

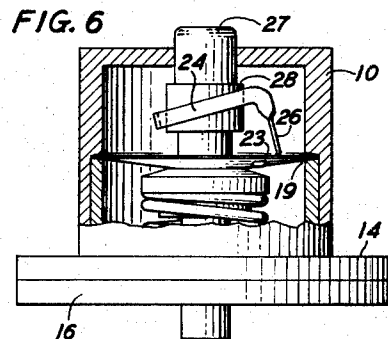
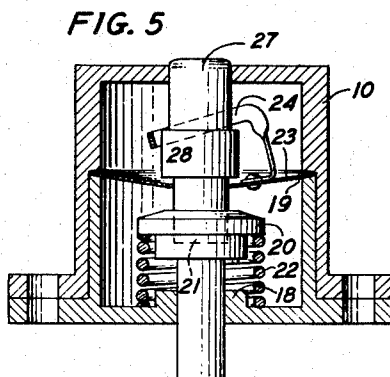
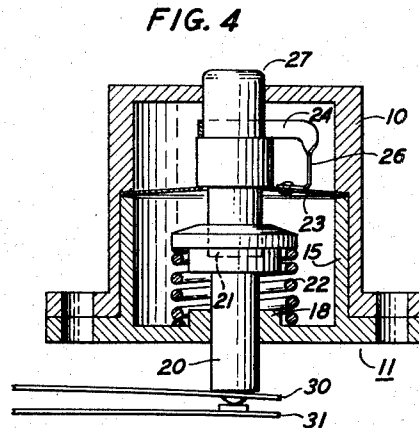
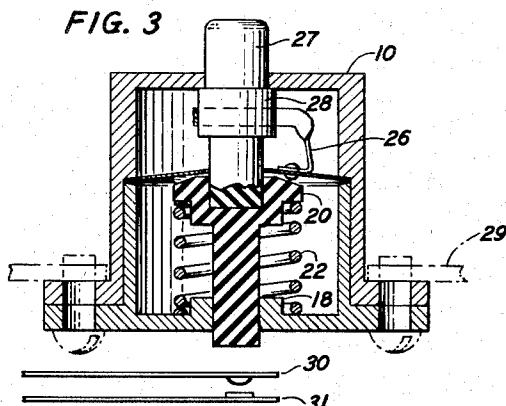
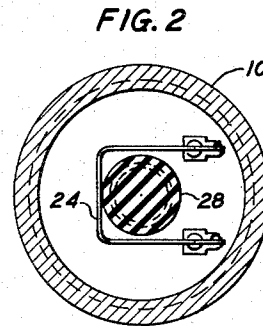
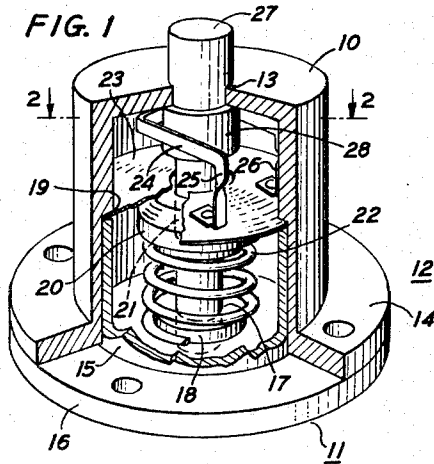
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2,873,334

LOCKING PUSH BUTTON MECHANISM

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LOCKING PUSH BUTTON MECHANISM

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This invention relates to push button mechanisms and more particularly to push button mechanisms of the locking type.

In many kinds of electrical and mechanical equipment, push button mechanisms are employed as control or keying means. It is desirable in such equipment that the mechanisms be rugged, relatively insensitive to shock and reliable in operation. To accomplish this object, push button mechanisms of the locking type are commonly employed and these usually comprise one mechanism to lock the equipment in one condition and another mechanism to return the equipment to a normal condition. In portable electrical testing equipment, for example, a telephone lineman's handset, such arrangements are not especially suitable since they are bulky, cumbersome to operate, and often materially affect the weight of the equipment.

It is an object of this invention to provide a push button mechanism which is compact, rugged, reliable in operation, and relatively insensitive to shock and vibration.

It is another object of the invention to provide a push button mechanism of the locking type which is of simple construction and is conveniently adaptable to a considerable range of operating pressures and movements.

