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PUSH ON - PUSH OFF SINGLE BUTTON SWITCH

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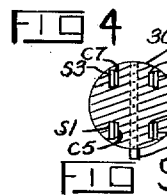
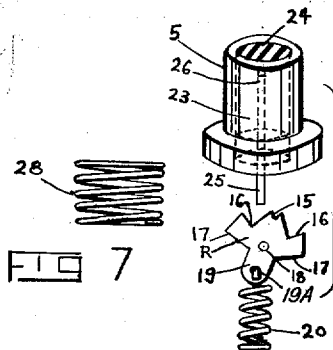
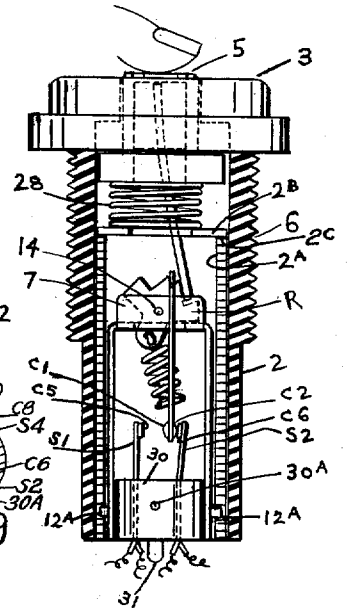
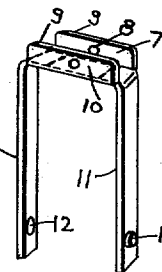
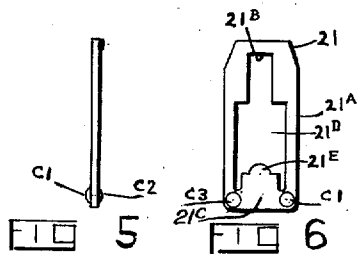
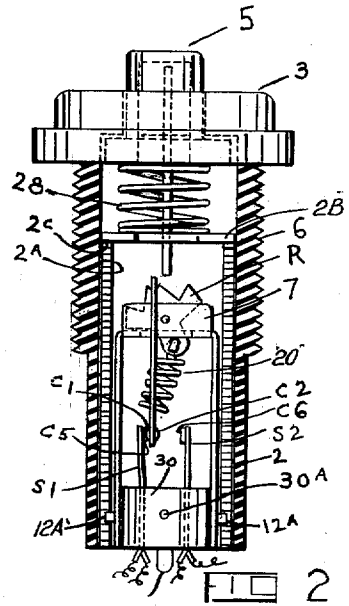
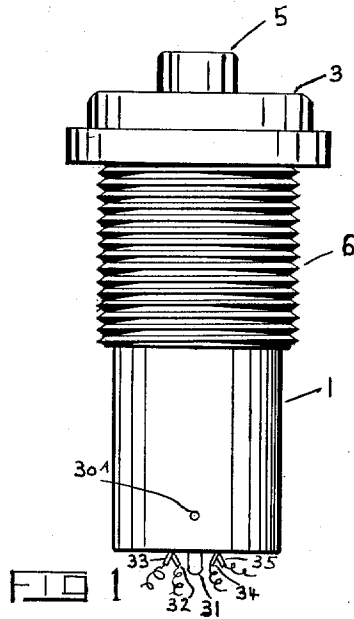


FIG 8

FIG 3

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# UNITED STATES PATENT OFFICE

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## PUSH ON-PUSH OFF SINGLE BUTTON SWITCH

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1 Claim. (Cl. 200—159)

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This invention relates to push on-push off single button switches, and more particularly to that type of switches the casing of which is installed within a bore in a panel such as an airplane instrument panel.

The objects of the invention are to provide a switch having a single push-button operating a double throw switch means for each push thereof; to provide a faster snap-action and wider contact pressure angle due to the movement of both ends of the tension blade in opposite directions out of its normal plane and thus producing a higher contact pressure than is found in any other type of switches; to provide a method of making contact that prevents breaking of made contacts under vibratory conditions; and to provide a switch with self-cleaning and wiping contacts.

