

TITLE OF THE INVENTION

Reversible Push Button Switch

Industrial Field of the Invention:

This invention relates to a three-point type reversible push button switch showing a superior operating characteristic in which there is provided a structure for eliminating an erroneous operation caused by wrong depressing of a push button switch for operating an electro-magnetic solenoid of a hydraulic device for operating an upper lift or a lower lift, for example.

Prior Art:

In general, in the case of the two-point type push button switch having a mechanical reversible interlock, two push buttons can not be pushed in concurrent with a mechanical interlock in view of its structure, though in the case that its safety characteristic is important in view of its operation, it is required to arrange a structure in which no operation is performed unless each of the aforesaid two reversible push buttons and another operating button are pushed and it has not been proposed to provide a reversible push button switch which is quite compact in size and superior in operation.

In addition, a pendant switch which is similar to the aforesaid structure showed that its water-proof structure of a bushing had a following problem when it is used in an outdoor environment. In Fig.18, reference numeral 1 denotes a cover for storing a switch unit of a pendant switch, reference numeral 2 similarly denotes a case for covering the switch unit of the pendant switch, and reference numeral 3 denotes a bushing presser for pressing a bushing 5 from its side surface with a small screw or the like, wherein a hanger section 4 having a hole is arranged at a part of the bushing presser 3.

In this case, as indicated by arrows, a route of water entering from outside area showed four cases, i.e. a first case in which the water is transmitted within a space inside the bushing 5, a second case in which the water is transmitted within a clearance between the bushing presser 3 and the cover 1, a third case in which the water is transmitted within a clearance between the bushing presser 3 and the case 2, and a fourth case in which the water is transmitted within a clearance between the bushing presser 3 and the bushing 5. In addition to this, an assembling structure for component elements was complex, only one hanging direction was set for the hanging section and it was not necessarily satisfactory in view of both workability and water-proof characteristic.

In addition, the adjoining working surface had no function capable of temporarily fixing the push button

switch, so that there was a certain problem in view of working when one person performed several works.

If the water-proof structure is more improved, two main body hangers are arranged and its fixing surface can be magnetically adsorbed, it might be possible to propose a structure of a compact-sized three-point type reversible push button switch in which erroneous operation caused by a wrong depressing of button is not produced.

An object of the invention is to overcome or substantially ameliorate at least some of the disadvantages of the prior art.

Summary of Invention:

According to the present invention, there is provided a reversible push button switch comprising a normal turning operation part and a reverse turning operation part including a moveable contact-point part co-operatively connected to an inter-lock mechanism and its corresponding fixed contact-point part; a shift operating part including a moveable contact-point part and its corresponding fixed contact-point part in a direction perpendicular to a central position on a central line connecting said normal turning operation part with said reverse turning operation part; a normal turning circuit constituted under a simultaneous depression of said normal turning operation part and said shift operating part; and a reverse turning circuit constituted under a simultaneous depression of said normal turning operation part and said shift operating part.

Preferably, a ring is arranged at a portion where a water-proof rubber held by a space between a side end case and a cover is deleted.

Preferably, a plurality of yokes are held at a magnetic member and there is formed a structure in which said yokes are projected out of a plurality of grooves below the cover.

Drawings:

In order that the invention might be more fully understood, embodiments of the invention will be described, by way of example only, with reference to the accompanying drawings, in which:

