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PUSH BUTTON ELECTRICAL SWITCH

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The present invention relates to a push button elec- 15 trical switch.

An object of the present invention is to provide a push button electrical switch which has means enabling the user either to momentarily close a circuit or continuously close the circuit.

Another object of the present invention is to provide a push button electrical switch which lends itself to employment in various circuits for the control of lights, motors, or other appliances.

A further object of the present invention is to provide 25 an electrical switch which may be provided with any number of pairs of contacts for sequential energization of a plurality of circuits.

A still further object of the present invention is to provide an electrical switch which is positive in operation, one sturdy in construction, one simple in structure, and one which is economically feasible.

These and other objects and advantages of the present invention will be fully apparent from the following description when taken in conjunction with the annexed 35 drawing, in which:

Figure 1 is an isometric view taken from the bottom and to one side of the electrical switch of the present invention;

Figure 2 is a view on an enlarged scale, taken on the 40 line 2-2 of Figure 1;

Figure 3 is a view, on an enlarged scale, taken on the line 3-3 of Figure 1, showing the electrical contacts in the continuously closed position;

Figure 4 is a fragmentary view similar to Figure 3, 45 showing the initiation of movement of the push button plunger to effect the execution of rotary movement of the spindle;

Figure 5 is a fragmentary view showing the switch contacts in open position following the momentary contact as 50 made in Figure 4;

Figure 6 is a view taken on the line 6--6 of Figure 3; and

Figure 7 is an isometric exploded view of the plunger, ent invention.

Referring in detail to the drawing, the reference numeral 10 designates a housing having an upper end 12 and a lower end 14. The housing 10 is constructed of upper and lower electrically nonconducting sections 16 and 18 60 portion 26 of the spindle 22 and has one end bearing detachably secured together by bolt and nut assemblies 20. A cylindrical spindle 22 is mounted in the lower section 18 for rotary movement and for reciprocating upward and downward movements. A switch element, embodying a conductive circular plate 24, is mounted upon 65 a reduced lower end portion 26 of the spindle 22 for movement therewith.

Blocks 28 and 30 project from the lower end 14 of the housing 10 and support fixed contacts 32 and 34 which have portions in the path of movement of the plate 24 70 when projected downwardly by the movement of the spindle 22.

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A depressible and releasable push button plunger 36 is mounted in a bore 38 in the upper housing section 16 for sliding up and down movement, the bore 38 being in registry with the bore 40 in the lower section 18 in which the spindle 22 is positioned. The plunger 36 is positioned adjacent the end of the spindle 22 remote from the plate 24 and is in axial alignment with the spindle 22.

Means is provided connecting the plunger 36 to the spindle 22 so that successively depressing and releasing 10 of the plunger 36 effects the rotation and reciprocatory movement of the spindle 22 to cause alternately stationary engagement of the plate 24 with the fixed contacts 32 and 34, and momentary engagement of the plate 24 with the fixed contacts 32 and 34 followed by disengagement of the plate 24 with the contacts 32 and 34. Specifically, this means includes a pair of actuating and

opposed fingers 42 and 44 on the end of the plunger 34 adjacent the spindle 22. The means also includes two opposed pairs of working cam faces on the end of the spindle 22 adjacent the plunger 36. The first pair of 20

working cam faces is designated in Figure 7 by the numeral 46 and the other pair by the numeral 48. The faces of the pair 46 are of a different configuration than the faces of the pair 43. As shown in Figure 4, the face of each pair 46 and 48 includes a straight portion 50 and a dwell portion sloping downwardly from the top of the straight portion 50, the dwell portion being designated by the reference numeral 52. The terminating point of the dwell portion 52 is designated by the reference nu-80 meral 52'. The terminating point of the dwell portion of the cam face next adjacent the pair of cam faces 48 or cam faces 46, is at a lower level than the dwell portion terminating point 52', as shown most clearly in Figure 4 and designated by the reference numeral 52''.

