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(54) Electrical switch assemblies.

(57) A joystick switch assembly has a lever (3) which can pivot about a central point (7), with a plurality of switches (22) distributed about that point. The lever (3) operates two sliders (11, 12) in mutually transverse directions, only one slider being movable at a time. The sliders (11, 12) carry spring loaded plungers (20) which co-operate with the switches (22). When a slider (11, 12) is moved by tilting the lever (3) from a central, neutral position, the plungers (20) carried by that slider operate associated switches (22). But when the lever (3) is released, the spring loading (19) pushes the slider back, causing the lever (3) to revert to the neutral position, and the plungers (20) follow to their initial positions causing the switches (22) also to revert. The principle is also applicable to a switch assembly in which the operating lever moves in only one plane.

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Description

Electrical Switch Assemblies

This invention relates to electrical switch assemblies. It was developed primarily for those switches with a "joystick" control, but the basic principle is applicable to switches with a control element that moves in one plane only.

Generally, a joystick switch assembly has a lever which is directly biased by a spring into a central, neutral position. The operator can shift it away from this in any direction "around the clock", and there are usually four microswitches arranged equidistantly around the lever which are selectively operated by a formation on the lower end of the lever. Often, it is desirable only to operate one such switch at a time, but it is difficult to guard against simultaneous operation of two switches when the lever is tilted to an intermediate position.

It is the aim of this invention, when applied to a joystick control, to guard against this problem. It is also an aim to provide a switch having a lever control and automatic return to neutral with a different and more positive feel than many conventional switches.

According to the present invention, there is provided an electrical switch assembly comprising a lever mounted for pivotal movement about a point and a switch spaced from the point and arranged to be operated by the lever, characterised by a slide member co-operating with the lever and guided for movement in the place of movement of the lever, a spring-loaded element acting between the slide member and the switch to actuate the latter on movement of the lever from a neutral position and to allow de-actuation of the switch on reversion of the lever to said neutral position, the mutual co-operation of the switch and the slide member with the spring-loaded element being such that the lever when released is biased back to said neutral position by said spring loading.

There may be two switches, each with an associated spring-loaded element, on opposite sides of the pivot point, the lever being pivotable in opposite directions from said neutral position to actuate one or other of said switches through the slide member.

In the form primarily intended, there are two slide members co-operating with the lever and guided for movement transverse to one another, each having at least one associated switch and spring loaded element producing bias to said neutral position. Thus the lever is what is commonly known as a joystick.

The slide members will preferably move in mutually perpendicular directions, and movement of each slide member from the neutral position can be arranged to prevent movement of the other slide member from that position. Thus only the switch or switches associated with a single slide member can be actuated at one time.

For example, if the lever is moved in the north-south direction, it will shift one slide member in that direction, operating a group of switches on an east-west axis. The other slide member (the east-west one) is not moved and a group of switches on the north-south axis will remain unaffected.

Conveniently, the or each spring-loaded element is a plunger urged against the associated switche by a spring reacting against the slide member. The or each switch then preferably has a rocker with a detent in which the associated plunger engages to hold the rocker in a first switching position when the lever is in said neutral position. When the lever is tilted to move the associated slide member, the plunger shifts in relation to the detent to tip the rocker to a second switching state. When the lever is released the reaction from the plunger through its spring urges the associated slide member and the lever back to the neutral position, the plunger also returning to its initial position in the detent.

For a better understanding of the invention, one embodiment will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a stepped vertical section through a joystick switch assembly.

Figure 2 is a vertical section through the assembly, at right angles to that of Figure 1.

Figure 3 is a plan view of an upper slider forming part of the assembly.

Figure 4 is a plan view of a lower slider forming part of the assembly.

Figure 5 is an underneath plan view of both sliders in a central, neutral position, and

Figure 6 is an underneath plan view of the sliders with the top one shifted.

