelburg,
Otto Frey
BY *John H. Edwards*,
their ATTORNEY.

E. F. MEKELBURG ETAL

DUST PROOF SWITCH ENCLOSURE WITH SWITCH AND DOOR INTERLOCK

Filed Aug. 17, 1960

10 Sheets-Sheet 9



INVENTORS.

INVENTORS.
Eck & Mahellburg,
Otto Frey
BY John A. Leonard,
their ATTORNEY.

Oct. 16, 1962

E. F. MEKELBURG ETAL

3,059,072

DUST PROOF SWITCH ENCLOSURE WITH SWITCH AND DOOR INTERLOCK

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10 Sheets-Sheet 10

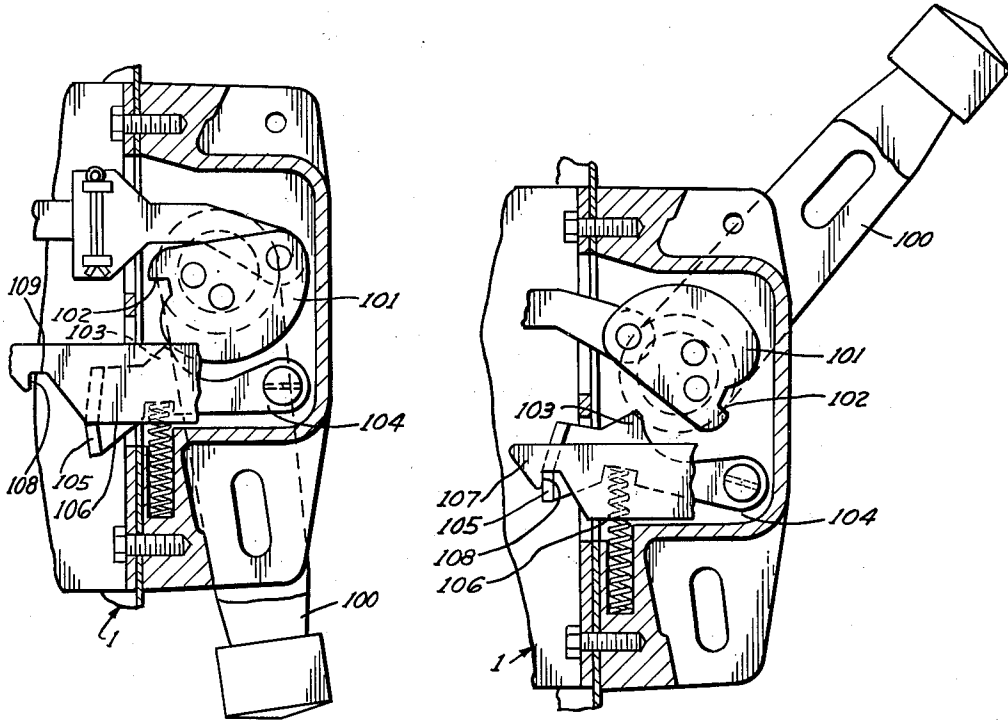


Fig. 24.

Fig. 25.

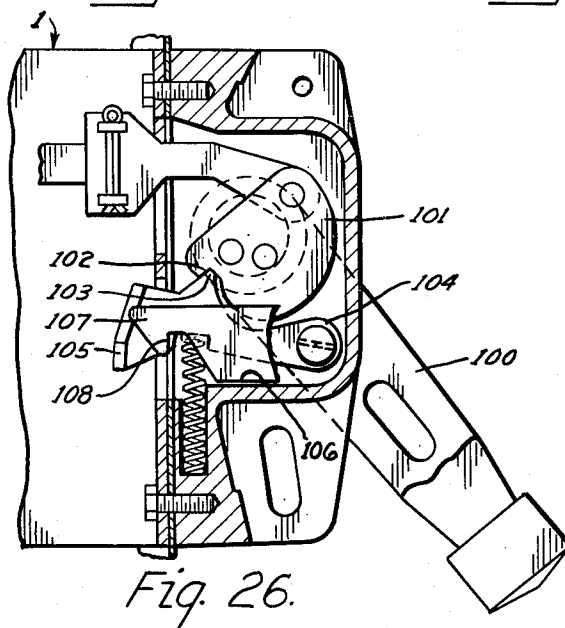


Fig. 26.

INVENTORS.
Carl F. Mekelburg,
Otto Fref
BY *John H. Leonard*,
their ATTORNEY.

1

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3,059,072

DUST PROOF SWITCH ENCLOSURE WITH SWITCH AND DOOR INTERLOCK

Earl F. Mekelburg, Wauwatosa, and Otto Frey, Milwaukee, Wis., assignors to Square D Company, Detroit, Mich., a corporation of Michigan

Filed Aug. 17, 1960, Ser. No. 50,250
12 Claims. (Cl. 200—50)

This invention relates to a new dust-tight switch enclosure and interlocking mechanism interconnecting the switch and door so that inadvertent opening of the door while the switch is on and inadvertent closure of the switch while the door is open are eliminated.

