Oct. 29, 1968 D. W. PALMER 3,408,466

CIRCUIT INTERRUPTER WITH LOCKING PROVISION

Filed Dec. 10, 1964

FIG. 1

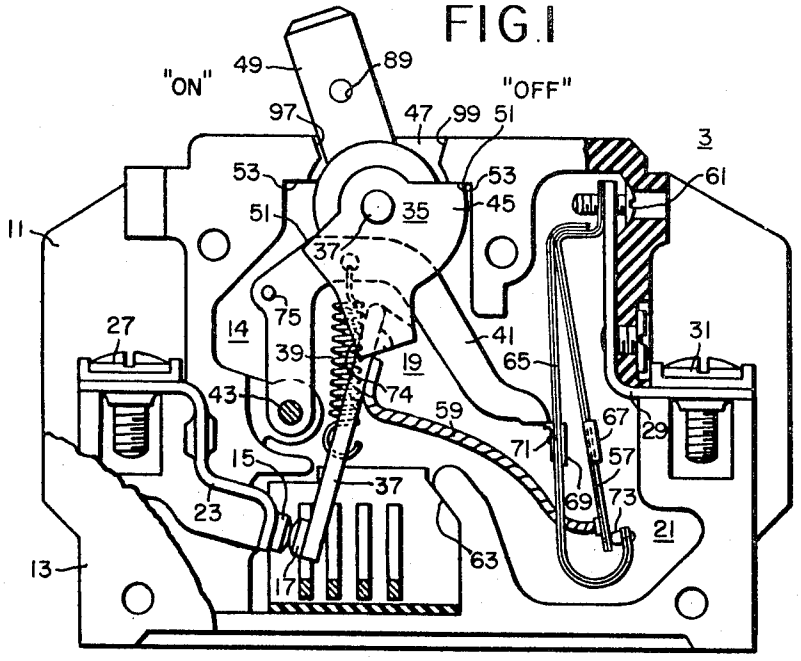


FIG. 3

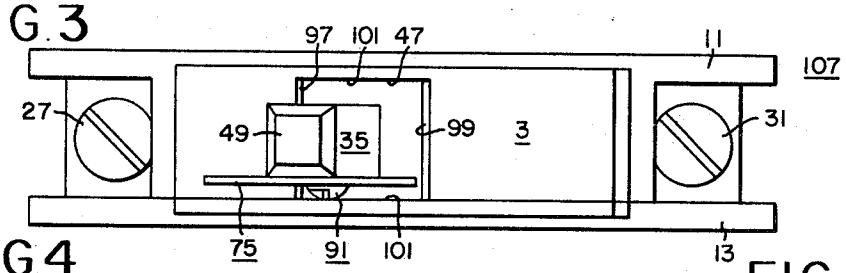


FIG. 4

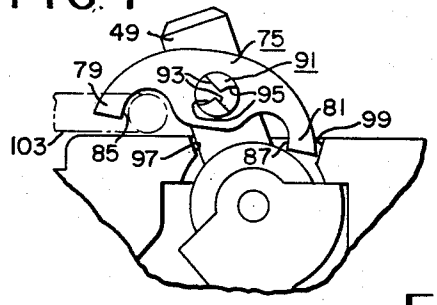


FIG. 5

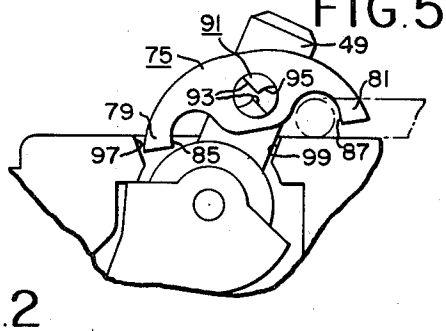
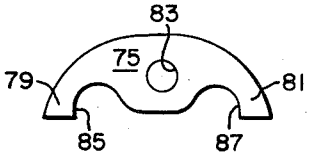


FIG. 2



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CIRCUIT INTERRUPTER WITH LOCKING PROVISION

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This invention relates generally to circuit interrupters and more particularly to circuit interrupters of the type that may be padlocked in one or more selected operating positions.

