July 12, 1960 L. LUDWIG 2,945,098

ELECTRICAL DEVICES

Filed June 15, 1959

Fig. 1.

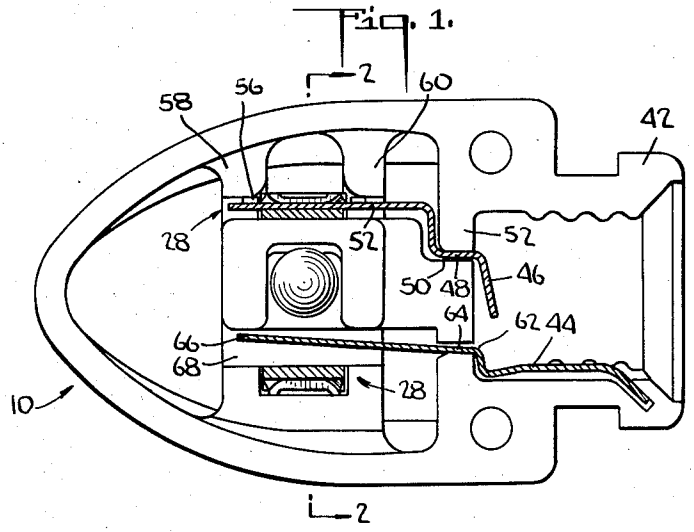


Fig. 2.

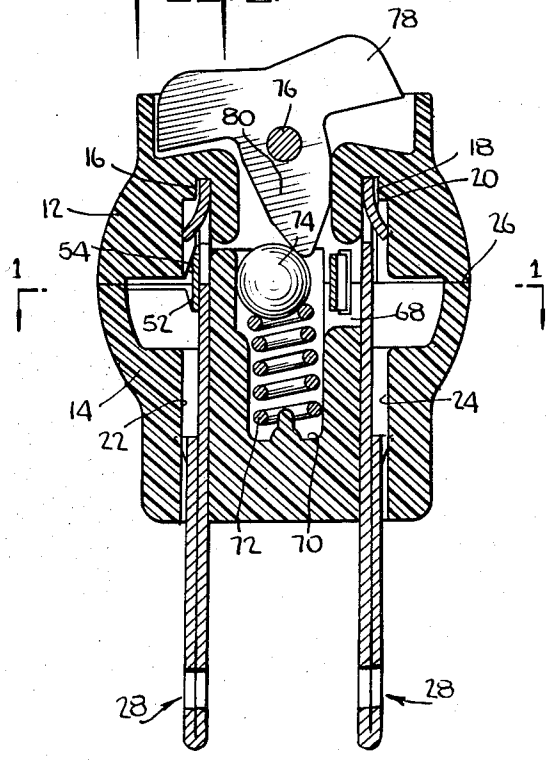
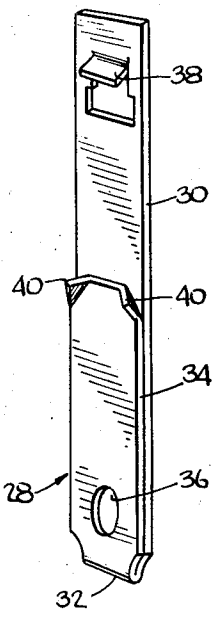


Fig. 3.



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ELECTRICAL DEVICES

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2 Claims. (Cl. 200—51)

This invention relates to electrical devices.

It is an object of my invention to provide an electrical device having a novel means for rapidly securing plural parts of a casing to one another in a simple manner which lends itself to high speed automated assembly.

It is another object of my invention to provide an electrical device wherein the securing means, when once operative, absolutely prevents any subsequent shifting of the casing parts with respect to one another or the contact elements.

It is another object of my invention to provide an electrical device wherein a connecting means is included which is so arranged that the parts of the casing cooperate with one another to permanently lock themselves together.