Referring to the accompanying drawing, the Figure 1 is an upright elevation of the improved switch; Figure 2 is a similar elevation but illustrating a portion of casing in cross-section to expose interior parts in one position; Figure 3 illustrates said portion of casing in cross-section to expose said interior parts in another position; Figure 4 is a fixed support in perspective for holding an interior rocker part; Figure 5 is an edge view of a tension blade carrying contacts; Figure 6 is a front view of said tension blade; Figure 7 is a return-spring for push-button; Figure 8 illustrates bracketed push-button, rocker with connecting spring; and Figure 9 is a cross-section of an insulation member with stops and terminals.

With more particular reference to the accompanying drawing, the numeral 1 designates the entire device, as illustrated by the Figure 1. The casing 2 is substantially of cylindrical tubing form of preferred structure for installation within a bore provided therefor by a panel, such as an airplane instrument panel (not illustrated) but may be of any other desired form. The face 2B of the casing 2 has a greater exterior diameter than that of the portion insertable within a bore. The face 2B is provided with a central opening 4 within which to accommodate the push-button 5 keyed therein against rotation. An exterior portion of the cylindrical casing 2 is threaded, as at 6, to correspond to the tapped nut (not illustrated) which holds the device 1 within the bore.

Within the cylindrical tubular portion of the casing 2 there is inserted an insulation sleeve 2A having a washer 3 resting upon its upper edge 2C and, within the sleeve 2A a transverse extending supporting element comprising an upper

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U-shaped portion 7 having a central bore 8 through both parallel walls 9, a floor opening 10 and a pair of standards 11, each having an inwardly projecting boss 12 adapted to be shaped within depressions 12A provided by the insulation plug 30.

A rocker element R, within the U-shaped upper portion 7 of said supporting element, is mounted therein between said parallel walls 9 by means of the pivot 14 for a limited movement therein and within the floor opening 10. The upper edge of the rocker R is provided with a centrally notched seat portion 15, and upon both sides of said seat 15 the rocker R is provided with a downwardly extending oblique cam surface 16 and the stop shoulder 17. A central bore 18 through the rocker R is provided to register with the bore 8 of the parallel walls 9 of the U-shaped portion 7. The lower tapered end 19 of the rocker R is provided with a small opening 19A holding one end of the coil spring 20, the rocker R and the coil spring 20 together comprising the compression arm structure of the switch device. The normal at-rest positions of the compression arm structure R and 20 relative to the tilted tension blade 21 are over-centered, as illustrated by the Figures 2 and 3.

The tension blade 21 is a metal plate having side arms 21A, the connection top portion 21B and the bottom 21C enclosing the opening 21D. Projecting from the bottom 21C into the opening 21D is a short arm 21E. Projecting from opposite side surfaces of the bottom 21C are contacts C1 and C2 on one side and contacts C3 and C4 on the opposite side, these contacts preferably being made of silver. The contact C4 is not illustrated, it being hidden behind the contact C2 in the Figure 5.

The tension blade 21 is hung over the U-shaped portion 7 thus positioned within the opening 21D with the top 21B resting within the notch 15 of the rocker R. The spring 20, carried by the rocker R and movable through the opening 21D, has its free end placed over the tapered short arm 21E, the coil spring 20 maintaining the tension blade 21 yieldingly connected with the rocker R.

The push-button 5 has a longitudinally extending cavity 23 with a slightly flexible rubber filler 24 therein. A rod 25, with an upper portion 26 embedded within the filler 24, has a free end extending downwardly into open space within the interior of the casing 2 above, but normally spaced from, the rocker R, as illustrated by the Figure 3. The button 5 is provided with the coil return-spring 28 having one end supported by

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said washer 3 and bearing against the bottom of the button 5.

The lower portion of the casing 2 is provided with an insulation plug 30 having the exteriorly projection barrier 31 extending therebelow. Embedded and being supported within the insulation plug 30 are metal posts providing above the plug 30 the pairs of slightly yieldable stops S1, S2, S3 and S4, each being provided, if desired, with contacts C5, C6, C7 and C8, respectively, for engagement of the contacts C5 and C6 by the said contacts C1 and C2, and the engagement of the contacts C7 and C8 by the contacts C3 and C4, respectively, carried by the tension blade 21. The lower ends of the embedded metal posts providing the terminals 32, 33, 34 and 35.

