PUSHBUTTON SWITCH OPERATOR WITH A REVERSIBLE LOCKOUT

ABSTRACT: An enclosure structure including an operator for a pushbutton-type switch. The enclosure is of the dust or watertight type and supports a handle which is movable with an oscillating motion to an ON position and an OFF position to actuate either one of a pair of linearly movable switch operating buttons and a plate which is selectively movable in either of two positions on a front wall of the enclosure to lock the operating handle in either the ON or OFF positions.
This invention relates to enclosures for switches and more particularly to fluid-proof and dusttight enclosures or boxes which may be securely locked to prevent unauthorized operation of a switch within the enclosure from either the ON or the OFF positions.

Enclosures for electrical devices used in industrial operations have been standardized into various categories to satisfy the service conditions imposed by the environment in which the devices are installed. The National Electrical Manufacturers Association (NEMA) has developed a NEMA 4 classification, commonly known as watertight, for enclosures which are particularly suited for use on ship docks and in dams, breweries and the like, which shall meet the requirements of a predescribed hose test. Another NEMA classification, called NEMA 12, is designated for enclosures which have been designed for use in those industries where it is desirable to exclude such materials as dust, lint, fibers and flyings, oil seepage or coolant seepage from within the enclosure.

One of the requisites of a dusttight and fluidtight switch enclosure is that it must be dusttight and waterproof and provide an arrangement whereby a switch within the enclosure may be actuated from the exterior of the enclosure. A further requirement is that an arrangement be provided to prevent the switch from being operated from either the ON position or the OFF position. An arrangement is provided for locking the switch in the OFF position is included so that the switch may be prevented from being actuated to a circuit closing position and complete a circuit to a motor which drives machinery while the machinery is being serviced so as to prevent damage to the equipment or injury to personnel. On occasion it is necessary that the continuity of circuits be continuously maintained for safety requirements. Arrangements are provided which will prevent the switch from being operated to a circuit opening position by unauthorized personnel. An example of an installation requiring this feature may occur in school buildings wherein switches are provided with a lock-on structure to prevent mischievous students from interrupting the service to lights, fans and the like.

Watertight and dusttight enclosures are well known and heretofore have been provided with rather complicated mechanisms for actuating the switch within the enclosure from the exterior of the enclosure. The structure as herein disclosed is characterized by its pleasing appearance and a structure that is both economical to manufacture and durable, so that it will withstand abuse that is normally encountered in industrial environments. Additionally, the structure may be readily serviced, is substantially tamper-proof and arranged to indicate the operating condition of the switch within the enclosure from the exterior of the enclosure. Further, the structure includes a simple lockout mechanism which may be selectively positioned to maintain the switch in either the OFF or ON circuit positions.

It is an object of the present invention to provide an enclosure for a pushbutton switch that includes a lockout mechanism which may be selectively positioned to accept a padlock to prevent movement of the switch operator from either the ON or the OFF circuit positions.

An additional object is to provide a switch enclosure with stops for external operating handle and a lockout structure that includes a plate having a pair of openings therein which are arranged so that the position of one of the openings may be reversed to accept a padlock and selectively lock a switch in either the ON or the OFF circuit positions.

A further object is to provide an operating mechanism for an enclosure wherein the operating mechanism includes a housing having an external operating handle mounted on one end and a rotatable lever mounted on the other end that is arranged to engage and move the pushbuttons of the switch when the external operating handle is oscillated between two limiting positions that are provided by a cover for the switch.
housing part 40 may be formed of a suitable thermoplastic or thermosetting plastic material, all of which are well known to those skilled in the art. The housing part 40 is secured to the cover portion 12 and has a front wall 42 and a back wall 44 forming an external front surface 44 disposed at the exterior of the enclosure 10 and an internal surface 46. The surfaces 44 and 46 each extend transversely of the plane 26. The internal surface 46 is arranged to face and be spaced from the operating ends 32 and 34 of the pushbuttons 22 and 24. The housing part 40 has a left side 48 and a right side 50, each of which extends from the front surface 44 to a rear surface 52. The front surface 44 is arranged to be secured to the front face of the cover 14. The front surface 44 and the right side 50 are formed to provide a generally triangularly shaped indentation 54. The indentation 54 has a sidewall 56 extending from the front surface 44 in a plane that is parallel and spaced from the plane 26. The portion of the indentation 54 adjacent the sidewall 56 is provided with a generally triangularly shaped groove 58, most clearly illustrated by FIGS. 2 and 4. Extending through the sidewall 56 from the exterior of the part 40 into the cavity 16 is a cylindrical bore 60. The bore 60 extends along an axis that is perpendicular to the plane 26, equidistant between the lines of movement of the pushbuttons 22 and 24 and parallel between the internal surface 46 and the ends 32 and 34 of the housing portion 40. Positioned by the bore 60 is a means 62 for selectively moving the pair of spaced pushbuttons 22 and 24 in their respective lines of movement within the cavity 16 with a manual force that is applied from the exterior of the enclosure 10.

