Nov. 23, 1948. P. T. REPKA 2,454,341

SWITCH OPERATING MECHANISM

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FIG. 1

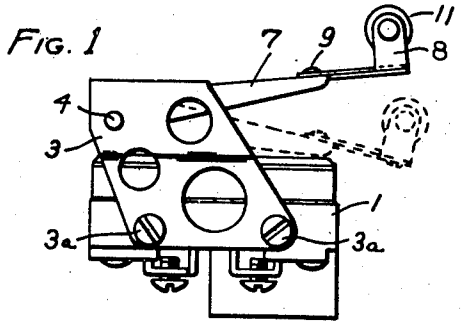

FIG. 2

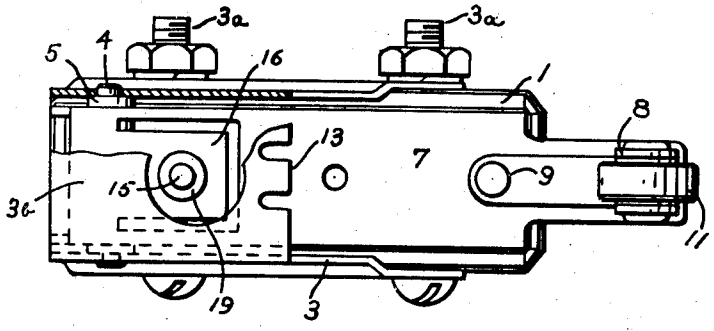

FIG. 3

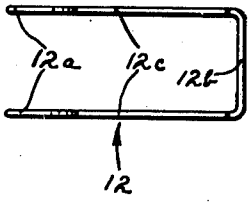

FIG. 4

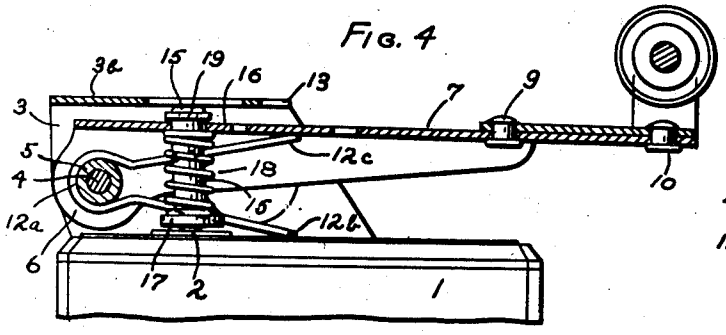

FIG. 5

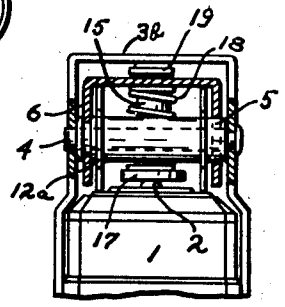

FIG. 6

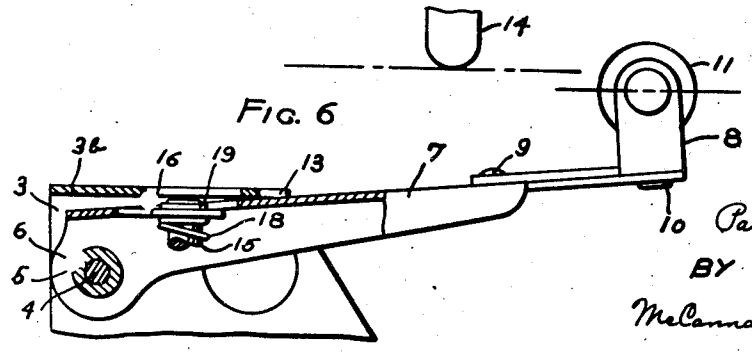

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FIG. 7

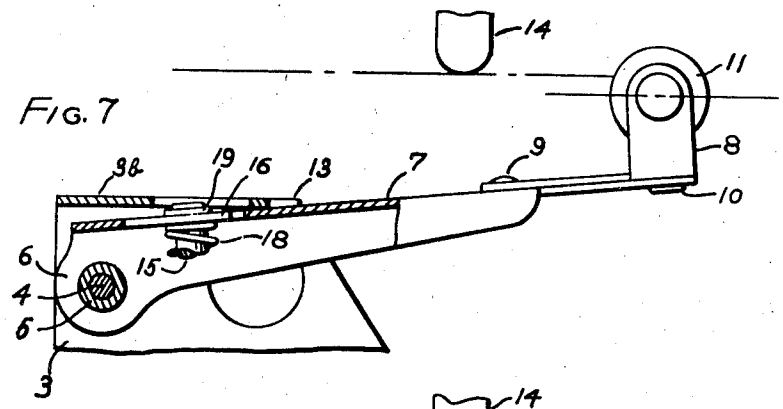


FIG. 8

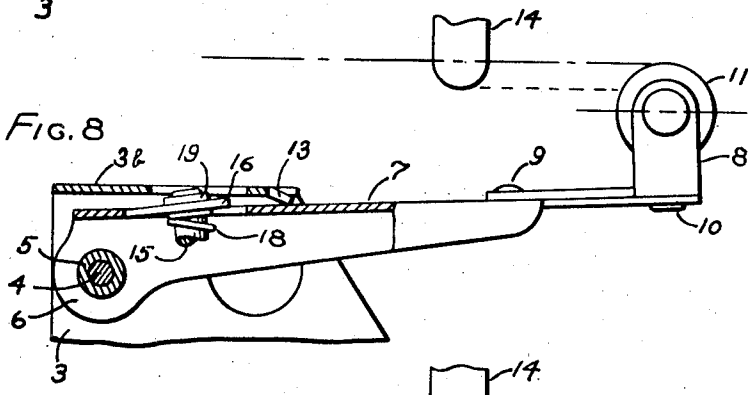


FIG. 9

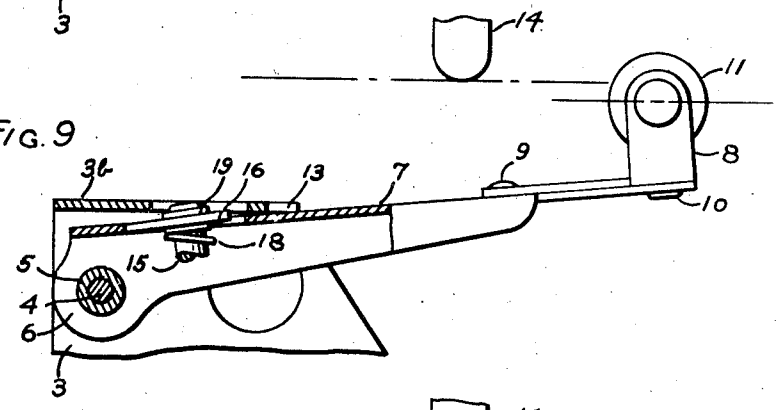
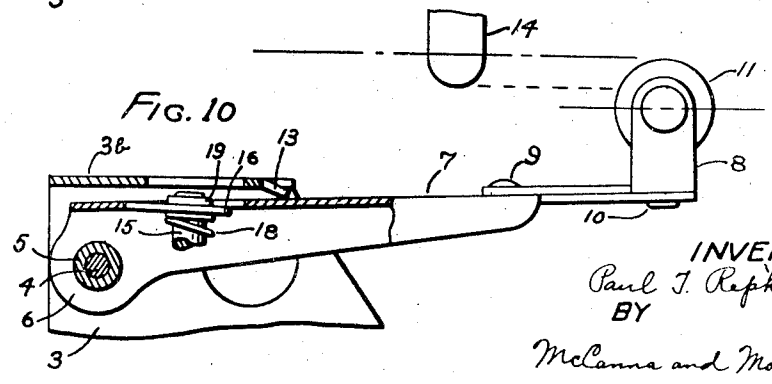


FIG. 10



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2,454,341

SWITCH OPERATING MECHANISM

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Application September 7, 1944, Serial No. 552,963

11 Claims. (Cl. 200—153)

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This invention relates to improvements in electric switches of the so-called overtravel type, and more particularly to improvements in the operating arm for such a switch.

In the use of overtravel switches where the switch is operated by pressure applied from some moving mechanical element the relation in use between the structure on which the switch is mounted and the moving element which operates the switch may vary in new structures and later as a result of wear or strain may vary further from time to time. Accordingly, it is necessary in the design of such a switch that it be capable of some adjustment when placed in new assemblies and that it be capable of further adjustment from time to time during use. I have found from experience that where switches of this character are used in places where extensive vibration occurs, as in airplanes and in tanks, the abovementioned adjustments, if made with the aid of screws, nuts, etc., are apt to be unsatisfactory, as such devices are themselves frequently jarred loose by prolonged vibration.