It is a specific object of the invention to provide a switching operating device for portable test equipment, which does not materially affect the size and weight of such equipment, and is easy to operate.

A feature of the push button assembly of this invention is a peripherally secured, convex-concave spring washer or perforated diaphragm surrounding a portion of a push button and having a latching member or bracket secured to its convex face, said latching member being biased against a side of the push button by virtue of its attitude on the diaphragm, whereby upon partial depression of the button from its "normal" or unoperated position, the latching member encounters a shoulder on the button to latch it in the partially depressed or operated position.

A further feature of the invention lies in means associated with the push button for deflecting the diaphragm to a concave-convex condition upon full depression of the button to release the button from the latch by changing the position of said latch.

Another feature of the invention is a biasing means for returning the push button, the diaphragm and the latching member to their normal positions and retaining them therein upon release of the button from its fully depressed position.

In an illustrative embodiment of this invention, a perforated diaphragm or washer is peripherally mounted in a housing with an inner portion of the push button within the diaphragm opening. The outer end of the button projects through an aperture in the housing. An intermediate enlargement of the button having inner and outer shoulders is pressed against the inner wall of the housing by biasing means. A U-shaped latching member having its legs secured to a face of the diaphragm em-

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braces the enlargement of the button. In this, the normal or unoperated condition of the mechanism, the diaphragm is flexed with its convex face toward the latching member, which biases a transverse portion of the U-shaped bracket against the button at the enlargement. Thus, as previously indicated, a partial depression of the button allows the latching member to snap behind the outer shoulder of the enlargement to perform its latching function. Upon full depression of the button the inner shoulder of the enlargement flexes the diaphragm to an alternative position with its latch supporting face now concave. The latching member is thus deflected to a position out of contact with the button allowing return of the parts to their normal positions by the biasing means when the button is released.

These and other features of the invention will be more fully understood from the following detailed specifications taken in conjunction with the accompanying drawing in which:

Fig. 1 is a perspective view of an embodiment employing the principles of the invention with a portion broken away to show the parts thereof;

Fig. 2 is a cross section of the embodiment of Fig. 1 in the plane 2—2;

Fig. 3 is a longitudinal section of a switch employing the principles of the invention with the parts thereof in their normal positions;

Fig. 4 shows the switch of Fig. 3 in the locked condition;

Fig. 5 indicates the switch in the releasing condition; and

Fig. 6 discloses the switch parts an instant before returning to their normal positions.

As shown in Fig. 1 an interfitting cover 10 and base 11 comprise the housing 12 of the push button mechanism. The cover includes an aperture 13, an orificed flange portion 14, and is counterbored to a predetermined depth. The base includes a cup-like portion 15, an orificed flange portion 16, a central opening 17 and a boss 18 surrounding the opening. The cup-like portion 15 fits within the counterbore of the cover. The height of the cup-like portion is slightly less than the depth of the counterbore thus defining an annular groove 19 in the otherwise cylindrical interior of the housing. The orificed flange portions 14 and 16 are aligned and held together by suitable fastening devices, for example, those shown in Fig. 3.

A spring-loaded plunger 20 is mounted within the housing and serves as the biasing means for the mechanism. The plunger includes a recess 21 in the head thereof. The shank of the plunger passes through the central opening 17. A helical spring 22 fits about the boss 18 and presses against the plunger head to bias the plunger toward the cover.

The push button mechanism includes a latching means which comprises the perforated diaphragm 23 peripherally mounted in the annular groove 19 and the U-shaped bracket or latching member 24. The diaphragm 23 is flexed with its convex face toward the aperture 13. The bracket includes legs 25 and 26 for attaching it to the diaphragm. The legs are appropriately twisted to face the closed portion of the bracket, and are mounted perpendicularly to the convex surface of the diaphragm. Normally the spring-loaded plunger 20 abuts the inner face of the diaphragm.

The operating means of the mechanism is the push button 27 which passes through the perforated diaphragm 23 into the recess 21 of the plunger and also extends outside the housing through the aperture 13. The button includes an enlarged shouldered portion or section 28 having inner and outer shoulders. The outer shoulder normally abuts the inner wall of the housing due to the action of the spring-loaded plunger 20 against the button

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27. The portion 28 is normally surrounded by the bracket 24, the structural arrangement of these members being more clearly illustrated in Fig. 2. In the condition shown in Figs. 1 and 3 the portion 28 of the button deflects the bracket to the left flexing the legs 25 and 26 for reasons which will become apparent hereinafter.

