Oct. 6, 1970 W. C. SCHUMACHER 3,532,846

COMBINED PUSH-IN AND SCREW TERMINAL CONTACT

Filed Jan. 17, 1969 2 Sheets-Sheet 1

Fig. 1.

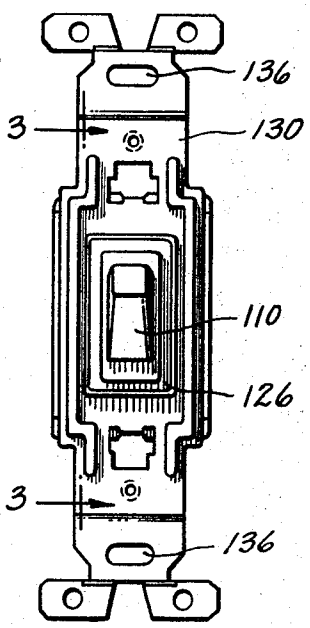


Fig. 2.

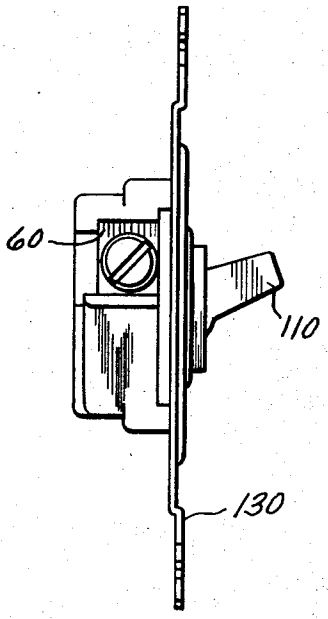


Fig. 3.

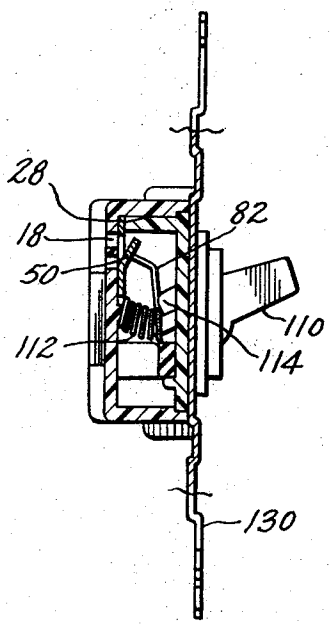


Fig. 5.

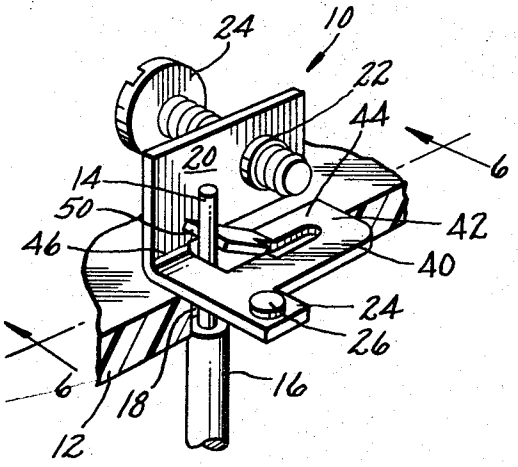


Fig. 7.

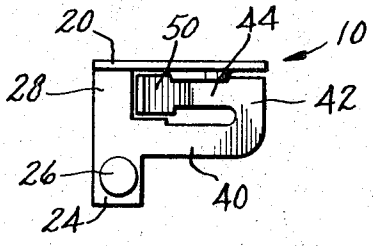


Fig. 8.

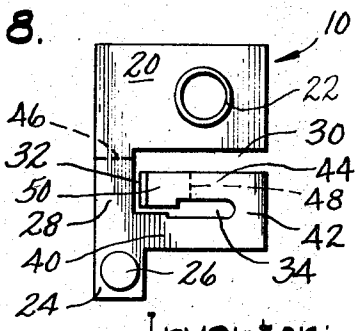
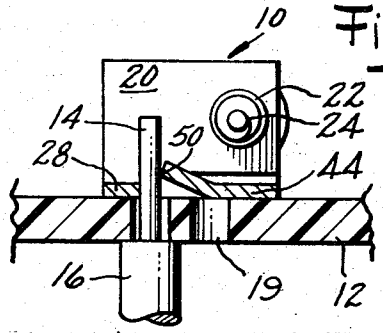


Fig. 6.