Accordingly, I have in this invention provided means for adjusting an overtravel switch permitting it to be readily adjusted after installation and during use and avoiding the difficulties produced by loosened screws or nuts.

One of the objects of my invention is to provide adjustment means for overtravel switches which will be of the utmost simplicity in construction.

Another object of the invention is to provide means for adjustment of an overtravel switch, not requiring the use of wrenches and requiring no more than such a simple tool as a screwdriver or other instrument suitable for bending a piece of metal.

Another object of the invention is to provide adjustment means in an overtravel switch which can easily be altered after the switch is installed and so designed that the adjustment feature will itself not get out of adjustment.

The foregoing and other objects and advantages of the invention will become apparent from a perusal of the specification and drawings in which I have described and shown, in order to illustrate the nature of the invention, one embodiment thereof, which is at present a preferred form of construction.

Referring now to the drawing:

Fig. 1 is a side elevation of an overtravel switch having mounted thereon an actuator arm made in accordance with my invention.

Fig. 2 is a top plan view with a part thereof broken away showing the assembly appearing in Fig. 1.

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Fig. 3 is a plan view of the restoring spring employed to keep the actuator arm elevated.

Fig. 4 is a vertical longitudinal sectional view of the actuator arm shown in Fig. 1.

Fig. 5 is an end view of the actuator arm assembly as viewed from the left from Fig. 4.

Fig. 6 is a longitudinal sectional view of the actuator arm showing one of the adjustment tabs slightly bent to change the adjustment of the switch. Here the free position of the arm is not altered, but the bending of the tab, as shown, downwardly will cause the switch to operate upon a lesser downward movement of the arm.

Fig. 7 is a longitudinal sectional view of the actuator arm showing both adjustment tabs, to be later described, in their normal position and, diagrammatically, a striker element in position to strike the roller on the actuator arm.

Fig. 8 is a sectional view of the actuator showing both adjustment tabs bent from their normal position, causing the free position of the arm to be somewhat lower and the operating point for the switch to occur at a somewhat lower angular position of the arm than would be the case of the unadjusted device shown in Fig. 7.

Fig. 9 shows no adjustment on the tab which controls the free position of the arm but it retains the same adjustment on the other tab as does Fig. 8.

Fig. 10 is another longitudinal sectional view of the actuator arm showing the small tab bent downwardly as in Fig. 8 to lower the free position of the arm and the other tab bent downwardly as in Fig. 6.

Referring further to the drawing, as this invention is not concerned with the construction of the contact mechanism itself in the switch, it is sufficient here to show only the housing 1 and the reciprocable plunger 2 extending from the housing and which operates the switch mechanism contained within the housing, a suitable switch being one such as disclosed in U. S. Patent No. 1,960,020, to McGall.

To support the actuator arm I provide a U-shaped bracket generally indicated as 3 in which the arm is pivotally supported on the pintle 4 extending through the bracket. The bracket spans the housing of the switch and is secured thereto by bolts 3a, the bracket having a central top portion 3b. A sleeve 5 surrounds the pintle and two depending ears on opposite sides of the arm such as the ear 6 engage the sleeve 5. The arm consists of the channel shaped member 7 on which the aforesaid ears are formed and the bracket 8 secured by rivets 9 and 10 to

the outer end thereof for supporting the roller 11.

In order to restore the arm 7 to its uppermost or free position there is provided the spring 12 (Fig. 3) having loops 12a wrapped around the sleeve 5, an intermediate portion 12b bearing against the top of the housing 1 and legs 12c bearing against the underside of the arm 7.

When the arm is in its free position it may either bump against the edge of the bracket 3 as shown in Fig. 7 or its free position may be lowered somewhat by bending the tab 13 downwardly as shown in Figs. 8 and 10. Such an adjustment will lower the position of the roller relatively to the striking piece which is symbolized by the element 14, and which of course may be any moving structural element intended to operate such a switch. The entire arm and supporting bracket are made of sheet metal stock so that the tab 13 may be bent down to any desired position of angularity by pushing on it with a screwdriver or bending it with a small pair of pliers or by using some other similar instrument. The sheet metal employed is however of such strength and rigidity that it does not flex or bend appreciably under the forces to which it is normally subjected in use. Therefore, when such an adjustment is made it cannot fall out of adjustment due to some of the usual causes such as vibration as might happen if adjustment involved the use of a screw or nut.