At certain installations it is required or desirable to be able to padlock a circuit interrupter in one or more selected positions. For certain types of circuit interrupters the padlocking provision is required or desirable in only a small percentage of the overall number of circuit interrupters that a manufacturer may supply. Thus, it is desirable to provide means for padlocking a standard type circuit interrupter without necessitating substantial reconstruction of the circuit interrupter.

An object of this invention is to provide an improved circuit interrupter having provision for padlocking the actuating handle of the circuit interrupter in one or more selected positions.

Another object of this invention is to provide improved means for padlocking a manually operable handle of a circuit interrupter in the "on" and "off" positions.

Another object of this invention is to provide an improved circuit interrupter of the type comprising a housing having an opening at the front thereof with a manually operable handle protruding through the opening to permit manual operation of the circuit interrupter with improved means for padlocking the circuit interrupter in one or more selected positions.

A further object of this invention is to provide an improved standard type molded-case circuit interrupter with improved padlocking means permitting the circuit interrupter to be padlocked in one or more selected positions, which padlocking means is readily adaptable to a number of standard types of circuit interrupters without requiring substantial retooling of the interrupters.

Another object of this invention is to provide an improved circuit interrupter with padlocking means that may be readily mounted in the field to permit the circuit interrupter to be padlocked in one or more selected positions thereof.

The novel features that are considered characteristic of this invention are set forth in particular in the appended claims. The invention itself, however, both as to structure and operation, together with additional objects and advantages, will be best understood from the following detailed description when read in conjunction with the accompanying drawings.

In said drawings:

FIGURE 1 is a side elevational view, partly in section and with the cover plate partly broken away, of a circuit breaker embodying principles of this invention;

FIG. 2 is a side elevational view of a locking member constructed to cooperate with the circuit breaker of FIG. 1;

FIG. 3 is a plan view of the circuit breaker of FIG. 1 with the locking member of FIG. 2 secured thereto;

FIG. 4 is a partial view of the circuit breaker of FIG. 1 with the locking member of FIG. 2 secured thereto padlocked in the "on" position; the hasp of a padlock being shown in broken lines; and

FIG. 5 is a view similar to FIG. 4 with the circuit breaker being padlocked in the "off" position.

Referring to the drawings, there is shown in FIG. 1 a molded-case type circuit breaker **3**. The circuit breaker **3** is more specifically described in the patent to E. J. Walker et al., Patent No. 2,568,423. Thus, only a brief description of the circuit breaker **3** is given herein. The circuit breaker **3** comprises an insulating housing part **11** and an insulating cover part **13** cooperable with the housing part **11** to form a compartment to thereby house a circuit breaker mechanism **14**. The mechanism **14** comprises a stationary contact **15**, a movable contact **17**, an operating mechanism **19** and trip device **21**.

The stationary contact **15** is rigidly secured to the inner end of a conductor **23** that extends out from the compartment formed by the housing **11, 13**. A terminal connector **27** is provided at the other end of the terminal **23** to enable connection of the circuit breaker in an electric circuit. A conductor **29**, having a terminal connector **31** at its outer end and supporting the trip device **21** at its inner end, is supported at the other end of the housing **11, 13**.

The movable contact **17** is fixedly secured on the free end of a generally U-shaped switch arm or contact arm **37**. The opposite legs of the U-shaped contact arm **37** are supported in recesses in a molded insulating operating member **35**. The operating member **35** is pivotally supported by means of trunnions **37** at opposite sides thereof, which trunnions are rotatably mounted in bearing supports formed in the housing parts **11, 13**. An overcenter operating spring **39** is supported under tension between the bight portion of the contact arm **37** and a releasable trip member **41** that is pivotally supported at **43** on the housing parts **11, 13**. The releasable trip member **41** is latched at its free end by means of the trip device **21**.