Heretofore, a common practice has been to provide switch cabinets with a door which carries a switch operating handle, the door being held in closed position by suitable so-called captive screws. In this earlier type of structure, the switch operating handle ordinarily is separated from the switch operating mechanism when the door is open. Hence, with the door in open position, the switch cannot be locked in an off position.

Again, the inconvenience of tightening and loosening the closure screws is such that workmen frequently leave the screws in loose condition so that they can be manipulated by hand. Thus, the screws fail to hold the door in dust tight relation to the cabinet.

The present structure is designed to overcome the objections of the prior structures by a number of interrelated features. The switch operating handle, instead of being carried by the door, is carried on that margin of the cabinet front wall which surrounds and defines the opening to be closed by the door. The handle remains at all times connected to the switch, so that the switch is in on and off positions only when the handle is in on and off positions, respectively, whereby the handle always indicates truly the open and closed positions of the switch.

The mechanism is such that the switch operating handle, and thereby the switch itself, can be thrown to off position readily regardless of whether the door is open or closed.

The handle can be thrown from an off to an on position with the door open only by deliberate manipulation of a part of a defeater mechanism accessible inside of the cabinet.

Furthermore, the handle can be latched in the off position by a plurality of padlocks with the door in the open position so that the switch cannot be closed either inadvertently or deliberately with accompanying operation of certain latch defeater mechanisms. When the door is closed and latched, the switch can be thrown to on and off positions readily. With the door in the closed and sealed position, and the switch in on position, the door cannot be opened except by the manipulation of two separate defeater mechanisms, one for partially releasing the door latch, and the other one for operation, after the door latch has been partially released and the door positively held slightly ajar, for finally releasing the door. Thus two separate and distinct defeater mechanisms must be operated successively and the door positively held partially released between operations, to open the door when the switch is in the on position.

Again, the door latching mechanism is so arranged that if it has been inadvertently left in latching position with the door open, and the door is slammed shut, the mechanism will release itself to permit closure of the door and then return to a latching, but non-sealing, position. Therefore, once the door is slammed shut, it cannot be reopened without special manipulation.

Furthermore, the door latch is such that when the door handle is moved to closed position, it causes the door to

be drawn tightly into firm, dust-sealing relation to the cabinet.

The door may be closed readily without the use of any special tools. It can be opened when the switch is in closed position only by the manipulation of two separate and distinct defeating mechanisms by means of a tool, thus requiring a double by-passing operation around the interlocking mechanisms for alerting personnel to the fact that the switch is on. For this purpose, it is necessary first to operate a defeater with a special tool to release the handle of the door latching mechanism for operation, then while holding the defeater released, turning the handle to release its door latch, and then while holding the door slightly ajar and holding the defeater still in releasing position, operating a second defeater mechanism for the switch handle interlock with the door.

On the other hand, the switch can readily be cut off whether the door is open or closed. The closing and sealing of the door is accomplished without any special tools. All that is necessary is that the door be pushed to closed position wherein it initially latches and can be reopened only by the manipulation of the defeater mechanism. To seal the door, it is only necessary to rotate the door operating handle.

The switch cannot be turned on with the door only partially latched. Before it can be turned on, the door must not only be latched. It must be drawn to sealed position so that a dust-tight closure is provided.

The door latches at both the top and the bottom so as to assure the proper application of the sealing pressure.

The switch operating mechanism and its means for interlocking with the door when the switch is in closed position, is placed to one side of the door opening so as not to obstruct access into the cabinet. All of the operating mechanisms are extremely simple and direct acting.

Various objects and advantages of the invention will become apparent from the following description wherein reference is made to the drawings, in which:

FIG. 1 is a front elevation of the switch cabinet, embodying a preferred form of the invention, with the door closed and the switch in an on position;

FIG. 2 is a view similar to FIG. 1 with the switch in the off position;

FIG. 3 is a front elevation of the cabinet of FIG. 1 with the door fully open and the door latch in released position;

FIG. 4 is a view similar to FIG. 3 with the door latch in latching position;

FIGS. 5 and 6 are a vertical sectional view and a horizontal sectional view, respectively, and are taken on the lines 5—5 and 6—6, respectively, in FIG. 1;

FIGS. 7 and 8 are a vertical sectional view and a horizontal sectional view, respectively, and are taken on the lines 7—7 and 8—8 in FIG. 2;

FIG. 9 is an enlarged fragmentary front elevation of the door latching mechanism showing the same in the fully closed position, part thereof being shown in section for clearness in illustration;

FIGS. 10 and 11 are horizontal sectional views taken on the lines 10—10 and 11—11, respectively, of FIG. 9;

FIG. 12 is a view similar to FIG. 9 showing the door latching mechanism in fully open position;

FIGS. 13 and 14 are horizontal sectional views taken on the lines 13—13 and 14—14, respectively, of FIG. 12;

FIG. 15 is a view similar to FIG. 9 showing the door latching mechanism when the door is open and in unlatched position;

FIGS. 16 and 17 are fragmentary sectional views taken on the lines 16—16 and 17—17, respectively, of FIG. 15;