For operating directly on the plunger 2 of the switch I provide a post 15 extending through a tab 16, having on its lower end an enlarged portion or collar 17 for retaining the spring 18 under compression against the under side of the tab 16. A small collar 19 at the upper end of the post prevents it from being disengaged from the tab 16.

Referring to Fig. 4, if the actuator arm be rotated downwardly by the action of an exterior force the tab 16 acting through the spring 18 against the collar 17 on the post 15 will depress the plunger 2, which itself is usually spring loaded, and thus actuates the switch at a preselected operating point in the travel of the arm. Further downward travel of the actuator arm may occur but thereafter the plunger 2 may engage a stop within the housing or the bottom end of the post 15 may strike the top of the switch housing, but due to its spring mounting in the tab 16 the post will not oppose further downward movement of the arm, but will merely slide through the tab.

Upon upward release of the arm 7 the spring 12 will restore it to its free position and the lower end of the post will be disengaged from the plunger 2.

It will now be apparent that while the tab 13 may be bent to vary the free position of the arm and consequently the pretravel of the arm before the post engages the plunger and operates the switch, the tab 16 may be bent upwardly or downwardly to alter the particular angular position or operating point of the actuator arm at which operation of the plunger 2 will occur.

If tab 16 be bent upwardly, as shown in Figs. 8 and 9, the post 15 will not move the plunger 2 a sufficient distance to operate it until the arm has been rotated downwardly a greater angle than would be necessary if the tab 16 were in the same plane as the top of the arm.

If the tab 16 be bent downwardly, as shown in Figs. 6 and 10, the post 15 will move the plunger 2 to its operating position upon less angular movement of the arm 7. Since this tab is likewise made of sheet metal it can be bent with a screwdriver or some other simple instrument to the desired position of angularity, and this may be done upon a switch already installed or in use. While the tab may be bent, obviously it will remain in the position to which it is bent; hence no change of adjustment will occur accidentally in normal use.

It will now be apparent that two important adjustments of the actuator arm are provided in the simplest kind of construction. The use of such switch assemblies on airplanes, tanks, and other instruments of warfare indicate that quick, easy, and permanent adjustment without the use of special tools is a desirable objective in these devices.

As was stated above the present invention does not involve the contact mechanism operated by the plunger 2. The actuator arm shown in the drawing is arranged to apply the operating force to a plunger having only a short travel, as would be required in a snap switch of the character shown in said McGall patent, but may be used with switches whose operating plungers have more or less travel than McGall's plunger.

The construction and arrangement of parts herein shown and described is at present the preferred form of this invention, but it should be understood that some modification in the parts and in the details of construction are contemplated, and may be employed, without departing from the spirit and scope of the invention defined in the following claims.

Having shown and described my invention, I claim:

1. An over-travel actuator for a plunger operated electric switch comprising a bracket for attachment in a fixed position relative to the housing of the switch, an actuator arm pivotally supported on said bracket for rotation toward and away from the switch to operate the same, a metal member carried by and integral with said arm shaped and positioned to be bendable with respect to said arm, and means supported on said member for contacting the plunger to operate the switch, the bending of said member relatively to said arm being arranged to alter the angular position of the arm on its pivot at which the plunger is actuated.

2. An actuator for a plunger operated electric switch comprising a bracket for attachment in a fixed position relative to the housing of the switch, an actuator arm pivotally supported on said bracket, a metal member carried by and integral with said arm shaped and positioned to be bendable with respect to said arm, means supported on said member for contacting the plunger to operate the switch, the bending of said member relatively to said arm being arranged to alter the angular position of the arm on its pivot at which the plunger will be actuated, and a bendable metal tab disposed between said arm and a fixed portion of said bracket for regulatably establishing the at rest angular position of said arm.

3. An actuator for an electric switch having a reciprocable plunger for operating the contact mechanism thereof, comprising a bracket rigidly connectable with the switch in which said plunger is located, an operating arm pivotally mounted on said bracket, a member carried by said arm and a post supported on said member arranged to contact the end of said plunger, means for resiliently supporting said post on said member to permit the post to yield after contacting and operating said plunger, said member being bendable

relatively to the arm in order to vary the effective plunger operating position of said post, and means carried on said arm remotely from its pivotal point of support to be acted upon by an outside force for operating the switch.