It is another object of my invention to provide an electrical device wherein the connecting means constitutes an extremely simple, single inexpensive part that is foolproof and rugged in operation.

It is another object of my invention to provide a combined switch and contact element which cooperate in a unique and highly desirable manner that assures positive, efficient and reliable operation.

Other objects of my invention in part will be obvious and in part will be pointed out hereinafter.

My invention accordingly consists in the features of construction, combinations of elements and arrangements of parts which will be exemplified in the device hereinafter illustrated and described and of which the scope of application will be indicated in the appended claims.

In the accompanying drawings in which is shown one of the various possible embodiments of my invention,

Fig. 1 is a central sectional view through a night light incorporating my invention, the same being taken substantially along the line 1—1 of Fig. 2;

Fig. 2 is a sectional view taken substantially along the line 2—2 of Fig. 1; and

Fig. 3 is a perspective view of the unitary combined connecting and contact element utilized in accordance with my invention.

Referring now in detail to the drawings, the reference numeral 10 denotes a night light which incorporates the basic principle of the present invention and typifies an electric device which embodies all the features thereof.

The night light 10 includes a casing which, pursuant to the instant invention, is formed of two sections 12, 14. As illustrated, the two sections are not mirror images of one another and in general the particular contour of the individual sections of the casing is of no importance except that they must mate to define a casing; that is to say, they must, when brought into abutment, cooperate to provide a housing. For this purpose, the two sections are hollow with an open side, i.e. depressed, the two open sides being adapted to be brought together to form a hollow housing. Pursuant to standard practice, the two individual sections are made from an electrically nonconductive material which is unaffected by elevated temperatures, e.g., temperatures up to 300° F., typical materials being hard rubber, or, preferably, a thermosetting plastic as, for example, a phenol formaldehyde condensation resin.

The specific exterior and interior configurations of the two sections and of the resulting casing will depend upon the functional use of the electrical device, and, as an example, the specific shape of the night light 10 will be described in detail hereinafter. However, pursuant to the principal aspect of the instant invention, the internal configurations of said sections include at least one pair, and desirably at least two pairs, of associated, preferably registered, bores, i.e., wells. That is to say, at least one well, and preferably two wells are provided in one section, and at least one well, and preferably two wells are provided in the other section, the wells of each pair (one well in each section) preferably being in linear registration. Moreover, the wells in each section have one open end facing toward the other section, the lengths of the wells in both sections preferably being perpendicular to the abutment plane between the two sections. The wells may be blind or may have both ends open as soon will be appreciated.

Specifically, the casing half 12 includes the blind wells 16, 18 which are molded into the interior thereof. Each said well is of uniform, transversely elongated cross-section except near its blind end where it is of reduced size. The wells 16, 18 are mirror images of one another in that the aforesaid reduction in cross-section is oppositely arranged as can best be seen in Fig. 2. The cross-sectional contour of the wells is approximately oblong with two corners of one long side blocked off. A well 16, 18 alternatively might be described as constituting a first portion which is of uniform oblong cross-section from the open end to the blind end and a second contiguous smaller portion which is of uniform cross-section and extends from the open end almost all the way to the blind end, terminating at a shoulder 20. The second portion is narrower than the first portion and is arranged symmetrically with respect to the longitudinal axis of the first portion.

The other casing section 14, likewise is provided with two wells, these being denoted by the reference numerals 22, 24. The latter wells have both ends open, unlike the blind wells 16, 18. Moreover, the latter wells are of uniform cross-section from end to end. The outer ends of the wells 22, 24 are on the outside of the casing for the night light. The inner ends of the wells 22, 24 terminate within the hollow interior of the casing. It will be observed that the two halves abut one another at a plane zone 26. The longitudinal axes of all the wells 16, 18, 22, 24 are perpendicular to this plane zone. Moreover, each well of each casing section is in registry with its associated well in the other casing section, i.e., the well 16 is in registry with the well 22 and the well 18 is in registry with the well 24 when the casing sections are properly assembled.

