

IMPROVEMENTS IN/OR RELATING TO ELECTRICAL SWITCHES

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This invention relates to electrical switches.

BACKGROUND

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Electrical switches are required to operate in a variety of environments and to enable operation by a wide range of users. By way of an example, an environment may require the switch to be exposed to water or moisture requiring for safety a specially sealed switch. In many instances the consumers preference would be for a switch which provided a normal external appearance. An example of a special situation, would be a disabled or handicapped user requiring a larger switch rocker for the switch than would normally be provided.

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An object of the present invention is to provide an electric switch which enables a switch unit to be associated with a mounting plate and switch rocker to accommodate different environmental or operational requirements.

PRESENT INVENTION

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Accordingly in one aspect the invention may broadly be said to consist in an electric switch comprising a mounting plate, a switch rocker pivotally mounted in said mounting plate said switch rocker incorporating a dependant control member, a switch module having fixed contacts a movable contact member and a actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts said switching unit being attached to the mounting plate with the switch rocker control member operatively engaged with the switch actuator so that movement of the switch rocker causes the control member to move the actuator to open or close an electric circuit between said fixed contacts.

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In a further aspect the invention may broadly be said to consist in an electric switch comprising a mounting plate, a switch rocker pivotally mounted in said mounting plate said switch rocker incorporating a dependant control member, waterproof diaphragm through which the control member of the switch rocker protrudes while maintaining a seal

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with said diaphragm, a switch module having fixed contacts and a movable contact member and a actuator operable to move the movable contact member to open or close an electric circuit between said fixed contact with the waterproof diaphragm providing a waterproof barrier between the switch and the mounting plate surrounding the switch rocker, and with the switch unit being mounted on the mounting plate with the switch rocker control member protruding through the waterproof diaphragm operatively engaging with said switch actuator so that movement of the switch rocker causes the control member to move the actuator to open or close an electric circuit between said fixed contacts.

In yet a further aspect the invention may broadly be said to consist in an electric switch comprising a mounting plate, a switch rocker aperture in said mounting plate, switch rocker pivotally mounted in said mounting plate to operate in said switch rocker aperture between two positions, said switch rocker being exposed from the front of the mounting plate for movement between the two positions and having dependant from the rear thereof a central transverse control member in line with the pivotal mounting for the switch rocker, a switch module mounted rearward of the mounting plate in operative engagement with the switch rocker control member, said switch module having a body fixed contacts located in said body of moveable contact member located in said switch body in the operative association with the fixed contacts, and actuator pivotally mounted in said switch body and operable to move the movable contact between positions to open and close the electric circuit between said fixed contacts.

In a still further aspect the invention may broadly be said to consist in an electric switch comprising a mounting plate having a switch rocker aperture therein, a switch rocker pivotally mounted in said mounting plate to operate in said switch rocker aperture between two positions, said switch rocker being exposed from the front of the mounting plate for movement between the two positions and having dependant from the rear thereof a central transverse control member in line with the pivotal mounting for the switch rocker, a switch module mounted at the rear of the mounting plate in operative engagement with the switch rocker control member, said switch module having a body fixed contacts located in said body a moveable contact member located in the switch body in the operative association with the fixed contacts, an actuator pivotally mounted in said switch body and operable to move the movable contact between positions to open and close the electric circuit between said fixed contacts and a waterproof diaphragm through which the central member of the switch rocker protrudes while maintaining a seal with the



diaphragm and with the outer periphery of the diaphragm sealed about the switch rocker aperture to locate the switch unit beyond a waterproof diaphragm.

DRAWING DESCRIPTION

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One preferred embodiment and modifications thereof are described with reference to the accompanying drawings in which:

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Figure 1 is a sectional view through an electric switch according to the present invention for use as a waterproof switch;

Figure 2 is a section through a switched plug unit of modified construction also incorporating the waterproof switch;

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Figure 3 is an exploded view showing the various components in the electrical switch according to the present invention;

Figure 4 is a plan view of the switch body;

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Figure 5 is a detail of one form of pivot connection in the mounting plate for the switch rocker;

Figure 6 is a detail showing an alternate pivot connection for the switch rocker;

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Figure 7 is a detail of a larger switch rocker;

Figure 8 is a rear view of the mounting plate with the switch unit attached and

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Figure 9 is a perspective view partly broken away of a waterproof switch unit having a detachable cover plate.

PREFERRED EMBODIMENT

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The electric switch according to the present invention may be applied in a number of different electrical fittings and an exemplary range of these has been included in the accompanying drawings. Figure 3 is an exploded view of the components and the present



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invention will be described with initial reference to figure 3 but the drawing reference numbers for the appropriate components will also be used on the other figures.

5 The switch has a mounting plate 1 in which is formed an aperture 2 to receive a switch rocker 3. The switch rocker 3 is pivotally mounted in the mounting plate 1. To achieve this pivotal mounting protuberances 4 project centrally from each side of the rocker 3, with the protuberances having a V recess in the upper surface. The protuberances engage a seat 5 having a complimentary V pivot 6 at the base of an open recess 7 as shown in greater detail in figure 5.

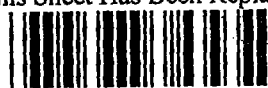
10 Alternatively the pivot 6 may be located in a closed recess 8 with the protuberances 4 formed to engage with a force fit into the recesses 8 thus retaining the switch rocker 3 in engagement with the mounting plate 1 once fitted in place.

15 Movement of the switch rocker is limited by stops 9 engaging with part of the mounting plate so that the rocker moves between two defined positions for the switching action.

20 Dependant centrally from the undersurface of the rocker is a transverse control member 10 substantially in line with the pivot projections 4. The member 10 is shaped to engage with and operate an actuator of a switch unit as will be described in greater detail here below.

25 The size of the switch rocker 3 can be varied. For normal use a conventional switch rocker size would adopted but for special purposes, for example, if the switch was to be used in an environment requiring easier operation, for example, for disabled people, a larger switch rocker could be incorporated in the mounting plate and an example of the larger switch rocker is illustrated as 3a in figure 7.

30 The switch rocker is designed to operate a switch unit 11. The switch unit has a switch body 12 in which are located two fixed contacts 13 and 14 with terminals 15 and 16 to allow electrical connection. A central transverse pivot 17 is also provided on which is pivotally supported a movable contact member 18. The moveable contact member has central projections 19 from either side which engage within locating recess 20 in the switch base. The moveable contact 18 is thus pivotally mounted in the switch base and
35 can move between two positions to effect the switching action.



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An actuator 20 has a spring loaded plunger 21 which engages the top surface of the moveable contact 18. The actuator 20 has projections 22 from either side thereof that engage within apertures 23 in the side of the switch body to provide a pivotal mounting. On the top surface of the actuator 20 is a member 23 locating a central transverse recess 24 which in use is engaged by the end of the control member 10 protruding from the switch rocker 3.

The switch unit 11 has a mount 25 in which the switch unit engages. The mount 25 is screwed to the mounting plate with screws 25a so that the switch unit is held in place with the control member of the switch rocker operatively engaged with the recess 24 of the actuator 20. The body of the switch unit 11 has retaining arms 25b so that when the body is pressed into mount 25 the arms will retain the body in place.

Where the switch is used in an environment requiring waterproofing a suitable waterproof membrane 26 is located between the switch mounting plate 1 and the switch unit 11. The waterproof diaphragm is shaped to ensure that there is an adequate seal about the control member 10 which protrudes through the diaphragm and with the periphery with the diaphragm sealed in engagement with the mounting plate. It is preferable to have a shaped diaphragm having a peripheral rib 27 a raised central section 28 with a central transverse slot 29 to engage about the control member 10. The configuration of the diaphragm is such that the slot 29 is arranged so that in the normal position the diaphragm will engage the control member 10 of the rocker switch at or adjacent the pivot line of the rocker. This can be seen in figure 1. In this way movement of the switch rocker causes minimal movement of the diaphragm thus assisting in preserving the life of the diaphragm and ensuring a long operating life of the waterproof switch. The mount 25 is arranged to ensure that there is a good peripheral seal of the diaphragm when the switch is assembled as is shown in figure 1.

