

Jan. 16, 1945.

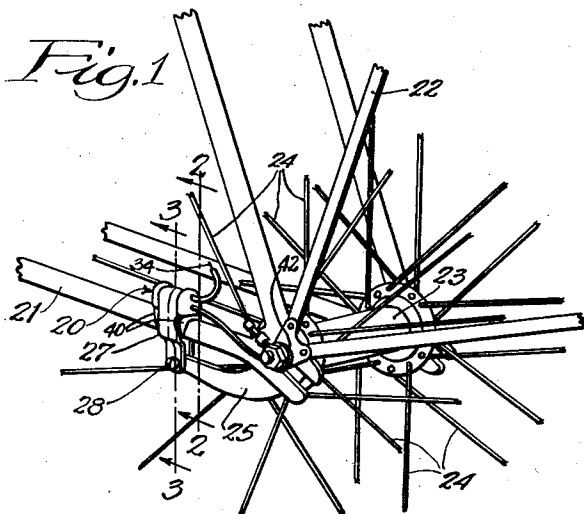
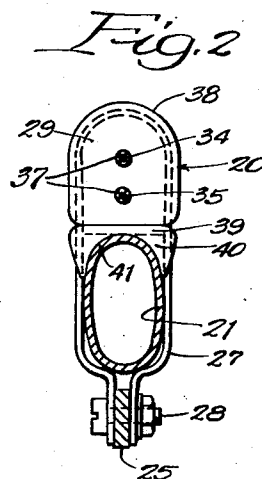
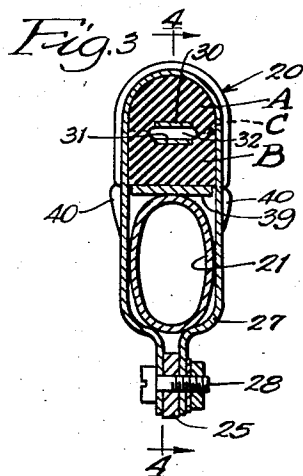
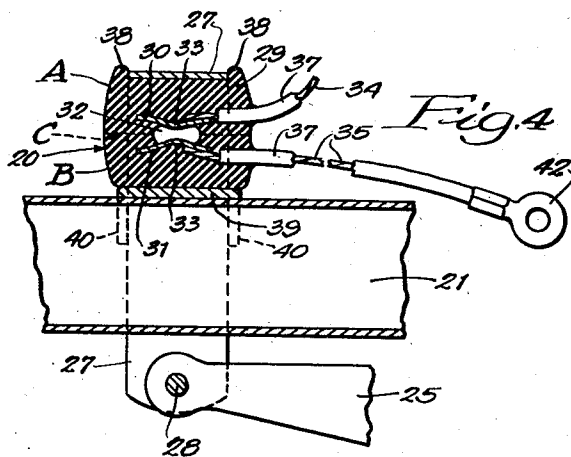
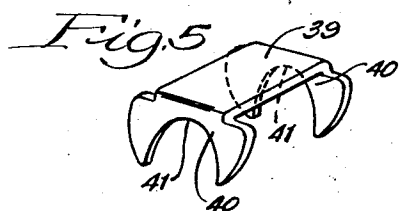
F. W. SCHWINN

2,367,441

SEALED SWITCH

Filed Aug. 6, 1941

3 Sheets-Sheet 1



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Jan. 16, 1945.

