Feb. 20, 1962 J. J. ORAVEC 3,022,391

CIRCUIT BREAKER OR SWITCH HAVING LOCKING PROVISION

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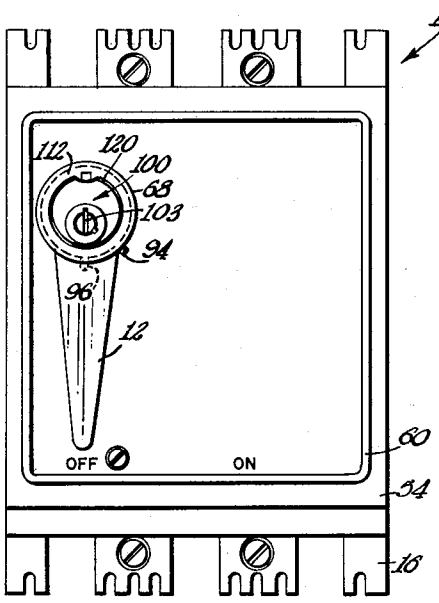

FIG. 1

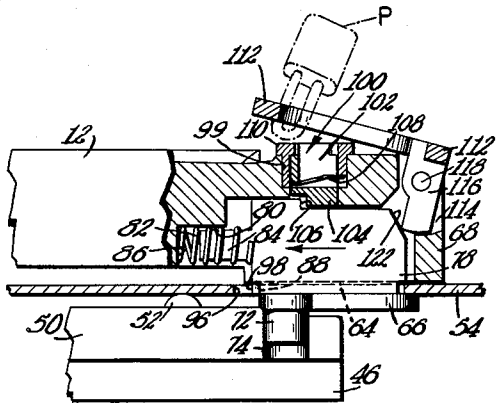

FIG. 3

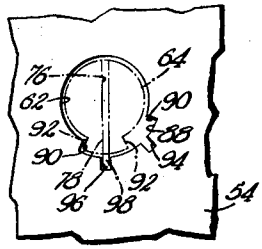

FIG. 4

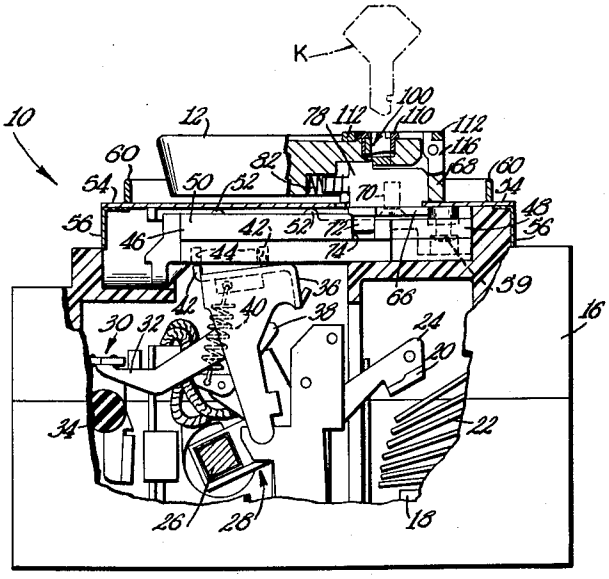

FIG. 2

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CIRCUIT BREAKER OR SWITCH HAVING LOCKING PROVISION

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This invention relates generally to a circuit controlling instrumentality such as a circuit breaker or switch and, more particularly to a circuit breaker or switch having novel provision for locking the actuating handle thereof in a selected position.

One object of the present invention is the provision of an enclosed front operated circuit breaker or switch having an improved and novel provision for locking the actuating handle thereof in a selected position. Pursuant to this object of the present invention the handle may be locked in either the "on" or "off" position by either, or both, of two locking systems operative to interlock a common locking member, one of such systems being key-operated with the other system including a padlock-receiving lock ring for externally locking the handle. Accordingly the operating handle is effectively locked against actuation to another position except when the common locking member is unlocked by the key-operated system and the padlock-receiving lock ring. A feature of the present invention is the convenient, accessible and compact arrangement of the locking systems with respect to the operating handle, both the key-operated lock and the lock ring being carried by the handle in a unique organization.