FIG. 18 is an enlarged fragmentary left side elevation of the interlocking mechanism, showing the same in a

3

normal off position, and is taken on the line 18—18 in FIG. 2;

FIGS. 19 and 20 are a front elevation and a top plan view, respectively, of the structure illustrated in FIG. 18;

FIG. 21 is a view similar to FIG. 18 showing the switch partially moved from the position shown in FIG. 18;

FIG. 22 is a left side elevation of the structure illustrated in FIG. 18, showing the switch in on position with the switch operating handle unreleased by the operator;

FIG. 23 is a view similar to FIG. 18 showing the switch in fully on position with the operating handle released by the operator, and is taken on the line 23—23 of FIG. 1; and

FIGS. 24, 25 and 26 are fragmentary left side elevations, similar to FIG. 18, illustrating a modified form of door and switch operating handle interlocking mechanism, in three positions, respectively FIG. 24 showing the door closed and the switch in fully off position, FIG. 25 showing the switch in on position with the handle unreleased and the door moved slightly from fully closed position, and FIG. 26 showing the door open and the switch in the off position with maximum opening movement of the handle.

Referring to the drawings, the cabinet, indicated generally at 1, comprises a back wall 2 on which the switch mechanism is to be mounted, side walls 3, and the conventional top wall 4 and bottom wall 5. Suitable hangers 6 are provided for securing the cabinet to a support. The cabinet has a front wall 7 in the form of a marginal flange defining an opening 8 through which access to the interior is afforded for mounting of the switch mechanisms and other parts of the structure hereinafter to be described.

The opening 8 of the cabinet is closed by a suitable closure or door 9 which is connected by hinges 10 to the cabinet for swinging about a vertical axis to open and closed positions.

The inner periphery of the front wall 7 has a forwardly projecting peripheral flange 11. The door has a rearwardly projecting peripheral flange 12 which, in the closed position of the door, surrounds the flange 11 in outwardly spaced relation in the plane of the wall 7. A sealing gasket 13 is connected to, and carried by, the door and is juxtaposed against the flange 12 thereof. This gasket extends inwardly from the flange 12 a sufficient distance so that it is engaged by the forwardly extending edge of the peripheral flange 11 when the door 9 is drawn tightly into closed position, so as to form an effective dust proof seal coextensive peripherally with, and surrounding, the opening 8.

As mentioned in the objects, it is desirable that the door be capable of being drawn into sealed position readily, and for this purpose a door latching mechanism is provided. This mechanism and its operation is best illustrated in FIGS. 9 through 17.

As therein illustrated, the door is provided with a rocker lever 20 which is pivoted on the door by means of a pivot 21 for rocking about a horizontal axis extending forwardly and rearwardly of the cabinet. Connected to, and rigid with, the lever 20 is an external operating handle 22 by which the lever can be rocked about its pivot to positions for latching the door in sealed position and for releasing the door. At its outer end, the rocker lever carries a roller 23 which is rotatable about an axis extending radially from the pivot 21. The roller is arranged to engage the inner face of the front wall 7 at the margin defining the opening 8, preferably directly beneath the flange 11 thereof. The roller is tapered axially in the direction away from the pivot 21 so that when it is moved into position against the inside of the wall 7 for latching the door, it presents a progressively increased diameter to the wall 7 and thereby gradually cams the door tightly to closed and sealed position.

As mentioned in the objects, it is desirable that the door be drawn thus tightly into closed position both near the top and the bottom, and for this purpose a duplicate rocker lever 24, the same in operating effect as the lever

4

20, and with a duplicate roller 25, is pivotally connected to the inside of the door near the top thereof. The levers 20 and 24 are connected together at locations eccentric to their pivots, by a suitable link 26 so that they operate concurrently in the same direction. The lever 24 also has an additional roller 25a mounted thereon which rotates on the inner surface of the door 9 to provide support for the lever 24 when the lever is moved to the latching position.

A spring 28 is operatively connected to the lever 20 and biases it, and through the link the lever 24, to the open position illustrated in FIG. 12.

In FIG. 9, the handle and lever are shown in the door latching position. In FIG. 12, they are shown in a fully released position. In FIG. 15, they are shown in an intermediate position in which the door is latched slightly ajar by other means.

It is desirable that when the door is latched in sealed position, that it cannot be unlatched without requiring the use of a special tool. For this purpose, a defeater latch mechanism, indicated generally at 30, is provided. This mechanism comprises a locking lever 31 mounted on the door by means of a pivot 32 having its rotational axis parallel to the axis of the pivot 21. This lever 31 is biased by a spring 33 toward the locking position illustrated in FIG. 9. The defeater latching lever has a latching means in the form of a shoulder 34 which, when the lever 31 is in its latching position relative to the lever 20, and the lever 20 is in door latching position, as illustrated in FIG. 9, engages a complementary latching shoulder 35 on the lever 20. The shoulders 34 and 35, when engaged, are so positioned that if an attempt is made to rock the lever 20 in a counterclockwise direction in FIG. 9, to release the roller 23 from the front wall 7, the force to the shoulder 35 is directed substantially through the axis of the pivot 32 of the lever 31, and thus arrests rotation of the lever 20 to an open position.