The embodiment illustrated in figure 2 is a switched plug unit 30 the switch body 12a has essentially the same components as were described above, but the switch unit is mounted directly in the mounting plate 1a and an escutcheon member 31 in the mounting plate which defined the aperture for the switch rocker holds the waterproof diaphragm 26a in position.

A similar configuration is illustrated in figure 9 where a switch unit made in the same style is illustrated. The switch has a mounting plate 1b over which is fitted in use a

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removable cover 32. The escutcheon 31 and the diaphragm 26a remain the same as illustrated in figure 2.

5 The present invention provides a switch which used with the waterproof diaphragm allows the switch to pass all of the Australian, British and New Zealand standard specifications required for a waterproof switch.

10 It will be apparent from the foregoing that the actuator mechanism can be designed to suit any particular requirement. For example, the same operating arrangement could be preserved but the actuator significantly enlarged to provide the user with a large actuator surface. In this instance it would not be necessary to provide the sealing as is required for a waterproof embodiment of the present invention.

15 The present invention allows a conventional switch module to be incorporated in a mounting plate that can either assume the appearance of a standard switch or be modified so that the switch rocker surface is of any desired size.



CLAIMS:

- 5 1. An electric switch comprising a mounting plate, a switch rocker pivotally mounted
in said mounting plate said switch rocker incorporating a dependant control
member, a switch module having fixed contacts a movable contact member and a
10 actuator operable to move the movable contact member to open or close an electric
circuit between the fixed contacts said switching unit being attached to the
mounting plate with the switch rocker control member operatively engaged with
the switch actuator so that movement of the switch rocker causes the control
member to move the actuator to open or close an electric circuit between said fixed
contacts.
- 15 2. An electric switch comprising a mounting plate, a switch rocker pivotally mounted
in said mounting plate said switch rocker incorporating a dependant control
member, a waterproof diaphragm through which the control member of the switch
20 rocker protrudes while maintaining a seal with said diaphragm, a switch module
having fixed contacts and moveable contact member and a actuator operable to
move the moveable contact member to open or close an electric circuit between
said fixed contacts, with the waterproof diaphragm providing a waterproof barrier
between the switch and the mounting plate surrounding the switch rocker, and with
the switch unit being mounted on the mounting plate with the switch rocker control
25 member protruding through the waterproof diaphragm operatively engaging with
said switch actuator so that movement of the switch rocker causes the control
member to move the actuator to open or close an electric circuit between said fixed
contacts.
- 30 3. An electric switch comprising a mounting plate, a switch rocker aperture in said
mounting plate, a switch rocker pivotally mounted in said mounting plate to
operate in said switch rocker aperture between two positions, said switch rocker
being exposed from the front of the mounting plate for movement between the two
positions and having dependant from the rear thereof a central transverse control
member in line with the pivotal mounting for the switch rocker, a switch module
35 mounted at the rear of the mounting plate in operative engagement with the switch
rocker control member, said switch module having a body fixed contacts located



in said body a moveable contact member located in said switch body in the operative association with the fixed contacts, an actuator pivotally mounted in said switch body and operable to move the movable contact between positions to open and close and electric circuit between said fixed contacts.

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4. An electric switch comprising a mounting plate having a switch rocker aperture therein, a switch rocker pivotally mounted in said mounting plate to operate in said switch rocker aperture between two positions, said switch rocker being exposed from the front of the mounting plate for movement between the two positions and
10 having dependant from the rear thereof a central transverse control member in line with the pivotal mounting for the switch rocker, a switch module mounted at the rear of the mounting plate in operative engagement with the switch rocker control member, said switch module having a body fixed contacts located in said body a moveable contact member located in the switch body in the operative association
15 with the fixed contacts, an actuator pivotally mounted in said switch body and operable to move the movable contact between positions to open and close and electric circuit between said fixed contacts, a waterproof diaphragm through which the central member of the switch rocker protrudes while maintaining a seal with the diaphragm and with the outer periphery of the diaphragm sealed about the
20 switch rocker aperture to locate the switch unit beyond a waterproof diaphragm.
5. An electric switch as claimed as in claim 4 where in the waterproof diaphragm engages the transverse central member of the switch rocker at a location at or adjacent to pivot line of the rocker to minimise movement of the diaphragm by the
25 central member upon operation of the switch rocker.
6. An electric switch as claimed in claim 5 where in the waterproof diaphragm has a peripheral rib or flanged arranged to form a sealable connection to isolate the switch unit from the mounting plate or means associated therewith.
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7. An electric switch as claimed in any one of claims 4 to 6 where in the central section of the diaphragm has a transverse recess through which the control member of the switch rocker protrudes while retaining a seal and with the central section of the diaphragm being flexible and shaped so that the normal position of the diaphragm when installed provides the engagement with the control member at or
35 adjacent the pivot line of the switch rocker.



- 5 8. An electric switch as claimed in any one of the proceeding claims where in the switch rocker is pivotally mounted in the mounting plate by two centrally located side protuberances each having a recessed upper surface to engage a complimentary seat in the mounting plate.
- 10 9. An electric switch as claimed in claim 8 where in the complimentary seats in the mounting plates are each located at the top of a recess with open access from the bottom.
- 15 10. An electric switch as claimed in claim 9 where in the complimentary seats in the mounting plate are each located at the top of a confined recess with the protuberances on the switch rocker once located in the recess as being retained in place unless deformed for removal.

An electric switch when constructed arrange and operable with reference to figures 1, 3, 4, 5, 8 or 2 or 6 or 7 or 9.

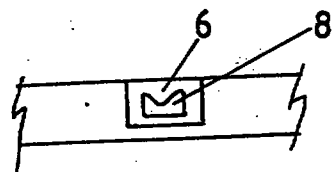


FIG. 6

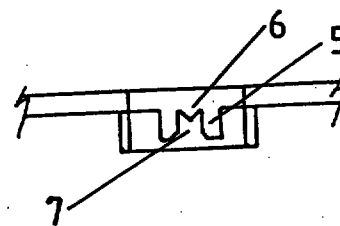


FIG. 5

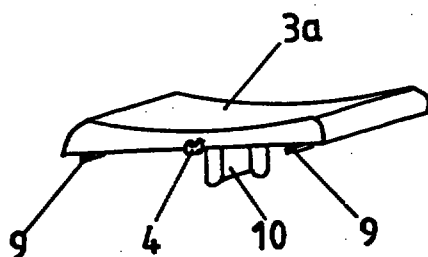


FIG. 7

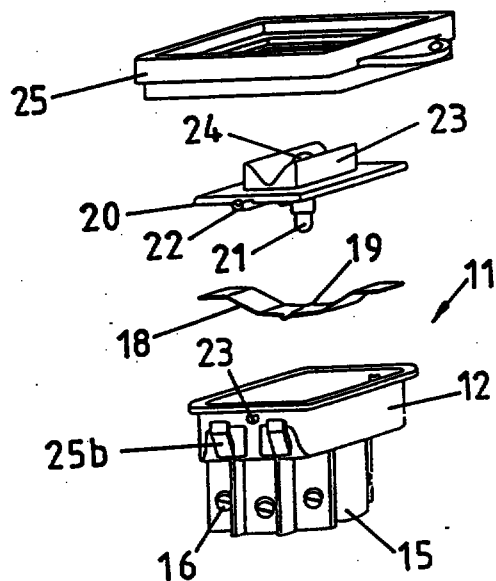
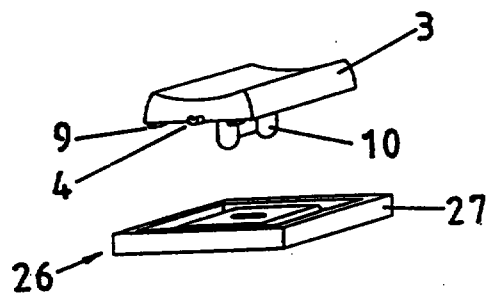
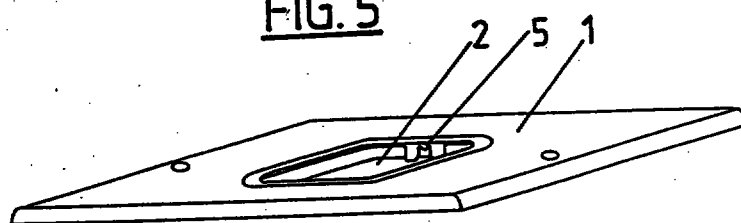