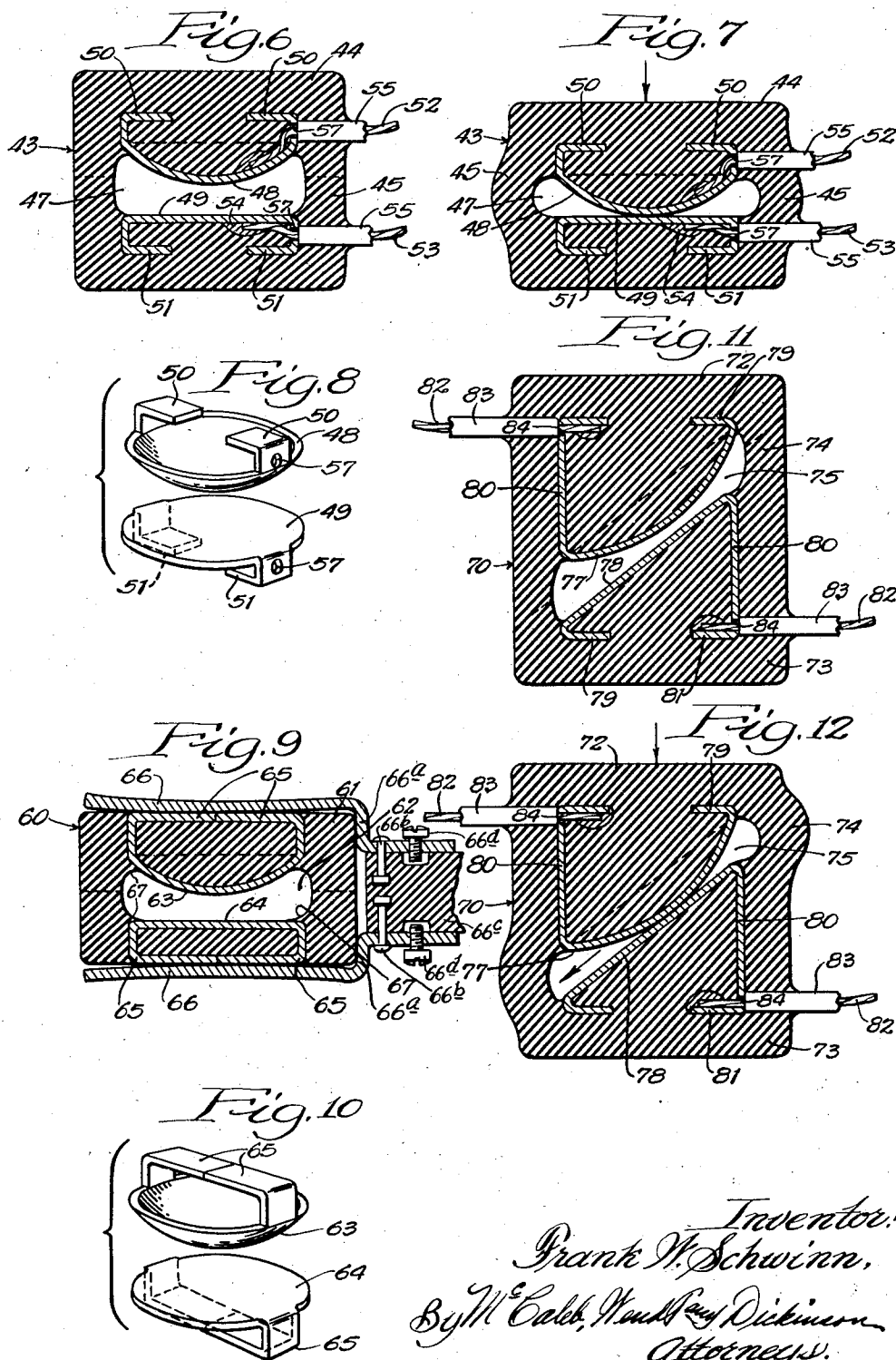
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SEALED SWITCH

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3 Sheets-Sheet 2



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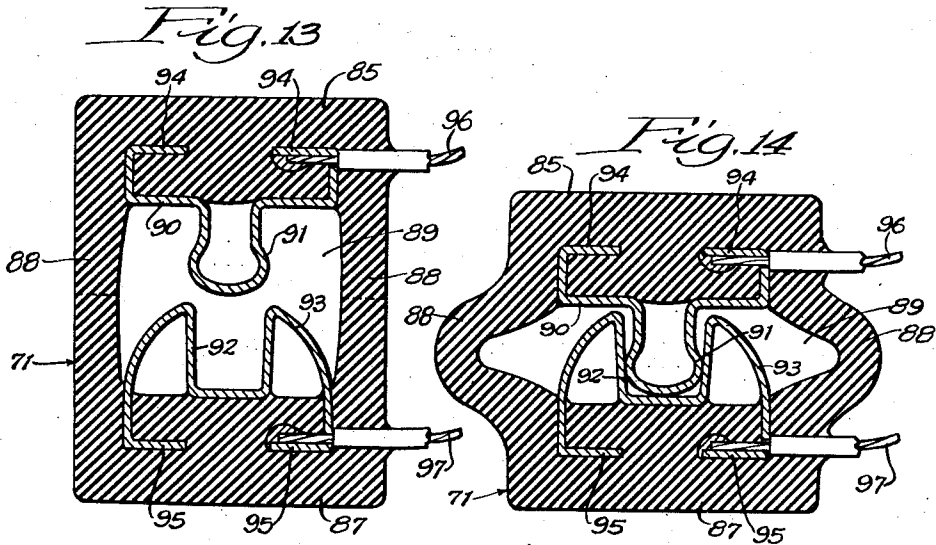
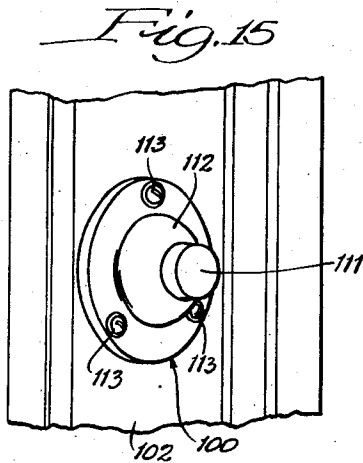
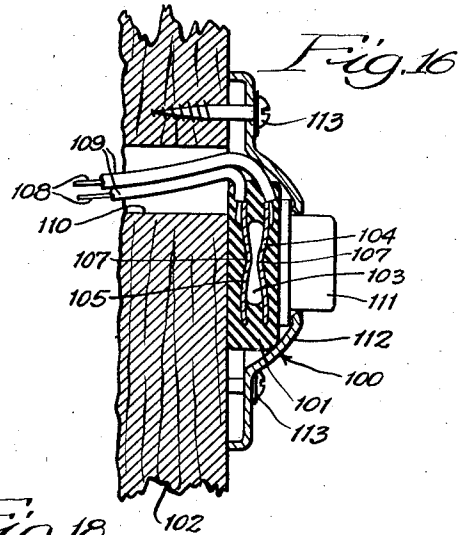
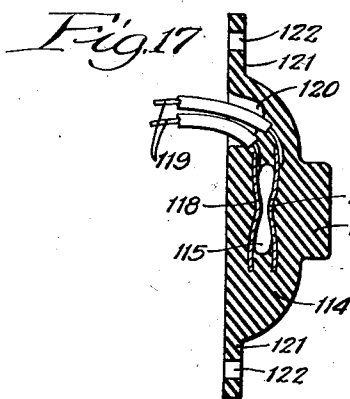
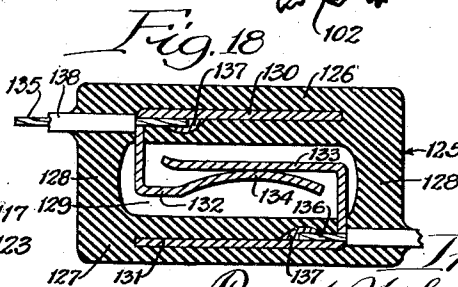
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2,367,441