The pivot 32 of the lever 31 is mounted on the door for rotation with the lever 31. At its outer end, it has a screw slot 36 in which a tool can be inserted for rotating the lever 31 in a counterclockwise direction against the bias of its spring 33. Thus, once the lever 20 is moved to latching position and is latched therein by the lever 31 of the defeater mechanism 30, the lever 20 cannot be moved to release the roller 23 without first inserting a tool in the slot 36 and rotating the lever 31 in a counterclockwise direction against the bias of the spring 33.

It sometimes happens that a workman will slam the cabinet door closed while the door handle operated latching mechanism is in door latching position, in which position the rollers 23 extend outwardly of the opening beyond the margin of the wall 7 and hence in blocking relation to closure of the door. In order to prevent damage to the latching mechanism or the cabinet and door when such inadvertent closing or slamming of the door occurs, the lever 31 is provided with a cam surface 37.

In a direction from the rear of the door forwardly toward the door, the surface 37 slopes laterally of the opening from a position within the peripheral limits of the opening, when the door is closed, outwardly beyond the peripheral limits, as best illustrated in FIGS. 11, 14 and 17. The cam 37 is arranged so that, as the door is closed, the surface 37 engages the flange 11 of the front wall 7 and rocks the lever 31 from its latching position with respect to the lever 20, which is in a counterclockwise direction in FIG. 9, a sufficient distance to remove the shoulders 34 out of the path of the shoulder 35. When this position of the lever 31 is reached, it releases the lever 20, whereupon the biasing spring 28 returns the lever 20 to the fully open position illustrated in FIG. 12. In this position, the roller 23 is in non-obstructing relation to the closure of the door.

As mentioned, the lever 31 is biased by its spring 33 in the clockwise direction in FIG. 9. Accordingly, as soon as the cam 37 has cleared the inner limit of the wall 7, the

5

lever 31 is released. Since the lever 20 has been moved by its spring 28 out of latching position to the position illustrated in FIGS. 12 and 15, the spring 33 moves the lever 31 to the position illustrated in FIG. 15. In this position, a detent or shoulder 38 on the lever 31 passes to the rear or inner face of the wall 7, as illustrated in FIGS. 11 and 15, and thus prevents opening of the door sufficiently to gain access to the interior. However, this detent does not latch the door firmly in sealed position, but leaves it slightly ajar and merely prevents its opening sufficiently for access.

As mentioned, the lever 24 near the upper portion of the door is connected to the lever 20 by means of the link 26, so that the levers 20 and 24 operate in all respects the same.

Referring next to the switch operating mechanism, the switch includes a contact carrier 40 which carries contacts 41 for movement to open and closed position with respect to stationary contacts 42. The carrier 40 is mounted in a conventional manner for swinging to on and off positions about a fixed axis. It is connected to a bail 43 having its end portions in the form of radially extending arms 44. The arms 44 are pivotally connected to the switch support by pivots 45 so that the bail can be swung about an axis extending horizontally transversely of the cabinet, between the walls 3, and coincident with the fixed axis of the carrier.

Mounted on the flange 7 or, if desired, on the one of the side walls 3 which is opposite from the hinges 10, is a switch handle operated mechanism for swinging the carrier to on and off positions. This mechanism, best shown in FIG. 8, comprises a support 45a supporting a disc 46 for rotation relative to the bail about a pivot 47. The disc is provided with circumferentially spaced lugs 48 and 49 which, upon rotation of the disc 46 in opposite directions about the axis of the pivot 47, respectively, engage the bail and move it and the carrier to and from open and closed positions, respectively. It is desirable that the bail operate the carrier with a snap action and in response to a switch operating lever which is accessible from the outside of the cabinet. For this purpose, a housing 50 is provided on the outside of the cabinet at the right-hand margin of the front wall 7. The interior of the housing 50 is in communication with the interior of the cabinet and therefore forms, in operating effect, a part of the interior of the cabinet insofar as the moving parts included within the housing are concerned. A handle 51 is mounted therein by a pivot 52 for swinging about a horizontal axis extending transversely of the cabinet, to and from the open or off position illustrated in FIG. 18 from and to the fully on position illustrated in FIG. 23. The handle is provided with an elongated slot 53 and an aperture 54 which, in the on position of the handle, registers with an aperture 54a in a fin 55 which is rigid with the housing 50. Consequently, a padlock can be passed through the two apertures for locking the handle 51 in the fully on position. The housing 50 is also provided with a fin 56 having an elongated slot 57 adapted to be registered with the slot 53 when the handle is in the fully off position, as illustrated in FIG. 18. The slots 53 and 57 are such that three padlocks can be passed through them when they are aligned for locking the handle in the fully off position so that unauthorized persons cannot possibly tamper with the handle and close the switch. The handle 51 is connected to the disc 46 so that when the handle is in its fully on position, the switch is in fully closed or on position, and when the handle is in fully off position, the switch is in fully open or off position.