Yet another object of the present invention is the provision of a circuit breaker or switch actuating handle locking mechanism which is of simple and unique design and construction, economical to manufacture and assemble, and foolproof and reliable in operation.

The illustrative embodiment of the invention, which has been outlined above as incorporating certain novel features forming part of the invention, is more fully described in the remainder of this specification, from which further novel features and objects and advantages will become apparent. In the following description reference is made to the accompanying drawings forming part of this disclosure, in which drawings:

FIG. 1 is a front elevational view of a circuit breaker formed according to the present invention with the handle shown unlocked in the "off" position;

FIG. 2 is a side elevational view thereof with parts broken away to reveal the internal structure;

FIG. 3 is an enlarged fragmentary side elevational view showing the handle locking mechanism, the handle being shown locked by the padlocked lock ring; and

FIG. 4 is a fragmentary front view of the breaker cover part with the operating handle removed but showing part of the handle and locking member schematically.

Referring to the drawings, there is shown a front operated circuit breaker 10 of a similar type as disclosed in Patent No. 2,673,264 issued on March 23, 1954, in the name of T. M. Cole and assigned to the assignee herein. The circuit breaker may be a single pole or multi-pole type and is provided with a handle 12 of the front operated twist type which is pivotally movable about an axis substantially perpendicular to the plane of the breaker to "on" and "off" positions to correspondingly actuate the breaker. The handle is also movable to reset the breaker subsequent to tripping. The circuit breaker may be mounted in a suitable enclosure (not shown) and when so mounted the handle 12 remains accessible for actuation.

The exemplified circuit breaker 10, which is disclosed

in greater detail in the above referred to patent, is a three-pole unit and comprises a casing 16 of molded insulating material which houses and supports the elements of the breaker mechanism. The breaker is provided at each pole with an associated pair of stationary and movable contacts 18 and 20, respectively, and an arc extinguisher 22. The movable contact 20 is mounted on a movable contact member 24 which in turn is mounted for actuation by the insulated bar 26 which extends across all of the poles of the breaker and is journalled for rotation in the walls of the casing. The contact member 24 is movable to "open" and "closed" positions by the operating mechanism indicated generally at 28 at the center pole, there being provided a trip device indicated generally at 30 for effecting the automatic opening of the movable contact in response to predetermined overload conditions. Operatively associated with the mechanism 28 is a cradle 32 which in turn is associated with the trip device 30 in the well known manner. The trip device 30 includes a trip bar 34 which is suitably mounted for rotation about its longitudinal axis. On overload conditions in the circuit breaker the trip bar 34 will be rotated to release the cradle 32 whereby mechanism 28 will open the companion contacts 18 and 20. The mechanism 28 is of the quick make and break type and includes a forked operating lever 36, a toggle 38, overcentering springs 40, and the releasable cradle. The lever 36 is pivotally movable to actuate the movable contact member 24 and is provided with a pair of upstanding flanges 42 which interfit in companion slots 44 (FIG. 2) of the actuating plate 46 which is formed of insulating material.

The poles of the breaker are interconnected by bar 26 for conjoint and simultaneous operation, the breaker being opened and closed at all of the poles by the actuating handle 12, and is automatically opened at all of the poles upon the occurrence of an overload in the circuit at any one of the poles. The handle is of the trip-free type in which the breaker contacts separate on predetermined circuit overload conditions independent of handle position so that if the handle is locked "on" the breaker will still open on predetermined overload conditions.