SEALED SWITCH

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,367,441

SEALED SWITCH

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Application August 6, 1941, Serial No. 405,589

4 Claims. (Cl. 200—52)

This invention relates to improvements in weatherproof or sealed electrical switches, and more particularly concerns a switch having the contacts supported by and sealed within a hollow resilient body which is compressible to actuate the contacts.

There has been a long-felt need for a practical, low cost simple switch, which can be made in small, compact sizes, readily adaptable to meet a large variety of applications, and which is thoroughly and reliably sealed against the entrance of air, gas, vapors, moisture, liquids, dust or particles of foreign matter to the switch contacts, and which might short-circuit, corrode, film, or insulate the contacts, or be ignited by arcing at the contacts.

Switches have heretofore been proposed which are superficially enclosed within a rubber sheath. That type of construction is generally not satisfactory because of the difficulty in securing a completely sealed condition and the liability of the relatively thin sheath becoming broken or punctured and, further, because of the additional cost of the sheath. Such a switch, furthermore, retains all of the prior undesirable features of metal springs and other delicate mechanism liable to break or wear out, thus creating a high replacement cost.

Another type of sealed switch has been designed for use in long lengths as traffic switches to lie across the path of moving vehicles in driveways and streets for such purposes as controlling traffic signals, alarms, or garage doors. The design of such traffic switches has not been adaptable to the field of small compact hand or mechanically actuated unit switches.

An object of this invention is to provide a sealed switch of exceptionally simple, readily adaptable structure that may be produced in standardized small, compact form at low cost, and which is eminently suitable for use in a great many places where a completely protected, relatively easily operating switch is required.

Another object is to provide a switch of this kind that may be molded from compressible resilient insulating material, such as natural or artificial rubber, into any of a wide variety of shapes and styles having predetermined operating characteristics to meet a large range of practical applications.

My switch eliminates the use of small and delicate, trouble-making parts and in its simplest form comprises only three parts, a hollow compressible body and a pair of contact members which are mounted within and supported by the

body and movable into and out of contact by compression and expansion of the body. The arrangement may be such as to expose portions of the contact members to receive current conducting elements of an electrical circuit directly. For most purposes, however, leads may extend out from the contacts within the body for connecting the switch in an electrical circuit exteriorly of the switch body. The engagement of the leads with the contacts is such as to preclude fluid leakage past the leads into the contact chamber. Thus, it is possible to produce the switch at very low cost but nevertheless of great reliability. The manufacturing cost is so low that the switch can be furnished for less than the cost of repairing more complex types of switches.

Another feature of my invention is the utilization in the operation of the switch of not only the inherent resiliency of the material of the switch body but also of the pressure of gas trapped within the body cavity in which the contacts are located.

Another object is to design a switch having a resilient body completely sealing the contacts and acting, when compressed, to carry the contacts into rubbing engagement to assure a perfect electrical contact.

A further object is a weatherproof switch including a mounting peculiarly adaptable to use with a bicycle stop light and to be mounted on a rear fork member of the frame to be actuated by the reaction of the coaster brake arm.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings:

Fig. 1 is a fragmentary view, in perspective, of the coaster brake portion of the rear wheel of a bicycle, and the rear fork and mud guard braces, showing one of my sealed switches in use as a brake-operated signal switch;

Fig. 2 is an enlarged end elevational view of the switch, taken substantially in the plane of the line 2—2 of Fig. 1, and showing certain associated parts in section;

Fig. 3 is a vertical sectional view through the switch and associated parts, taken substantially in the plane of the line 3—3 of Fig. 1;

Fig. 4 is a vertical sectional view taken longitudinally through the switch and its mount along the line 4—4 of Fig. 3;

Fig. 5 is a perspective view of the saddle upon which the switch is seated;

Fig. 6 is a vertical sectional view through a modified form of the switch showing the switch body in normal or distended condition;

Fig. 7 is a vertical sectional view of the switch of Fig. 6, showing the same compressed to bring the switch contacts into engagement;

Fig. 8 is a perspective view showing the electrical contact members of the modified form of switch of Fig. 6;

Fig. 9 is a vertical sectional view through another modified form of the switch;

Fig. 10 is a perspective view of the contact members of the modified switch shown in Fig. 9.