The assembly is mounted mostly within a hollow body 1 in the centre of whose top there is a bulbous, open topped guide formation 2 for a joystick lever 3. This lever has an upper stem 4 to receive an operating knob 5, the lower end face of which is concave and spherically curved to match the outer face of the formation 2.

Below the stem 4 the lever has a part-spherical formation 6, centred on point 7, whose curved surface matches the concave inner surface of the formation 2. Thus, subject to constraints described below, the lever 3 can pivot about the point 7 in any direction, although of course to a limited angle. It is shown in a central, neutral position.

Below the formation 6 the lever 4 reduces over a conical portion 8 to a stem with an upper part 9 and a lower part 10. These parts are generally square, but on each one a pair of opposite sides have part-cylindrical convex surfaces, those on the part 9 facing in directions at right angles to those on the part 10.

This lower end of the lever 4 operates two sliders 11 and 12. The upper slider 11 is generally rectangular in plan and shallow H-shaped in side view. The central web 13 of the H has a longitudinal slot 14 in which lies the part 9. When the lever 4 is tilted from left to right as shown in Figure 1, this part 9 simply moves lengthwise of the slot and has no effect on the upper slider 11. But when the lever is tilted in the transverse directions, left to right in

Figure 2, the convex surfaces of the part 9 engage the sides of the slot 14 and the slider 11 is shifted. It is guided by its ends 15 co-operating with the inside of the body 1.

The lower slider 12 is also generally rectangular in plan but U-shaped in side view, as best seen in Figure 2. The web 16 of the U has a longitudinal slot 17, transverse to the slot 14, in which engages the lower part 10 of the lever 4. The action is similar to that of the upper slider, with the lower one being guided by its ends 18 co-operating with the inside of the body 1.

It will be seen that when the lever 4 is shifted in the plane of Figure 1 or 2 to move one slider, the other remains unaffected. Also, as can be seen from Figure 5, if an attempt is made to move the joystick in a diagonal direction, the corners of the ends 15 and 18 will mutually interfere, making this action impossible. Only one slider or the other can be shifted from the neutral position at any one time, and one example of this is shown in Figure 6, where the upper slider 11 has been moved.

On the longitudinal centre line of each slider, each end 15 and 18 has a blind vertical bore open to the underside, and each of these receives a coil spring 19 and a plunger 20. The nose of each plunger is rounded and normally rests within the apex of a V-shaped recess 21 at the centre of a rocker 22, which is the main component of an electrical switch. This is mounted in a cradle 23, and on either side of the recess 21 there are extensions 24 with electrical contacts 25 on the underside. In Figure 1, the vertical section has been stepped out of the central plane to show the switch construction, and the plungers 20 and switches associated with the upper slider 11 are omitted for clarity.

When lever 4 is tilted from the central, neutral position and one of the sliders is moved, the nose of each plunger 20 carried by that slider slides up one side of the associated recess 21 until, as it passes the support point on that side, the rocker 22 tilts to bring the contact 25 on that side down against another contact (not shown) to complete a circuit.

It will be understood that his happens simultaneously with switches at each end of the slider.

When contact is made, the plunger nose is still resting in the recess 21, and the surface which it abuts still slopes downwards back into the cradle 23. Therefore, if the lever 4 is released, with the help of the springs 19, the two plungers 20 at the opposite ends of the slider snap back towards the apex of the V, restoring the rockers 22 to the level position, separating the contacts, and also bringing the lever 4 back into the central, neutral position.

While a relatively complex joystick arrangement has been described, it will be understood that a simpler switch might have the lever constrained to pivot in one plane only and to co-operate with a single slider. And instead of several switches, there may just be one.

Claims

1. An electrical switch assembly comprising a lever (3) mounted for pivotal movement about a point (7) and a switch (22) spaced from the point and arranged to be operated by the lever, characterised by a slide member (11, 12) co-operating with the lever and guided for movement in the plane of movement of the lever (3), a spring-loaded element (19, 20) acting between the slide member and the switch (22) to actuate the latter on movement of the lever (3) from a neutral position and to allow de-actuation of the switch (22) on reversion of the lever (3) to said neutral position, the mutual co-operation of the switch (22) and the slide member (11, 12) with the spring loaded element (19,20) being such that the lever (3) when released is biased back to said neutral position by said spring loading (19).

