

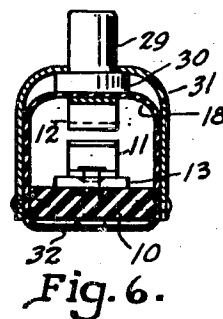
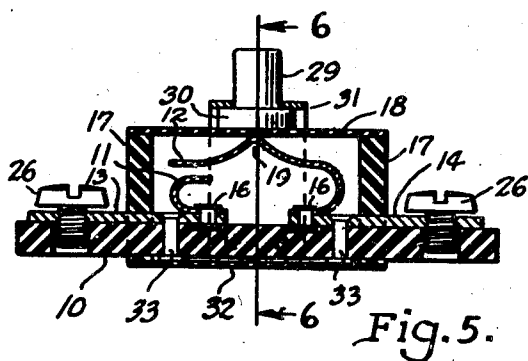
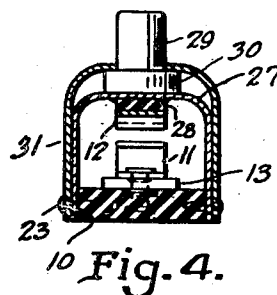
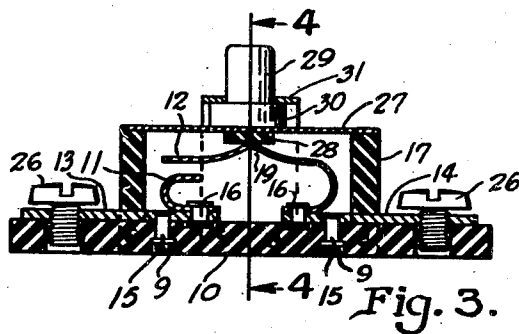
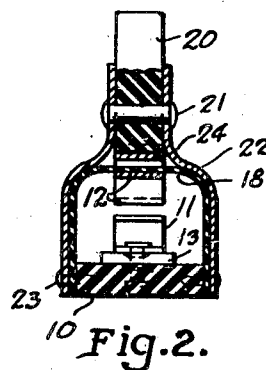
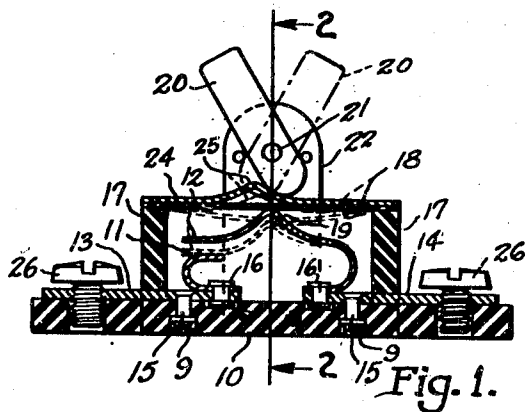
Dec. 28, 1948.

H. HUBBELL
SEALED SWITCH

2,457,153

Filed Feb. 3, 1945

2 Sheets-Sheet 1



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H. HUBBELL
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2 Sheets-Sheet 2

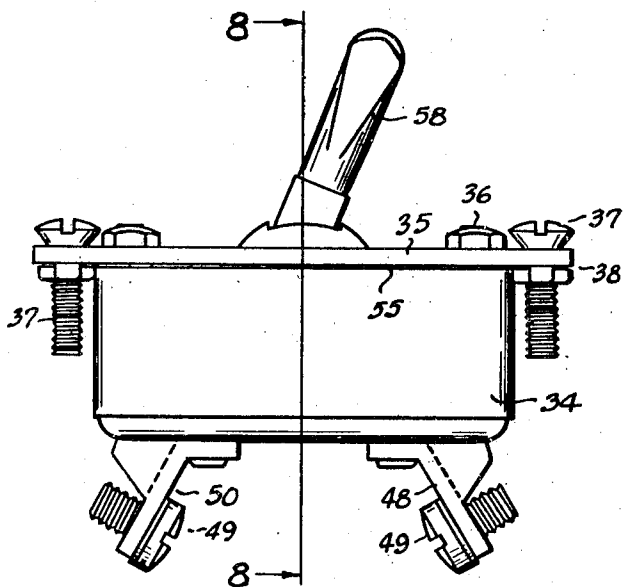


Fig. 7.