Figs. 11 and 12 are vertical sectional views taken in a similar plane through a further modified form of the switch, the switch contacts being shown in separated relation in Fig. 11 and in contacting relation in Fig. 12;

Fig. 13 is a vertical sectional view showing still another modification of the switch, with the contacts separated;

Fig. 14 is a vertical sectional view showing the switch of Fig. 13 compressed to bring the contacts into engagement;

Fig. 15 is a perspective view of a doorbell switch construction embodying the invention;

Fig. 16 is a vertical sectional view through the doorbell switch shown in Fig. 15;

Fig. 17 is a vertical sectional view through a modified form of the doorbell switch; and

Fig. 18 is a vertical sectional view through another modified form of the switch, which is of the normally closed type.

Referring to the drawings in detail, in Figs. 1 to 4, inclusive, is shown a preferred form of my switch, indicated generally by the reference numeral 20, used as a water and dustproof stop signal light switch of a bicycle. Only fragmentary portions of the rear fork 21 and of the rear mud guard braces 22, together with the coaster brake 23 and fragmentary portions of the spokes 24 of the bicycle are shown in Fig. 1, as it is believed that these few details will permit of full understanding of this use of the switch without more elaborate showing of the remainder of the well-known bicycle structure. The coaster brake 23 has the usual brake arm 25, which is connected to the lower bar of the fork 21 by means of a metal strap 27 looped about the bar and detachably secured to the arm by means of a bolt 28.

The stop light (not shown) of the bicycle may be of any preferred construction and is considered, in the present instance, as operating on a single wire hookup wherein the mud guard braces 22 are current-carrying parts of the light circuit.

The switch 20 comprises simply a small, slightly elongated hollow block body 29 formed of a compressible resilient material enclosing a pair of contact members 30 and 31. In the form shown, the body 29 is molded from resilient rubber or equivalent material of suitable resiliency, having a small, preferably central, cavity or chamber 32 which is of somewhat flattened form horizontally.

The contact members 30 and 31 may be identically formed from narrow strips of electrical conducting material, such as brass, and extend lengthwise of the body 29 along the top and bottom walls of the cavity 32. At their end portions the contact members are entirely embedded in the material of the body 29 at the opposite ends of the chamber 32. The center portions of the contact members are bowed inwardly to present contact points 33. The rub-

ber of the body 29, intervening between the opposed ends of the contact strips 30 and 31, holds the contact strips normally spaced apart.

Leading from either of the ends of the contact strips 30 and 31 are wires 34 and 35, respectively. The ends of the wires may be secured to the strips as by soldering, and are preferably located on the opposite sides of the contact strips from the chamber 32. An insulating sheath 37 surrounds each of the wires 34 and 35, and is preferably of a grade and type of rubber or other material which can be vulcanized firmly to the body 29. The inner ends of the insulating sheaths 37 terminate a substantial distance from the chamber 32, and are thereby separated from the chamber 32 by solid portions of the body material. Thus, even though the sheaths may accidentally be imperfectly vulcanized or even work loose, the sealed condition of the chamber 32 will remain unbroken.

In constructing the switch 20, the body 29 may be initially molded as separate upper and lower halves A and B, with the contact strips 30 and 31 and the associated wires 34 and 35, respectively, and their sheaths molded in place. The halves of the body are then secured together permanently as by vulcanizing or cementing. In Figs. 3 and 4, the broken line C represents the vulcanized or cemented joint between the two halves. In the separate halves A and B, there will, of course, be shallow, matching depressions which combine to form the chamber 32 when the halves are secured together.

To close the contacts of the switch 20, the upper and lower portions of the body 29 are squeezed together on an axis of compression extending through the contact points 33 until the contact points 33 interengage. In this, the portions of the body 29 which define the side and end walls of the chamber 32, being of relatively reduced mass compared with the top and bottom portions of the body, will compress and distort more readily and thus facilitate quick contacting of the contact points. It will be observed that the compact upper and lower opposed engagement faces of the body block are in more than projected co-extension with the major or horizontal area of the chamber 32, so that when the upper and lower portions of the body are squeezed together by substantially over-all compressive engagement of opposed actuating members, the chamber is substantially ensmallled.

The side and end walls of the chamber 32 intersect the flexure plane of the body 29 and are formed concave in order to reduce distortional strains, and to avoid any tendency of these walls to distort inwardly between the contact members when the switch is under closing compression. Their concavity permits these walls to bend easily as the top and bottom portions of the body come together. As shown in Fig. 3, the concavity of the side walls preferably extends laterally beyond the side edges of the contact strips 30 and 31, thus further assuring freedom from possible interference by inward distortion of such walls. As a result of their concave formation, the end walls of the chamber 32, which extend between the anchored end portions of the contact strips 30 and 31 (Fig. 4), tend to distort longitudinally outwardly of the body under vertical compression and thus move away from the contact points 33.

The resiliency of the material of the body 29 acts when the switch-closing pressure is released to return the body to the uncompressed

or open switch condition. In addition, I may utilize the pressure of a compressed gas within the chamber 32 to assist in quick opening of the switch contacts upon release of the switch-closing pressure. Any suitable gas may be utilized for this purpose but, as a matter of expediency and availability, the chamber 32 may be filled with air at ordinary atmospheric or higher pressure. As a result of the ensmallment of the chamber 32 when the switch is compressed to close the contact points 33, not only is the material of the body compressed, but the gas within the chamber 32 is also compressed by the closing together of the top and bottom walls of the contact chamber 32 and supplements the resiliency of the lateral walls of the cavity in urging the body block back to normal shape, and thereby the contacts back to their normal relative position. The compressed gas goes into the pockets which form at the ends and the sides of the chamber 32 by distortion of the concave end and side walls.