The night light further includes unitary contact and connecting elements; that is to say elements which in the preferred form of my invention perform dual functions. Considered from the point of view of novelty, the primary function of the two elements is to connect the two halves of the casing and their secondary function is to act as electrical contacts.

Considered operationally, each of the aforesaid elements includes two uni-directional locking members. That is to say, two members each of which can move in one direction relative to third or fourth members but which will automatically lock against relative movement in an opposite direction. The uni-directional movements of the two members of each element are oppositely acting, i.e. one member can move relative to a third member in one direction but will lock against relative move-

ment in the other direction, and the other member can move relative to a fourth member in said other direction but will lock against relative movement in said one direction. Moreover, each element includes structural means permanently interconnecting the first two members in such a manner that permissible movement of the third and fourth members relative to the first two members is toward the area between said first two members, while the third and fourth members are locked against relative movement outwardly away from the area between the first two members.

More specifically each unitary contact and connecting element is indicated by the reference numeral **28**. Since the elements are alike, only one will be described. It is also worthwhile to note that, although I have shown and now will describe male contact elements, my invention is equally applicable to contact elements of the female type. Said contact element **28** is fabricated from any of the usual materials, e.g. resilient electrically conductive strip stock, such for instance as resilient brass or phosphor bronze. Great resilience is not required; indeed the normal resilience of ordinary brass rather stiff sheet stock will serve my purpose. The element **28** has a straight flat body **30**, connected at the male prong end thereof by an abrupt retroverted bend **32** to a return leg **34** which lies flat against the body and extends back about half the length of the body to form the male prong. The provision of such a body and leg is entirely conventional in the electric fixture field. Also conventional is the presence of the registered pair of openings **36** near the tip of the prong.

The principal novelty of my invention lies in the provision on said contact element of the two uni-directional locking members to which reference was made above. The first of these members comprises a tang **38** carried by the body at the end remote from the bend **32**. The tang is formed from, e.g. struck from, the material of the body, thereby consisting of a tab, the tip and sides of which are free of the body, and the base of which is in one piece with the body. The tang protrudes from the body in roughly a longitudinal direction. More particularly, the tang is inclined in order to achieve my invention, the inclination being toward the opposite end of the body, that is to say, where the bend **32** is located. The angle of inclination between the tang and the body is not critical, providing that it is less than 90 degrees.

It is to be observed that the width of the body **30** is interrelated with the width of the first portion of the wells **16, 18**, the dimensions of these two components being such that the body is a free-sliding fit in said first portion. The tang is dimensionally interrlated with the second portion of each of the wells **16, 18**, the width of the tang being just slightly less than the width of said second portion so that considered only widthwise each tang has a free-sliding fit in the associated second portion of the well.

However, the perpendicular distance the tang protrudes from the body does not match in the foregoing fashion the corresponding dimension of the associated well, in that the tang projects (when unstressed) from the body a distance greater than the corresponding dimension of the second portion of the associated well. Accordingly, when during assembly of a night light the body of the element **30** is thrust into a well **16, 18**, the tang will not be freely received in said well, but will be flexed toward the body as it enters the well, the flexing being away from the direction of movement of the body, and will drag against the associated side of the well as it is pushed deeper into the well. Due to the inclination of the tang in a direction having a component opposite to the direction of bodily movement experienced by the tang upon entering the well, the tang can be forced into the well. However, when it is attempted to move the body **30** in the opposite (retrograde or outward) direction with respect to the well, the tip of the tang will bite into the well and prevent such movement. Using the earlier terms of reference, the tang **38** constitutes one uni-directional locking member which can experience free movement into the well, but automatically locks to prevent reverse movement; or considered from an opposite point of view, the casing can move to receive the tang **38** and body **30** but cannot thereafter be moved away therefrom.