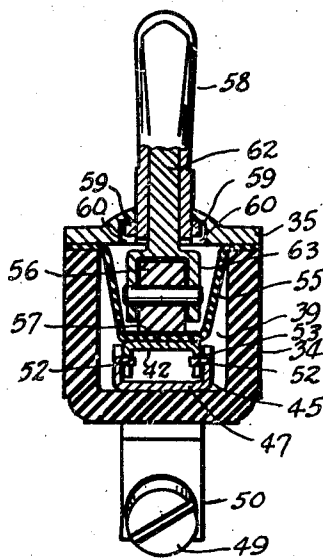


Fig. 8.

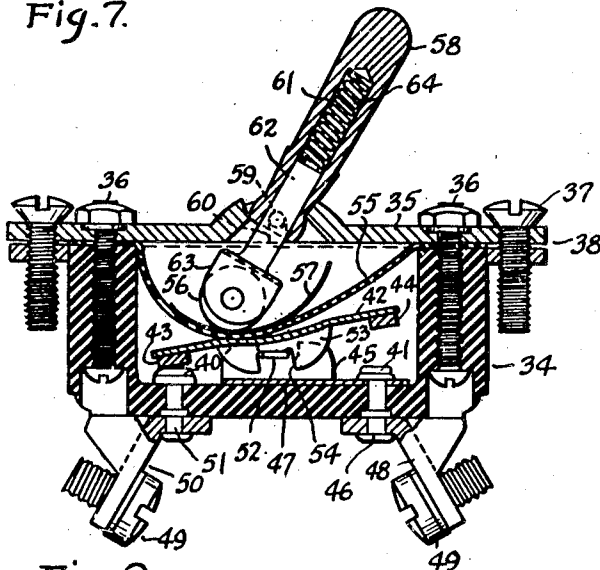


Fig. 9.

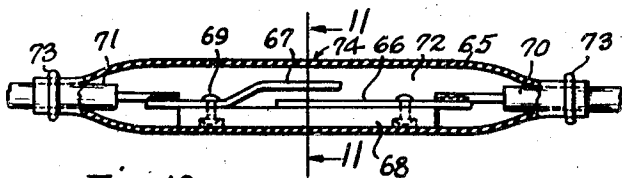
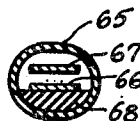


Fig. 10.



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Fig. 11.

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UNITED STATES PATENT OFFICE

2,457,153

SEALED SWITCH

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14 Claims. (Cl. 200-168)

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This invention relates to electrical switches and has for an object to provide an improved and simplified construction in which the switch contacts are sealed from the outer atmosphere so that there is no danger of igniting surrounding objects or gases by arcing of the contacts and the contacts are protected from corrosion and deterioration from atmospheric conditions.

Another object is to provide an improved construction in which the enclosing and sealing means includes a flexible wall portion which may or may not be of insulating material, but is preferably of such material, and is adapted to be flexed for shifting a movable contact relative to another contact for making or breaking a circuit.

With the foregoing and other objects in view I have devised the construction illustrated in the accompanying drawings forming a part of this specification. It is, however, to be understood the invention is not limited to the specific construction and arrangement shown but may embody various changes and modifications within the scope of the invention.

In these drawings:

Fig. 1 is a longitudinal section through a switch constructed according to my invention;

Fig. 2 is a transverse section thereof on the line 2-2 of Fig. 1;

Fig. 3 is a section similar to Fig. 1 showing a somewhat modified construction;

Fig. 4 is a transverse section substantially on the line 4-4 of Fig. 3;

Fig. 5 is a section similar to Figs. 1 and 3 showing another somewhat modified construction;

Fig. 6 is a transverse section substantially on the line 6-6 of Fig. 5;

Fig. 7 is a side elevation of another modified construction of the switch;

Fig. 8 is a transverse section thereof substantially on line 8-8 of Fig. 7;

Fig. 9 is a longitudinal section of this switch;

Fig. 10 is a partial side elevation of another modification, a portion of the enclosing flexible tubular member being broken away and the enclosed elements being shown in side elevation, and

Fig. 11 is a transverse section substantially on line 11 of Fig. 10.