The arrangement as shown in Fig. 1 is such that pressure for closing the switch 20 is created by any application of the coaster brake 23 to stop the bicycle. For this purpose the switch is interposed between the loop of the anchoring strap 27 and the adjacent lower frame bar of the fork 21. The strap loop snugly embraces substantially the entire engagement face of the top and also the sides of the body 29. Slippage of the switch body 29 from under the loop of the anchoring strap 27 is prevented by retaining beads 38 formed at the opposite ends of the body and spaced apart about the same distance as the width of the strap.

A saddle member 39 resting upon the fork bar provides a flat base under the switch body. The saddle member 39 may be stamped from sheet metal shaped to provide integral right angular leg flanges 40 which are cut out to form aligned downwardly opening notches 41 for straddling the fork bar. The sides of the legs 40 extend laterally beyond the side edges of the body of the saddle and function as retaining ears engageable with the opposite edges of the anchoring strap to avoid relative displacement of the saddle and strap.

When the coaster brake 23 is applied, the simultaneous downward torque exerted by the brake arm 25 tends to rotate the latter counterclockwise so that it pulls down upon the strap 27, thus compressing the switch body 29 and closing the contact points 33. This completes the stop light circuit from a battery (not shown) through the wire 34, the switch 20, the wire 35, and the mud guard braces 22. An electrical connection between the wire 35 and the mud guard braces is perfected through an eye terminal 42 on the wire which engages the braces where the latter are secured upon the rear wheel axle.

Promptly upon release of the coaster brake, the rebound force which has been created in the switch body 29 by its compression, returns the body to normal and thus raises the anchoring strap 27 and brake arm 25 to initial position from the slight downward deflection resulting from the compression.

Because of its resilient action, the switch body 29 also acts to some extent as a shock absorber for the coaster brake.

It will be apparent that the switch 20 is permanently sealed against moisture and dirt. This, taken together with the fact that the body 29 of the switch which supports the contacts is formed

from an insulating material, assures that the switch will not short-circuit. The operation of the switch is smooth and positive. Furthermore, no special structure or reconstruction of the coaster brake is necessary to adapt the switch for operation by the coaster brake. The only change in any conventional part of the coaster brake assembly is in the arm-anchoring strap 27 which has a slightly larger loop so as to accommodate the switch.

Although the switch 20 has been described as especially adapted for use as a bicycle stop light switch, it may obviously be used for other purposes where a completely sealed switch is necessary and where base and compression members for operating the switch are available. It is adaptable for use in automobiles as a stoplight or starter switch, in automatic machinery where protection is necessary against oil, cutting agents, dust, and the like.

Since it must withstand fairly strong pressure, sometimes of shock proportions as when the coaster brake of the bicycle is jammed on, the switch 20 is of fairly compact and relatively stiff construction. For some uses, the switch 20 may therefore not be sufficiently sensitive, that is, it may require greater than available force or pressure for operation. Because of its small, compact construction, this condition may exist even though the selected grade of rubber or other resilient material may be as soft or flexible as practicable.

I have accordingly provided a switch 43 (Figs. 6 and 7) which is designed for more sensitive operation. The switch 43 has a hollow body 44 provided with reasonably massive upper and lower portions joined together by comparatively much thinner and quite flexible integral vertical walls 45. The hollow interior of the body serves as a sealed contact chamber 47. The inner faces of the walls 45 may be concave as shown.

When pressure is applied, as for example downwardly at the top of the body 44, on an axis of compression as indicated by the arrow at the top of Fig. 7, the thin walls 45 will distort readily and bulge out as seen in Fig. 7 in a flexure plane intersecting the axis. Thus, little, if any, compression of the more massive top and bottom portions of the switch body is required to squeeze them together.

Compression of the switch body 44, as described, brings into engagement electrical contact members 48 and 49 which are secured against the upper and lower walls, respectively, of the chamber 47. Inasmuch as the sides 45 of the switch body 44 are of such limited thickness as may preclude proper anchoring of the contact members 48 and 49 laterally beyond the chamber 47, they are provided with upwardly and inwardly directed pairs of substantially L-shaped integral anchoring flanges 50 and 51, respectively, which are embedded in the massive portions of the switch body between the contact members and the opposite engagement faces of the body. The anchoring flanges have their attached legs extending vertically and the remaining legs lying horizontally within the thrust path of the switch-closing pressure that is applied to the body 44. This arrangement reinforces and stiffens the pressure-receiving massive portions so that the switch-actuating pressure is more directly transmitted to the contact members 48 and 49 and to the thin and easily distorted side walls 45.

The contact members 48 and 49 may be made from brass or other metal stock in round disc

form, as shown in Fig. 8, with the upper contact member 48 of concavo-convex shape. This permits the contact member 48 to make point engagement with the contact member 49, even though pressure may be applied unevenly to the switch body in closing the switch.

Electrical lead wires 52 and 53 are secured to the back faces of, respectively, the contact member 48 and the contact member 49 as by means of soldering 54. The wires are encased in insulating sheaths 55 vulcanized within the body. The anchored end portions of the wires 52 and 53 are received through apertures 57 in respective ones of the anchoring flanges 50 and 51, and are thus positively engaged and held against twisting or working loose from the contact members in the movement of the switch body incident to closing and opening of the switch.