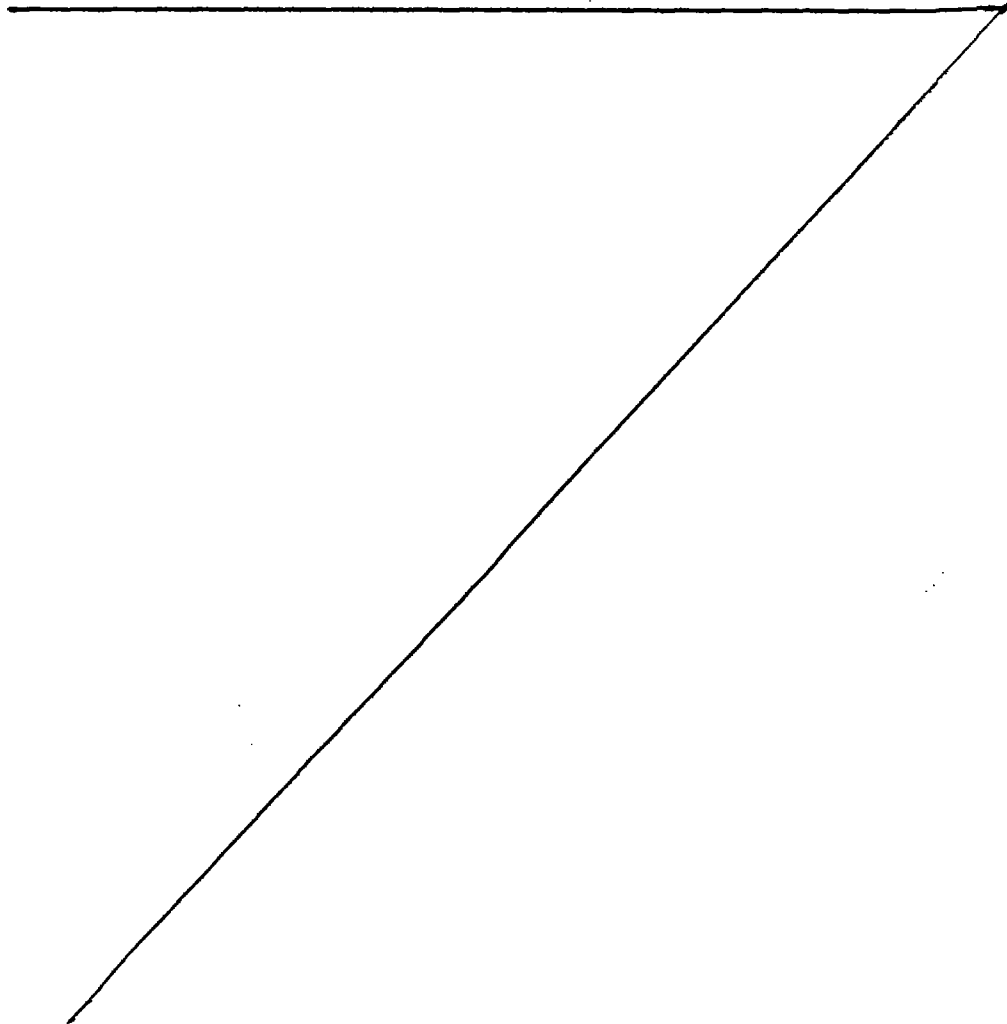


Fig.1 is a front elevational view for showing the reversible push button switch of the present embodiment.

Fig.2 is a front elevational view for showing a switch unit of the reversible push button switch of the present embodiment.

Fig.3 is a front elevational view for showing a mechanism of a switch unit of the reversible push button switch of the present embodiment.

Fig.4 is a sectional view taken along a line A-A of a switch unit of the reversible push button switch of the present embodiment.

Fig.5 is a sectional view taken along a line B-B of a switch unit of the reversible push button switch of the present embodiment.

Fig.6 is a rear view for showing a switch unit of the reversible push button switch of the present embodiment.

Fig.7 is an internal connecting diagram for showing a switch unit of the reversible push button switch of the present embodiment.

Fig.8 is a sectional view for showing a bottom part of a switch unit of the reversible push button switch of the present embodiment.

Fig.9 is a rear view for showing a switch unit of the reversible push button switch of the present embodiment.

Fig.10 is a right side elevational view for showing a switch unit of the reversible push button switch of the present embodiment.

Fig.11 is a partial bottom view for showing a state in which a ring is fixed to a switch unit of the reversible push button switch of the present embodiment.

Fig.12 is a partial front elevational view for showing a state in which a ring is fixed to a switch unit of the reversible push button switch of the present embodiment.

Fig.13 is a perspective view for showing a fixed contact point for a contact point (a) of a switch unit of the reversible push button switch of the present embodiment.

Fig.14 is a perspective view for showing a fixed contact point for a contact point (b) of a switch unit of the reversible push button switch of the present embodiment.

Fig.15 is a view for showing a state in which a magnet showing a magnetism and a yoke are integrally formed.

Fig.16 is a view for showing a state in which a magnet showing a magnetism and a yoke are integrally formed at a metallic member.

Fig.17 is a view for showing a state in which a magnet showing a magnetism and a yoke are integrally formed at a member other than a metallic member.

Fig.18 is a sectional view for showing a bottom part in a state in which a bushing is installed at a push button switch comprised of prior art cover and case by a bushing presser composed of a hanger part.

Embodiments:

Referring to the drawings, embodiments of the invention will be described.