The operating member **35** comprises a molded insulating main operating lever part **45** supported within the housing **11, 13** in proximity to an opening **47** in the front of the housing **11, 13**. The operating member **35** also comprises a handle part **49** molded integral with the lever part **45**. The handle part **49** extends through the opening **47** out through the front of the circuit breaker **3**. The operating lever **45** of the operating member **35** is formed with opposite stop surfaces **51** that cooperate with opposite internal surfaces **53** on the housing part **11, 13** to limit operating movement of the operating member **35** in both directions. The operating lever **45** of the operating member **35** substantially closes the opening **47** in the housing **11, 13** in all positions of the operating member **35**. The contact arm **37** is electrically connected to one end of a tripping bimetal **57** by means of a flexible conductor **59**. The tripping bimetal **57** is fixedly secured to the terminal strip **39** by means of a screw member **61**.

The circuit through the breaker extends from the terminal conductor **23** through the contacts **15, 17**, the contact arm **37**, the flexible conductor **59**, the current carrying tripping bimetal **57** through the terminal conductor **29**.

The circuit breaker is manually operated by operation of the operating member **35**. Movement of the handle **49** in a clockwise (FIG. 1) direction moves the operating lever **45** to move the legs of the contact arm **37** overcenter to the left of the line of action of the overcenter operating spring **39** whereupon the operating spring **39** biases the contact arm **37** to the open position and causes movement of the contact arm to the open position with a snap action. The contact arm **37** is stopped in the open

position when it engages a projection 63 that is molded integral with the housing part 11.

The contacts are manually closed by reverse operation of the operating member 35. Counterclockwise movement of the operating member 35 moves the contact arm 37 to position the legs of the contact arm overcenter to the right of the line of action of the overcenter spring 39 whereupon the spring 39 operates to move the contact arm 37 to the closed position seen in FIG. 1 with a snap action.

The circuit breaker is constructed to be tripped open instantaneously in response to overload currents above a predetermined value, and to be tripped open after a time delay in response to lesser overload currents below the predetermined value, by means of the trip device 21. In addition to the tripping bimetal 57, the trip device 21 comprises a latching bimetal 65 that latches the free end of the trip member 41 and also compensates for changes in ambient temperature. The latching bimetal 65 is welded or otherwise suitably secured at the upper end thereof to the upper end of the tripping bimetal 57. A magnet member 67 is rigidly mounted on and surrounds the three sides of the tripping bimetal 57. A magnet member 69 is rigidly secured to one side of the latching bimetal 65 by means of a suitable rivet that also secures a latch 71 to the opposite side of the latching bimetal 65. As is shown in FIG. 1 the latch 71 normally engages the free end of the trip member 41 to prevent clockwise rotation of the trip member 41 about the pivot 43.

Upon the occurrence of an overload current above the rated current but below a predetermined value, the tripping bimetal 57 is heated by the current flow therein and it deflects moving its free end toward the right during which movement it engages an insulating button 73 at the free end of the latching bimetal 65 to move the latching bimetal in the same direction causing the latch 71 to release the trip member 41 whereupon the trip member 41 is pivoted by the force of the spring 39 in a clockwise direction about the pivot 43. As the trip member 41 pivots about the pivot 43 the line of action 39 of the springs 39 is moved to the right of the upper end of the switch arm 37 whereupon the spring contracts to move the switch arm to the open position. The trip member 41 is stopped in the lower position when it engages the upper side of the projection 63. During this tripping operation the handle 49 is automatically moved to an intermediate position between the "on" and "off" positions in a well-known manner.

The circuit breaker is trip-free in that the contact arm 37 will be moved to the tripped position upon release of the releasable member 41 even if the handle 49 is held in the on position.

Before the contacts can be closed following an automatic tripping operation, it is necessary to reset and relatch the mechanism. This is accomplished by moving the handle 49 clockwise to the full off position during which movement a lower leg part 74 of the operating lever part 45 engages a pin 75 to move the releasable member 41 in a counterclockwise direction about the pivot 43. Near the end of this movement, the free end of the member 41 wipes by the latch 71 slightly flexing the latching bimetal 65 and when the free end of the member 41 is past the latch 71 the bimetal 65 snaps back to latch the member 41 in the latching position shown in FIG. 1. Thereafter, the circuit breaker 3 can be manually or automatically operated in the same manner hereinbefore described.