The external shape of the switch 43 may be square, round, or any other preferred shape, and the pressure faces (the upper and lower faces as viewed in Figs. 6 and 7) are preferably flat in order to facilitate engagement of the switch body between opposed members of an operating mechanism.

For some purposes it may be desirable to have a fully sealed switch but in which direct engagement can be had with the contact members exteriorly of the switch body, and thus avoid the use of lead wires. Such a switch, identified by the numeral 60, is shown in Fig. 9, and has a compressible resilient body 61 enclosing a cavity 62 to provide a chamber for upper and lower electrical contact members 63 and 64, respectively. The upper contact member 63 may be of concavo-convex form so as to make point contact with the lower contact member 64 when the switch is closed. Each of the contact members has a pair of substantially L-shaped anchoring flanges 65 which have their shorter legs integral with the respective contact members and their longer legs lying in co-planar edgewise abutting relation and provide pressure resistance reinforcements for the switch body block spaced from the upper and lower faces of the respective contact members.

In order to permit a direct electrical connection with the contact members, the abutting long legs of the anchoring flanges 65 are exposed flatwise to serve as friction terminals at the engagement faces of the switch body 61. Thus, the switch is adapted to be placed directly in a holder or clip between a pair of opposed current conducting elements, such as fingers 66 in an electrical circuit, without requiring connection of lead wires. This is of particular advantage in places where replacement of the switch may have to be made with more or less frequency.

The fingers 66 of the switch holder may be in themselves resilient or may be resiliently mounted to bear yieldably but firmly against the friction terminals of the switch 60.

In order to facilitate the insertion of the switch 60 and assure thorough electrical contact against the terminal faces thereof, the holder fingers 66 may be of slightly inwardly bowed shape and have their front ends formed as outwardly flaring lips. The rear end portions of the fingers 66 are in the form of angular flanges which provide forwardly facing limit shoulders 66^a for engagement by the opposing sides of the switch body 61. The rearwardly projecting portions of the angular flanges are connected, as by means of anchoring rivets 66^b, to the opposite sides of an insulating

base member 66^c. Terminal screws 66^d are threaded into the rear flanges for connecting the electrical lead wires of the circuit to the holder.

Where the insulating member 66^c is resilient, the entire holder may be squeezed to actuate the switch. On the other hand, the fingers 66 may be of such flexibility that they can be directly flexed inwardly sufficiently to compress the switch body 61 and actuate the contacts 63 and 64.

The contact chamber 62 has the thin side walls concave in order to reduce strain and assure outward distortion or buckling of these walls when the switch body is compressed to close the contacts 63 and 64. At the top and bottom of the side walls, the material of the switch body 61 preferably extends into overlapping relation to the contact faces of the respective contact members, as indicated at 67, in order to effect a seal against leakage due to possible loosening of the body material from the outside vertical faces of the short legs of the anchoring flanges 65 which extend to the outside of the switch body.

Where it is desirable to have a rubbing engagement between the contacts of the switch, either the modified form of switch 70 shown in Figs. 11 and 12, or the modified switch 71 shown in Figs. 13 and 14, may be used.

The switch 70 comprises upper and lower relatively massive body portions 72 and 73, respectively, of substantially triangular shape joined together in spaced relation by relatively thin, interiorly concave integral walls 74 which seal the space between the body portions to form a chamber 75. The chamber is of flattened shape and lies at an oblique angle with relation to the upper and lower, preferably flat, horizontal engagement faces of the switch body. Upper and lower obliquely tilted electrical contact members 77 and 78 are supported by the body portions 72 and 73, respectively, in opposed normally spaced relation on the top and bottom walls of the chamber 75. The upper contact member 77 may have a convex contact face for point engagement with the face of the lower contact member 78.

Each of the contact members is anchored in its respective supporting body portion by means of a pair of anchoring flanges 79 and 80 embedded therein. In each instance, the anchoring flange 79 is relatively short and extends inwardly from that portion of the edge of the associated contact member which is located nearest the adjacent engagement face of the switch body. The flanges 80 are of sufficient length to extend vertically from the remote edges (considered with respect to the horizontal engagement faces) of the respective tilted contact members to points opposite the anchoring flanges 79 and have short legs 81 directed edgewise toward, but in spaced, co-planar relation to the flanges 79. Thus, the anchoring flanges are interposed between the contact members and the engagement faces of the switch body and receive equally the compression thrust to which the switch body is subjected in closing the contacts. Electric lead wires 82, encased in insulating sheaths 83 vulcanized to the switch body, may extend through apertures 84 in the anchoring flanges 80 adjacent the horizontal flange legs 81 and are soldered to the inner faces of such legs.

When the switch 70 is compressed to close the contacts, as by downward vertical pressure upon the upper face of the switch body on a central axis of compression, as indicated by the arrow at the top of Fig. 12, the side walls 74 yield by bowing outwardly until the contact member 77

engages the inclined contact face of the member 78. Continued pressure causes the member 77 to slip down the inclined face of the member 78 with a relative oblique movement as indicated by the oblique directional arrow. The rubbing or frictional action thus occurring has a scraping, cleaning effect at the engaged portions of the contacts and assures a positive electrical connection.