The operation of the push button mechanism will be described with reference to Figs. 3, 4, 5 and 6 wherein the mechanism is shown as a switching device. It should be understood that the mechanism has application to both mechanical and electrical equipment, but an electrical application has been selected arbitrarily for reasons of convenience in explanation. In Fig. 3 the push button mechanism is shown attached to a frame 29 and a set of contact members 30 and 31 is appropriately mounted (by means not shown) in juxtaposition to the push button mechanism. It is readily apparent that the switch button 27 and plunger 20 in the normal or "off" position are relatively insensitive to shock because of pressure due to the spring 22, which is selected to apply sufficient force to counteract expected vibration in these members.

The switch contacts are closed as shown in Fig. 4 by depressing the button 27 which causes the plunger 20 to deflect the member 30 to engage member 31. The button while closing the contacts slides the portion 28 past the bracket 24 so that the inner shoulder of the portion 28 engages the diaphragm 23. The flexure in the bracket legs is released and they return to their regular position thereby resulting in the transverse portion of the bracket snapping in behind the shoulder. Release of the button with the bracket in this position locks the switch in the "closed" or "on" position since the upward thrust of the spring-loaded plunger 20 against the button member is resisted by the stiffness of the diaphragm. The switch button travel for reaching the locked position is readily determined by an operator since an audible click is produced when the bracket snaps in behind the shoulder. It is apparent that in the "closed" or "on" position the switch button and plunger are also insensitive to shock since downward movement of these members is resisted by increased pressure of the spring 22 and upward movement of these members is resisted by the stiffness of the diaphragm member.

To unlock the mechanism the switch button is fully depressed causing the inner shoulder of the portion 28 to deflect the diaphragm to an outwardly concave configuration, as shown in Fig. 5. In so doing the transverse portion of the bracket 24 is moved away from the button simultaneously swinging clear of the portion 28. On release of the button, the enlarged shouldered portion has sufficient clearance to pass within the bracket as the spring 22 returns the button and the plunger to their normal positions. The plunger in returning to its normal position allows the contact members (not shown) to open and subsequently presses against the diaphragm, as shown in Fig. 6, with sufficient force to return the diaphragm to its normal outwardly convex position. The contact members 30 and 31 have not been shown in Figs. 5 and 6 for reasons of convenience. The enlarged shouldered portion is so spaced from the plunger that it returns to its normal position abutting the housing 12 before the diaphragm is returned to its normal position by the plunger. The bracket member, as a consequence, is biased against the shoulder and is ready to snap behind the shoulder when the button is depressed on the next operation.

In the disclosed locking type push button mechanism, the few parts thereof enable it to be rugged in construction and light in weight. The dimensions and material thicknesses of the mechanism may be readily selected to obtain a considerable range in operating pressure and movements. Thus, these characteristics of the mechanism make it desirable for a wide variety of mechanical and electrical application. The disclosed mechanism is espe-

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cially suitable for portable test equipment, since it is small in size, easy to operate and provides operation which is relatively insensitive to shock and vibration.

It is to be understood that the above-described embodiments are merely illustrative of the principles of the invention and applicant does not intend to limit the invention to the particular embodiments shown herein. Numerous other embodiments may be devised by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. A push button mechanism comprising a housing having an aperture in one wall, a push button having an outer end projecting through the aperture, an inner end connected to and urged outwardly by biasing means, and an enlarged shouldered section intermediate the ends thereof; a diaphragm mounted within the housing and encircling said button adjacent the inner end thereof; a latching member embracing the enlarged section and secured to the diaphragm, said latching member being biased against the enlarged section by virtue of its attitude on the diaphragm, whereby a partial movement of the button against the biasing means allows the latching member to rest on a shoulder of the enlarged section of the button to latch the button, and whereby further movement of the button in the same direction deflects the diaphragm to urge the latching member away from the button to unlatch the button.