The means 62 for selectively moving the pushbuttons 22 and 24 includes a shaft 64, a handle 66, a lever 68, an O-ring seal 70, and a C-ring 72. Additionally, the means 62 includes a means for selectively preventing the movement of the handle 66 from one position to another position which is illustrated in FIG. 5 as a locking plate 74 that has a pair of openings 76 and 78 located therein to function in a manner as will be hereinafter described.

Extending inwardly into the cavity 16 and located on opposite sides of the plane 26 from the internal surface 46 are a pair of bosses 80 and 82. The boss 80 has a cylindrical socket 84 which is centered on the axis of the bore 60. The boss 82 has a free end wherein a hemispherical groove is disposed. The hemispherical groove similarly is centered on the axis of the bore 60.

The shaft 64 has a length sufficient to permit a cylindrical portion 86 on the left hand end of the shaft 64 to be journaled within the socket 84 while a portion, not shown, which has the handle 66 nonrotatably secured thereon, positions the handle 66 within the indentation 54. A portion 85 of the shaft 64 received within the bore 60 is suitably grooved to receive the O-ring seal 70. The O-ring seal 70 prevents the entrance of fluids and dust from the exterior of the enclosure 10 into the cavity 16. A portion of the shaft 64 designated by a numeral 88 is shaped to provide a nonrotatable connection between the shaft 64 and the lever 68 and permit the shaft 64 to be detached from the lever 68. This result is accomplished by truncating the opposite sides of the shaft 64 and providing a similarly shaped bore 89 in the lever 68 which receives the shaft 64 so that the lever 68 and the shaft 64 may be separated by sliding the lever 68 on the shaft 64 and withdrawing the end portion 86 from the bore 89. The lever 68 is positioned between the bosses 80 and 82 to be rotated by the shaft 64. The truncated portions of the shaft 64 are arranged so that the lever 68 extends substantially perpendicular to the handle 66. The lever 68 is positioned against the bore 60 by the C-ring 72. The C-ring 72 is received in a suitable groove in the shaft 64 that is located in the shaft 64 so a surface of the C-ring 72 is positioned adjacent the portion of wall 56 facing the cavity 16. The removal of the C-ring 72 from the groove 90 will permit the shaft 64 to be slidably moved to the right in FIG. 2 as the portion 86 of the shaft slides in the noncircular bore 89 in the lever 68. The lever 68 has arm portions 92 and 94 extending in substantially opposite directions from the shaft 64. As shown, the arms 92 and 94 are slightly inclined to provide free ends 96 and 98 on the arms 92 and 94. The free ends 96 and 98 are arranged to engage ends 32 and 34 to move the buttons 22 and 24 in their respective lines of movement when the shaft 64 rotates between two positions as dictated by the oscillating movement of the handle 66 within the indentation 54.