It is desirable that the switch move to off and on positions with a snap action. An operating connection is provided between the handle 51 and the disc 46 for assuring this action. For this purpose, a disc 58 is connected to the handle 51 for rotation therewith about the axis of the pivot 52. A rod 59 is pivotally connected at one end to the disc 58. The opposite end of the rod 59 engages an

6

elongated slot 60 in, and extending generally circumferentially of, the disc 46. A spring 61 is connected at one of its ends to the rod 59 and at the other of its ends to a fixed abutment in the cabinet. The spring 61 normally urges the rod 59 to the right downwardly in FIG. 18, thus biasing the rod generally in that direction so that, as in FIG. 18, its end is normally at the right hand end of the slot 60. Also connected to disc 46 is a dead-center mechanism which includes a rod 62 having one end connected in an elongated circumferentially extending slot 63 in the disc 46. The other end of the rod 62 is received in a suitable guide 64 carried by the casing. A biasing dead center spring 66 is interposed between the end wall of the guide 64 and a suitable shoulder 67 on the rod 62. The spring urges the rod to the left and generally upwardly, as in FIG. 18 when the spring is at one side of dead center, and to the right and generally upwardly, as in FIG. 23, when the spring is at the other side of dead center. As the result of these connections, movement of the handle to on position causes a snap action of the disc 46, and hence of the bail, to move the switch to on position with a snap action. Movement of the handle to the off position causes a snap action of the disc 46 and hence of the bail, to move the switch to off position with a snap action. At the same time, the action is such that when the handle is moved part way toward off or on position a predetermined distance sufficient to initiate the snap action, it itself is drawn correspondingly to fully off or fully on position against an abutment 70 or 71 on the housing 50.

The operation of this mechanism is best illustrated in FIGS. 19 through 23. Starting with the open or off position of the handle, as illustrated in FIG. 18, it is to be noted that the rod 59 has rotated the disc 46 in a clockwise direction sufficiently to initiate the snap action and the abutment 49 has engaged an arm 44 of the bail 43 and moved it to the extreme clockwise position wherein the switch is off. In this position, a suitable abutment 75 on the disc 46 has engaged a fixed stop 76 carried by the cabinet. In this position, one end of the rod 59 is held in the right hand end of the slot 60 due to the pull and biasing effect of the spring 61, which pull continuously urges the rod 59 downwardly in FIG. 18. Also, in this position, the dead-center spring 66 is compressed and is urging the rod 62 to rotate the disc 46 clockwise or in the same direction in which it has been urged to move by the handle and the spring 61. The switch is open.

To close the switch, the handle 51 is swung in a counterclockwise direction in FIG. 18. The initial effect of this movement is to move the rod 59 to the left, as illustrated in FIG. 21, until its left end is in the end of the slot 60 farthest from the handle 51. Continued movement of the handle in the on direction results in causing the rod 59 to rotate the disc 46 counterclockwise until the rod 62 and spring 66 eventually pass dead center position. When they do so, the spring 66 moves the switch immediately to the position illustrated in FIG. 22 with a snap action. In this latter position, the abutment 48 has been brought against the bail arm 44 and the bail rotated in the counterclockwise direction. At the same time, the disc 46 has been moved in a counterclockwise direction so that the left-hand end of the rod 59 is in the right-hand end of the slot 60 and an abutment 77 is in engagement with a fixed abutment 78 carried by the cabinet. The spring 61 operates to swing the handle 51 to its fully on position against the abutment 71, as shown in FIG. 23. Movement of the handle in the opposite direction, of course, reverses the process and opens or turns off the switch with a snap action.

It is desirable that the switch and door be interlocked so that the switch cannot be turned on while the door is open and the door cannot be opened when the switch is on. For this purpose, a defeat latching mechanism 79 is operatively connected to the handle.

The defeat latching mechanism 79 comprises a locking lever 80 pivotally mounted in the housing 50 by means

of a pivot 81 for swinging about an axis parallel to the axis 52 of the lever. The locking lever 80 is biased by means of a spring 82 to swing in a direction toward the disc 58. The disc 58 has a shoulder 83 positioned to inter-engage with a detent 84 on the lever 80 when the handle 51 is moved from off position part way toward on position. Thus, normally, with the handle 51 in off position, the detent 84 is positioned to prevent turning of the handle to on position so long as the lever 80 is free to move in the direction in which biased by the spring 82. The position of the shoulder 83 on the disc 58 is such that when the handle 51 is in on position, the shoulder is beyond the detent 84 in a counterclockwise direction of rotation. The disc 58 has a cam surface 85 which, when the handle is swung from on toward off position, holds the lever 80 with its detent 84 in a withdrawn position so that it does not interfere with the swinging of the handle 51 to off position. When the surfaces 85 and shoulder 83 pass the detent 84 while moving in a clockwise or off direction, the detent 84 drops into position to be engaged by the shoulder 83 to prevent return of the shoulder 83 and handle 51 in a counterclockwise or on direction.