FIG. 3

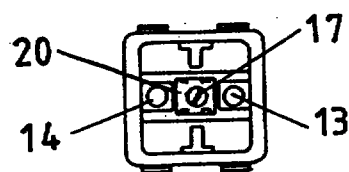


FIG. 4

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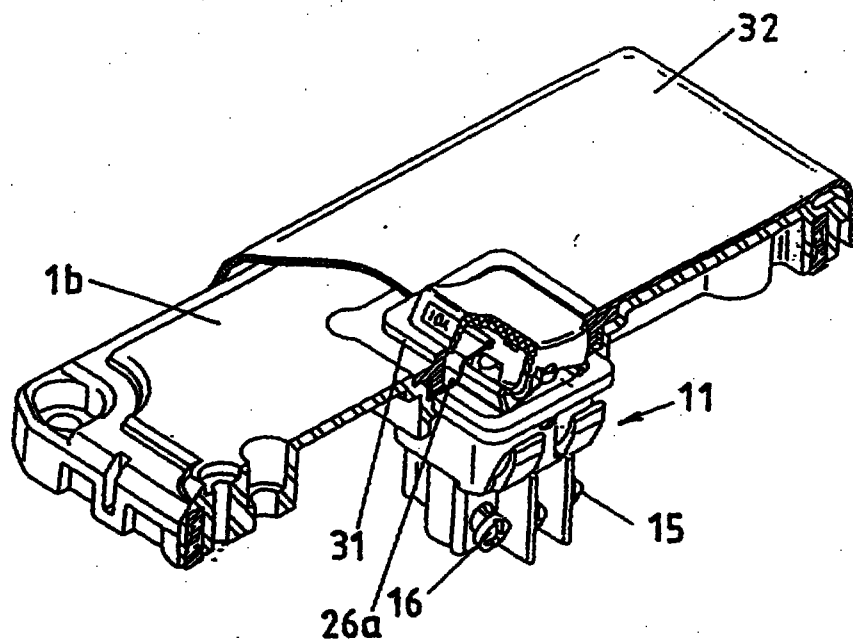


FIG. 9

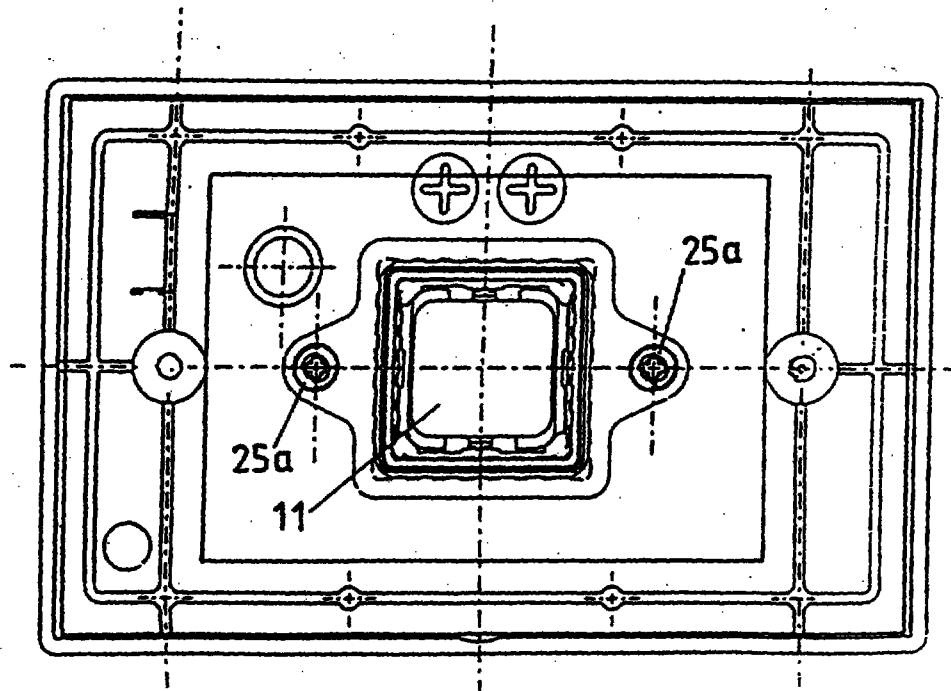


FIG. 8

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CLAIMS:

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1. An electric switch comprising:
 - a mounting plate having a front and a rear face;
 - a switch rocker pivotally mounted in said mounting plate, said switch rocker being exposed from said front face of said mounting plate;
 - a control member extending from the rear of the switch rocker, such that pivotal movement of the rocker causes corresponding pivotal movement of the control member;
 - a switch unit having fixed contacts, a movable contact member and an actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts, the actuator mounted for pivotal movement relative to the switch rocker and provided with a recess, the control member of the rocker being operatively engaged within the recess such that pivotal movement of the switch rocker provides a positive force to effect relative pivotal movement of the actuator to open or close the electric circuit between said fixed contacts.
2. The electric switch as claimed in claim 1 wherein the pivotal mounting of the switch rocker is provided on opposite sides of the switch and the pivotal mounting of the actuator is also provided on the opposite sides of the switch.
3. The electric switch as claimed in claim 1 or claim 2 wherein the pivotal axis of the switch rocker extends substantially parallel to the pivotal axis of the actuator.
4. The electric switch as claimed in claim 2 or claim 3 wherein the control member of the switch rocker engages within the recess of the actuator such that pivotal movement of the control member in one direction effects pivotal movement of the actuator in the opposite rotational direction.
5. The electric switch as claimed in any one of the preceding claims, wherein the movable contact member is pivotally mounted to open or close the electric circuit between the fixed contacts, the movable contact member is provided with a recess and wherein the actuator is provided with a plunger to operatively engage in the recess of the movable contact member such that pivotal movement of the actuator provides a positive force to effect relative pivotal movement of the movable contact member to open or close the electric circuit between the fixed contacts.



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REPLACEMENT SHEET

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6. The electric switch as claimed in claim 5 wherein the movable contact member is pivotable about an axis substantially parallel to the pivotal axis of the actuator.
7. The electric switch as claimed in claim 5 or claim 6 wherein the plunger is spring loaded.
8. The electric switch as claimed in any one of the preceding claims further including a waterproof diaphragm extending between the actuator and the switch rocker to provide a waterproof barrier therebetween.
9. The electric switch as claimed in claim 8 wherein the waterproof diaphragm extends in a manner enabling positive engagement between the control member and the actuator.
10. The electric switch as claimed in claim 8 or claim 9 wherein a portion of the waterproof diaphragm extends circumferentially about the control member.
11. The electric switch as claimed in claim 10 wherein an end of the control member engages within the recess of the actuator, said portion of the waterproof diaphragm extending circumferentially about the control member being spaced from said end of the control member.
12. The electric switch as claimed in any one of the preceding claims wherein the control member is provided in line with the pivotal mounting of the switch rocker.
13. The electric switch as claimed in any one of the preceding claims, wherein the control member is incorporated into the switch rocker and depends from the rear of the switch rocker.
14. An electric switch comprising:
 - a mounting plate having a front and a rear face;
 - a switch rocker pivotally mounted to pivot in said mounting plate about a first transverse axis, said switch rocker being exposed from said front face of the mounting plate;
 - a control member extending from the rear of the switch rocker such that pivotal movement of the rocker causes corresponding pivotal movement of the control member;



a switch unit having fixed contacts, a movable contact member and an actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts, the actuator being pivotally mounted to pivot relative to the switch rocker about a second transverse axis substantially parallel to the first transverse axis, the actuator provided with a recess and the control member being operatively engaged within the recess such that pivotal movement of the switch rocker provides a positive force to effect relative pivotal movement of the actuator to open or close the electric circuit between said fixed contacts.

15. The electric switch as claimed in claim 14 wherein the control member of the switch rocker engages within the recess of the actuator such that pivotal movement of the control member in one direction effects pivotal movement of the actuator in the opposite rotational direction.

