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3,211,872

DOOR JAMB SWITCH WITH INTEGRAL SPRING-CONTACT MEANS

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4 Sheets-Sheet 1

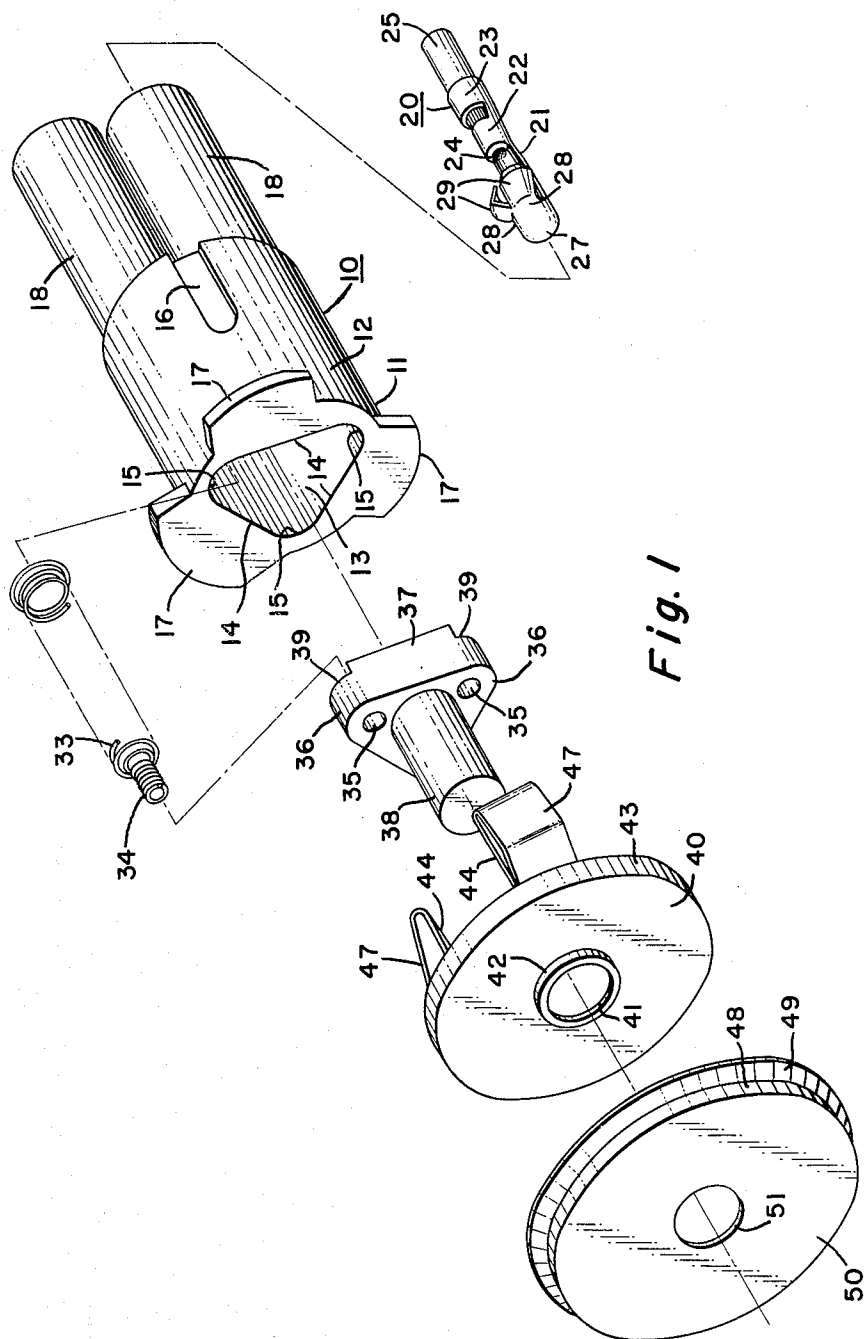


Fig. 1

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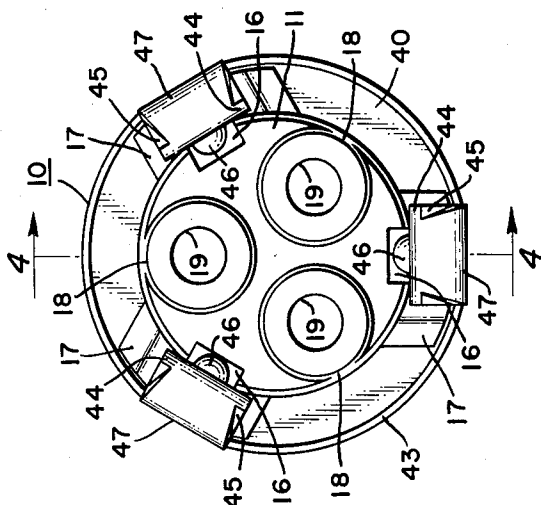