Whereas the switch 70 is designed for a relatively small range of movement between the contact members in an angular path, the switch 71 is designed for somewhat greater, but rectilinear relative movement between the contacts. In the switch 71, the compressible resilient body has upper and lower relatively massive body portions 85 and 87, respectively, provided with flat, parallel exterior engagement faces. The portions 85 and 87 are spaced substantially apart by relatively thin, interiorly concave, integral side walls 88 sealing a contact chamber 89. At the top of the chamber 89 the upper portion 85 of the switch body supports a contact member 90 provided with a downwardly projecting boss or contact head 91 of preferably bulbous shape. An upwardly opening socket 92 formed in a lower contact member 93 supported at the bottom of the chamber 89 is designed to receive the contact head 91. The contact members 90 and 93 have anchoring flanges 94 and 95, respectively, which include portions interposed in thrust receiving relation between the respective contact members and the adjacent engagement faces of the body, similarly as in the switch 43. Although the contacts 90 and 93 are shown as comprising formed metal strips, they may also be made from metal discs formed with substantially the head and socket shapes described.

When the switch 71 is compressed as shown in Fig. 14, the side walls 88 become distorted and bow outwardly and the body portions 85 and 87 approach until the contact head 91 enters the contact socket 92. The outer transverse dimension of the head 91 is preferably slightly larger than the inner transverse dimension of the socket 92 so that the head 91 will enter the socket with a frictional, rubbing action that assures thorough electrical contact between the two contact members. The walls of the socket 92 may be formed to yield slightly when the head 91 enters it.

Connection of the switch 71 in an electrical circuit exteriorly of the body of the switch may be effected through electrical leads 96 and 97 which have their ends soldered to the anchoring flanges 94 and 95 of the respective contact members.

In Figs. 15 and 16 is shown a modified form 100 of my switch particularly adapted for use as a door bell or annunciator switch. One of the principal sources of trouble with door bell switches arises from shorting of the circuit by entrance of moisture to the switch contacts. Inasmuch as the contacts in my switch are completely sealed within the waterproof body, such trouble is avoided.

The switch 100 comprises a flat, hollow rubber body 101 which may rest flatwise against a supporting structure or base such as a door jamb 102. In the body 101 is a shallow cavity 103 and a pair of contact members 104 and 105 lie on the opposite sides of the cavity and have their ends embedded within the body much the same as in the switch 20. The center portions of the contact members are bowed inwardly as indicated at 107 to approach one another closely for point

contact. The walls of the cavity at the sides and between the embedded end portions of the contact members are preferably concave as in the previously described forms. Lead wires 108 are secured to the opposed ends adjacent one side of the body 101, with their rubber sheathing 109 vulcanized in the body. The leads may extend from the switch through a hole 110 bored through the jamb 102.

Compression against the switch body 101 to close the contact point 107 is effected by a push button 111 bearing against the outer face of the body 101 and held in place by a centrally perforated, laterally flanged retainer casing or housing shell 112. The housing shell may be secured to the jamb 102 by means of washerhead screws 113. It will be clear that regardless of the exposure of the switch 100 to the elements, moisture cannot disrupt the electrical circuit at the switch.

In the modified form of door bell switch 114 shown in Fig. 17, the functions are substantially like the switch 100, but the switch is made to avoid the need for a housing shell or separate push button. The switch 114 includes a body of compressible resilient material having a cavity 115 which houses opposed, normally spaced contact members 117 and 118. The rear face of the switch body is flat and is adapted to rest against a door jamb or the like (not shown). Lead wires 119 by which the switch 114 is connected in an electric bell or annunciator circuit extend from the contact members 117 and 118 out of the switch body through a recess 120 in the rear face of the body.

In this form, the switch body has an integral lateral flange 121 provided with holes 122 to receive the screws for securing the switch to the door jamb. In addition, the switch 114 has molded integrally at the center of its front face, a boss 123 serving as a push button.

The door bell switch 114 is inexpensive to make and since it is all formed in one piece, eliminates separable parts that might become lost prior to installation of the switch. Since all parts of the switch body, including the push button and the attaching flange, are formed of the same weather-resistant material, it will uniformly resist weathering and is free from the deteriorating effect of corrosion which attacks switches having exposed metallic parts.

The switches thus far described have all been of the normally open style, that is, the embedded contacts are held apart by the material of the switch body in the extended or non-compressed condition of the switch, and are carried into switch closing engagement by the squeezing toward one another of the opposite contact carrying portions of the switch body. For some purposes it may be necessary to have a normally closed switch which may be selectively opened by the squeezing of the switch body. An example of such a normally closed switch, identified generally by the numeral 125, is shown in Fig. 18.

The switch 125 comprises a body of resilient, compressible material and includes relatively thick head and base portions 126 and 127, respectively, which are integrally connected together by side walls 128 which hermetically seal a contact chamber 129. The inner faces of the walls 128 may be concave, as shown.

Normally closed contact members 130 and 131 are carried by the head 126 and the base 127, respectively. Each of the contact members is preferably of substantially U-shape construction, having one leg embedded in the respective sup-

porting member parallel to the preferably flat engagement face of such member. The web portions of the contact members extend into the chamber 129 at diametrically opposite sides, and the remaining legs 132 and 133 of the contact members extend into overlapping engagement inside of the U of the respectively opposed engagement member. The contact leg 132 may be bowed toward the contact leg 133, as indicated at 134, in order to assure thorough electrical contact therewith. Preferably, the contact legs 132 and 133 are so related that in the non-compressed condition of the switch, they bear against one another with sufficient opposing pressure to maintain a firm engagement.