16. An electric switch comprising:

a switch unit having fixed contacts, a movable contact member and a pivotally mounted actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts, the switch unit being attached to a mounting plate, the mounting plate having a front and a rear face;

a switch rocker mounted in said mounting plate for pivotal movement relative to the switch rocker, said switch rocker being exposed from said front face of the mounting plate;

a control member extending from the rear of the switch rocker such that pivotal movement of the switch rocker causes corresponding pivotal movement of the control member with the control member operatively engaged with the switch actuator so that movement of the switch rocker causes the control member to move the actuator to open or close the electric circuit between said fixed contacts;

a waterproof diaphragm extending between the actuator and the switch rocker to provide a waterproof barrier therebetween in a manner permitting the control member to positively engage with the actuator, wherein the waterproof diaphragm is fixed in sealing engagement with the underside of the mounting plate along a peripheral portion of the mounting plate surrounding the switch rocker.

17. The electric switch as claimed in claim 16 wherein a portion of the waterproof diaphragm extends circumferentially about the control member, said portion being spaced from an end of the control member engaging with the switch actuator.

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18. The electric switch as claimed in claim 17 wherein said portion of the waterproof diaphragm is of reduced thickness.

19. An electric switch comprising a mounting plate having a switch rocker aperture therein, a switch rocker pivotally mounted in said mounting plate to operate in said switch rocker aperture between two positions, said switch rocker being exposed from the front of the mounting plate for movement between the two positions and having dependant from the rear thereof a central transverse control member in line with the pivotal mounting for the switch rocker, a switch unit mounted at the rear of the mounting plate in operative engagement with the switch rocker control member, said switch unit having a body, fixed contacts located in said body, a moveable contact member located in the switch body in operative association with the fixed contacts, an actuator mounted in said switch body for pivotal movement relative to the switch rocker and operable to move the movable contact between positions to open and close an electric circuit between said fixed contacts, a waterproof diaphragm through which the central member of the switch rocker protrudes while maintaining a seal with the diaphragm and with the outer periphery of the diaphragm sealed about the switch rocker aperture to locate the switch unit beyond a waterproof diaphragm.

20. The electric switch substantially as hereinbefore described with reference to Figures 1, 3, 4, 5 and 8 or as modified by Figures 2, 6, 7 or 9.

21. An electric switch comprising:

- a mounting plate having a front and a rear face and a switch rocker aperture;

- a switch rocker pivotally mounted in said switch rocker aperture, said switch rocker being exposed from said front face of said mounting plate such that when installed, the mounting plate and the switch rocker present the external appearance of a normal switch;

- a control member extending from the rear of the switch rocker, such that pivotal movement of the rocker causes corresponding pivotal movement of the control member;

- a switch unit having fixed contacts, a movable contact member and an actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts, the actuator mounted for pivotal movement relative to the switch rocker, the control member of the rocker being operatively engaged with the actuator such that pivotal movement of the switch rocker causes



the control member to effect relative pivotal movement of the actuator to open or close the electric circuit between said fixed contacts;

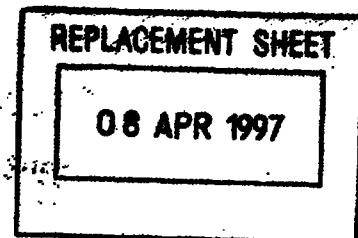
a waterproof diaphragm extending between the mounting plate and the switch unit to provide a waterproof barrier behind the switch rocker to protect the switch unit in a manner such that in use, no bias is applied by the diaphragm to the control member which would adversely affect the operation of the control member in effecting pivotal movement of the actuator.

22. The electric switch as claimed in claim 21 wherein the waterproof diaphragm is fixed in sealing engagement with the underside of the mounting plate along a peripheral portion of the mounting plate surrounding the switch rocker aperture.

23. The electric switch as claimed in claim 21 or claim 22 wherein a portion of the waterproof diaphragm extends circumferentially about the control member, said portion being spaced from an end of the control member engaging with the switch actuator.

24. The electric switch as claimed in any one of claims 21 to 23 wherein the actuator is provided with a recess and the control member of the switch rocker is operatively engaged within the recess such that pivotal movement of the switch rocker provides a positive force to effect the relative pivotal movement of the actuator to open or close the electric circuit.

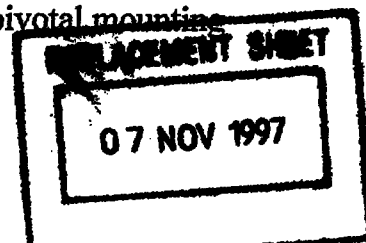
25. The electric switch as claimed in any one of claims 21 to 24 wherein the control member extending from the rear of the switch rocker is in line with the pivotal mounting of the switch rocker.



CLAIMS:

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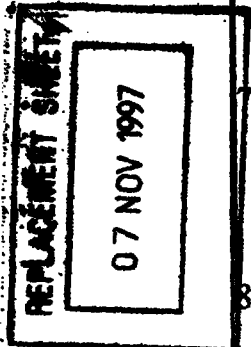
1. An electric switch comprising:
 - a mounting plate having a front and rear face;
 - an external actuator operably mounted in said mounting plate, said external actuator being exposed and operable from said front face of said mounting plate;
 - a control member extending from the rear of said external actuator such that movement of the external actuator causes a pivotal movement of the control member;
 - a switch unit having fixed contacts, a moveable contact member with contacts to complete a contact set with the fixed contacts and an internal actuator operable to move the moveable contact member to open or close an electrical circuit between the fixed contacts, the internal actuator being mounted for pivotal movement relative to the external actuator and provided with a recess, the control member of the external actuator being operatively engaged within the recess such that movement of the external actuator provides a positive force to effect pivotal movement of the internal actuator to open or close the contact set.
2. An electric switch comprising:
 - a mounting plate having a front and a rear face;
 - an external actuator pivotally mounted in said mounting plate, said external actuator being exposed from said front face of said mounting plate;
 - a control member extending from the rear of the external actuator, such that pivotal movement of the external actuator causes corresponding pivotal movement of the control member;
 - a switch unit having fixed contacts, a movable contact member and an internal actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts, the internal actuator mounted for pivotal movement relative to the external actuator and provided with a recess, the control member of the rocker being operatively engaged within the recess such that pivotal movement of the external actuator provides a positive force to effect relative pivotal movement of the internal actuator to open or close the electric circuit between said fixed contacts.
3. The electric switch as claimed in claim 2 wherein the external actuator is pivotally mounted on opposite sides of the switch and the pivotal mounting





of the internal actuator is also provided on the opposite sides of the switch.

4. The electric switch as claimed in claim 3 wherein the pivotal axis of the external actuator extends substantially parallel to the pivotal axis of the internal actuator.
5. The electric switch as claimed in claim 3 or claim 4 wherein the control member of the external actuator engages within the recess of the internal actuator such that pivotal movement of the control member in one direction effects pivotal movement of the internal actuator in the opposite rotational direction.
6. The electric switch as claimed in any one of the preceding claims, wherein the movable contact member is pivotally mounted to open or close the electric circuit between the fixed contacts, the movable contact member is provided with a recess and wherein the internal actuator is provided with a plunger to operatively engage in the recess of the movable contact member such that pivotal movement of the internal actuator provides a positive force to effect relative pivotal movement of the movable contact member to open or close the electric circuit between the fixed contacts.
7. The electric switch as claimed in claim 6 wherein the movable contact member is pivotable about an axis substantially parallel to the pivotal axis of the internal actuator.
8. The electric switch as claimed in claim 6 or claim 7 wherein the plunger is spring loaded.
9. The electric switch as claimed in any one of the preceding claims further including a diaphragm extending between the internal actuator and the external actuator to provide a substantially waterproof barrier therebetween.
10. The electric switch as claimed in claim 9 wherein the diaphragm extends in a manner enabling positive engagement between the control member and the internal actuator.
11. The electric switch as claimed in claim 9 or claim 10 wherein a central section of the diaphragm extends circumferentially about the control member.