The plate 46 is slidably mounted in a plane parallel to the front face of the breaker for correspondingly actuating the lever 36 thereof. The plate 46 is disposed in the region of the center pole of the breaker for engagement with the lever 36 which is disposed thereat. The plate 46 interfits in a slot 48 of casing 16 and rides on the longitudinal rails 50 projecting into said slot. Projecting from plate 46 are integral protuberances 52 which serve as anti-friction elements between the plate and the overlapping front cover plate 54 of the breaker. The cover plate 54 is of sheet metal construction and includes a depending peripheral flange 56 which interfits with the forwardly projecting part 58 of the casing. Upstanding from the cover plate 54 is a peripheral rim 60 spaced inwardly of the marginal edge of the cover plate. The cover plate 54 is secured in position on the part 58 of the casing by screws 59, only one of which is shown in the drawings.

The plate 54 is provided with an aperture 62 for the mounting of the handle 12, the latter having a raised spacer-like part 64 which interfits in said aperture (see FIG. 4). The casing and plate 46 are suitably cutaway to receive with operating clearance the handle actuating lever 66 which serves to transmit motion from the handle 12 to plate 46. The lever 66 is connected to the hub 68 of the handle by screws 70, the lever having a laterally projecting pin 72 at its outer end which is engaged in the elongated transversely extending slot 74 of plate 46. Thus the turning movement of the handle is effective to slide the plate 46 along its rails through the cooperative

association of pin 72 and slot 74 to thereby actuate lever 36 and the breaker mechanism to a corresponding position.

The operating handle 12 may be locked in either the "on" or "off" position by either, or both, of two locking systems, pursuant to the present invention. The hub 68 of the handle is provided at the rear thereof with an elongated slot 76 which receives a complementary rectilinearly movable locking member 78. Communicating with the slot 76 below the handle hub is a recess 80 in which is seated a compression spring 82 which at one end engages the projecting portion 84 of the locking member, the opposite end of the spring engaging the end wall 86 of recess 80. Thus the spring 82 biases the locking member 78 in the direction opposite to the arrow shown in FIG. 3 which is the unlocking or handle-releasing direction. The locking member 78 extends substantially to the face of handle part 66 and thus projects through the aperture 62 of plate 54. Continuous with the aperture 62 is an arcuate cutout portion 88 (FIG. 4) having shoulders 90 which cooperate with companion shoulders 92 of part 64 to limit handle turning movement. Connected with and extending from the arcuate cutout portion 88 is a pair of spaced slots 94 and 96 which are adapted to receive the locking portion 98 of the member 78 when the latter is extended to handle-locking position in the manner to be described. When the locking member is extended into the handle-locking position, the locking portion 98 will be accordingly extended into the slot 94 when the handle is in the "on" position and said locking portion will be extended into the slot 96 when the handle is in the "off" position, to thereby lock the handle in position.

Press-fitted or otherwise suitably secured in the aperture 99 of the hub of the handle is a key-operated lock 100 having a key-rotated barrel 102 provided with a depending eccentric cam element 104 which is disposed for cooperation with the shoulder 106 of the locking member. On the key rotation of the barrel 102 to lock the handle in position cam 104 will engage shoulder 106 to slide the locking member 78 to locking position in which locking portion 98 wil be extended into a companion slot 94 or 96 corresponding to the position of the handle. When the barrel 102 is rotated to unlocked position, the locking member will be spring projected to the handle-releasing position, assuming the lock ring 112 to be described is in handle-releasing position. The barrel 102 is adapted to receive a conventional companion key K which on proper registration in the keyway 103 depresses the locking leaf-spring finger 108 from inter-engagement with a notch in the fixed sleeve 110 of the lock 100. The keyway 103 is conveniently disposed at the handle hub. Two such notches in sleeve 110 are provided, spaced arcuately about 120°, so that finger 108 will lock barrel 102 in either its locking or release position.