Referring first to Figs. 1 and 2, the device shown by way of example comprises an insulating base member 10 on which are mounted a pair of switch contacts 11 and 12. These contacts may be mounted in various ways, but they are preferably mounted on conductors 13 and 14 respectively and mounted on the base by any suitable means such as rivets 15, and the contacts may be either integral with these conductors or connected therewith by any suitable means such as rivets 16. The contact 11, as shown, is a stationary contact of resilient metal bent to substantially U-

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shape as shown and the free upper portion thereof may be rigid or yieldable somewhat as desired. The contact 12 is a movable spring contact of resilient strip metal movable relative to the stationary contact 11. In the present arrangement it is shown as spaced above the contact 11 when in the open or circuit breaking position, and by its resilient action tends to move away from it to break the circuit, but it may be shifted toward and from the contact 11, as indicated in dotted lines Fig. 1. It will of course be understood the contact arrangement may be reversed so that instead of the resilient spring action of the contact 12 tending to shift it away from the stationary contact 11 to open the circuit, they may be arranged so that it tends to move toward the stationary contact to close the circuit.

These contacts are closed and sealed from the outer atmosphere. In the present construction there are a pair of spaced end walls 17 either integral with or secured to the base 10 and preferably of insulating material. Extending between these walls and sealed to them by any suitable means, such for example as a suitable cement, so as to make a tight compartment and enclosing the contacts is a flexible thin wall 18, preferably of insulating material, such, for example, as some of the plastic cellulose or similar materials, and the movable contact 12 is closely adjacent to this wall so that by pressure on the wall it may be depressed to force the contact 12 into engagement with the contact 11 to close the circuit. The body portion of the contact 12 may be humped or offset upward as shown at 19 to engage the flexible wall 18. The wall 18 may be depressed to operate the movable contact manually by thumb or finger or some operating means may be employed for flexing it to shift the contact. In the arrangement shown there is a toggle lever 20 pivoted at 21 in the spaced arms of a bracket 22 of metal or other suitable material secured to the base 10 by any suitable means, such, for example, as screws 23. This toggle may be of insulating or other material, and it could be so arranged that by movement over the hump 19 it would shift the contact member, but because this would mean wear on the flexible element 18 it is preferred to provide a flexible metal strip 24 at the outer side of the flexible material 18 and provide this with a hump 25 over which the lower end of the toggle slides as the toggle is rocked on its pivot to depress the strip 24 and the flexible wall 18 to shift the switch. In Fig. 1 the lever 20 is shown in broken lines with its lower rounded end just moved over the top of the hump 25 to a short distance on the other side so as to depress the contact 12 and retain it in engagement with contact 11, as shown in dotted lines, to maintain the circuit closed. This strip 24 will take the wear of the toggle and protect the flexi-

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ble material 18. The flexible insulating material 18 is sealed to the end walls 17 and to the sides of the base 10. Also the conductors 13 and 14 are sealed in the end walls 17 where they pass through them, and the rivets 15 are sealed at 9 so that the switch contacts are entirely enclosed and sealed from the outer atmosphere. Means is provided for connecting leads or other conductors to the conductors 13 and 14 outside of this sealing chamber, such, for example, as the binding screws 26. The flexible wall 18 and the member 24 tend to return to their upper positions by their own resilient action, and this is assisted by the spring or resilient action of the contact 12.

In the form shown in Figs. 3 and 4, instead of using the flexible wall 18 of insulating material this may be a thin flexible wall 27 of metal sealed to the end walls 17 and the base member to seal the contacts from the outer atmosphere. However, as this is a metal member and therefore an electrical conductor, the contact 12 does not engage it directly, but an insulating element 28 is mounted at the inner side of the flexible wall 27 and between it and the conductor 12. This may be secured on the wall 27 or separately mounted as to move with it, or it could be secured to the contact 12. The same means could be used for flexing the wall 27 to shift the movable contact as shown in Figs. 1 and 2, or it could be shifted by pressure from the thumb or finger. However, an arrangement is shown by which it may be shifted by a push-button 29 preferably of insulating material having an enlarged head 30 resting on top of the wall 27 and the reduced portion guided in an opening in a yoke 31 of metal or other suitable material secured to the base 10. Resilient action of the spring contact 12 and wall 28 tends to move this wall and the push-button to an upper position when pressure on it is released. The conductors 13 and 14 are sealed in the walls 17, and the flexible wall 27 is sealed to the end walls 17 in the base 10 by any suitable sealing means such, for example, as a suitable cement to wholly seal the contacts from the outer atmosphere, the same as in Figs. 1 and 2.

In Figs. 5 and 6 is shown a similar construction in which the flexible thin wall of insulating material 18 may be operated on directly by a thumb or finger to operate the movable switch member, or it may be operated by a push-button 29 the same as in Figs. 3 and 4. This flexible wall of insulating material is sealed to the end walls 17 and the base 10 the same as in Figs. 1 and 2, but instead of stopping at the lower edges of the base member as in the first two figures, it is shown as extending entirely around under the base as indicated at 32 to cover the lower portion of the base and to seal and insulate the rivets 33 used for mounting the conductors 13 and 14 on the base. These conductors are sealed in the walls 17 the same as in the other forms.