12. The electric switch as claimed in claim 11 wherein an end of the control member engages within the recess of the internal actuator, said central section of the diaphragm extending circumferentially about the control member at or adjacent the pivot line of the external actuator and being spaced from said end of the control member.
13. The electric switch as claimed in any one of the preceding claims wherein the external actuator is pivotally mounted in said mounting plate and the control member is provided in line with the pivotal mounting of the external actuator.
14. The electric switch as claimed in any one of the preceding claims, wherein the control member is integral with the external actuator.
15. An electric switch comprising:
a mounting plate having a front and a rear face;
a switch rocker pivotally mounted to pivot in said mounting plate about a first transverse axis, said switch rocker being exposed from said front face of the mounting plate;
a control member extending from the rear of the switch rocker such that pivotal movement of the rocker causes corresponding pivotal movement of the control member;
a switch unit having fixed contacts, a movable contact member and an internal actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts, the internal actuator being pivotally mounted to pivot relative to the switch rocker about a second transverse axis substantially parallel to the first transverse axis, the actuator provided with a recess and the control member being operatively engaged within the recess such that pivotal movement of the switch rocker provides a positive force to effect relative pivotal movement of the actuator to open or close the electric circuit between said fixed contacts.
16. The electric switch as claimed in claim 15 wherein the control member of the switch rocker engages within the recess of the internal actuator such that pivotal movement of the control member in one direction effects pivotal movement of the internal actuator in the opposite rotational direction.
17. An electric switch comprising:
a switch unit having contacts, a movable contact member and an

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actuator operable to move the movable contact member to open or close an electric circuit between the contacts, the switch unit being attached to a mounting plate, the mounting plate having a front and a rear face;

a switch rocker pivotally mounted in said mounting plate, said switch rocker being exposed from said front face of the mounting plate;

a control member extending from the rear of the switch rocker in line with the pivotal mounting for the switch rocker, the control member being operatively engaged with the actuator so that movement of the switch rocker causes the control member to move the actuator to open or close the electric circuit between said contacts;

a diaphragm extending between the actuator and the switch rocker to provide a substantially waterproof barrier therebetween in a manner permitting the control member to positively engage with the actuator, wherein the diaphragm is fixed in sealing engagement with the underside of the mounting plate along a peripheral portion of the mounting plate surrounding the switch rocker.

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18. The electric switch as claimed in claim 17 wherein the diaphragm is also fixed in sealing engagement with the rear face of the mounting plate along a peripheral portion of the switch unit surrounding the actuator.
19. The electric switch as claimed in claim 17 or claim 18 wherein a central section of the diaphragm extends circumferentially about the control member, said central section being disposed at or adjacent the pivot line of the switch rocker.
20. The electric switch as claimed in claim 19 wherein an end of the control member engages with the actuator, the engaging end of the control member being disposed rearwardly of the pivot line.
21. The electric switch as claimed in claim 19 or claim 20 wherein said central section of the diaphragm is of reduced thickness.
22. The electric switch as claimed in any one of claims 17 to 21 wherein the control member is dependant from the switch rocker and protrudes through the diaphragm.
23. The electric switch as claimed in any one of claims 17 to 22 wherein the



actuator is mounted for pivotal movement relative to the switch rocker and is provided with a recess, the control member of the rocker being operatively engaged within the recess such that pivotal movement of the switch rocker provides a positive force to effect relative pivotal movement of the actuator to open or close the electric circuit between said contacts.

24. The electric switch as claimed in any one of claims 17 to 24, wherein the actuator includes a shield to protect the undersurface of the diaphragm from arcing.
25. An electric switch comprising a mounting plate having a switch rocker aperture therein, a switch rocker pivotally mounted in said mounting plate to operate in said switch rocker aperture between two positions, said switch rocker being exposed from the front of the mounting plate for movement between the two positions and having dependant from the rear thereof a central transverse control member in line with the pivotal mounting for the switch rocker, a switch unit mounted at the rear of the mounting plate in operative engagement with the switch rocker control member, said switch unit having a body, fixed contacts located in said body, a moveable contact member located in the switch body in operative association with the fixed contacts, an actuator mounted in said switch body for pivotal movement relative to the switch rocker and operable to move the moveable contact member between positions to open and close an electric circuit between said fixed contacts, a substantially waterproof diaphragm through which the control member of the switch rocker protrudes while maintaining a seal with the diaphragm and with the outer periphery of the diaphragm sealed about the switch rocker aperture to locate the switch unit beyond a waterproof diaphragm.
26. An electric switch comprising:
- a mounting plate having a rear face and a substantially planar front face;
 - a switch rocker pivotally mounted in said mounting plate for pivotal movement between two positions, said switch rocker being exposed from said front face of said mounting plate such that in each position a respective side of the switch rocker is substantially flush with the front face of the mounting plate to present the external appearance of a normal switch;
 - a control member extending from the rear of the switch rocker, such

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that pivotal movement of the rocker causes corresponding pivotal movement of the control member;

a switch unit having fixed contacts, a movable contact member and an actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts, the control member of the rocker being operatively engaged with the actuator such that pivotal movement of the switch rocker causes the control member to move the actuator to open or close the electric circuit between said fixed contacts;

a diaphragm extending between the actuator and the switch rocker to provide a substantially waterproof barrier therebetween wherein a central section of the diaphragm extends circumferentially about the control member, said central section being disposed at or adjacent the pivot line of the switch rocker.

27. The electric switch as claimed in claim 26 wherein an end of the control member engages with the actuator, said end disposed rearwardly of the pivot line of the switch rocker.
28. The electric switch as claimed in claim 26 or claim 27 wherein said central section of the diaphragm is of reduced thickness.
29. The electric switch as claimed in any one of claims 26 to 28 wherein the diaphragm is fixed in sealing engagement along a peripheral portion of the switch unit surrounding the actuator.
30. The electric switch as claimed in any one of claims 26 to 29 wherein the diaphragm is fixed in sealing engagement with the rear face of the mounting plate along a peripheral portion of the mounting plate surrounding the switch rocker aperture.
31. The electric switch as claimed in any one of claims 26 to 30 wherein the actuator is mounted for pivotal movement relative to the switch rocker and the actuator is provided with a recess, the control member of the switch rocker being operatively engaged within the recess such that pivotal movement of the switch rocker provides a positive force to effect the relative pivotal movement of the actuator to open or close the electric circuit.
32. The electric switch as claimed in any one of claims 26 to 31 wherein the

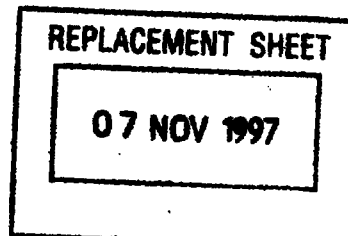
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actuator includes a shield to protect the undersurface of the diaphragm from arcing.

33. The electric switch as claimed in any one of claims 26 to 32 wherein the control member protrudes through the diaphragm.
34. The electric switch substantially as hereinbefore described with reference to Figures 1, 3, 4, 5 and 8 or as modified by Figures 2, 6, 7 or 9.



IMPROVEMENTS IN/OR RELATING TO ELECTRICAL SWITCHES

This invention relates to electrical switches.

BACKGROUND

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Electrical switches are required to operate in a variety of environments and to enable operation by a wide range of users. By way of an example, an environment may require the switch to be exposed to water or moisture requiring for safety a specially sealed switch. In many instances the consumers preference would be for a switch which provided a normal external appearance. An example of a special situation, would be a disabled or handicapped user requiring a larger switch rocker for the switch than would normally be provided.

An object of at least a preferred embodiment of the present invention is to provide an electric switch which enables a switch unit to be associated with a mounting plate and switch rocker to accommodate different environmental or operational requirements.

PRESENT INVENTION

Accordingly in one aspect the invention may broadly be said to provide an electric switch including: a mounting plate having a front and rear face; an external actuator operably mounted in said mounting plate, said external actuator being exposed and operable from said front face of said mounting plate; a control member extending from the rear of said external actuator such that movement of the external actuator causes a pivotal movement of the control member; a switch unit having fixed contacts, a movable contact member with contacts to complete a contact set with the fixed contacts and an internal actuator operable to move the movable contact member to open or close an electrical circuit between the fixed contacts, the internal actuator being mounted for pivotal movement relative to the external actuator and provided with a recess having opposing sides, the control member of the external actuator being operatively engaged within the recess such that movement of the external actuator provides a positive force by the control member against one or other of the sides of the recess to effect pivotal movement of the internal actuator to open or close the contact set.