The second uni-directional locking member constitutes a pair of corner tangs **40** formed by bending out the free corners of the leg **34**. These corners are bent to be angularly inclined to the plane of the leg **34** and therefore of the body **30**. The direction of orientation is such the corners are inclined toward the tang **38**. The distance that the tips of the tangs **40** perpendicularly project from the leg **34** and body **30** is such that, when the male prong is introduced in either well **22, 24** with the bend **32** foremost, there is insufficient space to accommodate the tangs so that as the tangs **40** enter one of the wells **22, 24** they will be bent and their tips will drag against the associated wall of the well, permitting the tangs to move in that direction. But as soon as it is attempted to withdraw the contact element **28** the tips of the tangs will bite into and engage said wall of the well to prevent such retrograde movement.

It will be observed that the tangs **40** are inclined oppositely to the tang **38** so that the direction of free movement of the wells in the two casing sections with respect to all of said tangs is inwardly toward one another, and the direction in which the wells are locked against movement is outwardly apart from one another. It should be mentioned that the described flexions of the tang **38** and the tangs **40** may be very slight, indeed unnoticeable to the human eye. Only a tiny amount of bending is required to store up enough energy to cause the tangs to bear against the associated walls of the well so as to bite into and brake against them when it is attempted to move the wells outwardly away from one another.

It will be seen that if, as is indicated, the element **28** is coupled to the casing half **14** by introduction of the bend **32** into a well from the inside of said half, said bend will protrude from the casing half when the tangs **40** are disposed in the well whereby the exposed tip and following part of the element **28** may function as male contact element. It also will be obvious that the element **28** will work equally well as a unitary coupling and contact element if it were shaped as a conventional female contact provided, of course, that it included oppositely inclined tangs leaning toward one another and adapted to engage opposed casing sections.

To assemble the casing for the night light **10**, the interior ends of the two contact elements **28** bearing the tangs **38** are introduced into the wells **16, 18** far enough for the tangs **38** to bear against the second portions of said wells. The male prongs of the elements are introduced into the wells **22, 24** far enough for the tangs **40** to bear against the associated walls of said wells. At this time, the two halves of the casing still may be spaced apart. Now the two halves are brought into contact at the plane zone **26**. In so doing, one of both of the sections **12, 14** will move relative to the elements **28**. This operation preferably is performed with the aid of a jig, or automatically, so that the distances the two male prongs of the contact elements project from the casing half **14** will be controlled to a common desired predetermined length. In the preferred form of my invention, the interior ends of the elements **28** will, at this time, be adjacent the blind ends of the wells **16, 18**.

It will be appreciated from a study of the foregoing construction that when the two halves of the casing are abutted against one another, the contact elements are locked against relative movement, longitudinal movement in one direction being barred by the tang **38** and in the opposite direction by the tangs **40**. Neither casing half is able to move relative to the contact elements. For example, the casing half **12** is unable to move retro-

gradely with respect to the contact elements because of the tangs 38. It is unable to move further onto the contacts 28 because to do so would require retrograde movement of the casing half 14 which movement is barred by the tangs 40. The same considerations prevent movement of the casing half 14 with respect to the contacts. Thereby, with an extremely simple construction, not requiring threading, auxiliary connectors or riveting, I have arranged to secure two casing halves to one another permanently with a mere thrusting action. By utilizing the contacts to couple the casing sections I am, moreover, able to eliminate an extra operation and an extra part.

Although the casing coupling arrangement above described is designed to be employed in an electrical device having contacts, and although such arrangement even is capable of use where the coupling elements do not function as contacts, I have shown said combined coupling and contact elements herein in connection with a specific electric device, to wit, a particular night light in which the elements assume a third function which will become apparent as this description proceeds.

To utilize the casing for a night light, I provide in each casing half 12, 14 a branch 42. The two branches cooperate to form an internally threaded husk, as is conventional, which is adapted to receive the threaded ferrule on the stem of a small standard electric light bulb (not shown). I also include in the night light the usual side and center contact strips 44, 46 which respectively are adapted to engage the ferrule and center tip of said stem.

