Oct. 15, 1957 D. W. JOHNSON 2,810,050

MANUALLY RELEASABLE LOCKING MEANS FOR AXIALLY MOVABLE ELECTRIC SWITCH SHAFTS

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FIG. 1

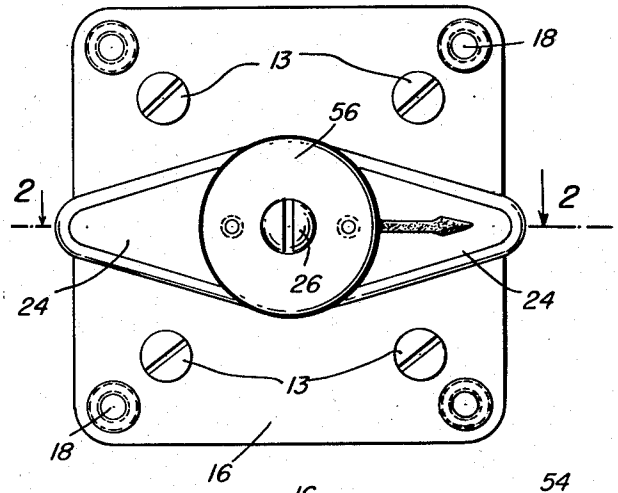
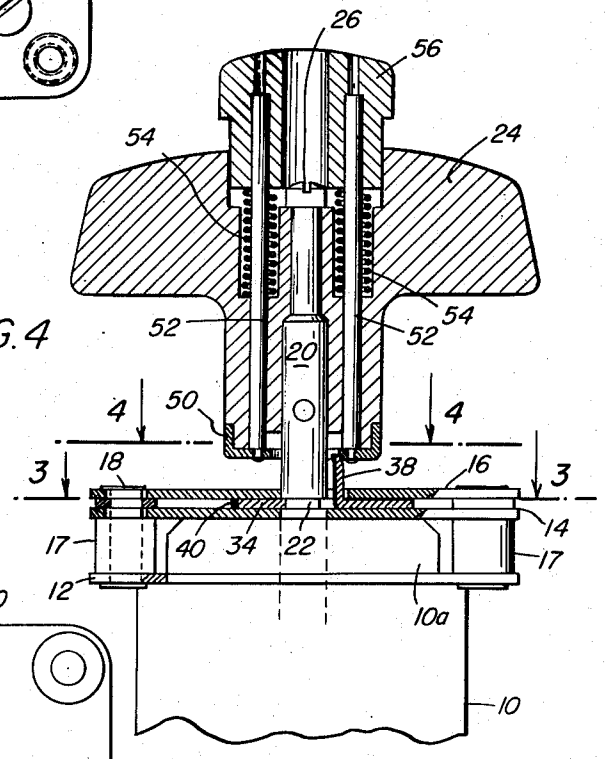


FIG. 2



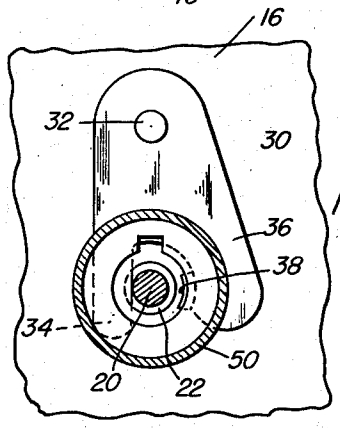


FIG. 4

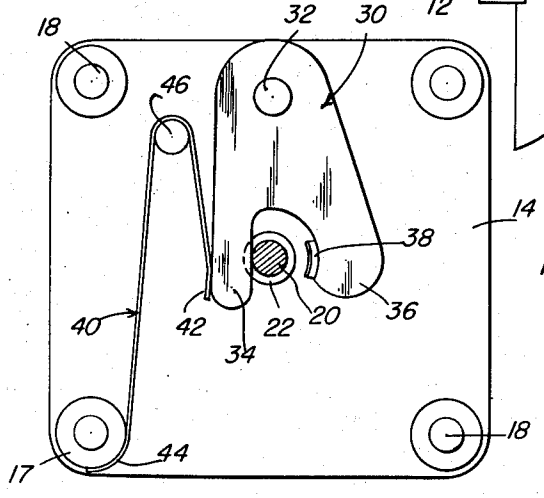


FIG. 3

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MANUALLY RELEASABLE LOCKING MEANS FOR AXIALLY MOVABLE ELECTRIC SWITCH SHAFTS

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8 Claims. (Cl. 200—169)

This invention relates to locking means for electric switches, and more particularly, it relates to locking means to prevent axial movement of a movable contact operating shaft of an electric switch which might occur on the switch being subjected to a sudden severe shock or blow.