In a further aspect the invention may broadly be said to provide an electric switch

including: a mounting plate having a front and a rear face; an external actuator pivotally mounted in said mounting plate, said external actuator being exposed from said front face of said mounting plate; a control member extending from the rear of the external actuator, such that pivotal movement of the external actuator causes corresponding pivotal movement of the control member; a switch unit having fixed contacts, a movable contact member and an internal actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts, the internal actuator mounted for pivotal movement relative to the external actuator and provided with a recess having opposing sides, the control member of the external actuator being operatively engaged within the recess such that pivotal movement of the external actuator provides a positive force by the control member against one or other of the sides of the recess to effect relative pivotal movement of the internal actuator to open or close the electric circuit between said fixed contacts.

In accordance with another aspect of the invention there is provided an electric switch including: a mounting plate having a front and a rear face; an external actuator pivotally mounted in said mounting plate, said external actuator being exposed from said front face of said mounting plate; a control member extending from the rear of the external actuator, such that pivotal movement of the external actuator causes corresponding pivotal movement of the control member; a switch unit having fixed contacts, a movable contact member and an internal actuator pivotally mounted to move the movable contact member to open or close an electric circuit between the fixed contacts, the internal actuator mounted for pivotal movement relative to the external actuator and provided with a recess, the control member of the external actuator being operatively engaged within the recess such that pivotal movement of the external actuator provides a positive force to effect relative pivotal movement of the internal actuator, and wherein the movable contact member is provided with a recess and wherein the internal actuator is provided with a dependent member to operatively engage in the recess of the movable contact member such that pivotal movement of the internal actuator provides a positive force to effect relative pivotal movement of the movable contact member to open or close the electric circuit between the fixed contacts.

In accordance with a further aspect of the invention there is provided an electric switch including: a switch unit having contacts, a movable contact member and an internal actuator operable to move the movable contact member to open or close an electric circuit between the contacts, the switch unit being attached to a mounting plate, the mounting plate having a front and a rear face; an external actuator pivotally mounted in said

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mounting plate, said external actuator being exposed from said front face of the mounting plate; a control member extending from the rear of the external actuator in line with the pivotal mounting for the external actuator, the control member being operatively engaged with the internal actuator so that movement of the external actuator causes the control member to move the internal actuator to open or close the electric circuit between said contacts; a diaphragm extending between the internal actuator and the external actuator to provide a substantially waterproof barrier therebetween in a manner permitting the control member to positively engage with the internal actuator, wherein the diaphragm is fixed in sealing engagement along a peripheral portion of the switch unit surrounding the internal actuator and wherein a central section of the diaphragm extends circumferentially about the control member, said central section being disposed at or adjacent the pivot line of the external actuator.

In accordance with yet another aspect of the invention the invention provides an electric switch including: a switch unit having contacts, a movable contact member and an internal actuator operable to move the movable contact member to open or close an electric circuit between the contacts, the switch unit being attached to a mounting plate, the mounting plate having a front and a rear face; an external actuator pivotally mounted in said mounting plate, said external actuator being exposed from said front face of the mounting plate; a control member extending from the rear of the external actuator in line with the pivotal mounting for the external actuator, the control member being operatively engaged with the internal actuator so that movement of the external actuator causes the control member to move the internal actuator to open or close the electric circuit between said contacts; a diaphragm extending between the internal actuator and the external actuator to provide a substantially waterproof barrier therebetween in a manner permitting the control member to positively engage with the internal actuator, wherein the diaphragm is fixed in sealing engagement with the underside of the mounting plate along a peripheral portion of the mounting plate surrounding the external actuator.

In accordance with a still further aspect of the invention there is provided an electric switch including: a mounting plate having a rear face and a substantially planar front face; an external actuator pivotally mounted in said mounting plate for pivotal movement between two positions, said external actuator being exposed from said front face of said mounting plate such that in each position a respective side of the external actuator is substantially flush with the front face of the mounting plate to present the external appearance of a normal switch; a control member extending from the rear of the external actuator, such that pivotal movement of the external actuator causes corresponding pivotal

movement of the control member; a switch unit having fixed contacts, a movable contact member and an internal actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts, the control member of the external actuator being operatively engaged with the internal actuator such that pivotal movement of the external actuator causes the control member to move the internal actuator to open or close the electric circuit between said fixed contacts; a diaphragm extending between the internal actuator and the external actuator to provide a substantially waterproof barrier to protect the switch unit in a manner such that in use, no bias is applied by the diaphragm to the control member which would adversely affect the pivotal operation of the control member to move the internal actuator.

DRAWING DESCRIPTION

One preferred embodiment and modifications thereof are described with reference to the accompanying drawings in which:

Figure 1 is a sectional view through an electric switch according to the present invention for use as a waterproof switch;

Figure 2 is a section through a switched plug unit of modified construction also incorporating the waterproof switch;

Figure 3 is an exploded view showing the various components in the electrical switch according to the present invention;

Figure 4 is a plan view of the switch body;

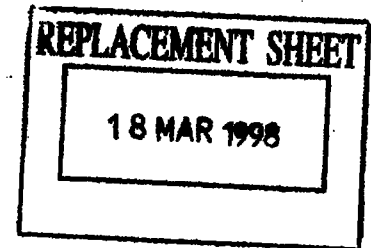
Figure 5 is a detail of one form of pivot connection in the mounting plate for the switch rocker;

Figure 6 is a detail showing an alternate pivot connection for the switch rocker;

Figure 7 is a detail of a larger switch rocker;

Figure 8 is a rear view of the mounting plate with the switch unit attached; and

Figure 9 is a perspective view partly broken away of a waterproof switch unit



having a detachable cover plate.

PREFERRED EMBODIMENT

The electric switch according to the present invention may be applied in a number of different electrical fittings and an exemplary range of these has been included in the accompanying drawings. Figure 3 is an exploded view of the components and the present invention will be described with initial reference to Figure 3 but the drawing reference numbers for the appropriate components will also be used on the other figures.

The switch has a mounting plate 1 in which is formed an aperture 2 to receive a switch rocker 3. The switch rocker 3 is pivotally mounted in the mounting plate 1. To achieve this pivotal mounting protuberances 4 project centrally from each side of the rocker 3, with the protuberances having a V recess in the upper surface. The protuberances engage a seat 5 having a complimentary V pivot 6 at the base of an open recess 7 as shown in greater detail in figure 5.

Alternatively the pivot 6 may be located in a closed recess 8 with the protuberances 4 formed to engage with a force fit into the recesses 8 thus retaining the switch rocker 3 in engagement with the mounting plate 1 once fitted in place.

Movement of the switch rocker is limited by stops 9 engaging with part of the mounting plate so that the rocker moves between two defined positions for the switching action.

Dependant centrally from the undersurface of the rocker is a transverse control member 10 substantially in line with the pivot projections 4. The member 10 is shaped to engage with and operate an actuator of a switch unit as will be described in greater detail here below.

The size of the switch rocker 3 can be varied. For normal use a conventional switch rocker size would be adopted but for special purposes, for example, if the switch was to be used in an environment requiring easier operation, for example, for disabled people, a larger switch rocker could be incorporated in the mounting plate and an example of the larger switch rocker is illustrated as 3a in Figure 7.

The switch rocker is designed to operate a switch unit 11. The switch unit has a switch

body 12 in which are located two fixed contacts 13 and 14 with terminals 15 and 16 to allow electrical connection. A central transverse pivot 17 is also provided on which is pivotally supported a movable contact member 18. The movable contact member has central projections 19 from either side which engage within locating recess 20 in the switch base. The movable contact 18 is thus pivotally mounted in the switch base and can move between two positions to effect the switching action.

An actuator 20 has a spring loaded plunger 21 which engages the top surface of the movable contact 18. The actuator 20 has projections 22 from either side thereof that engage within apertures 23 in the side of the switch body to provide a pivotal mounting.