In Figs. 7, 8 and 9 is shown how this invention may be applied to a toggle type of switch. It comprises a body 34 of insulating material, preferably of a suitable molded plastic, open at one side, which may be closed by the plate 35 secured by any suitable means such as the screws 36. This plate may be a metal member and includes screws 37 on overhanging ears 38 for mounting the device in an outlet box or other suitable support. The body encloses a chamber 39 in which the switch contacts are mounted comprising stationary contacts 40 and 41 and a rocking member 42 of conducting material

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carrying movable contacts 43 and 44 to engage the contacts 40 and 41. It so happens that in this particular construction the contact 41 is merely a stop or abutment to maintain the movable member 42 in the open or circuit breaking position. Member 42 is mounted to rock on a support 45 mounted on the lower wall of the chamber 39 by any suitable means, such as a rivet 46 molded in the material of the body, and passing through and riveted over the base portion 47 of the member 45 and forming an electrical connection between this member and an outside member, such as the bracket 48 to which a lead wire may be connected by any suitable means, such as a binding screw 49. The contact 40 is connected with a similar bracket 50 through a similar conducting rivet 51 molded in the body member, and thus the chamber 39 may be sealed from the outside atmosphere except for the open side of the body which is sealed by a separate member, as will be later described. As previously indicated, the movable contact 42 is mounted to rock on the supporting member 45. For this purpose the side walls of the member 45 are each provided with inwardly extending pivot lugs 52, and the member 42 is provided with downwardly extending side flanges 53 each provided with a notch 54 to seat over the lugs 52, permitting the member 42 to rock on these lugs, and these lugs and the notches cooperate to hold the member 42 in position on the support 45.

The open side of the chamber 39 is sealed by a flexible insulating member 55 comprising flexible sheet material clamped between the plate 35 and the free edges of the body 34 entirely around the periphery thereof. This may be a sheet of suitable rubber or plastic material, and is preferably of electrical insulating material. It is dishd at the center so as to rest on top of the member 42, and this member 42 is operated through this flexible sealing member in a manner similar to the forms previously described. In this case, however, a roller 56 runs back and forth over the top of the member 42 but on the opposite side of the flexible member 55, so that the seal of the chamber 39 enclosing the switch contacts is maintained. In order to reduce wear on the flexible member 55, a thin strip of sheet metal 57 may be located between the roller 56 and the flexible material 55.

The roller 56 is operated back and forth to provide a sort of toggle action with relation to the movable contact member 42 through an operating handle 58 pivoted on laterally extending pivot lugs 59 seated in recesses 60 opening outwardly from the bottom of the plate 55. This handle encloses a longitudinal recess 61 in which the non-circular shank 62 of the mounting member 63 for the roller 56 may slide longitudinally, and a coil spring 64 is mounted between the inner end of the shank 62 and the inner end of the recess 61, tending to force the member 62 outwardly or downwardly to yieldingly retain the roller 56 against the flexible member 55 and the movable contact 42. It will be understood that as the handle 58 is shifted back and forth, the roller 56 will run along the member 57, flexible diaphragm 55 and contact member 42, and as it passes to opposite sides of the straight line between the pivots 59 and 52 for the lever and the contact member respectively, it will rock the member 42 in opposite directions, holding it either in the position shown with the contact 43 in engagement with the contact 40 to close the circuit, or with the member 44 in engage-

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ment with the member 41 and the contact 43 spaced or separated from the contact 40 to open the circuit, depending on which side of the line between the pivots 59 and 52 the roller 56 is located.

It will be seen that as the handle is swung from either of its extreme lateral positions toward a position in alignment between the pivots 50 and 52, the distance from the pivot 59 to the roller will be shortened, causing the member 63 to be pushed upwardly and compress the spring 64, which as the roller passes by the line between the pivots 59 and 52 will act to push the member 63 outwardly, imparting a quick movement to the rest of the lever movement, quickly rocking the switch contact member 42 to the opposite position, causing a quick make and break between the switch contacts. This gives a snap acting toggle action.