Fig. 3

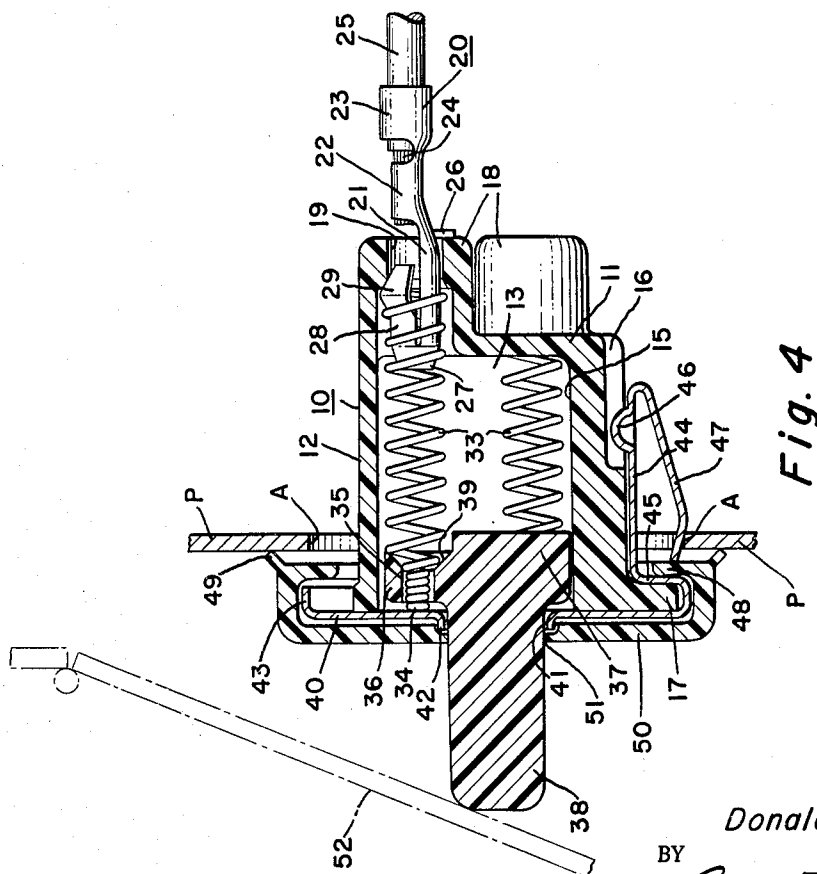


Fig. 4

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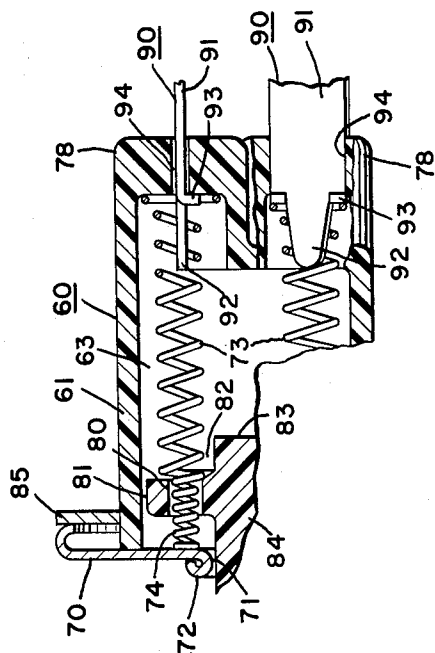


