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WALL SWITCH ASSEMBLY

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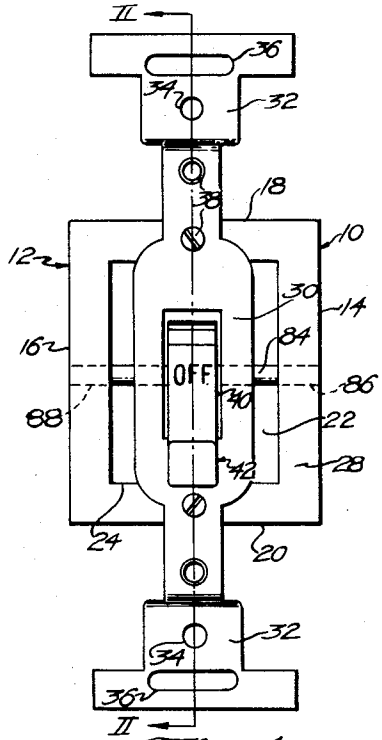


Fig. 1.

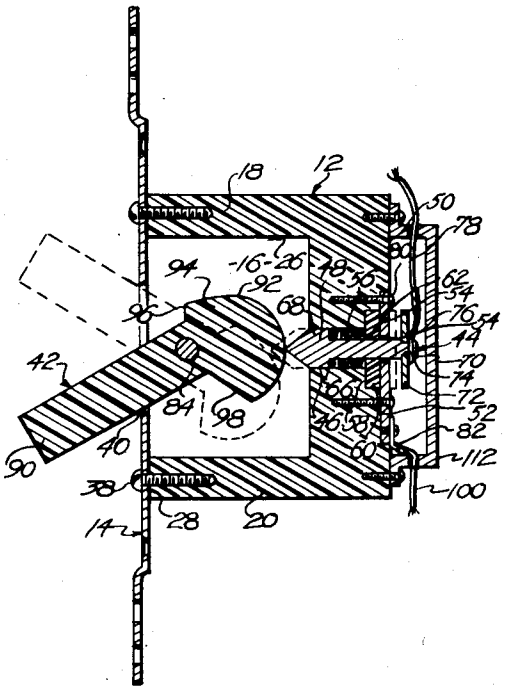


Fig. 2.

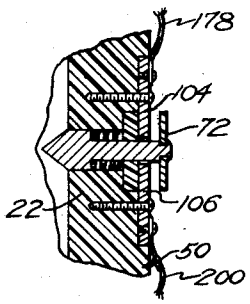


Fig. 4.

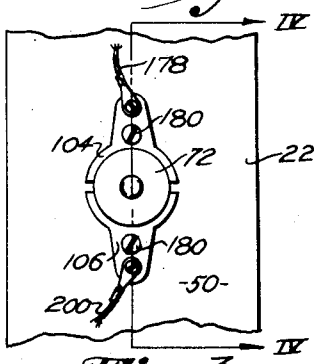


Fig. 3.

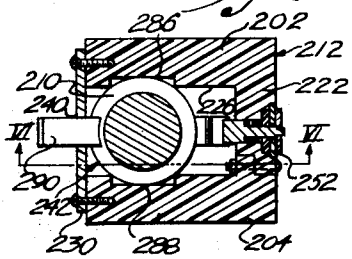


Fig. 5.

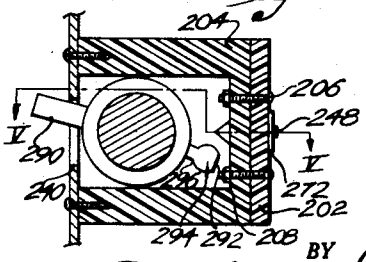


Fig. 6.

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WALL SWITCH ASSEMBLY

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3 Claims. (Cl. 200—153)

This invention relates to electrical switching apparatus and, more particularly, to a wall type switch assembly, the primary object hereof being to provide an inexpensive, noiseless switch of improved and simplified form.

As is well known, presently available snap action type electrical switches in which an overcenter spring urges one contact element into electrically conducting relationship with a pair of spaced contacts, tend to produce a loud click when the operating lever is shifted from one position to another. Much time and effort has been expended throughout the electrical control industry to solve this problem and at the same time provide a more efficient, less expensive, and longer lasting switch, but heretofore, the only practical solution found was in the nature of mercury switches wherein a quantity of mercury is placed in a shiftable container having spaced electrical leads passing thereinto, the circuit being completed when the mercury contacts the ends of both leads. Manifestly such mercury switches are relatively silent, but the cost factor has made their widespread use rather prohibitive as well as the tendency to be somewhat less durable than other types of switches.