Upon the occurrence of an overload above the predetermined value, the current flowing through the tripping bimetal 57 sufficiently energizes the magnet member 67 to effect attraction of the magnet member 69 whereupon the magnet 69 is instantaneously drawn toward the magnet 67 flexing the latching bimetal 65 to the right to release the trip member 41 and effect a tripping operation of the circuit breaker in the same manner hereinbefore described.

The bimetal 65 serves as a compensating bimetal to compensate for changes in ambient temperature in a manner that is more specifically described in the aforementioned patent to E. J. Walker et al., Patent No. 2,568,423.

There is shown in FIG. 2 a locking device 75 comprising a generally flat sheet metal member having two end parts 79 and 81 and an opening 83 intermediate the end parts 79 and 81. The locking device 75 is formed with a padlock-receiving notch 85 adjacent the end part 79 and a padlock-receiving notch 87 adjacent the end part 81. As can be seen in FIG. 1, the handle 49 of the circuit breaker 3 is provided with an opening 89 that extends therethrough. When it is desired to provide means for padlocking the circuit breaker 3 in one or more preselected positions the locking device 75 is attached to the handle 49 at either of the two opposite sides of the handle 49 by means of a one-way cutting screw 91 that passes through the opening 83 in the locking device 75 and is screwed with a cutting action into the handle opening 89. The screw 91 is a one-way type screw with two generally flat surfaces 93 that will be engaged by opposite sides of the blade of a screwdriver to provide clockwise (FIGS. 4 and 5) rotation of the screw upon clockwise rotation of the screwdriver. The screw 91 is provided with well-known type camming surfaces 95 that operate to cam the blade of the screwdriver out of working position if the screwdriver is rotated counterclockwise (FIGS. 4 and 5) in an attempt to rotate the screw 91 in a counterclockwise or releasing direction. A special tool, therefore, is required in order to work the screw 91 in a counterclockwise or releasing direction. The screw 91 is provided with a smooth short neck portion (not shown) adjacent the head part thereof which neck portion fits in the opening 83 of the locking device 75 with enough clearance to permit the locking device 75 to be rotated about the screw 91 in the plane of the paper as seen in FIGS. 4 and 5.

As can be seen in FIGS. 1 and 3–5, the insulating housing part 11 of the circuit breaker 3 is formed with the opening 37 at the front-part of the circuit breaker. A first surface 97 is provided at one end of the opening 47 and a second surface 99 is provided at the other end of the opening 47 which surfaces 97 and 99 are part of the molded insulating housing 11 and which surfaces serve to form the two end walls of the opening 47. As can be seen in FIG. 3, there are also two opposite side walls 101 that cooperate with the two opposite end walls 97, 99 to form the generally rectangular opening 47. As was previously described, when the operating member is mounted in position the operating lever part 45 serves to substantially close the opening 47 in all positions of the operating member 35.

When the locking device 75 is mounted on the handle 49, the circuit breaker can be manually operated in the same manner hereinbefore described. During manual operation the end parts 79 and 81 are evenly spaced away from the front of the housing so that the locking device 75 will not interfere with the manual operation. It is desired to padlock the circuit breaker in the "on" position; the locking device 75 is rotated about the screw 91 in a clockwise (FIG. 4) direction to move the end part 81 down into the opening 47. The hasp 103 (shown in broken lines in FIG. 4) of a padlock is then passed into the padlock-receiving notch 85 (FIG. 2) of the locking device 75 to prevent counterclockwise or unlocking movement of the locking device 75 about the screw 91. The maximum dimension between the bottom of the end part 79 of the locking device 75 and the front surface of the insulating housing 11, which dimension is limited by engagement of the end part 81 with the operating lever 45, is less than the diameter of the hasp 103 of the padlock so that once the padlock is locked in position the hasp 103 cannot be removed unless the locking device 75 is cut or distorted or bent completely out of position, or unless the padlock is unlocked and the hasp 103 moved axially out of the notch 85. With the hasp 103 in the