Fig. 6

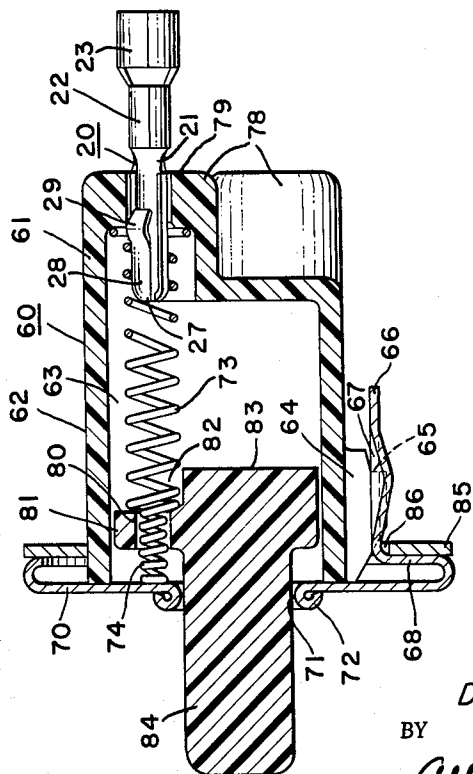


Fig. 5

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3,211,872 DOOR JAMB SWITCH WITH INTEGRAL SPRING-CONTACT MEANS

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2 Claims. (Cl. 200—159)

This invention relates to an electrical switching device, and, more particularly, to a unique assembly of a minimum number of parts affording multiple advantages herein disclosed.

An object of this invention is to provide a new and improved switch means having fewer parts for greater reliability yet having a sealed assembly that permits a reciprocable plunger-actuator means to operate freely in various climates, that avoids corrosion of grounding contacts yet having good grounding provision, and that seats properly for operating purposes on a door jamb of a vehicle, appliance and the like.

Another object of this invention is to provide a door jamb switch assembly including a main body portion of insulating material having integral axially extending passage-forming means sealingly engaged internally by multiple insulating material directly on wire terminating contacts which electrically engage spring means that terminate in a reduced taper ending projecting through an enlarged end of a reciprocable plunger movable centrally through a metal cap-like face plate portion selectively engageable by the taper ending of spring means internally as shielded and sealed both by the main body portion as well as by a resilient boot centrally apertured for the plunger.

Another object of this invention is to provide a door jamb switch means including an annular metal face plate portion having plural resilient J-shaped legs extending substantially axially thereof, and each including a dimple or bump for external bayonet fit to an inwardly recessed main body portion in which spring means are positioned to have tapered ending thereof extend through an enlarged plunger and end reciprocable within the main body portion sealingly engaged by multiple insulating material carried by wire terminating contacts fitted thereto for engagement also by the spring means having selective electrical engagement with the metal face plate portion covered by a sealing boot means on a side thereof opposite to that engaged by the main body portion.

A further object of this invention is to provide a door jamb switch assembly including an externally annular main body portion having three inward recesses externally coinciding in location with internal flat sides of a triangular inner cavity with substantially rounded corners each of which extends axially to corresponding triple passages formed integral therewith to receive in sealing engagement multiple insulating material carried by wire terminating contacts fitted thereto at least one spring means having a tapered ending extending axially into the triangular cavity and engaged by a corner of a mating triangular enlarged ending of a plunger portion reciprocable therewith as supported axially by a metal face plate portion that has three legs, each with a dimple or bump extending inwardly for locking into engagement with corresponding body portion recesses.

Another object of this invention is to provide a five-part door jamb switch means including an annular metal face plate portion having triple resilient J-shaped integral legs axially thereof each with an inward bump for external engagement with corresponding triple external recessing of a main body portion of insulating material having a hollow triangular interior which complements a triangular enlarged end of a plunger reciprocally supported

therewith by the metal face plate portion fitted with an elastomer boot on a side opposite to that engaged by the main body portion, coil spring means having one end tapered down to fit axially through cornering of the triangular enlarged end of the plunger which shifts the tapered free end of spring means into and out of make-break internal grounding engagement with the metal face plate portion while an opposite end of spring means fits axially into passage-forming means integral with the main body portion and sealingly engaged by movable elastomeric material carried on wire terminating contacts therewith resiliently engaged by the spring means while triangular cooperation of the enlarged plunger end and main body portion hollow interior prevent rotative movement yet permit linear reciprocation of parts.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIGURE 1 is an exploded perspective view of parts for a switch assembly having features in accordance with the present invention.

FIGURE 2 is a partially sectioned perspective assembly view of the parts of FIGURE 1.

FIGURE 3 is an end view taken in the direction of arrow 3 in FIGURE 2.

FIGURE 4 is a cross-sectional view taken along line 4—4 in FIGURE 3.