In the forms shown in Figs. 10 and 11, the switch elements are sealed within a tubular member 65 of flexible insulating material. The stationary and movable contacts 66 and 67 respectively are mounted on a member 68 of insulating material by any suitable means, such as the rivets 69. The movable contact 67 may be a flat spring strip normally spaced above the contact 66 by its spring or resilient action to open the circuit. The lead wires 70 and 71 may be connected to the contacts 66 and 67 respectively by any suitable means, such as soldering, and these leads pass through the opposite ends of the flexible tubular member 65 to the enclosed chamber 72 in which the contacts are mounted, and the chamber may be sealed by clamping rings 73 embracing the opposite end portions of the flexible tube to clamp it about the leads 70 and 71, or it may be sealed by any other suitable means. The contact 67 may be shifted to engage the contact 66 by pressing with the thumb and finger on opposite sides of the tube 65 at about the plane of the line 11-11, to thus close the circuit or, if the tube is resting on a support of some kind, by merely depressing the upper wall of the tubular member at about the point 74 to press the contact 67 into engagement with the contact 66. When the pressure is released the spring or resilient action of the contact 67 will shift it away from contact 66 opening the circuit. This makes a temporarily closed switch which may be used for signalling or where a circuit is to be closed only temporarily and held by the operator, as in use similar to flashlights and the like.

It will be understood from the above that the switch contacts are entirely enclosed and sealed from the outer atmosphere and they are also insulated. They may be enclosed by flexible insulating walls or walls which have at least a flexible portion. It is preferred that the walls be of insulating material, but this is not necessary as indicated. If the flexible enclosing wall is of transparent material, the contacts are easily inspected without breaking down the switch. A movable contact is operated through the flexible wall portion and by shifting this wall portion, and the contacts are also preferably separate from this flexible sealing and enclosing means. This makes a very simple and effective construction which effectively seals the contacts from the outer atmosphere and so protects them from corrosion or injury from atmospheric conditions. It also seals the contacts so that there is no danger of igniting gases or surrounding elements by arcing of the contacts, making the switch fireproof. It will also be evident that it is of very simple con-

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struction, involving a minimum number of parts, so that there is very little danger of its getting out of order and may be operated indefinitely.

Having thus set forth the nature of my invention, what I claim is:

1. An electrical switch comprising a body member forming a chamber open at one side, switch contacts in said chamber one of which is movable to and from the other, means for connecting lead wires with said contacts, a sheet of flexible material closing the open side of said chamber, a support outside said flexible material, an operating lever pivoted on said support, and a spring acting toggle means between said lever and said flexible material adapted on swinging of the lever through a central position to operate the movable switch member through the flexible material with a snap action.

2. An electrical switch comprising a body member provided with a chamber open at one side, switch contacts in said chamber including a stationary contact and a movable contact mounted on a member pivotally mounted for rocking movements, a member of flexible material closing the open side of said chamber and extending closely adjacent the rocking member, a support outside the flexible member, an operating lever pivotally mounted on the support, and means yieldably mounted on the lever to run back and forth on the flexible and rocking members as the lever is swung through an intermediate position to rock the rocking member in opposite directions.

3. An electrical switch comprising a body member provided with a chamber open at one side, cooperating stationary and movable contacts in the chamber, a switch member carrying the movable contact and mounted for rocking movements, a flexible member closing the open side of the chamber and extending adjacent said rocking member, a support, closing the open side of the chamber outside said flexible member, an operating lever pivoted in said support and carrying a roller running on the flexible and rocking members to swing said rocking member in opposite directions, and means mounting said roller on the lever permitting it to yield longitudinally as the lever is swung through an intermediate position, and a spring tending to shift the roller in the opposite direction to give a quick snap action as it passes by said intermediate position.

4. An electrical switch comprising as a unitary structure an insulating base, metal contacts mounted on the base one of which is movable toward and from the other, insulating means forming a sealed chamber enclosing and sealing the contacts from the outer atmosphere including a flexible wall portion adapted to be moved to shift said contact, means mounting the contacts in the sealed chamber independently of the flexible wall, a metal strip on the outer side of said flexible portion, means engaging said strip to flex said wall and shift the movable contact, and conductors connected with the contacts.

5. An electrical switch comprising as a unitary structure an insulating base, metal contacts mounted on the base one of which is movable toward and from the other, walls connected with the base forming a sealed chamber enclosing and sealing the contacts from the outer atmosphere including a flexible sheet metal portion adjacent the movable contact, means mounting the contacts in the sealed chamber independently of the flexible wall, an insulating means between said flexible portion and the contact, means mounted on and outside the walls for moving said flexible

portion to shift the contact, and conductors connected with the contacts.