On the top surface of the actuator 20 is a member 23 locating a central transverse recess 24 which in use is engaged by the end of the control member 10 protruding from the switch rocker 3.

The switch unit 11 has a mount 25 in which the switch unit engages. The mount 25 is screwed to the mounting plate with screws 25a so that the switch unit is held in place with the control member of the switch rocker operatively engaged with the recess 24 of the actuator 20. The body of the switch unit 11 has retaining arms 25b so that when the body is pressed into mount 25 the arms will retain the body in place.

Where the switch is used in an environment requiring waterproofing a suitable waterproof membrane 26 is located between the switch mounting plate 1 and the switch unit 11. The waterproof diaphragm is shaped to ensure that there is an adequate seal about the control member 10 which protrudes through the diaphragm and with the periphery with the diaphragm sealed in engagement with the mounting plate. It is preferable to have a shaped diaphragm having a peripheral rib 27 a raised central section 28 with a central transverse slot 29 to engage about the control member 10. The configuration of the diaphragm is such that the slot 29 is arranged so that in the normal position the diaphragm will engage the control member 10 of the rocker switch at or adjacent the pivot line of the rocker. This can be seen in Figure 1. In this way movement of the switch rocker causes minimal movement of the diaphragm thus assisting in preserving the life of the diaphragm and ensuring a long operating life of the waterproof switch. The mount 25 is arranged to ensure that there is a good peripheral seal of the diaphragm when the switch is assembled as is shown in Figure 1.

The embodiment illustrated in Figure 2 is a switched plug unit 30 the switch body 12a has

essentially the same components as were described above, but the switch unit is mounted directly in the mounting plate 1a and an escutcheon member 31 in the mounting plate which defined the aperture for the switch rocker holds the waterproof diaphragm 26a in position.

A similar configuration is illustrated in Figure 9 where a switch unit made in the same style is illustrated. The switch has a mounting plate 1b over which is fitted in use a removable cover 32. The escutcheon 31 and the diaphragm 26a remain the same as illustrated in Figure 2.

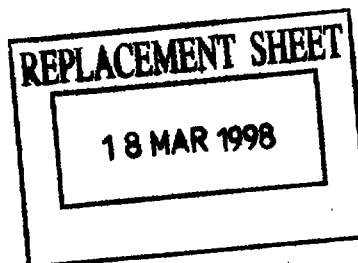
The present invention provides a switch which used with the waterproof diaphragm allows the switch to pass all of the Australian, British and New Zealand standard specifications required for a waterproof switch.

It will be apparent from the foregoing that the actuator mechanism can be designed to suit any particular requirement. For example, the same operating arrangement could be preserved but the actuator significantly enlarged to provide the user with a large actuator surface. In this instance it would not be necessary to provide the sealing as is required for a waterproof embodiment of the present invention.

The present invention allows a conventional switch module to be incorporated in a mounting plate that can either assume the appearance of a standard switch or be modified so that the switch rocker surface is of any desired size.

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CLAIMS:

1. An electric switch including:
 - a mounting plate having a front and rear face;
 - an external actuator operably mounted in said mounting plate, said external actuator being exposed and operable from said front face of said mounting plate;
 - a control member extending from the rear of said external actuator such that movement of the external actuator causes a pivotal movement of the control member;
 - a switch unit having fixed contacts, a movable contact member with contacts to complete a contact set with the fixed contacts and an internal actuator operable to move the movable contact member to open or close an electrical circuit between the fixed contacts, the internal actuator being mounted for pivotal movement relative to the external actuator and provided with a recess having opposing sides, the control member of the external actuator being operatively engaged within the recess such that movement of the external actuator provides a positive force by the control member against one or other of the sides of the recess to effect pivotal movement of the internal actuator to open or close the contact set.
2. An electric switch including:
 - a mounting plate having a front and a rear face;
 - an external actuator pivotally mounted in said mounting plate, said external actuator being exposed from said front face of said mounting plate;
 - a control member extending from the rear of the external actuator, such that pivotal movement of the external actuator causes corresponding pivotal movement of the control member;
 - a switch unit having fixed contacts, a movable contact member and an internal actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts, the internal actuator mounted for pivotal movement relative to the external actuator and provided with a recess having opposing sides, the control member of the external actuator being operatively engaged within the recess such that pivotal movement of the external actuator provides a positive force by the control member against one or other of



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the sides of the recess to effect relative pivotal movement of the internal actuator to open or close the electric circuit between said fixed contacts.

3. The electric switch as claimed in claim 2 wherein the external actuator is pivotally mounted on opposite sides of the switch and the pivotal mounting of the internal actuator is also provided on the opposite sides of the switch.
4. The electric switch as claimed in claim 3 wherein the pivotal axis of the external actuator extends substantially parallel to the pivotal axis of the internal actuator.
5. The electric switch as claimed in claim 3 or claim 4 wherein the control member of the external actuator engages within the recess of the internal actuator such that pivotal movement of the control member in one direction effects pivotal movement of the internal actuator in the opposite rotational direction.
6. The electric switch as claimed in any one of the preceding claims, wherein the movable contact member is pivotally mounted to open or close the electric circuit between the fixed contacts, the movable contact member is provided with a recess and wherein the internal actuator is provided with a plunger to operatively engage in the recess of the movable contact member such that pivotal movement of the internal actuator provides a positive force to effect relative pivotal movement of the movable contact member to open or close the electric circuit between the fixed contacts.
7. The electric switch as claimed in claim 6 wherein the movable contact member is pivotable about an axis substantially parallel to the pivotal axis of the internal actuator.
8. The electric switch as claimed in claim 6 or claim 7 wherein the plunger is spring loaded.
9. The electric switch as claimed in any one of the preceding claims further including a diaphragm extending between the internal actuator and the external actuator to provide a substantially waterproof barrier therebetween.
10. The electric switch as claimed in claim 9 wherein the diaphragm extends in a



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manner enabling positive engagement between the control member and the internal actuator.

11. The electric switch as claimed in claim 9 or claim 10 wherein a raised central section of the diaphragm extends circumferentially about the control member.
12. The electric switch as claimed in claim 11 wherein an end of the control member engages within the recess of the internal actuator, said raised central section of the diaphragm being disposed at or adjacent the pivot line of the external actuator.
13. The electric switch as claimed in any one of the preceding claims wherein the external actuator is pivotally mounted in said mounting plate and the control member is provided in line with the pivotal mounting of the external actuator.
14. The electric switch as claimed in any one of the preceding claims, wherein the control member is integral with the external actuator.
15. The electric switch substantially as hereinbefore described with reference to Figures 1, 3, 4, 5 and 8 or as modified by Figures 2, 6, 7 or 9.
16. An electric switch including:
 - a mounting plate having a rear face and a substantially planar front face;
 - an external actuator pivotally mounted in said mounting plate for pivotal movement between two positions, said external actuator being exposed from said front face of said mounting plate such that in each position a respective side of the external actuator is substantially flush with the front face of the mounting plate to present the external appearance of a normal switch;
 - a control member extending from the rear of the external actuator, such that pivotal movement of the external actuator causes corresponding pivotal movement of the control member;
 - a switch unit having fixed contacts, a movable contact member and an internal actuator operable to move the movable contact member to open or close an electric circuit between the fixed contacts, the control member being operatively engaged with the internal actuator such that pivotal movement of the external actuator causes the control member to move the internal actuator to open or close the electric circuit between said fixed contacts;

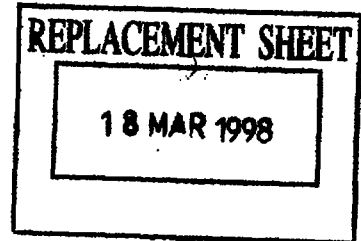


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a diaphragm extending between the internal actuator and the external actuator to provide a substantially waterproof barrier to protect the switch unit in a manner such that in use, no bias is applied by the diaphragm to the control member which would adversely affect the pivotal operation of the control member to move the internal actuator.