As a result, once the handle is moved to off position, it cannot be returned to the on position without in some manner removing the detent 84 from the path of the shoulder 83. The lever 80 is mounted on its pivot 81 for rotation therewith. The pivot 81 has at one end a notch 87. The notch 87 can be engaged by a screw driver when the handle is in on position and turned so as to turn the lever 80 counterclockwise in FIG. 18. However, the handle is arranged so that when it is in the off position, it overlies the notch 87. As a result, a screw driver cannot be inserted and used to swing the lever counterclockwise and hence the handle 51 cannot be moved to on position.

An interlock is provided between the door latching mechanism and the switch handle operating mechanism. As illustrated in FIGS. 18 through 24, the lever 80 has at its lower end a finger 90 which extends outwardly from the plane of the discs 46 and 58 so as to lie exposed within the lateral limits of the opening 8, but rearwardly from the forward limit of the opening 8. Mounted on the door is a door hook 91 which extends inwardly normal to the plane of the door. The disc 58 has a restraining cam surface 92 which engages the lever 80 and holds it with the finger 90 in a position out of the path of the hook 91 when the handle 51 is fully off, and permits the lever to swing so that the finger 90 is in the path of the hook when the handle is in other than off position. The door hook 91 has a cam surface 93 which, as the door is being moved to closed position while the handle is in on position, engages the finger 90 and swings the lever 80 counterclockwise against the force of its biasing spring 82 until the cam surface 93 passes the finger 90. Thereupon, the lever 80 is returned by its biasing spring to its original position and engages in back of a latching shoulder 94 on the hook 91 and latches the door in closed position. The door cannot be freed from the hook and opened while the handle 51 is out of off position except by placing a screw driver in the notch 87 and operating the lever 80 to defeat the interlock of the finger 90 and hook 91. Since the notch 87 is inaccessible when the handle 51 is in off position and the hook 91 does not itself move the lever to defeat the latching operation of the detent 84, the handle 51 cannot be moved to on position because of the shoulder 83 and detent 84, if the door is open or other than fully latched.

On the other hand, it is desirable that the lever 80 be movable to a position such that it defeats the latching operation of the detent 84 when the door is latched in fully closed and sealed position by the door handle operated latching mechanism heretofore described. For this purpose, an operating lug 96 is provided on the link 26. The lug 96 is so positioned that when the locking rollers

23 on the latching levers 20 and 24 are moved to a position such that they have moved the door into fully closed and sealed position, the lug engages the finger 90 and swings the lever 80, against the force of its biasing spring 82, to a position in which it cannot interlock in any manner with the shoulder 83 of the handle 51 and then holds it in that position.

Thus it is seen that when the door is open, or partially released or slightly ajar, the handle 51 cannot be moved to the on position. For like reasons, if the handle 51 is in on position, the door cannot be fully released. On the other hand, when the door is in closed position and has been drawn tightly into sealing position, the handle can be freely operated to on and off positions. The seal between the door and the cabinet cannot be broken without operating the defeater mechanism 30, regardless of the condition of the switch. The switch cannot be turned on unless the door is in fully closed and sealed position except by deliberate manipulation of the defeater mechanism. The switch can be turned on when the door is open only by operating the defeater mechanism 79 and this must be done deliberately by manually operating the lever 80 through the opening 8. Assuming the door is fully closed and the switch is in off position, the seal can be broken only by operating the defeater mechanism 30 and turning the handle 22. While the door is thus released, the switch handle cannot be moved to on position because of the interlock between the detent 84 and the shoulder 83.

Starting with the door in fully closed and sealed position, the lever 80 is held by the lug 96 in inoperative position, whereupon the switch can be thrown at will to on or off positions with a snap action. With the switch handle 51 in off position, the door can be opened by turning the defeater mechanism 30 by a hand tool and, at the same time, operating the door handle 22.

If the switch handle 51, however, is thrown to on position while the door is closed and sealed, and the door is then released, the shoulder 94 of the door hook 91 engages the finger 90 of the lever 80 and is prevented from outward movement and thus prevents opening of the door. The only manner of fully releasing the door under these conditions is to engage the now uncovered slot 87 with a screw driver and turn the lever 80 to inoperative position with respect to the hook 91. Even then, the door cannot be opened because the locking shoulder 38 of the defeater mechanism 30 prevents fully opening the door. Both it and the defeater mechanism 79 must be rendered inoperative concurrently. Usually this is best done by turning the defeater mechanism 30 in a counterclockwise direction and holding it there, and then turning the handle 22 to the door releasing position, and, while holding both the mechanism 30 and handle 22 in this condition, lifting the door outwardly until the shoulder 38 has passed the inner face of the front wall 7. Then, while still holding the door in this latter position, the defeater mechanism 79 of the lever 80 is operated so as to render the detent 84 inoperative.

If the door is fully open and the switch is off, the switch is locked, against turning on, by the detent 84. If it is desired to turn the switch on, this can be done by grasping the finger 90 by hand and pulling the lever 80 to an inoperative position.

In some instances, the lug 96, such as herein shown, may not be provided, in which case the cover hook must perform a dual function.