The handle may be also padlocked in either the "on" or "off" position and to this end there is provided a lock ring 112 which is pivotaly mounted to the hub 68 of the handle, the lock ring 112 being substantially of common diameter and center with said hub. The top of the hub is slotted at 114 to receive the downwardly projecting portion 116 of the lock ring which is pivotaly mounted in said slot by pin 118 fixed to the hub. The lock ring is pivotally movable from a handle-releasing position, as shown in FIG. 2, in which the lock ring is in flush relation with the hub of the handle to a handle-locking position in which the lock ring is angularly displaced from the hub as shown in FIG. 3. In the handle-releasing position, the lock ring interfits in the shallow peripheral relief 120 of the hub and smoothly merges with adjacent handle surfaces. On the raising of the lock ring about its pivot with the locking member 7 in handle-releasing position, the portion 116 of the lock ring will engage the cam edge 122 of the locking member to slide the latter into locking engagement with one of the slots 94 or 96 corresponding to the handle position to thereby lock the handle in such position. The ring is padlocked in the raised locking position by engaging one or more padlocks P through the lock ring which is effective to block the return of the lock ring to handle-releasing position (FIG. 3). On the return of the lock ring to handle-releasing position, the locking member 78 will be spring returned to its handle-releasing position. The lock ring 112 surrounds the lock 100 at the hub of the handle and thus both locking systems are disposed for operation in convenient relation at the hub of the handle.

From the above it will be apparent that the operating handle 12 may be locked in either the "on" or "off" position by either the lock 100 or lock ring 112, or both, and that the handle is effectively locked against rotation to another position except when the common locking member 78 is in the handle-releasing position or unlocked by both locking systems. In effecting the locking of the handle both locking devices 102—104 and 112—114 drive the same locking member 78. Neither locking device interferes with the other in driving member 78 in the locking direction; and conversely either locking device is effective alone to maintain the handle locked when the other locking device is returned to its release position. The assembly includes provision for multiple padlocks; yet the handle can be locked without using any appended padlock.

Various additional modifications of the above embodiments of the invention will readily occur to those skilled in the art, and therefore the invention should be broadly construed in accordance with its full spirit and scope.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. An enclosed circuit controlling instrumentality having a front operated twist handle, said handle being mounted on said instrumentality and turnable to a plurality of different positions for correspondingly actuating the mechanism of said instrumentality, and handle-locking means including a locking slide concealed in the handle and a locking device cooperable with said locking slide and movably carried by said handle for movement to operate said slide from handle-releasing position to handle-locking position in at least one of said handle positions, said device having an external padlock-receiving portion mounted for movement between handle-releasing and handle-locking positions, said padlock-receiving portion when in handle-releasing position being disposed too close to the handle to receive a padlock and said padlock-receiving portion when in handle-locking position being spaced from said handle sufficiently for receiving at least one padlock in position to prevent return of said padlock-receiving portion to said handle-releasing position.

2. An enclosed switch having a front operated twist handle, said handle being mounted on said switch and turnable to "on" and "off" positions for correspondingly actuating said switch mechanism, and locking means including a locking device pivotally carried by said handle for movement between handle-releasing position and handle-locking position and being effective to lock said handle in at least one of said handle positions, said device having an external locking ring adapted to admit plural padlock hasps, said ring being normally disposed so close to the handle when said device is in handle releasing position as to prevent entry of a padlock hasp without shifting the locking ring out of said handle-releasing position, said locking device being operative to lock said handle when said external locking ring is spaced from said handle sufficiently to admit the hasp of a padlock.

3. An enclosed switch having a front operated twist handle, said handle being mounted on said switch and turnable to "on" and "off" positions for correspondingly actuating said switch mechanism, and locking means including a common locking member movably carried by said handle, key-operated lock means carried by said

handle and cooperable with said locking member in each of said handle positions for locking the handle, and locking means including a locking device pivotally mounted on said handle for movement of said locking member into handle locking position and for release thereof, said device having an external locking ring adapted to admit plural padlock hasps, said ring being normally disposed so close to the handle when said device is in its locking-member-releasing position as to prevent entry of a padlock hasp without shifting the locking ring out of said member-releasing position, said locking device being operative to drive said member into handle-locking position when said external locking ring is spaced from said handle sufficiently to admit the hasp of a padlock, whereby the handle is locked in position when said key operated lock means or said locking device is in its respective locking position and whereby the handle is released only when both said key-operated locking means and said locking device are in their locking-member-releasing positions.