FIGURE 5 is a cross-sectional similar to that of FIGURE 4 for a switch means having modified structure therewith.

FIGURE 6 is a fragmentary cross-sectional view representing further change in structure from that of FIGURES 4 and 5.

Manufacturers of electrical switching devices for use on vehicles and the like are continually seeking to improve their products for greater reliability though providing fewer parts. So called door jamb switches used on vehicles in recent years can now be interchanged and replaced by a newly developed jamb switch means having features in accordance with the present invention. Such so called door jamb switches include a reciprocable plunger mean carried by a housing adapted to be mounted in a door or panel area such that a make or break electrical grounding circuit is established, for example, to energize interior or door entry courtesy lights upon opening and/or closing of vehicle doors or panels. In view of exposure to varying weather conditions, problems have been previously encountered due to corrosion of grounding contacts, poor electrical grounding connection between a vehicle frame or door jamb and switch structure as well as sealing means which prevent proper switch mounting and positioning or seals on switches which hinder three plunger operation in various climates. Door jamb switch means in accordance with the present invention include features to overcome such problems and to increase reliability though requiring only a minimum number of components or parts.

In FIGURES 1, 2 and 3 and 4 of the drawings there can be seen structure of a door jamb switching means indicated by numeral 10, generally, and having assembly features in accordance with the present invention. This switching means 10 includes a main body portion of moldable insulating material 11 having a substantially annular or cylindrical outer periphery 12 and a substantially triangular or three-sided hollow interior or cavity 13. This triangular interior or hollow cavity 13 includes flat sides 14 joined by substantially rounded corners 15 as can be best seen in the view of FIGURE 1. Also it is to be noted from this view of FIGURE 1, that the formation of the

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flat sides 14 in combination with the annular or substantially cylindrical outer surfacing 12 provides three locations in which wall thickness is greater for accommodating inward recessing 16 complementary thereto in each of the three-sided locations. This recessing 16 extends longitudinally along the main body portion 11 from an end thereof located a predetermined distance away from, though substantially in alignment with, triple outwardly extending flange means or ears 17 as can be best seen in the view of FIGURE 1. These flange means or ears 17 can also be seen in views of FIGURES 3 and 4.

Extending integrally and axially from the main body portion 11 there are passage-forming means or extensions 18 of which inner periphery coincides substantially with rounded corners 15 as a continuation thereof except for an annular inwardly extending integral abutment or shoulder 19 through which there is a restricted axial aperture or opening.

A wire terminating contact means generally indicated by numeral 20 as shown in views of FIGURES 1, 2 and 4 can be fitted to the passage forming means and/or extensions as represented in view of FIGURES 1-2 and 3-4 respectively. The extensions 18 as shown in the perspective views of FIGURES 1 and 2 are slightly longer than shown in a minor modification thereof in views of FIGURES 3 and 4. Thus the terminal means per se as indicated by numeral 20 can include a longitudinally extending main body portion 21 joining a conductor crimping end thereof having wings 22 and 23 adapted to be bent around wiring 24 having insulation 25 respectively engaged thereby. The terminal means further includes a downwardly bent projection, tab or lug 26 adapted to engage one side of the shoulder or abutment 19 as can be seen in views of FIGURES 2 and 4. The terminal means 20 shown in FIGURES 1, 2 and 4 also include a bullet-like nose or male end 27 rounded or tapered inwardly and having rearwardly extending projections 28 in pairs each with a detent or V-shaped anchoring portion 29 integral therewith and adapted to engage a tapered or rounded covering of the annular shoulder or abutment 19 on a side opposite to that engaged by the tab or lug 26 as can be best seen in views of FIGURES 2 and 4. Thus the terminal means 20 can be fitted and locked into position with the structure thereof in snug engagement with opposite sides of the annular shoulder or abutment 19. The size or diameter of the body portion 21 as well as the integral extensions 28 of the bullet-like nose portion 27 can be such that this tong or male-type terminal means can be fitted axially through the passage forming means 18 including the restrictive aperture provided by an inner periphery of the abutment or shoulder portion 19. It is to be understood that a terminal means such as 20 can be provided for one or more of the passage forming means 18. In the event only one such terminal means 20 is provided there can be resilient plugs or closures provided to seal off access to the passage forming means. These closures can be resilient or elastomeric cap means that can be press fitted either to an interior or outer surfacing of the passage forming means 18 subject to removal thereof for addition of terminal means in the second and third axial locations if desired. Thus, one or more line connections established by wiring such as 24 can be grounded and/or a pair or more of wires can be interconnected dependent upon the type of insulation and mounting panel used with an aperture or opening therein. If an insulation type material is used for the mounting panel, it is possible for the switching device 10 to establish a shielded switching interconnection between such conductors though preferably the switching device 10 is mounted as to a metal mounting panel having an aperture of such a panel indicated in FIGURE 4.