It is therefore, another important object of this invention to provide a switching assembly having a novel manually manipulable actuating lever which shifts one contact element out of engagement with the other contact element in such a manner as to completely obviate any contact or spring noises.

Another important object of this invention is to provide a switching assembly of the type just above alluded to wherein one end of the rod for moving the shiftable contact element into and out of engagement with the stationary contact plate rides on an eccentric cam surface formed on the innermost end of the switch assembly actuating lever to thereby cause the shiftable element to gradually engage and move away from the stationary plate and thus preclude any clicking noise when the circuit is completed or broken.

Also an important object is to provide a wall type switch assembly wherein the actuating lever and the housing upon which the electrical switching mechanism is mounted are constructed of moldable, highly wear-resistant, non-conductive material to effectively insulate the mechanism from the wall and the operator manipulating the lever and present an inexpensive, switch assembly having high strength characteristics.

An important object relates to the provision of a wall type switch assembly wherein a shiftable contact element is normally biased into engagement with the stationary contact plate, when the actuating lever is disposed in the "on" position, there being means attached to the contact element for gradually moving the element away from the plate when the actuating lever is swung to the "off" position.

Another important object is to provide a wall type switching assembly of the type wherein a molded, non-conductive actuating lever has an intermediate, integral, spherical portion pivotally mounted in spaced recesses

provided in the walls of the housing therefor whereby failure of the switch because of the actuating lever pivoting means becoming dislodged from the housing as is common in ordinary snap type switches is absolutely precluded.

Other important objects of the instant invention include the way in which the stationary contact referred to above may constitute a split ring having an electrical connection to each portion and the shiftable contact moves into engagement with both portions of the ring; and the way in which the contact element and the stationary plate may take the form of relatively flat discs thereby presenting a large contact area to minimize resistance to current flow through the switching mechanism; and many other important objects which will be explained or become clear as the following specification progresses.

In the drawing:

Figure 1 is a side elevational view of a wall type switch assembly constructed according to present invention and illustrating the brackets for attaching the assembly to a wall, the actuating lever thereof being disposed in the "off" position;

Fig. 2 is a cross-sectional view taken on the line II—II of Fig. 1;

Fig. 3 is a fragmentary, rear elevational view of a wall switch assembly embodying the concepts of the instant invention and showing a modified form of the main body contact plate;

Fig. 4 is a fragmentary, cross-sectional view taken on the line IV—IV of Fig. 3;

Fig. 5 is a cross-sectional view taken on the irregular line V—V of Fig. 6 and wherein is shown another type of manually manipulable actuating level for the switching mechanism; and

Fig. 6 is a cross-sectional view taken on the irregular line VI—VI of Fig. 5.

In the drawing, a wall type switch assembly embodying the concepts of the instant invention is designated generally by the numeral **10** and includes a hollow main housing **12** having a pair of parallel, normally upright side walls **14** and **16**, a top wall **18**, a bottom wall **20** and a rear wall **22** of substantially greater thickness than the remaining walls, the forward end of housing **12** having an opening **24** therein to provide access to the chamber **26** within housing **12**.

Mounted on the forward face **28** of housing **12** is an elongated bracket **30** which has a pair of identical extensions **32** provided with a plurality of openings **34** and slots **36** adapted for receiving screws or the like to secure the bracket **30** and in turn main housing **12** to any suitable wall structure (not shown). It is to be herein noted that bracket **30** is normally disposed equidistanly between walls **14** and **16** and secured to housing **12** by a plurality of screws **38** threaded into top wall **18** and bottom wall **20** respectively. Bracket **30** is additionally provided with an elongated central slot **40** for clearing the manually manipulable actuating lever **42**.

Electrical switching mechanism designated broadly by the numeral **44** is mounted in the rear wall **22** and in this respect there is provided an elongated, substantially horizontal bore **46** through wall **22** and disposed substantially equidistantly from side walls **14** and **16** and top wall **18** and bottom wall **20**. Bore **46** is of sufficient dimensions to clear an elongated metallic rod **48** reciprocably mounted therein and normally extending beyond both ends of the bore, the end of rod **48** disposed within chamber **26** being pointed to present a cam engaging follower structure. Mounted on the outermost face **50** of rear wall **22** is a metallic plate **52** which has a central perforation **54** of sufficient diameter to clear reduced portion **56** of rod **48** which extends therethrough. It should

be pointed out at this point that main housing 12 is preferably, although not necessarily, formed of non-conductive, highly wear-resistant plastic material having a low surface coefficient of friction, nylon meeting all of these specifications, to effectively insulate the switching mechanism 44 from the supporting wall structure and bracket 30. It is also of importance that metallic plate 52 can be conveniently constructed of highly conductive material such as silver or the like, and which serves the function of acting as one of the contact plates of the switch mechanism.