Embodiments of this invention are constructed such that a normal turning _____ operation part, a reverse turning operation part and a shift operation part pushed in the same manner as that of any of the aforesaid operation part in order to prevent any wrong operation are arranged in a <-shape in respect to the operating surface, the normal turning operation part and the reverse turning operation part can not be fed concurrently by an interlock plate, a shift operating part is arranged on a central line connecting the normal turning operation part with the reverse turning operation part in a direction perpendicular to a central position, the normal turning operation part and one-way contact point of the reverse turning operation part are connected by a connector member and then the connector member and one-way contact point of the shift operation part are connected by the connector member.

The water-proof structure of the bushing is constructed such that the hanger part is arranged below the cover, a projection is arranged at an inner end of the case and then a bushing is engaged with the cover and the inner end wall of the case, the case end in opposite direction of the hanger part below the cover is provided with a space part for fixing a hanger ring and as required, the water-proof rubber is held in the space part and when not required, the water-proof rubber is eliminated so as to fix the ring.

The adsorbing structure for the surface to which it can be magnetically adsorbed is an adsorbing device in which a magnetic circuit is constituted by magnetically adsorbing two yokes at both surfaces of a magnet showing magnetism, wherein the aforesaid two yokes are projected out of the two grooves formed at the rear side of the cover, thereby if the surfaces can be magnetically adsorbed, it can be adsorbed.

A shift operation part preventing a wrong operation, a normal turning operation part and a reverse turning operation part connected through a mechanical interlock are arranged such that their operability and external wiring are quite easy, they are improved with the water-proof structure and the hanger sections being applied, and further a magnetic circuit is constituted at a rear side of the cover of the reversible push button switch by the magnet and the yokes which can be magnetically adsorbed,

thereby the normal turning-on or reverse turning push button switch having a quite superior workability can be obtained.

A three-point type reversible push button switch showing a superior operability having a structure for eliminating an erroneous operation by a wrong depressing of the push button is made such that three push buttons are adjacent to each other as shown in Fig.1 in order to cause the normal turning push button and the reverse turning push button to be compact in shape in compliance with the shift push button. A positional relation of the push buttons will be described as follows.

In Figs.1 and 8, reference numeral 11 denotes a normal turning operation part, reference numeral 12 denotes a reverse turning operation part and reference numeral 13 denotes a shift operation part pushed in concurrent with either the normal turning operation part 11 or the reverse turning operation part in order to prevent any erroneous operation. Since both of them are constituted by one membrane switch 14 in order to make a water-proof structure, and they are installed in a hole where the operating part of the case 15 acting as the operating surface of the normal or reverse turning push button switch is projected. In both cases, a position of each of the operating sections may become a <-shape on the operating surface of the case 15 in view of its operating

characteristic. In addition, the normal or reverse turning push button switch of the present invention is constructed such that a bushing 41 is held by the case 15, a cover 55 and a water-proof rubber.

In Fig.2, the push buttons which are integrally assembled with a cover 52 of the switch unit covering a switch or the like and movable terminal section for assembling the movable contact-point sections in correspondence with the aforesaid normal turning operation part 11, the reverse turning operation part 12 and the shift operation part 13 within the three holes in the cover 52 are a normal turning push button 16, a reverse turning push button 17 and a shift push button 18, respectively.

In reference to the switch unit shown in Figs.3, 4 and 5, the arrangement and the constitution of the switch or the like will be described. The normal turning push button 16 and the reverse turning push button 17 are stored in a groove-like storing section of a base 19 storing the switch or the like of the switch unit; an interlock plate 20 for preventing a concurrent feeding of the normal turning push button 16 and the reverse turning push button 17 is fixed to a movable terminal part 21 integrally formed with the normal turning push button 16; twin contact-point type movable contact points 26, 26 are fixed by a spring pressure within a window part of the movable terminal part 21, moved in an upward or downward direction by a reaction force of the spring 24 below the base 19, and then the fixed contact points 28, 29 arranged in the groove of the

base 19 are opened or closed. Similarly, the twin contact-point type movable contact-points 26, 26 are fixed to a movable terminal part 22 formed integrally with the reverse turning push button 17, by a spring pressure of the movable terminal part 22 within the window, moved in an upward or downward direction by a reaction force of a spring 25 below the base 19 and then the fixed contact points 30, 31 arranged in the groove of the base 19 are opened or closed.