In a lower portion of FIGURE 2 there is illustrated an additional feature which can be provided as a cavity seal means generally indicated by numeral 30 in FIGURE 2 including an annular elastomeric body portion 31

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5 moldable directly over the crimping wings 22-23 as well as wiring 24 and insulation 25 subject to provision of outwardly extending annular sealing rings 32 engageable with an inner periphery of surfacing of the extension or longer passage forming means 18 illustrated in the views of FIGURES 1 and 2. The molded insulating material 31 at remote ends thereof can have a slightly tapered configuration and the sealing rings 32 can have a larger diameter than the inner periphery of the extensions of the passage forming means such that a press fit therebetween will provide a seal against entry of moisture as well as other foreign material including dust, dirt, and the like. Similar sealing rings could be provided on a soild internally usable plug for these passage forming means in the event no terminal means is fitted thereto for a particular installation.

Spring means 33 with a reduced diameter or tapered ending or projection end 34 can be made of a suitably coiled spring wire for assembly within the switch means in accordance with the present invention. This spring means 33 can be seen in views of FIGURES 1, 2 and 4. The end of the spring means 33 in a location remote from the tapered ending 34 thereof can be press fitted onto the outwardly tapered nose portion 27 and extensions 29 thereof as shown in views of FIGURES 2 and 4. Thus, the V-shaped anchoring portion 28 serves not only as a stop engageable with one side of the annular shoulder or abutment 19 but also as a stop for an end of the spring means 33.

30 The reduced diameter or tapered ending 34 of the spring means is adapted to fit axially through passages 35 provided in rounded corners 36 of a substantially triangular or three-sided enlargement 37 of a slideable plunger or actuator means 38. A conical recessing 39 can be provided for each of the rounded corners 36 adjacent to one end thereof thereby adapted to complement and receive the tapered ending and extension 34 of reduced diameter of the spring means 33 as can be best seen in views of FIGURES 2 and 4. These two views also show clearly that the reduced diameter ending 34 of the spring means 33 projects beyond the enlarged triangular portions 37 of the actuator or plunger 38 for at least one convolution or turn of the spring wire of the spring means.

45 The reduced diameter or tapered ending 34 of the spring means 33 can establish electrical grounding connection or electrical engagement against an inner surface of an annular metal face plate portion 40 having a passage 41 therethrough defined by an integral annular flange portion 42. Inner surfacing of this flange portion 42 is located slightly outwardly from the outer surfacing of the actuator or plunger means 38 through the inner surfacing of the flange portion 42 should be smooth as a possible bearing surface for the actuator or plunger means 38. The spring means 33 must be compressed during assembly of the face plate portion 40 to the main body portion 11 of the switch means 10 and the triangular enlargement 37 must be fitted complementary to the triangular cavity or hollow interior 13 of the main body portion for telescopic fitting of parts to each other during assembly thereof. The face plate portion 40 also includes an outer annular flange portion 43 with plural or triple legs or J-shaped integral projections 44 joined thereto by a radial segment 45. Each of the legs includes a radially inwardly extending dimple or bump 46 adapted to be fitted in locking engagement with the recessing 16 as can be seen in views of FIGURES 3 and 4. Each of the legs has an outwardly and rearwardly bent V-shaped ending 47 which peripherally engages panel P along aperturing A thereof and which also can hold a radially inwardly extending annular wall 48 of insulating material against segments 45. This annular wall 48 is located radially inwardly from a sealing lip 49 extending angularly therefrom into engagement with surfacing on one side of a panel as indicated in FIGURE 4. The wall

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48 and sealing lip 49 are carried by a cup-like sealing boot means 50 centrally apertured to include a snug sealing fit along an inner periphery 51 thereof as a bearing surface for the actuator or plunger means 38 reciprocable in a to and fro movement relative thereto. Such reciprocable movement can result from engagement of a pivotally mounted door or panel 52 indicated in FIGURE 4.