The invention is particularly applicable to switches known commonly as push pull switches in which a shaft for operating movable contacts is movable axially within or relative to a base or housing to cause engagement and disengagement of the switch contacts and is rotatable to select different circuit arrangements. Examples of such switches are found in my prior Patents 2,451,224 and 2,451,225 dated October 12, 1948. Such switches are often made in considerable length and their movable contact assemblies have considerable mass and inertia. There is a tendency, when such switches are subjected to sudden shocks or severe blows, for the movable contacts to separate momentarily from, or to momentarily engage, the fixed contacts. The same thing can happen if someone accidentally presses against or leans against or pulls the handle. Since separation or engagement, for even a fraction of a second, can result in the opening or closing of a circuit or series of circuits, it is desirable to prevent any movement of the shaft and hence, of the contacts it controls.

One object of the invention is to provide manually releasable locking means normally biased to hold the axially movable contact operating shaft of an electric switch from axial movement.

Another object of the invention is to provide locking means which can readily be disabled on manual grasping of the switch handle by engagement of a releasing member against the palm of the hand or by thumb pressure.

Another object is to provide locking means and disabling means of the foregoing type involving a minimum number of parts which can be economically manufactured and assembled and will be rugged and reliable in construction.

Other objects and advantages of the invention will become apparent as the invention is described in connection with the accompanying drawing.

In the drawing:

Fig. 1 is a top plan view of a switch embodying the invention.

Fig. 2 is a longitudinal section view taken along line 2—2 of Fig. 1.

Fig. 3 is a transverse section view taken along line 3—3 of Fig. 2.

Fig. 4 is an enlarged fragmentary view showing in transverse section along line 4—4 of Fig. 2 the relation of the locking member shaft and handle.

Referring to the drawing, the switch contacts and associated selecting mechanism (not shown), as heretofore known and used in various forms, may be housed within an insulating base **10** built up of a series of sections or made as a single body of insulation, as may be

desired or necessary for the particular use and circuits in which the switch is to be connected.

On top of the base **10** is a rectangular mounting plate **12** of sheet metal which may be secured to the base **10**.

Parallel to each other and to the mounting plate **12** are two additional plates **14** and **16** which are narrowly spaced from each other, the inner plate **14** (hereinafter referred to as a lock-supporting plate) being of sheet insulation and spaced from the metallic bottom plate **12** by spacing collars **17** on the shanks of screw bolts **18** located in the corners of the plates and securing together the three plates **12, 14** and **16**. The outer plate **16** is preferably of sheet metal and perforated at its corners to permit passage of the shanks of the securing bolts **18** whose ends are received in tapped holes in the corners of the mounting plate **12**. All of the plates have center apertures formed therein to permit the passage of the switch shaft **20**. The center hole in the mounting plate **12** is large in order to receive a large circular boss or end portion **10*a*** of the switch base structure. The assembly of plates **12, 14** and **16** is secured to base **10** by longitudinally extending bolts or screws **13** passing through all of the plates and entering the base.

On the end of the switch shaft is mounted an insulating handle **24** by a screw bolt **26** passing through an axial bore in the handle and screwed into a tapped axial hole in the shaft. The switch shaft **20** is also provided with a circumferential groove **22** located in the zone or space between the outer mounting plate **16** and the lock-supporting plate **14** in position to receive the edge of a stamped sheet metal locking lever **30**. The locking lever **30** is pivotally mounted upon a pivot pin **32** mounted in the lock-supporting plate **14**. The locking lever is slotted at its free end to provide two legs **34** and **36** which are located or lie on opposite sides of the switch shaft **20**. In order to normally bias leg **34** toward the switch shaft with its edge in the locking groove **22**, a U-shaped wire spring **40** is located between plates **14** and **16** with one (the inner) arm **42** of the spring pressing against the outer side of the locking lever leg **34** while the other or outer arm **44** presses against one of the spacing collars **17**. In order to maintain the spring in its desired location, the extreme end of its outer arm **44** may be curved to embrace the collar **17** which it engages; and the U-bend of the spring embraces a spring anchor pin **46** mounted in the lock-supporting plate **14**.

In order that the leg **34** of the locking lever may be moved from its engagement in the groove **22** of the switch shaft, a finger **38** is bent up substantially at right angles from the inside edge of the leg **36** in position to lie substantially parallel to the axis of the switch shaft. The finger **38** is preferably arcuate about the shaft axis to permit a greater extent of movement as it moves toward the switch shaft. The finger preferably has its upper end beveled from the outside toward the inside surface and slightly bent inwardly by a distance approximating the thickness of the finger, but preferably less than such thickness.

In order to move the locking lever to cause it to disengage the switch shaft in different rotary positions of the shaft when desired, an axially movable ring or cup shaped member **50** is movably mounted on the switch handle **24** in such position that, when moved axially toward the plate **16**, the inner circumference of the ring will engage the upper pivoted end of the finger **38** regardless of the rotary position of the handle and shaft and cause that finger to move radially inward toward the switch shaft as the locking lever pivots about its pivot **32**. Such movement causes the locking lever leg **34** to move out of the locking groove **22** of the shaft freeing the shaft for axial movement. Since the height of the finger **38** is

greater than the width of the groove **22**, the finger is prevented from entering the groove.