In addition, movable contact points 32, 32 are fixed to the movable terminal part 23 integrally formed with the shifting push button 18 by a spring pressure within the window of the movable terminal part 23 in a direction perpendicular to a position of the central line connecting a cooperating normal turning push button 16 and the reverse turning push button 17 through the interlock plate 20 and the interlock structure, moved in an upward or downward direction by a reaction force of the spring 33 below the base 19 and the fixed contact points 35, 36 arranged in the groove of the base 19 are opened or closed.

Since the push buttons and the contact-point parts are arranged as described above, bridge lines 1-4, 1-5 in an internal connecting diagram of Fig.7 may become a linear line in shape as shown in Fig.6, they are quite simple, resulting in that their manufacturing cost can also be reduced.

Then, the case in which the reversible push button switch of the present invention is actually operated will be described as follows. During the normal turning

operation, the normal turning operation part 11 and the shift operation part 13 are pushed concurrently, though Fig.7 means that the lines 1-2 and 5-6 are pushed concurrently. During operation of the switch device, the normal turning push button 16 is pushed and the movable contact points 26, 26 at the normal turning push button 16 close the fixed contact points 28, 29 arranged in the groove of the base 19. In this case, the reverse turning push button 17 becomes a passage opened state under an interlock action of the interlock plate 20. As the shift operation part 13 is pushed in concurrent with the normal turning operation part 11, the movable contact points 32, 32 at the shift push button 18 close passage for the fixed contact points 35, 36 arranged in the groove of the base 19. Also during the reverse turning operation, operation is similarly carried out.

Further, a structure in which the fixed contact points can be manually installed at the terminal part in an easy manner in the same degree of close fitness as that of the prior art at the rear surface of the cover 52 of the switch unit will be described as follows. As shown in Fig.4, the circular projections 34 having a slant surface, i.e. a total number of six projections, two projections for each of the buttons and three projections for each of the normal turning push button, the reverse turning push button and the shift push button, respectively, in the preferred embodiment, are arranged, as projections for use in fixing the fixed contact points, at the terminal part of the fixed

contact point fixing side at the rear surface of the cover 52 in order to facilitate an insertion of the fixed contact points through the side surface of the base 19 of the switch unit.

In order to facilitate an insertion of the fixed contact point against the projections 34 from a side surface, a shape of the fixed contact point has been devised. For example, the fixed contact point 28 in Fig.13 will be described, wherein 28a denotes a fixed contact point, and 28b is a tapped hole where a circular hub work is applied. 28c denotes a round hole to be fixed to each of the projections 34 arranged in opposition to the tapped hole 28b of the fixed contact point 28 for the contact point (a) constructed in a U-shape.

35 denotes a fixed contact point for the contact point (b), 35a denotes a fixed contact point, and 35c denotes a tapped hole where a circular hub work is applied. 35b is a round hole to be fixed to each of the projections 34 arranged in opposition to the tapped hole 35c of the fixed contact point 35 for the contact point (b) constructed in a U-shape.

Either the fixed contact point 28 or the fixed contact point 35 is manually inserted into the groove-like storing part of the base from the side surface with the tapped hole being placed outside the base 19 where the cover 52 having the movable contact point or push button or interlock plate assembled therein is installed. In this case, although either the fixed contact point 28 or the fixed contact

point 35 constituted in a U-shape can be loosely inserted into the groove-like storing part of the base 19, the slant surface of the projection 34 of the cover 52 is slid and engaged with the round holes 28c, 35b and then the fixed contact point 28 and the fixed contact point 35 are fixed.

In the prior art, fitting of the terminal element to the terminal section was carried out such that the section constituted by the U-shaped part of the terminal in the preferred embodiment was narrowed and press fitted by an air cylinder. However, the element can be easily assembled by a manual operation with the aforesaid structure.

Then, the water-proof structure is considered and further a hanger structure showing a superior assembling characteristic is provided. In reference to the prior art, a structure in which four routes of flowing water entered from outside into the main body of the push button switch as indicated at arrows in Fig.18 are reduced to three routes will be described. In the structures of the cover 55 and the case 15 shown in Fig.8, the hanger part 37 having a hole below the cover 55 and the cover 55 are integrally assembled and the upper part of the inner side end of the case 15 is provided with a fixing location 38 comprised of a cavity. 43b denotes a water-proof rubber for applying effects of water-proof and dust-proof to the case 15 and the cover 55. A wall 40 where a fixing fitting for fixing an external electrical wire is arranged at a location where the fixing location 38 is adjacent.