position seen in FIG. 4, if an attempt is made to operate the circuit breaker to the "off" position the end part **81** of the locking device **75** will engage the surface **99** of the insulating housing to prevent movement of the handle **49** to the "off" position to thereby prevent operation of the circuit interrupter to the "off" position. As was previously described, the circuit breaker is trip-free in that the contacts will be operated to the open position upon the occurrence of an overload current even if the handle **49** is held or locked in the "on" position.

If it is desired to padlock the circuit breaker in the "off" position after the handle **49** has been manually operated to the "off" position, the locking device **75** is rotated counterclockwise (FIG. 5) to the position shown in FIG. 5 and the hasp **103** of the padlock is passed into the notch **87** (FIG. 2) to be captured between the locking device **75** and the insulating housing of the circuit interrupter in the same manner hereinbefore described with respect to FIG. 4. If an attempt is then made to operate the circuit interrupter to the "on" position, the end part **79** of the locking device **75** will engage the surface **97** of the housing part **11** to prevent counterclockwise movement of the handle **49** to the "on" position to thereby prevent operation of the circuit interrupter to the "on" position, in the same general manner as was hereinbefore set forth with respect to FIG. 4.

It can be understood that the locking device **75** (FIG. 2) can be readily mounted on a standard type molded-case circuit breaker **3** (FIG. 1) to provide a circuit interrupting structure **107** (FIG. 3) that can be readily padlocked in either the "on" or "off" position. The locking device **75** may be readily securely mounted on the circuit breaker handle **49** at either of the two opposite sides of the handle by means of the single one-way cutting screw **91**. When the locking device **75** is in the mounted position on the handle **49** the handle **49** can be operated to the "on" and "off" positions with the locking device **75** mounted thereon, and when it is desired to padlock the operating handle **49** in either the "on" or "off" position the member **75** is merely rotated on the handle in the proper direction and the hasp of a padlock is passed into one of the two padlock-receiving notches to be captured between the locking device and the circuit breaker housing to thereby padlock the locking device in a position wherein the locking device prevents operation of the circuit breaker handle. Once the locking device **75** is mounted in position, a special tool is required in order to remove the one-way cutting screw that is used to secure the locking device **75** in position. It can be understood, that if it is desired to take further precaution against removal of the locking device **75** one could, for example, rivet the locking device **75** onto the handle **49**. The locking device **75**, which is specifically described as a sheet-metal generally flat member, can be made from any available rigid material. The thickness of the generally flat locking device **75** can also be varied in order to provide more or less strength depending upon the strength requirements at the installation. A locking device comprising a member of .028" thick sheet steel constructed in accordance with the teachings of this invention has been successfully tested.

While the invention has been disclosed in accordance with the provisions of the patent statutes, it is to be understool that various changes in the structural details and arrangement of parts thereof may be made without departing from some of the essential features of the invention.

I claim as my invention:

1. A circuit controlling device comprising a molded-case type circuit interrupter, said circuit interrupter comprising an insulating housing having a generally planar front having an opening therein, a pair of contacts supported within said housing, a handle protruding out through said opening and being pivotally movable along a plane generally normal to the plane of said generally planar front, said handle being pivotally movable between two different positions to open and close said contacts, a locking device mounted on said handle and being movable with said handle between said two positions, when said handle is in one of said positions said locking device being movable on said handle to a locking position to prevent movement of said handle to the other of said positions, and said circuit interrupter and said locking device being constructed and arranged such that when said handle is in said one position and said locking device is in said locking position the hasp of a padlock can be captured in place between said locking device and said circuit interrupter such that when said padlock is locked said hasp, said locking device and said circuit interrupter will interengage to prevent movement of said locking device out of said locking position and to prevent removal of said locked padlock.