2. A switch assembly as claimed in Claim 1, characterised in that there are two switches (22), each with an associated spring-loaded element (19, 20), on opposite sides of the pivot point (7), the lever (3) being pivotable in opposite directions from said neutral position to actuate one or other of said switches (22) through the slide member (11, 12).

3. A switch assembly as claimed in Claim 1 or 2, characterised in that there are two slide members (11, 12) co-operating with the lever and guided for movement transverse to one another, each having at least one associated switch (22) and spring loaded element (19, 20) producing bias to said neutral position.

4. A switch assembly as claimed in Claim 3, characterised in that the slide members (11, 12) move in mutually perpendicular directions.

5. A switch assembly as claimed in Claim 3 or 4, characterised in that movement of each slide member (11, 12) from the neutral position is arranged to prevent movement of the other slide member from that position.

6. A switch assembly as claimed in any preceding claim characterised in that the or each spring loaded element is a plunger (20) urged against the associated switch by a spring (19) reacting against the slide member (11, 12).

7. A switch assembly as claimed in Claim 6, characterised in that the or each switch has a rocker (22) with a detent (21) in which the associated plunger 20) engages to hold the rocker (22) in a first switching state when the lever (3) is in said neutral position, in that, when the lever (3) is tilted to move the associated slide member (11, 12), the plunger shifts in relation to the detent (21) to tip the rocker (22) to a second switching state, and in that, when the lever (3) is released, the reaction from the plunger (20) through its spring (19) urges the associated slide member (11, 12) and the lever (3) back to the neutral position, the plunger (20) also returning to its initial position in the detent.

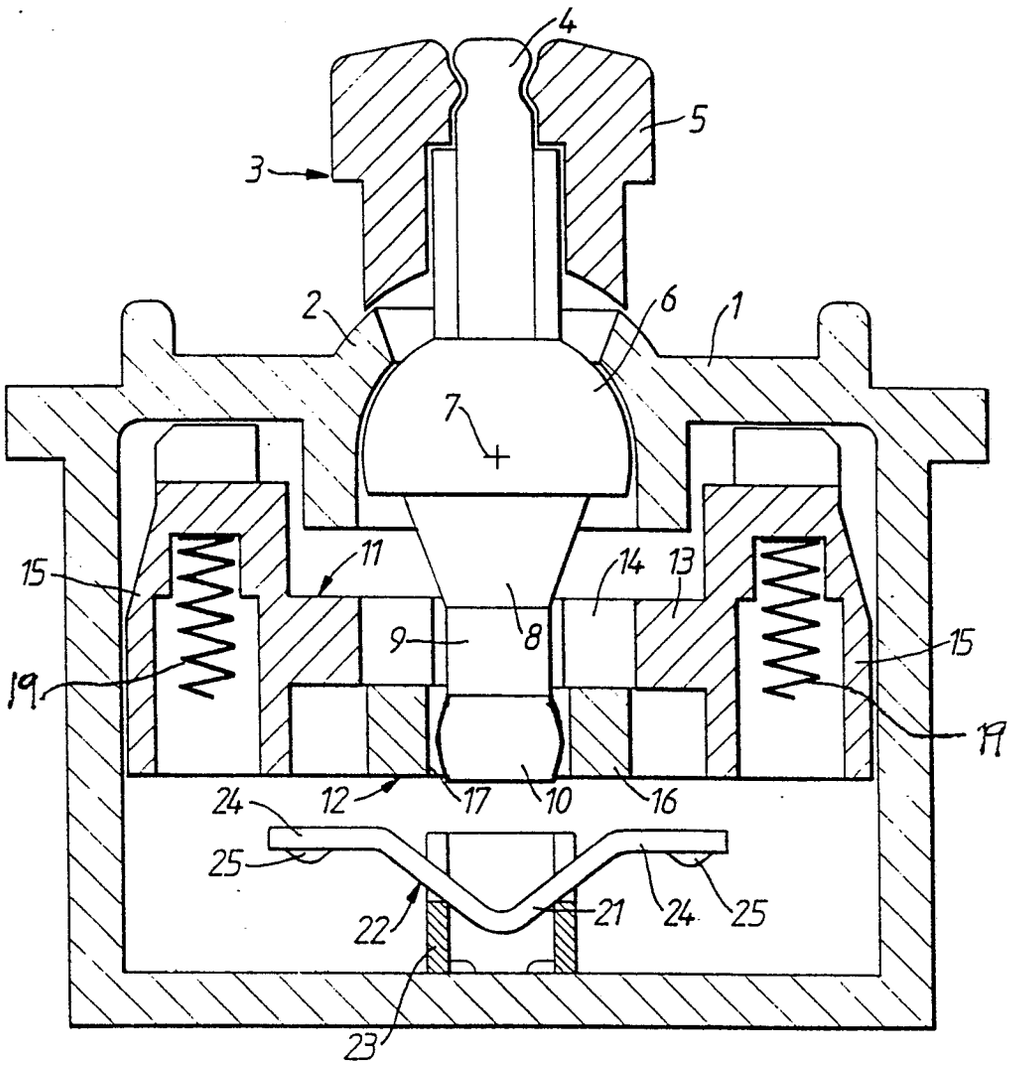
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Fig.1.