To maintain the unlocking ring **50** normally inactive and to enable it to be moved axially manually when desired, the ring is secured to the lower ends of two thin axially extending parallel operating rods **52** located on opposite sides of the switch shaft. The rods are slidable within bores in the handle which are enlarged at their upper ends to receive compression springs **54** which are coiled around the rods and press at their lower ends against the bottom of the bores at their upper ends against the thumb button **56**. The effect of these springs, therefore, is to hold the ring in its uppermost position against the lower end of the switch handle.

The button **56** is affixed on the upper end of the rods **52** by driving or screwing, or otherwise securing them in bores in the button parallel to the button axis, for which purpose the ends of the rods may be of reduced section.

The top surface of the handle has formed in its middle, a recess to receive the inner end of the button which preferably, but not necessarily, is round.

From the foregoing, it may be seen that when the parts are in their normal at-rest position, as illustrated best in Figs. 2 and 3, the leg **34** of the locking member **30** will be in the locking groove **22** of the switch shaft, being held therein by the pressure of the spring arm **42**. The switch shaft may not then be moved axially; but the rotatability of the shaft is not interfered with by the presence of the leg **34** in the groove **22**. When it is desired to operate the switch, the operator grasps the switch handle and simultaneously exerts thumb or palm pressure on the releasing button **56**. The pressure upon the button **56** overcomes the force of the coiled springs **54** and at the same time, causes the rods and the unlocking ring to move axially toward the switch. Such axial inward movement of the ring causes its inner circumference to engage the beveled end of the finger **38** to move down the beveled surface, pushing the finger toward the switch shaft, thereby pivoting the unlocking member about its pivot **32** and disengaging its leg **34** from the shaft. The handle and switch shaft may then be moved axially without hindrance. As soon as the operator takes his hand off the handle, the switch shaft is automatically returned to the position shown in Fig. 2 by reason of a biasing spring or springs (not shown) which causes the shaft to normally occupy the axial position shown in Fig. 2, as in my aforesaid prior patents. Release of the manual pressure on the button **56** also allows the spring arm **42** to press the locking leg **34** against the switch shaft so that as soon as the shaft reaches axial position of Fig. 2, the locking leg **34** will snap into the locking groove **22** and hold the switch automatically against any further axial movement.

Many modifications within the scope of the invention will occur to those skilled in the art. Therefore, the invention is not limited to the specific form and detail of the embodiment illustrated.

What is claimed is:

1. In an electric switch, an axially and rotatively movable shaft for operating switch contacts, a handle on said shaft constructed and arranged to be grasped in the hand of the operator to rotate and axially move the shaft, a locking member movable in a plane transverse to the shaft axis holding said shaft from moving axially, a manually operable releasing button on said handle engageable by the palm of the operator's hand as he grasps the handle, means actuated by said button to disengage said locking member from the shaft.

2. In an electric switch, an axially and rotatively movable shaft for operating switch contacts, a handle mounted on and movable with said shaft, a locking member engaging a circumferential groove in said shaft and holding said shaft from moving axially, a manually operable releasing button on said handle, means actuated by said button to disengage said locking member from the shaft.

3. In an electric switch, an axially and rotatively movable shaft for operating switch contacts, a handle on said shaft, a locking member movable in a plane transverse to the shaft axis and engaging a circumferential groove in said shaft and holding said shaft from moving axially but allowing rotation, a manually operable releasing button on said handle engageable by the palm of the operator's hand as he grasps the handle, means actuated by said button to disengage said locking member from the shaft.

4. In an electric switch, an axially movable shaft for operating switch contacts, a handle on said shaft, a locking member movable in a plane transverse to the shaft axis holding said shaft from moving axially, an axially extending member on said locking member, a manually operable releasing button on said handle, means actuated by said button and engageable with said axially extending member to disengage said locking member from said shaft.

5. The combination as claimed in claim 4 having means biasing said locking member into locking position, and means biasing said releasing button into non-operating position whereby said shaft becomes locked automatically on release of said handle.

6. In an electric switch, an axially movable shaft for operating switch contacts, a handle on said shaft, a locking member movable in a plane transverse to the shaft axis and engaging a groove in said shaft to hold said shaft from moving axially, an axial extension on said locking member, an axially movable circular member engageable with said extension to disengage said locking member from the shaft, a releasing button on said handle biased to inactive position, and axially movable means connecting said button and circular member.

7. In an electric switch, an axially movable shaft for operating switch contacts, a handle on said shaft, a locking member movable in a plane transverse to the shaft axis and engaging a groove in said shaft to hold said shaft from moving axially, an axial extension on said locking member, an axially movable circular member engageable with said extension to disengage said locking member from the shaft, a releasing button on said handle, axially movable means connecting said button and circular member, means biasing said locking member into locking position, and means biasing said releasing button into non-operating position whereby said shaft becomes locked automatically on release of said handle.

8. In an electric switch, an axially and rotatively movable shaft for operating switch contacts, a handle on said shaft, a locking member movable in a plane transverse to the shaft axis holding said shaft from moving axially, an axially extending member on said locking member, a manually operable releasing button on said handle, means actuated by said button and engageable with said axially extending member in different rotary positions of the shaft to disengage said locking member from said shaft.

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