A pin 30A may be driven through the casing 2, the sleeve 2A and the insulation plug 30 to secure the insulation plug 30 within the casing 2, provided that such pin 30A is not driven through or close to the embedded posts or the standards 11.

The operation of the push-button 5 by pressing downwardly from the position illustrated by the Figure 3, carries the rod 25 in direct alignment with the pivot 14 and onto the right-hand cam-surface 16 of the top edge of the rocker R in the rocker's tipped position as illustrated by the Figure 3. Upon engaging the cam-surface 16 the rod 25 is carried farther down the cam-surface 16 until engaging the shoulder 17 and operating the rocker R to the position illustrated by the Figure 2. The compression arm structure R and 20 is thus moved through the opening 21D from the over-centered position with respect to the tipped blade 21, illustrated by the Figure 3 to the opposite over-centered position, illustrated by the Figure 2, having passed through a center whereby the spring portion of the compression structure was put under greater compression due to the shortening of the distance between the wire opening 19A in the lower end of the rocker R and the spring supporting base of the tension blade arm 21E, and the upward bodily movement of the tension blade 21 as the seat 15 of the rocker R carries the upper extremity of the tension blade 21 into alignment with the pivot 14. It is the longitudinal movement of the tension blade 21 that provides the wiping, self-cleaning movement. Upon the compression arm structure passing through the opening 21D, the tension blade 21, by means of the release of the compression arm structure, is bodily moved and with a snap-action tips the contact carrying blade extremity thereby breaking away the contacts C1 and C3 from the stops S1 and S3, respectively, and engaging contacts C2 and C4 with the stops S3 and S4.

Upon a second operation of the push-button 5, the reverse movement is accomplished whereby C2 and C4 are broken away from the stops S2 and S4 and the contacts C1 and C3 are reengaged with the stops S1 and S3.

It is to be noted that in adapting the rod 25 to follow down either of the cam-surfaces 16 and to operate the rocker R, the filler 24 dampens the vibration so that it minimizes the movement of the rod 25 off its normal alignment with the button 5 and the pivot 14.

The improved electric switch device disclosed above provides for the operation of the switch by means of a single push-button 5 of which one push causes the breaking off of contact engagement with one circuit and makes contact engagement with a different and separate circuit.

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The next push of the same button breaks off contact engagement with said separate circuit and remakes contact engagement with said first-mentioned circuit. Thus a single button control of a switch device eliminates confusion to the operator; for two or more push-buttons necessary to the operation of the device can be confusing at times.

The method of construction herein disclosed is especially adapted to resist shock, vibration and acceleration effects, such as is present in airplanes, guided missiles, rockets and guns.

Contacts can be arranged in connection with the improved form of switch device for either single pole double throw or single pole double throw-double break for isolated circuits. The employment of slightly yieldable stops prevents contact bounce and consequent arcing of electric current.

I claim:

A switch mechanism having a casing; relatively spaced yielding stops provided by said casing; a fixed support within said casing; a rocker pivotally mounted for two extreme positions upon said fixed support, said rocker having on its upper portion relatively spaced shoulders; a tension blade adapted to be flexed and having an opening therethrough within which said rocker is positioned, said blade being suspended from said upper portion of said rocker between said shoulders; contacts with which opposite lower surfaces of said blade are provided each for engagement with one or the other of said yielding stops; a coiled wire spring of which the lower end is hinged to the lower portion of said blade within said opening and the upper end of said spring is attached to the lower end portion of said rocker; a single push button having a cavity therein and being slidably mounted within the upperpart of said casing, the manually pressable button having a spring-pressed return; a laterally yieldable filler body inserted within said cavity said filler body holding therein the upper end of a rigid rod, the free end of which being normally at rest in open space within said casing above said rocker but upon each pushed movement of said button the said free end of said rod is adapted to engage one of said shoulders to pivotally operate said rocker from one to the other of said extreme positions, the said rocker carrying overhead in one direction the upper portion of said blade while the spring-attached lower portion of said rocker is carried in the opposite direction against a further increased compression of said spring adapted to move the contact extremity of said blade from one to the other of said yielding stops; and a pressure-angle of high degree provided between the said spring and the said blade, said pressure being augmented by the release of the flexed condition of said blade as the said blade approaches its overcentering point.

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