As illustrated in FIGS. 24 and 25, the operating handle 100 is provided with a disc 101 carrying a shoulder 102 engageable with a detent 103 of a rock lever 104. The lever 104 is biased to locking position and corresponds to the lever 80 heretofore described. The lever 104 has an outturned finger 105 positioned to be engaged by a door hook 107 when the handle 100 is in other than off position, and to be out of the path of the hook when the handle 100 is in off position. The door hook is carried on the door in

9

a position such that when the door is moved to a closed position with the handle 100 in the on position, a surface 106 engages the finger 105 and swings the lever against the bias of its spring to releasing position, until the cam surface passes the finger 105. Thereupon, the finger 105 enters in back of a locking shoulder 103 on the hook. However, the hook has an edge wall 109 so positioned that it prevents the lever 104 from swinging in a clockwise direction a sufficient distance to permit the detent 103 to engage the shoulder 102. Thus, when the door is closed sufficiently to pass the cam surface 106 beyond the finger 105 in the inward direction, the detent 103 cannot interlock with the shoulder 102 and the switch can be turned on and off by the handle 100. Thus the switch is operable when the door is closed independently of whether or not the door is drawn to sealed position. It is only necessary that the door be closed sufficiently to cause the cam surface 106 to pass inwardly of the cabinet beyond the finger 105 and allow the finger 105 to return and interlock with the shoulder 103. This assures that the door will remain closed when the handle is in an on position, or that the handle cannot be turned to on position with the door open or slightly ajar without deliberate manipulation of the lever 104. This does not assure a positive dust seal as does the form hereinbefore described.

Having thus described our invention, we claim:

1. A cabinet member having a passage, a door member hingedly connected to the cabinet member for movement to open and closed positions relative to the passage, latching means movably mounted on one of the members and having a part movable transversely of the passage to a latching position in which, when the members are in closed position, it is disposed partially across the passage and in engagement with the other of the members for locking the members in closed position and in which, when the members are in open position, it is disposed in blocking relation to the passage, said part being movable from said latching position to an unlatching position in which the members are unlocked and in which it permits closure of the members unimpeded by the part, a spring biasing the latch means in a direction to move said part to said unlatching position, a defeater device carried by one of the members and movable to an active position in which it retains the latch means with the part in the latching position, and movable from its active position to an inactive position in which it is released from the latch means, a spring biasing the defeater device to active position, means operable manually from the exterior of the cabinet independently of the latch means, when the members are in closed position, to move the defeater device to said inactive position for releasing the latch means, additional means carried by the defeater device and by the one of the members other than the one by which the defeater is carried, respectively, and operative, upon movement of the members part way toward closed position, with the said part of the latch means in latching position, to engage and release the defeater device from the latch means before said part interferes with closure of the members.

2. The structure according to claim 1 wherein the defeater device includes detent means rendered operative by return of the defeater toward active position, by its biasing spring, upon movement of the members in the closing direction to a different position beyond the defeater release position, to directly latch the members in said different position.

3. The structure according to claim 2 wherein said additional means includes a cam having a camming surface engageable with a marginal wall of the one of the members other than the one by which the device is carried and movable by said marginal wall, upon movement of the members toward closed position, to move the defeater out of defeating position.

4. A cabinet having an opening, a door hingedly con-

10

nected to the cabinet for movement to open and closed positions relative to the opening, complementary releasable latching means on the door and cabinet, respectively, for latching the door in closed position, a switch in the cabinet movable to on and off positions, a switch handle movably mounted on the cabinet for movement to on and off positions, connecting means connecting the switch handle and switch for moving the switch to positions corresponding to those of the handle, one latch means mounted in the cabinet and movable by, and in fixed relation to, the movement of the switch handle, a second latch means complementary thereto and mounted in the cabinet for movement to latching position relative to said one latch means for latching the switch handle, and from latching position to releasing position for releasing the switch handle, a spring biasing the second latch means toward its latching position, means movable by, and in fixed relation to, movement of the switch handle for moving the second latch means out of latching position when the switch handle is moved from on toward off position a distance sufficient to cause the switch to move to off position and for permitting the second latch means to be moved by its spring to latching position when the switch handle is moved from an off position toward on position a distance sufficient to move the switch to on position, complementary means carried by the door and connectable to said second latch means and operative to hold the door in a closed position while the switch is in on position, and manually operable defeating means accessible for operation from the outside of the cabinet for defeating the latching operation of the door by the second latch means, independently of the handle, while the door is in closed position, and, concurrently, the handle is in on position.

5. The structure according to claim 4 wherein said defeater means is accessible to an operator through the cabinet opening when the door is open and is manually movable against the force of the biasing spring to an unlatching position, whereby an operator can release and move the switch to on position by the handle with the door open.

6. The structure according to claim 4 wherein the complementary releasable latching means on the door and have a part operative to move the second latch means to, and hold it in, released position with respect to the handle so long as the complementary releasable latching means are locking the door in closed position.