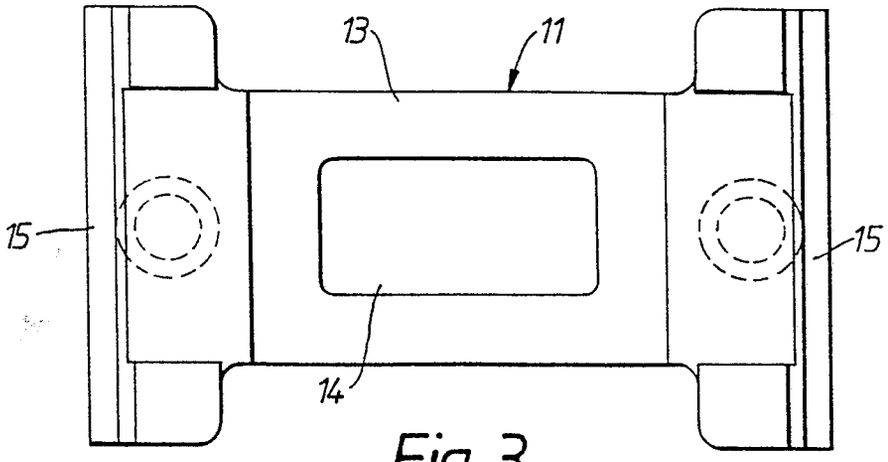
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Fig.3.