2. A circuit controlling structure comprising a circuit interrupter, said circuit interrupter comprising an insulating housing, said housing comprising a back and a front connected by two opposite end walls and two opposite side walls, said opposite side walls comprising generally planar parallel surfaces, said front having an opening therein, a pair of contacts supported within said housing, a handle protruding out through said opening and being movable along a plane generally parallel to the planes of said side walls, said handle being movable between two positions to open and close said contacts, a locking device movably mounted on said handle and being movable with said handle between said two positions, when said handle is in a first of said positions said locking device being movable on said handle to a first locking position to prevent movement of said handle to the second of said positions, means for padlocking said locking device in said first locking position, when said handle is in the second of said two positions said locking device being movable to a second locking position to prevent movement of said handle to said first of said positions, and means for padlocking said locking device in said second locking position.

3. A circuit controlling device comprising a housing having an opening therein, a pair of contacts supported within said housing, a handle protruding out through said opening and being movable between two positions to open and close said contacts, a locking device movably mounted on said handle and being movable with said handle between said two positions, said locking device comprising a first stop part and a first padlock receiving part, said locking device comprising a second stop part and a second padlock receiving part, when said handle is in a first of said two positions said locking device being movable to a first locking position wherein said first stop part prevents movement of said handle to the other of said two positions, when said locking device is in said first locking position said first padlock receiving part being in position to receive the hasp of a padlock to permit said locking device to be padlocked in said first locking position, when said handle is in the other of said two positions said locking device being movable to a second locking position wherein said second stop part prevents movement of said handle to said one of said two positions, when said locking device is in said second locking position said padlock receiving part being positioned to receive the hasp of a padlock to permit said locking device to be padlocked in said second locking position.

4. A circuit controlling device comprising a housing structure having an opening therein; a pair of contacts supported within said housing structure; a handle protruding out through said opening and being movable between two handle positions to open and close said contacts; a locking device movably mounted on said handle and being movable with said handle between said two handle positions; said locking device comprising a first stop part and a first padlock receiving part; said locking device comprising a second stop part and a second padlock receiving part; when

said handle is in a first of said two handle positions said locking device being movable to a first locking position wherein said first stop part engages said housing structure to prevent movement of said handle to the second of said two handle positions; when said locking device is in said first locking position said first padlock receiving part being in position to receive the hasp of a padlock; said circuit controlling device being constructed such that when the hasp of a padlock is padlocked in said first padlock receiving part said hasp will be captured between said locking device and said housing structure to prevent removal of said padlock, and said hasp and housing structure will cooperate to interfere with and prevent movement of said locking device out of said first locking position; when said handle is in said second handle position said locking device being movable to a second locking position wherein said second stop part engages said housing structure to prevent movement of said handle to said first handle position; when said locking device is in said second locking position said second padlock receiving part being positioned to receive the hasp of a padlock; said circuit controlling device being constructed such that when the hasp of a padlock is padlocked in said second padlock receiving part said hasp will be captured between said locking device and said housing structure to prevent removal of said padlock, and said hasp and said housing structure will cooperate to interfere with and prevent movement of said locking device out of said second locking position.

5. A circuit interrupting device comprising a circuit interrupter and a locking device, said circuit interrupter comprising an insulating housing having a generally planar front and an opening in said front, a pair of contacts supported within said housing, a handle protruding out through said opening and being movable between "on" and "off" positions to close and open said contacts, said handle being movable along a plane generally normal to the plane of said generally planar front, a first stop means on said housing in proximity to said handle and a second stop means on said housing in proximity to said handle, a locking device comprising a first stop part and a first padlock receiving part and a second stop part and a second padlock receiving part, means mounting said locking device on said handle for pivotal movement on said handle, when said handle is in said "on" position said locking device being pivotally movable on said handle to a first locking position wherein said first stop part engages said first stop means to lock said handle in said "on" position, when said locking device is in said first locking position said first padlock receiving part being positioned such that when the hasp of a padlock is padlocked in said first padlock receiving part said locking device will be padlocked in said first locking position, when said handle is in said "off" position said locking device being pivotally movable on said handle to a second locking position wherein said second stop part engages second stop means to lock said handle in said "off" position, when said locking device is in said second locking position said second padlock receiving part being positioned such that when the hasp of a padlock is padlocked in said second padlock receiving part said locking device will be padlocked in said second locking position, and when said locking device is padlocked in said first and second locking positions the padlock being captured in place between said circuit interrupter and said locking device.