2. A push button mechanism comprising a housing having an aperture in one wall, a push button having an outer end projecting through the aperture, an inner end connected to and urged outwardly by biasing means, and an enlarged shouldered section intermediate the ends thereof; a convex-concave diaphragm mounted within the housing and encircling said button adjacent the inner end thereof, a latching member attached to the convex face of said diaphragm and embracing the enlarged section, said latching member being biased against the enlarged section by virtue of its attitude on the diaphragm, whereby a partial movement of the button against the biasing means allows the latching member to rest on a shoulder of the enlarged section of the button to latch the button, and whereby further movement of the button in the same direction deflects the diaphragm to urge the latching member away from the button to unlatch the button.

3. A push button mechanism comprising a housing having an aperture in one wall, a push button having an outer end projecting through the aperture, an inner end connected to and urged outwardly by biasing means, an enlarged shouldered section of the button abutting the inner wall of the housing; a convex-concave diaphragm peripherally mounted within the housing and encircling said button adjacent the inner end thereof, a latch member attached to the convex face of said diaphragm and embracing the enlarged portion, said latch member being biased against the enlarged portion by virtue of its attitude on the diaphragm, whereby a partial movement of the button against the biasing means allows the latch member to rest on a shoulder of the enlarged section of the button to latch the button, and whereby further movement of the button in the same direction deflects the diaphragm to urge the latch member away from the button to disengage said member.

4. A push button mechanism comprising a housing having an aperture in one wall, a push button having an outer end projecting through the aperture, an inner end connected to and urged outwardly by biasing means, and an enlarged shouldered section intermediate the ends thereof and within the housing; a convex-concave diaphragm peripherally mounted within the housing and encircling said button adjacent the inner end thereof, a U-shaped bracket having leg portions twisted to face the transverse portion of said bracket, said leg portions attached to the convex face of said diaphragm, said bracket embracing the enlarged section of said button with its

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transverse portion biased against the enlarged section by virtue of its attitude on the diaphragm, whereby a partial movement of the button against the biasing means allows the transverse portion to rest on a shoulder of the enlarged section of the button to latch the button, and whereby further movement of the button in the same direction deflects the diaphragm to urge the U-shaped bracket away from the button to unlatch the button.

5. A push button mechanism comprising a housing having an aperture in one wall, a push button having an outer end projecting through the aperture, an inner end connected to and urged outwardly by a spring-loaded plunger, said plunger being in axial alignment with said button and positioned in a wall of the housing opposite the wall including the aperture; an enlarged shouldered section intermediate the ends of said button and within the housing, a diaphragm mounted within the housing and encircling said button adjacent the inner end thereof, a U-shaped bracket having leg portions twisted to face the transverse portion of said bracket, said leg portions secured to the diaphragm, said bracket embracing the enlarged section with the transverse portion biased against the enlarged section by virtue of its attitude on the diaphragm, whereby a partial movement of the button against the biasing means allows the transverse portion to rest on a shoulder of the enlarged section of the button to latch the button, and whereby further movement of the button in the same direction deflects the diaphragm to urge the U-shaped bracket away from the button to unlatch the button.

6. A push button mechanism comprising a housing having an aperture in one wall, a perforated diaphragm peripherally mounted in the housing, a push button having an inner end within the diaphragm opening, an outer end of the button projecting through the aperture, an intermediate enlargement of the button being pressed against the inner wall of the housing by biasing means, a

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U-shaped bracket having leg portions secured to a face of a diaphragm, said bracket embracing the enlargement of the button and being biased against the enlargement by virtue of its attitude on the diaphragm, whereby a partial depression of the button allows the bracket to snap behind the enlargement of the button to latch the button and whereby further movement of the button in the same direction deflects the diaphragm to urge the U-shaped bracket away from the button to unlatch the button.

7. A push button mechanism comprising a housing having an aperture in one wall, a perforated diaphragm peripherally mounted within the housing, a push button having an inner end within the diaphragm opening, an outer end of the button projecting through the aperture, an intermediate enlargement of the button having inner and outer shoulders, said outer shoulder being pressed against the inner wall of the housing by biasing means, a U-shaped latch having leg portions secured to a face of the diaphragm, said bracket embracing the enlargement of the button and being biased against the enlargement by virtue of the attitude of the leg portions on the diaphragm, whereby a partial depression of the button allows the latch to snap behind the outer shoulder of the enlargement to latch the button and whereby further movement of the button in the same direction causes the inner shoulder to deflect the diaphragm to urge the U-shaped latch away from the button thereby disengaging said latch.

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