6. An electrical switch comprising a unitary structure including separable metal contacts at least one of which is movable toward and from the other, connected walls forming a sealed chamber enclosing and sealing the contacts from the outer atmosphere including a flexible portion adapted by flexing thereof to shift the movable contact, means mounting the contacts on one of the walls and in the sealed chamber independently of the flexible wall, movable operating means mounted on the walls outside the chamber for flexing the flexible portion and operating through it to shift the movable contact, and means for connecting conductors to the said contacts.

7. An electrical switch comprising a unitary structure including separable metal contacts at least one of which is movable toward and from the other, walls forming a sealed chamber enclosing and sealing the contacts from the outer atmosphere including a flexible portion adjacent the movable contact, means mounting the contacts on the walls in the sealed chamber independently of the flexible wall, movable operating means mounted on the walls outside the chamber and operable to flex the flexible portion for shifting the movable contact through said flexible portion, and means for connecting conductors to the said contacts.

8. An electrical switch comprising separable metal contacts at least one of which is a resilient spring contact movable toward and from the other, walls forming a sealed chamber enclosing and sealing the contacts from the outer atmosphere including a flexible portion adjacent the movable contact and adapted to permit shifting of said contact through movement of said flexible portion, means mounting the contacts on the walls in the sealed chamber independently of the flexible wall, movable operable means mounted on the walls outside said chamber for flexing said flexible portion and operating through it to shift the movable contact, and means outside said walls for connecting conductors with the contacts.

9. An electrical switch comprising an insulating base, cooperating metal contacts mounted on the base including a contact movable toward and from the other, walls secured to the base forming a closed chamber sealing the contacts from the outer atmosphere and including a flexible portion adapted by flexing thereof to shift the movable contact, said contacts being mounted independently of said flexible wall, a support outside the chamber connected with the walls, a movable operating means mounted in the support for flexing said flexible portion and operating through it to shift the movable contact, and conductors connected with said contacts and leading from said chamber through said walls to the outside thereof and sealed therein.

10. An electrical switch comprising cooperating metal contacts one of which is a spring contact movable toward and from the other, insulating means for mounting the contacts, walls cooperating with the insulating means to form a closed chamber enclosing and sealing the contacts from the outer atmosphere and including a flexible portion adjacent the movable contact, means mounting the contacts on the walls and in the chamber independently of the flexible wall, movable operating means mounted on the walls outside the chamber for flexing said flexible wall portion to shift the movable contact, and conductors con-

nected with said contacts and extending to the outside of the chamber.

11. An electrical switch comprising as a unitary structure cooperating metal contacts one of which is movable toward and from the other, insulating means including walls forming a sealed chamber enclosing and sealing the contacts from the outer atmosphere and including a flexible portion adjacent the movable contact adapted to move to shift said contact, means mounting the conductors in the sealed chamber on the walls independently of the flexible wall, movable operating means mounted on the walls outside the chamber to flex the flexible portion and shift the movable contact, and conductors connected with said contacts.

12. A unitary electric switch structure comprising walls forming a chamber, at least one wall of the chamber being formed by an insulating base member, switch contacts in said chamber mounted on said base member and one of which is movable to and from the other to control a circuit, means for connecting conductor leads to said contacts, another wall of said chamber being formed by a sheet of flexible material, a support outside said flexible material connected with said walls, and an operating means mounted in said support and including means operable through said flexible material by flexing said material to operate the movable switch member.

13. An electric switch comprising walls forming a chamber, at least one wall of the chamber being formed by a relatively rigid insulating member, switch contacts in said chamber mounted on said insulating member and one of which is movable to and from the other to control a circuit, means for connecting conductor leads to said contacts, another wall of said chamber being formed by a sheet of flexible material, a relatively rigid support at the outer side of said flexible material, and a manually operable means mounted in said support including means mounted to press on the flexible member and flex said member so as to operate through it to operate the movable switch member.

14. An electrical switch comprising as a unitary structure an insulating base, metal contacts mounted on the base one of which is movable toward and from the other, walls forming a sealed chamber enclosing said contacts sealed from the outer atmosphere and including a thin flexible insulating wall adjacent the movable contact capable of being moved to shift the contact, means mounting the contacts in the sealed chamber independently of the flexible wall, movable operating means mounted outside the chamber as a part of said structure to shift the flexible wall and through it to shift the movable contact, and conductors connected with the contacts.

HARVEY HUBBELL.

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