An internal, annular recess 58 in axial alignment with the longitudinal axis of bore 46 is provided in the outermost face 50 of wall 22 and there is disposed within recess 58 an annular ring 60 having a perforation 62 of sufficient diameter to clear reduced portion 56. A coil spring 64 disposed around reduced portion 56 in circumscribing relationship thereto bears against the shoulder 66 presented by reduced portion 56 and against the innermost face of ring 60 to bias rod 48 in the direction of chamber 26. It is manifest that inasmuch as the enlarged portion 68 of rod 48 is of substantially equal diameter to the diameter of bore 46, the walls presenting bore 46 provide a bearing surface for enlarged portion 68 and because of the low surface coefficient of friction of nylon housing 12 and the high wear resistance of such material, the rod 46 will freely reciprocate in bore 46 without any tendency whatsoever to jam or stick therein. It is also of note that the reduced portion 56 of rod 48 slidingly engages the walls of ring 60 defining perforation 62 and thereby presents a bearing control surface for rod 48.

The end of rod 48 disposed externally of housing 12 has an extension 70 thereon and which is adapted for securing an annular disc-like contact element 72 to rod 48. Plate 72 may be secured to rod 48 in any suitable manner but it is preferred that element 72 be provided with a central opening 74, the extension 70 passing therethrough and the outermost end of extension 70 then be crimped over element 72. Electrical connection with element 72 may preferably be made by the provision of a lug or the like 76 in contact with element 72 and between the latter and the crimped portion of extension 70, lug 76 being provided with a conductor wire 78 connected therewith.

Plate 52 may be either rectangular or circular as desired and is secured to the outermost face 50 of wall 22 by a plurality of screws 80 extending into the wall 22 of housing 12. Because of the need of providing as much current flow through the switching mechanism with the least resistance, it is highly desirable to construct both contact element 72 and plate 52 of highly conductive materials such as silver or the like, but manifestly any electrically conductive material such as copper can be utilized. Means is also provided for making an electrical contact with plate 52 and which comprises a lug 82 secured to one end of plate 52. Since main housing 12 is constructed of non-conductive material such as nylon, the plate 52 is effectively insulated from bracket 30.

Means for reciprocating rod 48 in bore 46 and in turn moving element 72 into and out of contact engagement with plate 52, takes the form of an elongated manually manipulable actuating lever 42 swingably mounted within chamber 26 by virtue of a pivot pin 84 secured thereto and pivotally disposed in openings 86 and 88 in walls 14 and 16 respectively. Lever 42 includes a finger piece 90 extending through slot 40 to provide means for moving the lever from one end of its path of travel to another through a limited number of degrees determined by the length of slot 40. On the opposite end of lever 42 from finger piece 90 is a cam surface 92 adapted to engage the pointed end presenting cam follower structure on rod 48. From Fig. 2 of the drawings it can be seen that the cam surface 92 is of convex configuration and adapted to reciprocate rod 48 in a direction to move contact element 72 out of engagement with plate 52 when the lever 42 is swung to the "off" position with finger piece 90 located in its lowermost position.

The end of lever 42 which presents cam surface 92 consists of a lobe 94 having an upper leg segment 96 and a lower leg segment 98 of substantially longer length than segment 96 whereby the radii of the curved surface 92 joining the end of leg segment 96 with leg segment 98 decrease in length successively from the leg segment 96 to leg segment 98.

Pivot pin 84 and openings 86 and 88 are disposed in a position whereby when the finger piece 90 is located in its uppermost position, cam surface 92 does not engage the cam follower pointed end of rod 48 and spring 64 biases contact element 72 into engagement with plate 52 to thereby complete the circuit through the switch assembly 10, this all being clearly shown by the dotted line position of lever 42 in Fig. 2 of the drawings.

Although in some applications of the wall type switch assembly disclosed herein, the means for grounding the switching mechanism 42 may vary, it is most convenient to provide a ground wire 100 to lug 82 thereby making a complete circuit through mechanism 44 when element 72 contacts plate 52. In this respect it is notable that since an electrical circuit is completed through conductor wire 78, element 72, plate 52, and ground wire 100, the actuating lever 42 should preferably be constructed of non-conductive wear-resisting material such as nylon because electrical connection is made to metallic rod 48 when the circuit through mechanism 44 is completed. Since nylon has the desired characteristics of wear resistance and is adapted for molding or the like, it is the preferred material from which lever 42 is to be constructed.