4. An actuator for a plunger operated electric switch comprising an overtravel operating arm, and means for pivotally supporting one end of said arm at a fixed position relatively to the switch plunger, said means including a tab bendable for variably limiting the at rest position of said arm, a bendable tab integrally carried by said arm, and a spring loaded post yieldably supported on said second tab for contacting and operating said plunger, the second tab being bendable relatively to the arm to vary the angular position about the pivotal point of said arm where said post will operate said plunger.

5. An actuator for a plunger operated electric switch comprising an overtravel arm, means for pivotally supporting the arm on a fixed axis for rotation toward and away from the plunger, means on said arm to be contacted by an external force for rocking said arm on said switch, means carried by said arm for contacting the plunger to operate it, and a bendable metal tab on said arm for supporting the last said means, said tab being bendable by manually applied force at the time of installation of the switch or actuator to adjust the angular position of the arm at which the plunger will be operated.

6. An actuator for a plunger operated electric switch comprising a generally U-shaped bracket secured to the housing of the switch, an overtravel operating arm pivotally supported within said U-shaped bracket at a fixed distance from the switch housing, a metal tab integral with said bracket and bendable for determining the at rest position of said arm and for varying it, plunger operating overtravel means carried by said arm for contacting the plunger of the switch and means for supporting said plunger operating means on said arm, said supporting means including a cantileverly mounted metal element shaped and positioned to be bendable with respect to the arm by manually applied force to vary the angular position at which the arm will operate said plunger.

7. In combination with a plunger operated switch, a U-shaped bracket connectable with and spanning the housing of said switch, an arm pivotally supported at one end thereof within said bracket and having means at its other end to be contacted by an external operating force, plunger operating means comprising a spring loaded overtravel post carried by said arm to permit overtravel movement of the arm after operation of the switch, and means for supporting said plunger operating means on said arm including a member readily bendable upon installation by manually applied force for thereby selectively determining the angular position of the arm at which said plunger will be operated and the amount of overtravel of said arm.

8. An actuator for a plunger operated electric switch comprising a U-shaped bracket for attachment at a fixed position relatively to and spanning the switch housing, an actuator arm pivotally supported within said bracket, and overtravel means carried by the arm to contact and operate the plunger, said means including an element bendable by manually applied force whose bending determines selectively the angular position at which the arm operates the plunger, and a member yieldably mounted on said element to permit

further angular movement of the arm beyond the position necessary to operate the plunger.

9. An overtravel actuator for a plunger operated electric switch comprising an overtravel operating arm, and means for pivotally supporting one end of said arm at a fixed position with respect to the switch plunger, said means including a tab bendable for variably limiting the at rest position of said arm, a bendable tab integrally carried by said arm, a spring loaded post yieldably supported on said second tab for contacting and operating said plunger, the second tab being bendable with respect to the arm to vary the angular position about the pivot point of said arm where said post will operate said plunger, and spring means for urging the arm to the at rest position.

10. An actuator for a plunger operated electric switch comprising an operating arm, means for pivotally supporting said arm at a fixed axis for rotation toward and away from the plunger between an at rest position and an overtravel position, spring loaded overtravel means on said arm positioned to engage the plunger at a preselected position after preliminary free movement thereof upon rotation of the arm toward the plunger to operate the latter yieldable to permit overtravel movement of the arm, a tab on the arm for carrying the overtravel means bendable by manual force to preselect the position of the arm at which the overtravel means engages the plunger, and a bendable tab between the arm and the bracket to preselect the at-rest position of the arm to thereby preselect the operating point of the arm relative to the plunger, and spring means for moving the arm to the at-rest position.

11. An actuator for a plunger operated switch comprising a U-shaped bracket spanning the switch and having the sides thereof attached to the opposite sides of the switch housing to support the center portion of the bracket in fixed spaced relation to the plunger and switch housing, an actuator arm comprising a sheet metal strip pivoted between the sides of the bracket below the center portion having a free end for rotation of the arm toward the plunger by an externally applied force, a tab on said arm defined by a U-shaped cut intermediate the sides of said arm above the plunger, a spring loaded overtravel means mounted on said tab for operating the plunger, yieldable for overtravel movement of the arm, the tab being bendable with respect to the arm by manually applied force to preselect the operating position of the arm, a tab integral with the central portion of the bracket engageable by the arm and bendable by manually applied force to preselect the rest position of the arm, and spring means disposed between the housing and the arm for urging the arm to the rest position.

PAUL T. REPKA.

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