7. The structure according to claim 6 wherein said complementary releasable latching means carried by the door is a door hook having a cam surface and a hook portion, and the second latch means have a finger engageable by the cam surface of the hook and movable thereby for moving the second latch means to releasing position as the door is moved nearly to closed position, and said cam surface being shaped to release the finger so that it can lockingly engage with the hook portion as the door is moved farther in the closing direction.

8. The structure according to claim 6 wherein said complementary releasable latching means carried by the door is a member movably mounted on the door and operative in one position to be engaged by the said second latch means when the door is fully closed, and said complementary releasable latching means includes additionally an operating handle, means drivingly connecting the member and complementary releasable latching means for moving the member to a position to release said second latch means when the handle is moved to a position to cause the complementary releasable latching means to move to door locking position while the door is closed.

9. The structure according to claim 8 and further including a defeater mechanism mounted on the inside of the door and operative in an active position to prevent unlatching of the handle operated door latch, and

11

in an inactive position to release the handle operated door latch for unlatching, means biasing the defeater mechanism to active position, and means accessible from the outside of the cabinet by a tool and movable by the tool to move the mechanism to inactive position for permitting unlatching of the door by the handle operated latch when the switch handle is in on position.

10. A cabinet having an opening, a door hingedly connected to the cabinet for movement to open and closed positions relative to the opening, complementary latching means on the door and cabinet, respectively, for latching the door in closed position, a door operating handle movably mounted on the door for operating the complementary latching means, a switch in the cabinet, a switch handle mounted on the cabinet for movement to on and off positions for moving the switch to on and off positions corresponding to the on and off positions of the switch handle, a door latch spring-biased defeater on the inside of the door and normally biased to a position to prevent unlatching the door when the door latch is in latching position, a spring biased switch defeater in the cabinet and normally biased to a position to latch the switch in off position when the door is unlatched, means carried by the door and operative when the door is latched in closed position to release the switch defeater from latching relative to the switch, each of said defeaters having a tool engageable portion accessible from the outside of the cabinet for operation manually by a tool for moving it to, and holding it against its biasing force in, an inactive position, and said portions being positioned apart so that they cannot be operated concurrently by the same tool to inactive positions to permit unlatching and opening the door while the switch is on.

11. A cabinet having an opening, a door hingedly connected to the cabinet for movement to open and closed positions relative to the opening, complementary releasable latching means on the door and cabinet, respectively, for latching the door in closed position, a switch in the cabinet movable to on and off positions, a switch handle movably mounted on the cabinet for movement to on and off positions, connecting means connecting the switch handle and switch for moving the switch to positions corresponding to those of the handle, one latch means mounted in the cabinet and movable by, and in fixed relation to, the movement of the switch handle, a second latch means complementary thereto and mounted in the cabinet for movement to latching position relative to said one latch means for latching the switch handle, and from latching position to releasing position for releasing the switch handle, a spring biasing the second latch means toward its latching position, means movable by, and in fixed relation to, movement of the switch handle for moving the second latch means out of its latching position when the switch handle is moved from on toward off position a distance sufficient to cause the switch to move to off position and for permitting the second latch means to be moved by its spring to latching position when the switch handle is moved from an off position toward on position a distance sufficient to move the switch to on position, said connecting means including lost motion means affording limited relative movement between the switch handle and the switch, and dead cen-

12

ter spring means to throw the switch with a snap action to on position and to off position when the switch is moved part way to said positions by the switch handle, respectively, and means rendered operative by said snap movement of the switch to its on and off positions to move the switch handle fully to its corresponding on and off positions, respectively.

12. A cabinet having an opening, a door hingedly connected to the cabinet for movement to open and closed positions relative to the opening, complementary latching means on the door and cabinet, respectively, for latching the door in closed position, a door operating handle movably mounted on the door for operating the complementary latching means, a switch in the cabinet, a switch handle mounted on the cabinet for movement to on and off positions, operating means connecting the switch handle and switch for moving the switch to on and off positions corresponding to the on and off positions of the switch handle, a door latch, defeater means on the inside of the door and normally preventing unlatching the door when the door latch is in latching position, a switch defeater means normally latching the switch in off position when the door is unlatched, means carried by the door and operative when the door is latched in closed position to release the switch defeater means from latching relative to the switch, each of said defeater means having a tool engageable portion accessible from the outside of the cabinet for operation manually by a tool for moving it to, and holding it against its biasing force in, an inactive position, means preventing said portions from being operated concurrently by the same tool to inactive positions to permit unlatching and opening the door while the switch is on, said operating means including a member rotatable about a predetermined axis and operative upon rotation in opposite directions to move the switch to on and off positions, respectively, and connected to said switch handle, dead center spring means connected to the member to move the member to a fully on and fully off position with a snap action as the member is rotated to dispose the spring means to one side and the other side, respectively, of dead center, lost motion connecting means connecting the switch handle to the member for movement of the switch handle with the member to said on and off positions of the switch handle and for limited movement toward on and off positions relative to the member, and biasing means operative in the on position of the switch to effect said limited movement of the switch handle in the on direction to an extreme on position, and in the off position of the switch to effect said limited movement of the switch handle in the off direction to an extreme off position.

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