The opposed pair of faces 46 and 48 are adapted to be successively engaged and disengaged by the fingers 42 and 44 on successive alternately depressing and releasing of the plunger 36.

Spring means is operatively connected to the plunger 36 for urging the plunger 36 to the upward limit of its movement in the bore 38, or cam face release position, the upper end of the bore 38 being provided with a shoulder 54 against which abuts a cooperating shoulder 56 on the plunger 36. This means embodies a coil spring 58 having one end seated in a socket 69 provided in the upper end portion of the plunger 36 and having the other end bearing against the bight of an inverted U-shaped guide 62 which is secured by pins 64 in the bore 38 of the housing section 16.

The legs 66 and 68 of the guide 62 serve as abutment members for the straight portions 50 of the cam faces 46 and 48 to limit the step by step rotational movement of the spindle 22.

The housing lower section 18 is provided with a shoulabutment and guide component, and spindle of the pres- 55 der 70 against which bears one end of a coil spring 72 circumposed about the reduced lower end portion 26 and a larger but reduced portion 74 of the spindle 22. The spring 72 biases the spindle 22 upwardly in its bore 40. Another coil spring 76 is circumposed about the reduced against the upper face of the contact plate 24 and the other end bearing against the shoulder provided on the lower end of the second reduced portion 74 of the spindle The spring 76 biases the plate 24 into contacting 22. engagement with the fixed contacts 32 and 34 upon execution of downward movement of the spindle 22 in response to engagement of the fingers 42 and 44 of the plunger 36 when the latter is manually depressed in its bore 38.

As shown in Figure 4, the spindle 22 has been moved downwardly by the fingers 42 and 44, only the finger 44 being shown. The upper end of the dwell portion of the cam 46 is shown about to clear the lower end face or edge

of the leg 68 of the guide 62. The plate 24 is shown in electrical engagement with the fixed contacts 32 and 34.

In operation, as the plunger 36 is depressed manually, the fingers 42 and 44 engage the upper ends of the dwell portions of the cam faces 46 and 48 and depress the spindle 22 downwardly until the straight portions 50 clear and are disengaged from the adjacent faces of the legs 66 and 68 of the guide 62. The fingers 42 and 44 then effect the rotation of the spindle 22 a quarter turn and upon release of the plunger 36, the spring 72 forces the 10 spindle 22 upwardly to the limit of its movement determined by the engagement of the terminating point 52, 52' 52", with the lower end edges of the legs 66 and 68 of the guide 62.

Successive pressing of the plunger 36 downwardly in 15 pressing and releasing said plunger. the housing 10 effects the step by step rotation of the spindle 22, first moving the plate 24 into continuous engagement with the fixed contacts 32 and 34, for a single depression of the plunger 36, and then, when the legs 66 and 68 are in the shallower notches formed by the cam faces 48 or engaged in the terminating points 52' of the dwell portions 52, as in Figure 3, the plate 24 will be held in engagement with the fixed contacts 32 and 34 by the coil spring 76.

It will be seen therefor that upon depressing of the 25 plunger 36 momentary contact of the plate 24 with the fixed contacts 32 and 34 will be made and if the free ends of the legs 66 and 68 of the guide 62 enter the sloping dwell portion of the shorter cam face 48, the plate 24 will remain in fixed electrical engagement with the contacts 32 and 34. However, on the next succeeding depression of the plunger 36, the spindle 22 will rise to the limit of its upward movement in the housing 10 so that the terminating points 52" of the dwell portions of the cam 46 will be engaged by the lower ends of the legs 66 and 35 68, after the momentary contact has been made and the plate 24 will be shifted to out of engagement with the contacts 32 and 34, as shown in Figure 5.

The plunger 36 is provided with opposed slots 37 which slidably receive the legs 66 and 68 of the guide 40 62 and prevent the rotation of the plunger 36.