In the operation of the switch 125, squeezing pressure is exerted against the head and base portions 126 and 127 which carries them toward one another and causes the contact legs 132 and 133 of the contact members to separate, thus opening the switch. At the same time the concave lateral walls 128 distort outwardly away from the contact members.

Electrical connection of the contact members 130 and 131 is effected through the medium of electrical leads 135 and 136, respectively. The leads extend through the respective side portions of the body adjacent the webs of the contact members and through the webs and are anchored to the embedded legs of the contact members by means of solder or the like 137. The insulating sheaths 138 of the leads are preferably molded within the material of the body.

In all forms of my switch, the contacts are completely enclosed within the dust-proof, spark-proof and fluid-proof body. The compressible, resilient material of the body may be selected for the particular qualities of resiliency and resistance to water, oil or chemicals, best adapted for the use to which the switch is to be put. For example, an ordinary grade of natural rubber may be suitable for uses where the switch is merely to be exposed to the weather as for example in the tail light switch 20 or the doorbell switches 100 and 114. But when the switch is to be used in places where natural rubber will not stand up because subject to oil or certain gases or strong chemical solutions as in processing tanks, appropriate types and grades of synthetic rubber may be used. Hence, the term "rubber" where used in the claims is intended to be given a generic meaning, including both natural rubber and the synthetic or so-called rubber substitutes suitable for the present purpose. In addition to the several uses specifically illustrated or mentioned, there are of course many other uses for which my switches are eminently suitable. The switches may be formed in an infinite variety of shapes to fit practically any mechanical environment and can actually be made to fit in places where it is difficult or impossible to put ordinary switches.

Although not specifically mentioned in every instance herein, I contemplate that all of the described forms of switch or their variants may be filled with a gas (air being the form most likely used) under normal atmospheric or higher pressure which will be compressed when the switch is closed and thus assist in opening the switch. Each form of the switch, it will also be noted, preferably has the walls of the contact chamber of more or less concave form for the purposes described in connection with the switch 20.

An advantage of having the contact chambers of the switches gas filled is that during compres-

sion of the switches the pressure created by the compressing of the gas pushes the walls of the chambers laterally outwardly away from the portions of the contacts that are exposed within the chambers. This avoids any tendency of the material of the walls to bend inwardly into interfering relation with the contacts when the switch are flexed during operation of the switch.

It will be observed that in each of the forms of the switch that has lead wires extending from the contacts and out through the material of the body, the relationship of the lead wires is such as to move freely with the associated parts of the switch and avoid pulling or twisting strains which might tend to loosen the wires or their insulating sheaths. That is, the wires extend laterally of the direction of movement of the main parts of the switch. Thus, where the movement is vertical, the wires extend from the massive portions of the switch body in horizontal directions either from the same side of the body (Figs. 4, 6, 13, 16 and 17) or from opposite sides (Figs. 11 and 18).

Instead of simple contact members of the types illustrated, over-center or eccentric mechanical contact arrangements can be secured within the sealed cavity of the switch body to provide a switch that will remain in closed condition after actuation and until reactuated to release the contact mechanism.

While the invention is susceptible of various modifications, and alternative constructions, I have shown in the drawings, and have herein described in detail certain preferred embodiments, but it is to be understood that I do not thereby intend to limit the invention to the specific forms disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the following claims.

I claim:

1. In combination in an electrical switch construction of the character described adapted for controlling a bicycle stop light circuit, a hollow body of compressible resilient material having a pair of normally spaced electrical contacts therein, a base member adapted to be mounted upon the bicycle frame and providing a broad supporting surface for said body, and a looped member engaged over said body and extending past said base member for connection to the torque arm of the bicycle coaster brake so that when the coaster brake is applied the looped member will pull against and compress the body, thus closing said contacts, the resiliency of said body being such that the body normally returns to an uncompressed condition, carrying said looped member along, upon release of the pulling force from said looped member.

2. A switch construction substantially as set forth in claim 1, wherein said body carries means for engagement with said looped member to hold said body in place.

3. A switch construction substantially as defined in claim 1, wherein the base member carries means engageable with the looped member to hold the base member in place with respect to the switch body and the associated part of the bicycle frame.

4. In a sealed switch unit adapted for actuation by an external movable member, a block of resilient rubber constituting a body having a cavity therein formed to provide an axis of compression extending through the cavity, and presenting exposed faces intersected by the axis for compres-

sive engagement by the actuating member, rigid electrical contact means within the cavity adapted for relative movement into and out of contacting relation, said contact means including a sheet metal contact member having an anchoring element extending from one side thereof embedded in said body at the walls of the cavity nearest said exposed faces of the body and extending as a thrust resisting reinforcement into the material of the body between the contact member and said face, whereby compression of the body by said actuating member acting against said exposed face will also move said contact

member, said anchoring element being of substantially L shape, having an apertured leg integral with the contact member and extending therefrom toward the exposed engagement face of the body, and the other leg being directed into a position interposed as a thrust-opposing reinforcement intermediate the contact member and said face, and electrical leads connecting the contact means in an electrical circuit, one of the leads extending through the apertured leg and being anchored in electrical communication with said contact member.

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