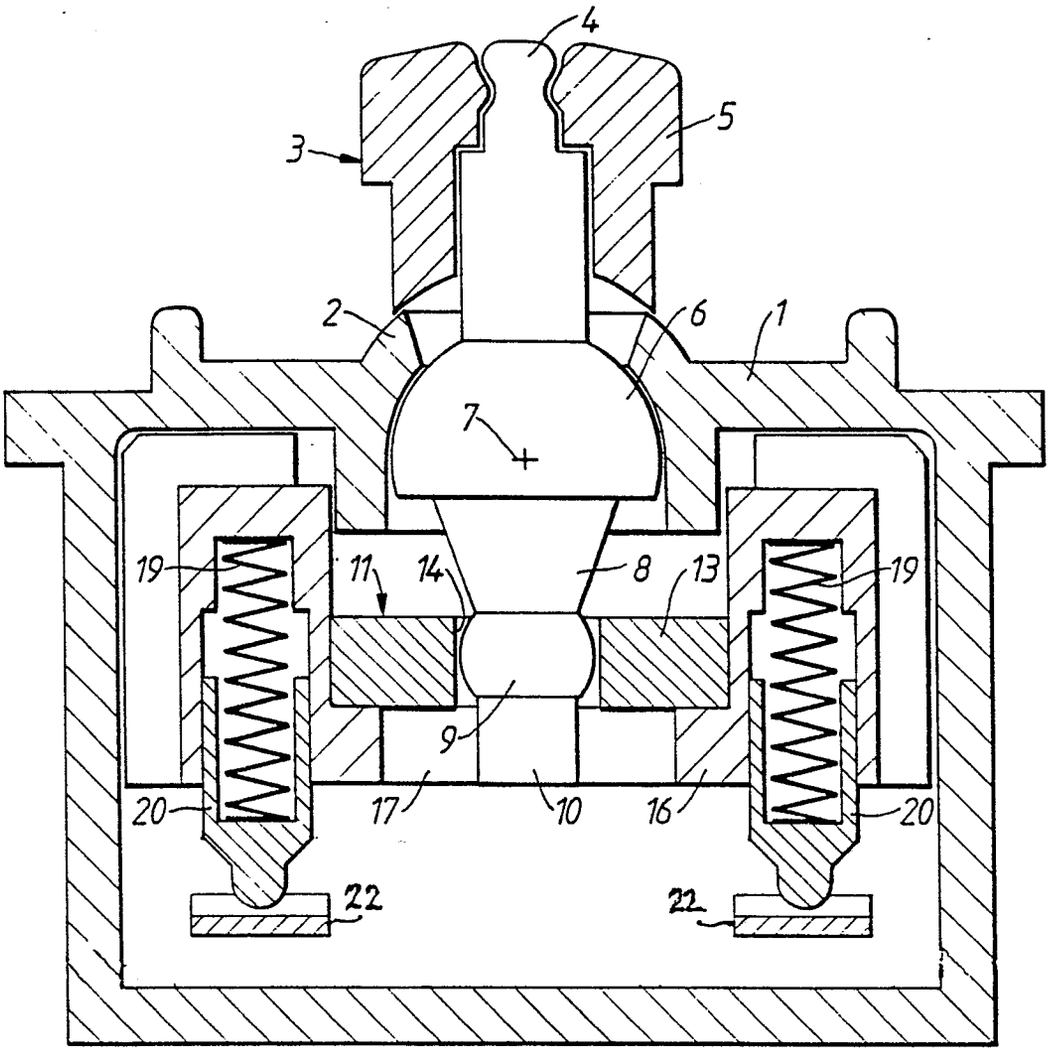

Fig. 2.

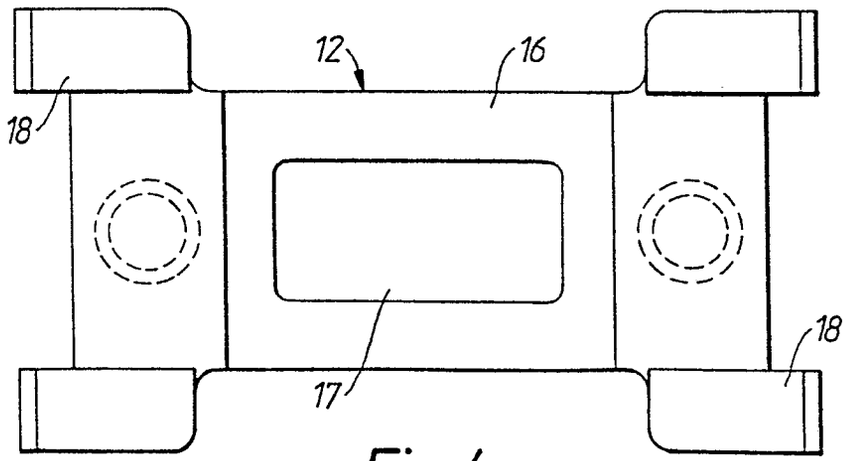

Fig. 4.