A bushing 41 having at its upper end a projection 38a and having at its lower end a projection 39 is pushed from side ends of the case 15 and the cover 55 and then a water-proof structure is constituted by the projection 38a and the projection 39 with pressures of the convex or concave surfaces. As indicated by arrows in Fig.8, the routes where water enters from outside can be reduced to three cases, i.e. a case in which the water is transmitted within the bushing 41, a case in which the water is transmitted within a clearance between the bushing 41 and the case 15 and a case in which the water is transmitted within a clearance between the bushing 41 and the cover 55. As described above, the hanger part 37 having a hole below the cover 55 is formed into an integral structure, thereby it is possible to attain the hanger structure having its improved assembling characteristic and water-proof characteristic.

In reference to the case in which the hanger structure of the reversible push button switch of the present invention can be hung in any one of the two directions, there is provided a structure in which an annular ring 42 can be installed at a side end opposite to the hanger part 37 as required.

In the case that there is no ring 42, the water-proof rubbers 43a, 43b which are integrally constructed as shown in Fig.10 are held in a space part of the side case 15 and a space part in the cover 55, though when the ring 42 is fixed, the water-proof rubber 43a of the water-proof rubbers 43a, 43b having integral assembled structure as

shown in Figs.11 and 12 is removed by scissors or the like and the ring 42 is fixed under utilization of a space part of the mold section for the removed case 15.

Thirdly, if the working surface can be magnetically adsorbed, a structure which can be magnetically mounted at either a vertical plane or a ceiling plane will be described. In Figs.8, 9, 16 and 17, a chamber 46 provided with grooves 45, 45 having a wall 44 is formed below the cover 55, and the adjoining sections of the grooves 45, 45 are provided with an elongated projection 47 which is integrally constructed with the cover 55.

In Fig.15 is shown a system in which yokes 54, 54 are integrally formed under application of magnetic force with a magnet 48 having magnetism, although this formed assembly is dropped into the chamber 46 from upper side of the cover 55 as shown in Fig.16, 17 and then fixed by a rubber lid 49.

Fig.16 illustrates a state in which the assembly of magnet 48 and yokes 54, 54 is adsorbed against the metallic member 50 which can be adsorbed magnetically, wherein the projection 47 is kept floated away from the metallic member 50. Fig.17 illustrates a state in which it is mounted at a member 51 other than metallic member which can be adsorbed magnetically, wherein the formed member of magnet 48 and yokes 54, 54 as well as the projection 47 are mounted in the same plane. As described above, if the material is metallic member which can be magnetically adsorbed by a

magnetic circuit having a quite simple configuration, it can be adsorbed.

Accordingly, in view of operability, water-proof characteristic and workability, the reversible push button switch which is more superior than that of the prior art can be attained.

In view of an operability of the normal turning push button, reverse turning push button and shift push button for preventing erroneous operation, it is possible to provide a reversible push button switch in which its structure can arrange rational arrangement, the terminal for use in connecting with an external electrical line can be fitted to the terminal section at such a degree of close fitness as one not changed from that of the prior art and further the water-proof structure for the bushing is made such that the case and cover structure also acting as the hanger part is arranged in view of its assembling characteristic and then the hanger of the ring can be arranged in another direction and if it is the metallic member which can be magnetically adsorbed, it can be positively fixed.

The embodiments have been advanced by way of example only, and modifications are possible within the spirit and scope of the invention as defined by the appended claims.



Claims:

1. A reversible push button switch comprising a normal turning operation part and a reverse turning operation part including a moveable contact-point part co-operatively connected to an inter-lock mechanism and its corresponding fixed contact-point part; a shift operating part including a moveable contact-point part and its corresponding fixed contact-point part in a direction perpendicular to a central position on a central line connecting said normal turning operation part with said reverse turning operation part; a normal turning circuit constituted under a simultaneous depression of said normal turning operation part and said shift operating part; and a reverse turning circuit constituted under a simultaneous depression of said normal turning operation part and said shift operating part.

2. A reversible push button switch according to Claim 1 characterised in that a ring is arranged at a portion where a water-proof rubber held by a space between a side end case and a cover is deleted.

3. A reversible push button switch according to Claim 1 characterised in that a plurality of yokes are held at a magnetic member and there is formed a structure in which said yokes are projected out of a plurality of grooves below the cover.