As shown in FIG. 4, the triangularly shaped groove 58 which extends in the plane perpendicular to the front surface 44 has a pair of sidewalls 100 and 102 converging toward the rear wall 20. The walls 100 and 102 are connected by a rounded apex 104. The plate 74 similarly has a pair of edges 106 and 108 and a rounded apex 110 which are congruent with the walls 100 and 102 and the apex 104 so that the plate 74 may be received in either of two selected positions in the groove 58. The opening 76 is located in the plate 74 along a line that bisects the angle defined by the edges 106 and 108 and is located to be aligned with the bore 60 to permit a portion of the shaft 64 to extend through the opening 76 when the locking plate 74 is in either of its two positions in the groove 58. The opening 78 is displaced from the bisecting line that extends through the opening 76 and is located so that at least a portion of the opening 78 projects forwardly of the front surface 44 when the plate 74 is in either of its two positions in the groove 58. Thus when the plate 74 is positioned in either of its selected positions, in a manner shown in FIG. 3, the opening 78 will be located to prevent movement of the operating handle 66 from the OFF position to the ON position when the shackle of a padlock, not shown, is passed through the opening 78. Additionally, when the plate 74 is positioned in the groove 58 in a manner illustrated in FIG. 4, the opening 78 will be located to receive the locking plate 74 and prevent the movement of the operating handle 66 from the ON position to the OFF position. The position of the locking plate 74 in the groove 58 may be readily changed by merely removing the C-ring 72 from its groove in the shaft 64 so that the assembly consisting of the handle 66, the shaft 64, and the O-ring seal 70 may be moved to the right in FIG. 2 as the portions of the shaft 64 are withdrawn from the bore 60, the socket 84, the bore 89 and the opening 76 in the plate 74. When the shaft 64 and the handle 66 are thus removed, the lever 68 will be detached from the shaft 64 and the position of the locking plate may be reversed in the groove 58. After the locking plate 74 is repositioned in the groove 58, the shaft 64 may be reinserted through the opening 76 into the bore 60 and the bore 89 in the lever 68 into its position wherein the portion 86 on the shaft is received in the socket 84. The shaft 64 together with the lever 68 and the handle 66 are maintained assembled with the housing part 40 when the C-ring 72 is reinserted in the groove in the shaft 64 so that the switch enclosure 10 may be readily converted to maintain the handle 66 in either its ON position or its OFF position. In this connection it should be noted that the opening 78, if properly positioned in the plate 74, will prevent the movement of the handle 66 from its ON and OFF positions respectively only when a portion of the opening 78 is obstructed by an item smaller than the shackle of a padlock. For example, the diameter of a thin wire as used in wire-type seals, may be employed and prevent the handle from moving from one of its selected positions to the other position as described.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto, as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. An enclosure for a pushbutton switch, said switch having a pair of spaced pushbuttons each having an operating end movable in a line of movement extending in a common plane, said enclosure including a part having a front wall providing an internal and an external surface extending in parallel planes that are transverse to the common plane and the internal sur-
face of said part facing and spaced from the operating ends of
the pushbuttons, a sidewall extending in a direction of the
switch from an edge of the front wall in a plane parallel and
spaced from the common plane, and a bore extending through
the sidewall along an axis that is transverse to the common
plane, equidistant to the lines of movement of the pushbut-
tons, and spaced between the rear surface and the operating
ends of the pushbuttons, a means for selectively moving the
pair of spaced pushbuttons in their respective lines of move-
ment, said means including a shaft having a first portion
rotatably journalied in the bore, a second portion projecting
from the sidewall externally of the enclosure part, and a third
portion extending in a space between the rear surface and the
operating ends of the pushbuttons, a handle nonrotatably
secured on the second portion of the shaft and movable
between two positions for rotating the shaft with an oscillating
movement between two positions, a lever nonrotatably
secured on the third portion of of the shaft, said lever having
arm portions extending substantially in opposite directions to
provide free ends on the arms which are engageable with the
operating ends of the buttons for selectively moving the but-
tons in their respective lines of movement when the handle is
respectively moved to the two positions, and a means includ-
ing a plate like member mounted in either of two selected posi-
tions on the front wall, said plate like member having a pair of
openings therein respectively located to receive the shaft and
a shackle of a padlock for selectively preventing movement of
the handle from a first of the two positions to a second of the
two positions when the plate like member is oriented in its first
position and for preventing movement of the handle from the
second position to the first position when the plate like member
is oriented in its second position.

2. The structure as recited in claim 1 including a V-shaped
indentation extending from the edge into portions of the front
surface and sidewall, said indentation having a shape to pro-
vide a recess for portions of the handle and stops for limiting
movement of the handle to the two positions.

3. The structure as recited in claim 2 including a groove in
the shaft that is located between the first and the third por-
tions of the shaft and a C-shaped ring removably received in
the groove to rotatably position the shaft in the enclosure part.

4. The structure as recited in claim 3 including a second
groove located in the first portion of the shaft and an O-ring
seal in the second groove.

5. The structure as recited in claim 2 wherein the V-shaped
indentation includes a V-shaped slotted portion that is ar-
 ranged to position the plate like member in either the first or
the second position.

6. The structure as recited in claim 5 wherein the plate like
member has generally a triangular shape with the corners of
the triangle rounded.

7. The structure as recited in claim 1 wherein a pair of
spaced supports extending from the internal surface provide a
support for the third portion of the shaft.

8. The structure as recited in claim 7 wherein the supports
are spaced to position the lever on the third portion of the
shaft.

9. The structure as recited in claim 8 wherein one of the
supports is provided with a cylindrical bearing to receive a
cylindrical end on the third portion and the other of the pair of
supports is provided with a hemispherical bearing surface and
the cylindrical bearing and the hemispherical bearing surface
have a radius of curvature centered on an axis of the bore.

10. The structure as recited in claim 1 wherein the enclo-
sure is formed of a die cast metal and includes a rear edge that
is positioned on a sheet metal cover for the enclosure.