It is to be noted that during assembly of the face plate portion 40 it is necessary to fit flange means 17 of the main body portion 11 into locations intermediate the segments 45 while the legs 44 are deflected slightly outwardly subject to a bayonet-like turning and twisting as well as axially telescoping of parts subject to interlock of the dimples or bumps 46 into recessing 16. Thus, once assembled, the flange means 17 become firmly anchored and positioned between one side of the face plate portion 40 and the segments 45 alignable therewith as represented in views of FIGURES 3 and 4. For disassembly of the parts it is necessary again to turn or twist the body portion as to the face plate portion subject to disengagement of the dimples or bumps 46 from the recessing 16 followed by axial removal of the parts from each other. During operation and assembled relationship of the parts it is apparent that to and fro linear movement of the actuator or plunger means 38 can effect disengagement of the reduced diameter or tapered ends 34 of the coil spring means 33 such that metal to metal contact is broken whenever a door 52 is closed relative to a panel or door jamb on a vehicle for example. Sealing engagement of the inner periphery 51 of the boot means 50 as well as engagement of the sealing rings 32 can assure closure of the cavity 13 against entry of moisture and foreign material thus obviating any possible corrosion of the contacting surfaces of the end of the spring means and one side of the face plate portion 40. Also the engagement of the spring means 33 onto the tapered nose 27-28 of the prong or male-type terminal means 20 is maintained with axial alignment of the passages 35 of the enlarged ending 37 of the actuator 38 reciprocable as to the triangular cavity or hollow interior 13 of the main body portion 11 of the switch means.

FIGURE 5 shows in cross section similar to that of FIGURE 4 another structure of a door jamb switch means generally indicated by numeral 60 including a main body portion 61 of insulating material also having a rounded outer periphery 62 and a substantially triangular interior or cavity 63. However, the main body portion 61 is modified slightly to have outwardly extending abutments 64 including a shoulder 65 engageable by leg means 66 which can have a recess 67 thereof cooperable with the abutment or shoulder 65. The leg means are integral at one end thereof with a segment 68 of a face plate portion 70 having a passage 71 formed by a curled flange portion 72 formed integrally therewith. This curved or curled flange portion 72 can optionally be supplemented as a bearing surface by a boot means similar to that indicated by numeral 50 in FIGURES 1, 2 and 3 of the drawings. In any event, a coil spring means 73 having a reduced diameter or tapered end 74 integral therewith can be provided for make and break electrical grounding contact against one side of the face plate portion 70. An opposite side or end of the spring means can be fitted to terminal means 20 having features described earlier. Such terminal means 20 can be fitted to a passage forming means or extension 78 with an inward annular shoulder or abutment 79 integral with the main body portion 61. The reduced diameter ending 74 of the spring means 73 can be fitted through passages 80 of corners 81 adjacent to recessing 82 of an enlarged end portion 83 of a reciprocable plunger or actuator 84. The enlarged portion 83 of the plunger or actuator 84 can have a substantially triangular shape to complement the corresponding triangular shape of the cavity 63 in a manner similar to that previously described for the switch means illustrated by

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views of FIGURES 1 through 4 inclusive. A mounting panel 85 with an aperture 86 therethrough as indicated in FIGURE 5 can be provided for the switch assembly 60.

In a fragmentary view of FIGURE 6 there is a sectional showing of the switch means 60 to which a differing male-blade terminal means 90 is fitted. This male-blade terminal means 90 includes a main body portion 91 formed as a flat rectangular metal member with a tapered tongue or extension 92 integral therewith in a location intermediate positioning tabs or projections 93. The tongue or tapered end 92 of the terminal means 90 can be engaged by an outwardly tapered ending of the coil spring means 73 in a manner similar to engagement of terminal means 20 by similar spring means. The male-blade terminal means 90 can be suitably connected to any conductor means and can be fitted through a flat slot 94 in an insulating body of a switch means.