4. An enclosed switching device having an enclosure, a front operated twist handle external of said enclosure, said handle being mounted on said switching device and turnable to "on" and "off" positions for correspondingly actuating said switching device, and handle-locking means including cooperable means carried by said handle and by said enclosure respectively, for locking the handle in at least one of said handle positions, said locking means including a key-operated lock carried by said handle, a locking member cooperable with said key-operated lock and movable thereby into handle-locking position when the lock is operated into its locked position, said member having spring biasing means effective to return said locking member to handle-releasing position when said key-operated lock is in its unlocked position, said handle-locking means additionally including a locking device movably carried by said handle and disposed for cooperation with said locking member for driving the latter into handle-locking position and for release thereof for spring-return to handle-releasing position, said locking device having an external padlock-receiving portion mounted for movement to a handle-releasing position too close to the handle to receive a padlock, and said padlock-receiving portion when moved to a position spaced from said handle sufficiently for receiving at least one padlock being in position to prevent return of the locking device into position for allowing spring-return of said locking member, whereby said handle is locked when either said key-operated lock or said handle-locking device is locked and when both of them are locked, and whereby said handle is released only when both said key-operated lock and said locking device are in their respective handle-releasing positions.

5. In a switch having a front operated twist handle turnable to a plurality of positions for correspondingly actuating the switch mechanism, key-operated lock means for locking said handle in a predetermined position, and supplementary locking means for externally padlocking said handle in said predetermined position, said locking means comprising complementary interengageable parts disposed to register in said handle predetermined position, a locking ring carried by said handle movable to a handle-locking position, and means interposed between said ring and complementary parts for interengaging the latter on the movement of said ring to the handle-locking position thereof, said ring in said last mentioned position being adapted to receive a padlock for externally locking said handle.

6. In a switch having a front operated twist handle turnable to a plurality of positions for correspondingly actuating the switch mechanism, key-operated lock means for locking said handle in a predetermined position, and supplementary locking means for externally padlocking said handle in said predetermined position, said locking means comprising complementary interengageable parts disposed to register in said handle predetermined position, a locking ring pivotally mounted on said handle for movement between a flush handle-releasing position and a handle-locking position in which said ring is pivotally displaced from said handle, the pivot axis of said ring being substantially perpendicular to the turning axis of said handle, and means interposed between said ring and complementary parts for interengaging the latter on the movement of said ring to said handle-locking position, said ring in said last mentioned position being adapted to receive a padlock for externally locking said handle.

7. In a switch having a front operated twist handle turnable to a plurality of positions for correspondingly actuating the switch mechanism, means for externally padlocking said handle in a predetermined position comprising complementary interengageable parts including a fixed part and a part carried by and movable with the handle, said parts being disposed to register in said predetermined position, a locking ring pivotally mounted on said handle for movement between a flush handle-releasing position and a handle-locking position in which said ring is pivotally displaced from said handle, the pivot axis of said ring being substantially perpendicular to the turning axis of said handle, and means interposed between said ring and complementary parts for interengaging the latter on the movement of said ring to said handle-locking position, said ring in said last mentioned position being adapted to receive a padlock for externally locking said handle.

8. A switching device having internal cooperable contacts and mechanism operable to close and to open the contacts, a front mounted rotary handle movable to "closed" and "open" positions, for correspondingly operating said mechanism, a locking member movably mounted in said handle and operable between a handle releasing position and a handle locking position, a stationary casing part having respective formations cooperable with said locking member when the latter is in its handle locking position both in the "open" and in the "closed" position of the handle, a key-operated lock in said handle having an element engageable with said locking member to drive the locking member into handle locking position, a spring for biasing said locking member to handle releasing position, a further member carried by said handle and movable between handle releasing and handle locking positions, said further member engaging said locking member and being biased to said handle releasing position by said spring, said further member being arranged to operate said locking member in the same handle-locking direction as that effected by said key-operated lock and being further arranged relative to said handle to be retained in said handle locking position upon interposition of a padlock between respective portions of the handle and said further member.

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