What is claimed is:

1. In an electric switch, a housing, a spindle movably mounted in said housing, a switch element fixed on one end of said spindle, fixed contacts carried by said housing 45 and cooperatively related to said switch element, a depressible and releasable push plunger positioned in said housing adjacent the other end of said spindle and in axial alignment with said spindle, and means connecting said plunger to said spindle so that successively depressing and releasing said plunger causes alternately stationary engagement of said switch element with said fixed contacts and momentary engagement of said switch element with said fixed contacts followed by disengagement of said switch element with said fixed contacts, said means embodying a pair of opposed actuating fingers on the end of said plunger adjacent said spindle and two opposed pairs of working cam faces on said spindle, the faces of each pair being of different configuration, said opposed pairs of faces being adapted to be successively engaged 60 and disengaged by said fingers on successive alternately depressing and releasing said plunger.

2. In an electric switch, a housing, a spindle movably mounted in said housing, a switch element fixed on one end of said spindle, fixed contacts carried by said housing 65 and cooperatively related to said switch element, a depressible and releasable push button positioned in said housing adjacent the other end of said spindle and in axial alignment with said spindle, and means connecting said plunger to said spindle so that successively depress- 70 ing and relasing said plunger causes alternately stationary engagement of said switch element with said fixed con-

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tacts and momentary engagement of said switch element with said fixed contacts followed by disengagement of said switch element with said fixed contacts, said means embodying a pair of opposed actuating fingers on the end of said plunger adjacent said spindle and two opposed pairs of working cam faces on said spindle, the face of each pair including a straight portion and a dwell portion sloping downwardly from the top of the straight portion, and the terminating points of the dwell portions of one of the opposed pairs of faces being at a lower level than the terminating points of the dwell portions of the other of the opposed pairs of faces, the faces of the opposed pairs being adapted to be successively engaged and disengaged by said fingers on successive alternately de-

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3. In an electric switch, a housing, a spindle mounted in said housing for rotary movement and for reciprocatory movement inwardly and outwardly of said housing, spring means operatively connected to said spindle urging said spindle outwardly of said housing, a switch ele-20 ment fixed on one end of said spindle, fixed contacts carried by said housing and cooperatively related to said switch element, a depressible and releasable push plunger positioned in said housing adjacent the other end of said spindle and in axial alignment with said spindle, and means connecting said plunger to said spindle so that successively depressing and releasing said plunger effects the rotation and reciprocatory movement of said spindle to cause alternately stationary engagement of said switch element with said fixed contacts and momentary engage-30 ment of said switch element with said fixed contacts followed by disengagement of said switch element with said fixed contacts, said means embodying a pair of opposed actuating fingers on the end of said plunger adjacent said spindle and two opposed pairs of working cam faces on said spindle, the faces of each pair being of different configuration, said opposed pairs of faces being adapted to be successively engaged and disengaged by said fingers on successive alternately depressing and releasing said plunger.

4. In an electric switch, a housing, a spindle mounted in said housing for rotary movement and for reciprocatory movement inwardly and outwardly of said housing, spring means operatively connected to said spindle urging said spindle outwardly of said housing, a switch element fixed on one end of said spindle, fixed contacts carried by said housing and cooperatively related to said switch element, a depressible and releasable push plunger positioned in said housing adjacent the other end of said spindle and in axial alignment with said spindle, other 50 spring means operatively connected to said plunger urging said plunger to the release position, and means connecting said plunger to said spindle so that successively depressing and releasing said plunger effects the rotation and reciprocatory movement of said spindle to cause 55alternately stationary engagement of said switch element with said fixed contacts and momentary engagement of said switch element with said fixed contacts followed by disengagement of said switch element with said fixed contacts upon execution of a partial revolution of an execution of reciprocatory movement of said spindle, said means embodying a pair of opposed actuating fingers on the end of said plunger adjacent said spindle and two opposed pairs of working cam faces on said spindle, the faces of each pair being of different configuration, said opposed pairs of faces being adapted to be successively engaged and disengaged by said fingers on successive alternately depressing and releasing said plunger.

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