Basically the switch means in accordance with the present invention requires the minimum number of parts subject to addition of a wiring connection contact or terminal means 20 or 90 thereto. Thus the switch means includes the main insulating body portion, spring means, plunger or actuator, face plate portion and boot means as can be best seen in the exploded view of FIGURE 1. Only five components or basic parts are required for the switch assembly plus the terminal means. The grounding circuit or electrical interconnection is made or broken by moving the plunger or actuator means in and out. The coil spring means can be provided with differing diameter portions with the smaller diameter being inserted through a hole in a base or enlarged ending of the plunger such that this smaller diameter extension of the spring means extends beyond the face of the plunger base. The larger end diameter of the spring means rests in a recess or passage forming portion adjacent to one end of the main insulating body portion of the switch means. Electrical circuitry is closed when the smaller end of the spring means rest against an inside surface of the face plate portion. The terminal means such as 20 and 90 can be inserted through a passage in the main body portion and can be held in place by friction and/or by locking tabs cooperating as to the main body portion and passage or cavity therein. Sealing rings such as 32 as well as the boot means 50 can be provided and the sealing rings 32 if used aid in holding the terminal means in place. The nose portion 27 or tapered ending 92 of terminal means can extend into the internal periphery of an ending of the coil spring means thereby completing the electrical circuitry. Coil spring means have been found to be able to carry current in a range up to 2 or 3 amps at a voltage up to 15 volts D.C. thus usable on vehicles equipped with batteries or sources of power of such values. It has also been found that metal for coil spring means can be used to carry current at low amperages for a long period of time for this type of application.

It is noted that when a plunger or actuator is depressed, the smaller end of the coil spring means is pushed or pulled away from the inner surface of the face plate portion thereby breaking the electrical circuit connection. In the embodiment of the view of FIGURES 1 through 4 the switch body and face plate portion are held together by a twisting bayonet-type interaction as well as an interlock of the legs of the face plate as to recessing or abutments of the main body portion. Dimples or bumps such as 46 can be added to enhance interlock of the face plate and body portion thereby preventing untwisting and disassembly. The boot means can be made of a polyvinyl chloride insulating material which is snapped over the face plate to seal the front of the switch assembly once the face plate and body portion have been assembled to each other.

Advantages of the switch means including assembled structure in accordance with the present invention include provision of fewer parts and increased reliability of the

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switch means. The switch means can be sealed at both front and rear ends thereof. The switch means is capable of carrying 1, 2 or 3 grounding circuits isolated from each other in closed positioning. The coil spring means found to be highly reliable when working within their stress limits form an important part of the switch means for both maintaining resilient interfit of components and carrying current when interconnecting the face plate portion and terminal means. Costly metals are avoided for any of the components particularly since there is external shielding of the cooperating electrical contact portions against entry of moisture and foreign material such as dust and dirt. Also it is to be noted that the switch means will work properly with 1, 2 or 3 coil spring means. The telescopic mating interfit of the triangular base or enlarged ending of the plunger and corresponding interior or cavity of the main body portion assure such proper switch operation. Provision of three corresponding legs on the face plate portion further insures good retention of the switch components as to a mounting panel aperture and a positive contact is provided by the legs of the face plate portion against the mounting panel.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A door jamb switch assembly, comprising, an externally annular main body portion having three external recesses coinciding in location with flat sides of a triangular inner cavity having substantially rounded corners each of which extends axially to corresponding triple passage-forming means integral therewith, wire terminating contact means fitted axially through the passage means, an enlarged insulating material provided adjacent to said contact means in a location axially remote from said cavity and fitted snugly into sealing engagement peripherally inside the passage means, at least one spring means having a tapered ending extending into the cavity from engagement with said contact means, a plunger portion

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including an enlarged triangular base integral therewith and complementary to the triangular cavity of said main body portion as well as recessed in corners thereof to admit said tapered ending of said spring means, and a metal face plate portion having a central passage to complement said plunger portion and having mounting legs each with a bump-like dimple extending inwardly for locking into engagement with corresponding body portion external recesses, said tapered ending of said spring means being shiftable into and out of engagement with said face plate portion due to linear reciprocating movement of said plunger portion.

2. Switching means requiring only a combining of five parts and male terminal means fitted thereto, comprising, an annular metal face plate portion having triple resilient J-shaped integral legs axially thereof with an inward bump, a main body portion of insulating material having triple external recessing corresponding to said bumps of said legs that interlock therewith, said main body portion having a triangular interior cavity with flat sides corresponding with location of said recessing, a plunger of insulating material including a triangular enlarged base thereof to complement the triangular interior cavity that permits reciprocable movement of said plunger centrally of said face plate portion, a cap-like sealing boot of resilient insulating material fitted around said face plate portion, and coil spring means having one end engaging the terminal means directly and an opposite end thereof tapered down to fit axially through cornering of the triangular enlarged base of said plunger.

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