There is shown in Figs. 3 and 4 of the drawings a wall type switch assembly embodying the concepts of the instant invention with the exception of a modified form of contact plate for engagement by the movable contact element 72 and it is apparent from Fig. 3 that such contact plate may conveniently take the form of a split ring generally designated by the numeral 102 and having a pair of opposed portions 104 and 106 to which are attached the conductor wire 178 and ground wire 200 respectively, the portions 104 and 106 being secured to the outermost face 50 of wall 22 by a pair of mounting screws 180 threaded into wall 22. In this form of the invention, it can be readily seen that neither the conductor wire 178 or the ground wire 200 is required to be movable and therefore there is no tendency whatsoever for such wires to become worn and break because of movement thereof during operation of the switching mechanism 44.

A modified type of actuating lever 242 is disclosed in Figs. 5 and 6 of the drawing for actuating electrical switching mechanism 44 which is identical with that described in Figure 1 and Fig. 2 of the drawings. Hollow main housing 212 includes a pair of sections 202 and 204 joined along a vertical line through the rear wall 222 and secured together by a plurality of screws 206 having nuts 208 on the threaded ends thereof. Manually manipulable actuating lever 242 includes an intermediate spherical portion 210 and an integral finger piece 290 extending through the opening 240 in mounting bracket 230. Disposed on the side of spherical portion 210 opposite from finger piece 290 is a cam extension member 296 which has a lobe 294 on the end thereof. Lobe 294 is preferably provided with a convex cam surface 292 on the outermost end thereof adapted to engage the pointed end of rod 248 and hold contact element 272 out of engagement with contact plate 252 when finger piece 290 is disposed in its lowermost or "off" position.

Means for swingably mounting lever 242 within the chamber 226 of housing 212 may take the form of a pair of spaced recesses 286 and 288 adapted for receiving opposed segments of spherical portion 210. Movement of

lever **242** is restricted to up and down reciprocation, by virtue of the fact that slot **240** in bracket **230** is only of sufficient dimensions to clear finger piece **290**, and thereby lateral movement of such finger piece **290** is effectively precluded.

From the foregoing, it can be appreciated that there is now presented a wall-type switch assembly which may be constructed at a minimum of cost, of inexpensive materials, which may be cast or molded, such switching assembly being of long-lasting, trouble-free characteristics and not liable to break down under use. Relatively high currents may be passed through switching mechanism **44** without danger to either the operative parts thereof or the person manipulating lever **42**, inasmuch as all of the parts for attaching the mechanism to the supporting wall structure and the means for actuating the switching assembly are all constructed of non-conductive material such as nylon. Also, by virtue of the fact that cam surface **92** does not engage rod **48** when the lever **42** is in an "on" position, the spring **64** biases element **72** into contacting engagement with plate **52**, and thereby presents a firm electrical contact connecting conductor wire **78** to ground wire **100**.

Another feature is the fact that when lever **42** is swung from one end of its path of travel to another, the pointed cam follower end of rod **48** slides on cam surface **92** to thereby gradually move contact element **72** into and out of engagement with contact plate **52**, and thereby obviate any clicking noise or the like ordinarily associated with snap-action type of wall switches. In the instant wall switch assembly, making and breaking of the circuit upon actuation of lever **42** is fast, positive, and efficient.

Another important feature is the fact that wall switch assembly **10**, as herein presented, may be utilized in any position, whether vertical, horizontal, or otherwise, and is not dependent upon being disposed in an upright position as are some other types of noiseless switches, especially of the mercury type.

If desired, a protective member, in the nature of a nylon cup-shaped covers **112**, may be secured to the face **50** of wall **22** by suitable screws and disposed in enclosing relationship to switching mechanism **44**, to effectively insulate mechanism **44** from the surrounding environment. It is manifest that cover **112** serves the additional function of preventing entry of dust and dirt into mechanism **44**.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a noiseless wall switch assembly, in combination, a hollow main housing adapted for disposition on a supporting wall; an elongated, manually manipulable actuating member having a spherical intermediate portion and an extension adjacent one end thereof provided with an arcuate cam surface; means for swingably mounting the member on the housing with the extension disposed within the same; electrical switching mechanism carried by the housing, said mechanism including a pair of relatively shiftable contact elements provided with flat interengageable faces, reciprocable structure operably coupled to one of the elements and spring means carried by the housing and engaging the structure for biasing the latter in a direction normally moving said one element into contacting relationship with the other element, said structure being engageable with said arcuate cam surface upon swinging of the member to thereby reciprocate the structure, said one element being disposed to shift smoothly and substantially inaudibly into and out of engagement with the other element upon reciprocation of the structure as said other end thereof slides smoothly on said cam surface; and means for making an electrical connection to each of the elements respectively.

2. In a noiseless wall switch assembly as set forth in claim 1 wherein said housing has a pair of spaced recesses for receiving opposed segments of said spherical body whereby the body is pivotally secured within said housing.

3. In a noiseless wall switch assembly as set forth in claim 1 wherein said actuating member is of non-conductive, wear resistant, plastic material.

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