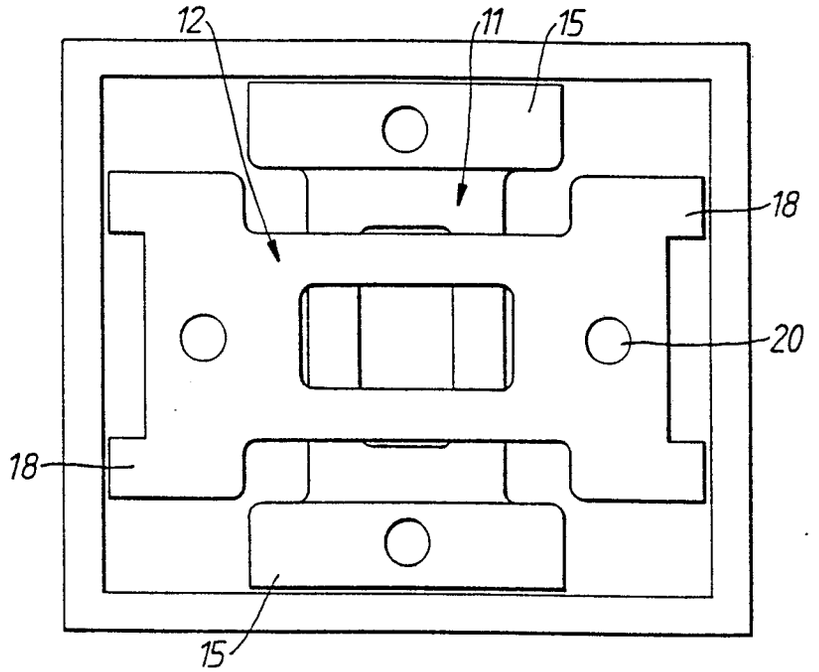

Fig.5.

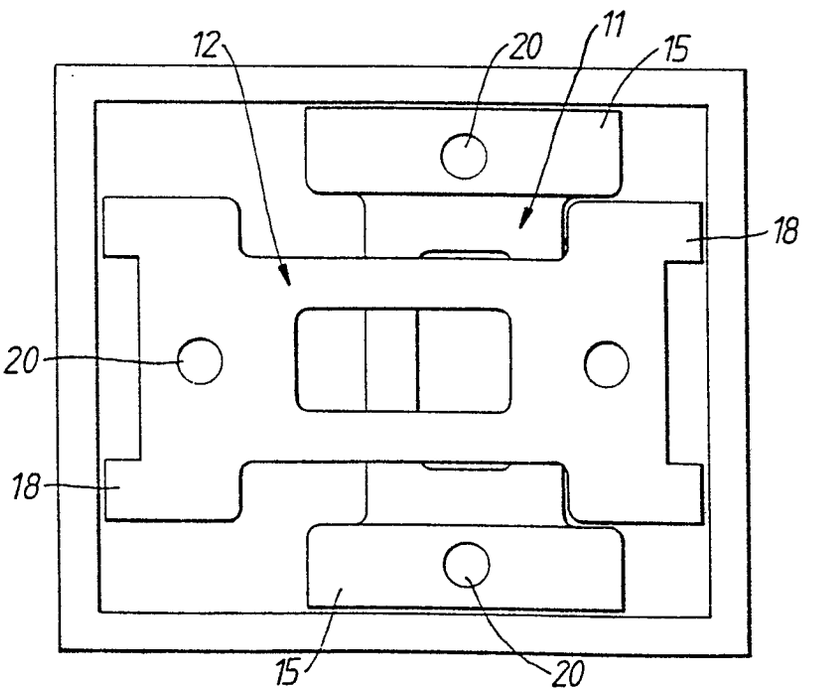

Fig.6.