17. The electric switch claimed in claim 16 wherein an end of the control member engages with the internal actuator, said end being disposed rearwardly of the pivot line of the external actuator and wherein a central section of the diaphragm extends circumferentially about the control member, said central section being disposed at or adjacent the pivot line of the external actuator.
18. The electric switch as claimed in claim 17 wherein said central section of the diaphragm is of reduced thickness.
19. The electric switch as claimed in any one of claims 16 to 18 wherein the diaphragm is fixed in sealing engagement along a peripheral portion of the switch unit surrounding the actuator.
20. The electric switch as claimed in any one of claims 16 to 19 wherein the diaphragm is fixed in sealing engagement with the rear face of the mounting plate along a peripheral portion of the mounting plate surrounding an aperture about the external actuator.
21. The electric switch as claimed in any one of claims 16 to 20 wherein the internal actuator is mounted for pivotal movement relative to the external actuator and the internal actuator is provided with a recess, the control member of the external actuator being operatively engaged within the recess such that pivotal movement of the external actuator provides a positive force to effect relative pivotal movement of the internal actuator to open or close the electric circuit.
22. The electric switch as claimed in any one of claims 16 to 21 wherein the actuator includes a shield to protect the undersurface of the diaphragm from arcing.
23. The electric switch as claimed in any one of claims 16 to 22 wherein the control member protrudes through the diaphragm.



24. An electric switch including:

a switch unit having contacts, a movable contact member and an internal actuator operable to move the movable contact member to open or close an electric circuit between the contacts, the switch unit being attached to a mounting plate, the mounting plate having a front and a rear face;

an external actuator pivotally mounted in said mounting plate, said external actuator being exposed from said front face of the mounting plate;

a control member extending from the rear of the external actuator in line with the pivotal mounting for the external actuator, the control member being operatively engaged with the internal actuator so that movement of the external actuator causes the control member to move the internal actuator to open or close the electric circuit between said contacts;

a diaphragm extending between the internal actuator and the external actuator to provide a substantially waterproof barrier therebetween in a manner permitting the control member to positively engage with the internal actuator, wherein the diaphragm is fixed in sealing engagement along a peripheral portion of the switch unit surrounding the internal actuator and wherein a central section of the diaphragm extends circumferentially about the control member, said central section being disposed at or adjacent the pivot line of the external actuator.

25. The electric switch as claimed in claim 24 wherein the diaphragm is also fixed in sealing engagement with the rear face of the mounting plate along a peripheral portion of the mounting plate surrounding the external actuator.

26. The electric switch as claimed in claim 24 or claim 25 wherein an end of the control member engages with the internal actuator, said end disposed rearwardly of the pivot line of the external actuator.

27. The electric switch as claimed in any one of claims 24 to 27 wherein said central section of the diaphragm is of reduced thickness.

28. The electric switch as claimed in any one of claims 24 to 27 wherein the internal actuator is mounted for pivotal movement relative to the external actuator and is provided with a recess, the control member of the external actuator being operatively engaged within the recess such that pivotal movement of the external



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actuator provides a positive force to effect relative pivotal movement of the internal actuator to open or close the electric circuit between said contacts.

29. The electric switch as claimed in any one of claims 24 to 28 wherein the internal actuator incorporates a shield to protect the undersurface of the diaphragm from arcing of the contacts.
30. The electric switch as claimed in any one of claims 24 to 29 wherein the external actuator protrudes through the diaphragm.
31. An electric switch including:
 - a switch unit having contacts, a movable contact member and an internal actuator operable to move the movable contact member to open or close an electric circuit between the contacts, the switch unit being attached to a mounting plate, the mounting plate having a front and a rear face;
 - an external actuator pivotally mounted in said mounting plate, said external actuator being exposed from said front face of the mounting plate;
 - a control member extending from the rear of the external actuator in line with the pivotal mounting for the external actuator, the control member being operatively engaged with the internal actuator so that movement of the external actuator causes the control member to move the internal actuator to open or close the electric circuit between said contacts;
 - a diaphragm extending between the internal actuator and the external actuator to provide a substantially waterproof barrier therebetween in a manner permitting the control member to positively engage with the internal actuator, wherein the diaphragm is fixed in sealing engagement with the underside of the mounting plate along a peripheral portion of the mounting plate surrounding the external actuator.
32. The electric switch as claimed in claim 31 wherein a central section of the diaphragm extends circumferentially about the control member, said central section being disposed at or adjacent the pivot line of the external actuator.
33. The electric switch as claimed in claim 32 wherein an end of the control member engages with the internal actuator, said end disposed rearwardly of the pivot line of the external actuator.



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34. The electric switch as claimed in claim 32 or claim 33 wherein said central section of the diaphragm is of reduced thickness.
35. The electric switch as claimed in any one of claims 31 to 34 wherein the external actuator protrudes through the diaphragm.
36. The electric switch as claimed in any one of claims 31 to 35 wherein the internal actuator incorporates a shield to protect the undersurface of the diaphragm from arcing of the contacts.
37. An electric switch including a mounting plate having an external actuator aperture therein, an external actuator pivotally mounted in said mounting plate to operate in said external actuator aperture between two positions, said external actuator being exposed from the front of the mounting plate for movement between the two positions and having dependant from the rear thereof a central transverse control member in line with the pivotal mounting for the external actuator, a switch unit mounted at the rear of the mounting plate, said switch unit having a body, fixed contacts located in said body, a movable contact member located in the switch body in operative association with the fixed contacts, an internal actuator mounted in said switch body for pivotal movement relative to the external actuator and operable to move the movable contact member between positions to open and close an electric circuit between said fixed contacts, the transverse control member being in operative engagement with the internal actuator, a substantially waterproof diaphragm through which the control member of the external actuator protrudes while maintaining a seal with the diaphragm and with the outer periphery of the diaphragm sealed about the external actuator aperture to locate the switch unit beyond a waterproof diaphragm.
38. An electric switch including:
- a mounting plate having a front and a rear face;
 - an external actuator pivotally mounted in said mounting plate, said external actuator being exposed from said front face of said mounting plate;
 - a control member extending from the rear of the external actuator, such that pivotal movement of the external actuator causes corresponding pivotal movement of the control member;
 - a switch unit having fixed contacts, a movable contact member and an



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internal actuator pivotally mounted to move the movable contact member to open or close an electric circuit between the fixed contacts, the internal actuator mounted for pivotal movement relative to the external actuator and provided with a recess, the control member of the external actuator being operatively engaged within the recess such that pivotal movement of the external actuator provides a positive force to effect relative pivotal movement of the internal actuator, and wherein the movable contact member is provided with a recess and wherein the internal actuator is provided with a dependent member to operatively engage in the recess of the movable contact member such that pivotal movement of the internal actuator provides a positive force to effect relative pivotal movement of the movable contact member to open or close the electric circuit between the fixed contacts.

39. The electric switch as claimed in claim 38 wherein the external actuator is pivotally mounted on opposite sides of the switch and the pivotal mounting of the internal actuator is also provided on the opposite sides of the switch.
40. The electric switch as claimed in claim 39 wherein the pivotal axis of the external actuator extends substantially parallel to the pivotal axis of the internal actuator.
41. The electric switch as claimed in any one of the preceding claims wherein the movable contact member is pivotable about an axis substantially parallel to the pivotal axis of the internal actuator.
42. The electric switch as claimed in any one of claims 38 to 41 wherein the dependent member is spring loaded.
43. The electric switch as claimed in any one of claims 38 to 42 further including a diaphragm extending between the internal actuator and the external actuator to provide a substantially waterproof barrier therebetween.
44. The electric switch as claimed in claim 43 wherein the diaphragm extends in a manner enabling positive engagement between the control member and the internal actuator.
45. The electric switch as claimed in claim 43 or claim 44 wherein a raised central



section of the diaphragm extends circumferentially about the control member.

46. The electric switch as claimed in claim 45 wherein an end of the control member engages within the recess of the internal actuator, said raised central section of the diaphragm being disposed at or adjacent the pivot line of the external actuator.
47. The electric switch as claimed in any one of the preceding claims wherein the external actuator is pivotally mounted in said mounting plate and the control member is provided in line with the pivotal mounting of the external actuator.
48. The electric switch as claimed in any one of the preceding claims, wherein the control member is integral with the external actuator.