6. A circuit controlling device comprising a circuit interrupter and a locking device, said circuit interrupter comprising an insulating housing having a generally planar front, said front having an opening therein, said housing comprising two opposite side surfaces and two opposite end surfaces defining said opening, a pair of cooperable contacts supported within said housing, a handle protruding from said housing through said opening and being movable between two operating positions to open and close said contacts, said handle being movable along a plane that is generally normal to the plane of said front, said locking device comprising a member having a first stop part and a second stop part, means pivotally supporting said locking device intermediate said first and second stop parts on said handle, said locking device comprising a first padlock receiving part between said pivot and said second stop part and a second padlock receiving part between said pivot and said first stop part, said first and second padlock receiving parts being open in the direction facing said front of said insulating housing, when said handle is in a first of said operating positions said locking device being pivotally movable on said handle to a first locking position wherein said first stop part engages a first of said end-surfaces to prevent movement of said handle to the second of said operating positions, when said locking device is in said first locking position said first padlock receiving part being positioned to receive the hasp of a padlock to permit said locking device to be padlocked in said first locking position, when the hasp of a padlock is padlocked in said first padlock receiving part said hasp cooperating with said circuit interrupter and said locking device to prevent movement of said locking device out of said first locking position and said locking device and said circuit interrupter cooperating with said hasp to capture said hasp in said first padlock receiving part, when said handle is in the second of said operating positions said locking device being pivotally movable on said handle to a second locking position wherein said second stop part engages the second of said end-surfaces to prevent movement of said handle to said first operating position, when said locking device is in said second locking position said second padlock receiving part being positioned to receive the hasp of a padlock to permit said locking device to be padlocked in said second locking position, when the hasp of a padlock is padlocked in said second padlock receiving part said hasp cooperating with said circuit interrupter and said locking device to prevent movement of said locking device out of said second locking position and said locking device and said circuit interrupter cooperating with said hasp to capture said hasp in said second padlock receiving part.

7. A circuit controlling device comprising a circuit interrupter and a locking device, said circuit interrupter comprising an insulating housing having a generally planar front, said front having an opening therein, a pair of cooperable contacts supported within said housing, a handle protruding from said housing through said opening and being pivotally movable between two different operating positions to open and close said contacts, said handle being pivotally movable along a plane that is generally normal to the plane of said front, said insulating housing defining a first stop means in proximity to said opening on a first side of said handle and a second stop means in proximity to said opening on the second side of said handle which second side is opposite said first side, said locking device comprising a member having a first end and a second end opposite said first end, means pivotally supporting said locking device intermediate the ends thereof on said handle, said locking device comprising a first padlock receiving part on the side of said pivot that is opposite said first end and a second padlock receiving part on the side of said pivot that is opposite said second end, when said handle is in a first of said operating positions said locking device being pivotally movable in a first direction on said handle to a first locking position wherein said first end engages said first stop means to prevent movement of said handle to the second of said operating positions, when said locking device is in said first locking position said first padlock receiving part being positioned such that the hasp of a padlock may be captured therein between said locking device and said insulating housing in which captured position said hasp will engage said locking device and said insulating housing to prevent

pivotal movement of said locking device in a second direction opposite said first direction out of said first locking position, when said handle is in the second of said operating positions said locking device being pivotally movable in said second direction on said handle to a second locking position wherein said second end engages said second stop means to prevent movement of said handle to said first operating position, when said locking device is in said second locking position said second padlock receiving part being positioned such that the hasp of a padlock may be captured therein between said locking device and said insulating housing in which captured position said hasp will engage said locking device and said

insulating housing to prevent pivotal movement of said locking device in said first direction out of said second locking position.

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