The center contact strip 46 has an intermediate portion 48 which is snugly received in a channel 50 formed in a partition wall 52 in each of the casing sections 12, 14. The center strip 46 also has a portion 52 which lies athwart one of the contacts 28 (the left-hand contact as viewed in Fig. 2), being held in position against the contact by engagement with a sloped side wall 54 in each of two channels 56 formed in transverse partitions 58, 60 in each of the two casing sections. The strip 46 can simply be placed in the channels 48, 56 prior to assembly and it will be clamped in place upon the juxtaposition of the casing sections.

The side contact strip 44 has an intermediate portion 62 which is received in a channel 64 in the partition wall 52 of each of the two casing sections. The interior end 66 of the strip 44, i.e. the end remote from the husk, is so shaped that when in idle position it is remote from the other contact 28 (the right-hand contact as viewed in Fig. 2), said end 66 located in a chamber 68 provided in the hollow interior of the casing so that it can be flexed into engagement with and away from said other contact 28. It will be quite apparent that when the end 66 is spaced from the contact 28 the light bulb in the husk will be deenergized, and when the end 66 touches the contact the bulb will be energized.

Suitable means is included to flex said end 66 in the manner just described. Said means conveniently may be of the type illustrated in my U.S. Letters Patent No. 2,743,330, for Silent Switch Structure, issued April 24, 1956. More particularly, I form a bore 70 in the casing section 14 between and parallel to the wells 22, 24, said bore having a closed bottom end and opening into the interior of the casing. A helical compression spring 72 has one end seated against the closed end of the bore and a ball 74 rests atop the other end of the spring. The bore is of sufficiently large diameter to permit the spring and the ball to sway therein and, as shown in Fig. 1, at least the upper end of the bore where the ball 74 is disposed is elongated transversely to the side contact strip 44 so as to allow the ball to be shifted in a direction perpendicular to said strip.

The switch structure further includes a shaft 76 perpendicular to the path of travel of the ball, said shaft being carried in the upper casing section 12. Pivoted on the shaft 76 is a lever 78 adapted to be operated by hand and having a nose 80 which bears against the ball. By oscillating the lever, the nose may be arranged to bear at will against either side of the ball. When the nose bears against the side shown in Fig. 2, it forces the ball away from the end 66 of the strip 44 which thereupon assumes its idle position in which it is spaced from the contact 28. If now the lever 78 is rocked to its either extreme position to bear against the opposite side of the ball 74, said ball will force the end 66 of the side contact strip against the contact 28 to close the energizing circuit for the bulb.

It now will be appreciated that the third function of the contact is as the stationary element of a switch.

It will be appreciated that by virtue of the foregoing construction I have provided an electrical device which is able, with very few parts, to provide contacts for circuits and electrical parts permanently interconnecting several casing parts and perform the functions of a simple switch.

It thus will be seen that I have provided an electrical device which achieves the several objects of my invention and is well adapted to meet the conditions of practical use.

As various possible embodiments of my invention might be made and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein described or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. An electrical device comprising a hollow casing, including two sections abutted against one another and having wells, said wells facing the zone of abutment, at least one electrical contact having at least a portion thereof located within said casing and including resilient protuberances inclined toward one another and integral with said contact, one of said protuberances being uni-directionally frictionally received in the well of one section and the other protuberance being uni-directionally frictionally received in the well of the other section, whereby said protuberances lockingly engage both said sections and retain them in abutment with one another.

2. An electrical device comprising a hollow casing including two sections abutted against one another and having wells, said wells facing the zone of abutment, at least one electrical contact having at least a portion thereof located within said casing and including resilient tangs inclined toward one another and integral with said contact, one said tang being uni-directionally frictionally received in the well of one section and the other tang being uni-directionally frictionally received in the well of the other section, whereby said tangs lockingly engage both said sections and retain them in abutment with one another.

References Cited in the file of this patent

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