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COMBINED PUSH-IN AND SCREW TERMINAL CONTACT

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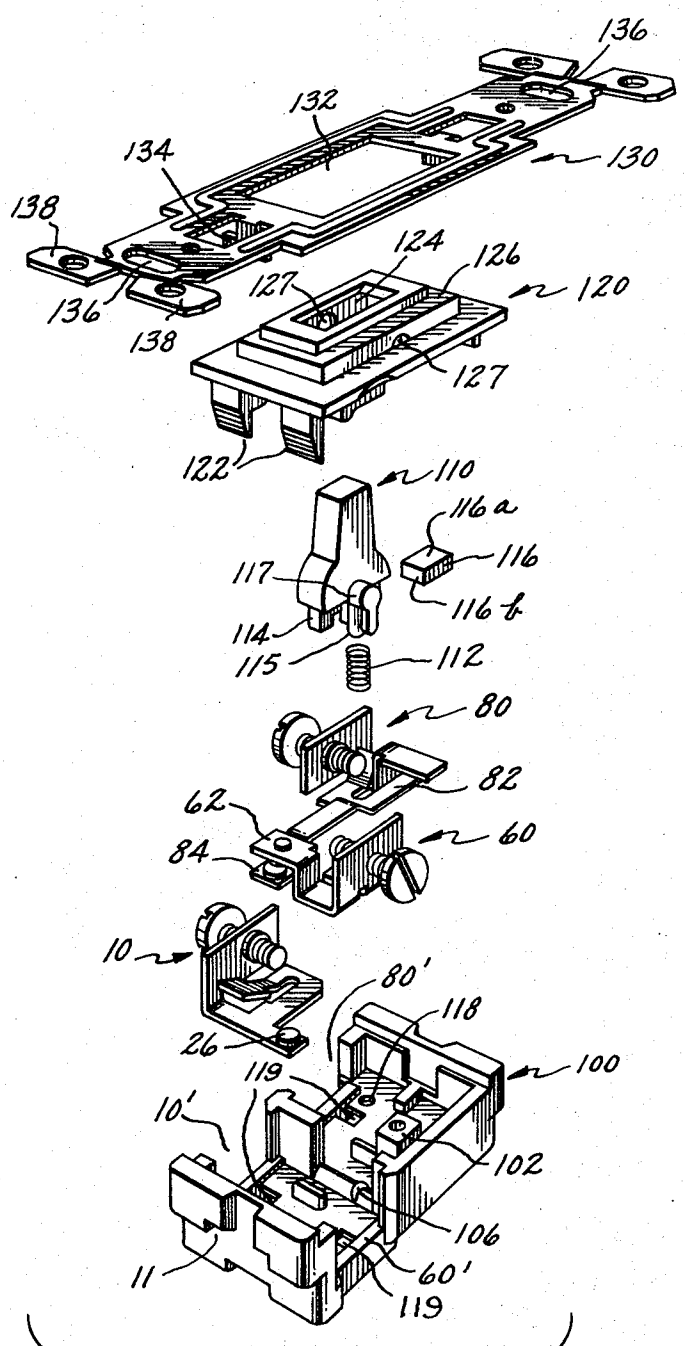


Fig. 4.

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United States Patent Office

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3,532,846

COMBINED PUSH-IN AND SCREW TERMINAL CONTACT

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Filed Jan. 17, 1969, Ser. No. 791,899
Int. Cl. H01r 7/06
U.S. Cl. 200—166 11 Claims

ABSTRACT OF THE DISCLOSURE

A compact electrical contact and electrical switch structure is provided having a combination of screw terminal, a push-in wire terminal and a make and break electrical contact terminal. The three terminals are formed in a single conpact electrical contact structure from a relatively small piece of metal strip bent at right angles between the screw terminal and push-in terminal.

The present invention relates to an electrical contact and related switch structure providing compact wire contact and electric switching structure and reliable quiet switching action.

It is known that alternating current switches may be made having arc resisting make and break electrical contacts and an overcenter toggle mechanism which provides for alternate contact and separation of the make and break contacts. The make and break electrical contact may be formed of cadmium oxide filled silver for example. Relatively quiet operation of such switches through incorporation of rubber bumper dampers in the switch housing is also known.

One sought after advantage in such alternating current switches is a relatively small size so that the wall box into which they are mounted may contain a number of wires and wire nut connectors without jamming or compressing the wires and connectors into the box.

Another advantage is low cost coupled with high reliability of both wire connection and make and break operation for both a single pole version of a switch as well as the three-way version. One factor which contributes to lower cost is the formation of switches having a smaller number of parts and also switches which have a single form of a part which may be used interchangeably in multiple locations. Also greater compactness of individual parts is advantageous where they provide performance equivalent to or better than the bulkier and more expensive parts.

Another sought after advantage is the ability to use a single switch in areas which require screw terminal connections with copper wire, or for installations where aluminum wire is used, and at the same time permit reliable push-in wire connection to be made with copper wire. In some areas the local electrical code permits push-in type connections to be made using copper wire and this is preferred because of the simplicity and time saving features of this type of wire connections. Such push-in type connections are described in U.S. Pat. No. 2,705,785. In other areas local codes do not permit such wire connections even where copper wire is to be employed. It is accordingly advantageous to an electrician or electrical contractor to be able to obtain and use a single wiring device which is suitable for use with either type of local code regulations.

It is accordingly one object of the present invention to provide an electrical contact for a switch having a make and break contact in combination with a wire screw terminal and a push-in wire terminal.

It is another object to provide a one piece switch contact element adapted to providing the combination of make and break contact together with wire screw terminal and push-in wire terminal in a compact and low cost terminal.

A further object of the present invention is to provide a single wiring device usable in areas having local codes which either permit use of push-in type wire connection or which require screw terminal connection.

Still a further object is to provide a reliable alternating current switch structure at low cost.

Other objects and advantages of the present invention will be in part apparent and in part pointed out in the description which follows.

In one of its broader aspects the objects of the present invention may be achieved by providing an electric contact, said contact comprising a metal strip, one end of said strip being provided with a threaded opening to receive a wire terminal screw, the other end of said strip being provided with a tab for attachment of a switch contact, and an intermediate portion of said strip having a J formation of slits extending in from one side thereof to form a wire gripping cam of J configuration extending in from the opposite side of said strip, and the end of the short arm of said J cam being bent up to provide a wire contact cam.

In one of its narrower aspects the objects of the invention may be achieved by providing a switch structure, said switch structure comprising an insulating housing, at least two contacts in said housing each of said contacts comprising a metal strip, one end of each strip being provided with a threaded opening to receive a wire terminal screw, the other end of said strip being provided with a tab for attachment of a switch contact, and an intermediate portion of said strip having a J formation of slits extending in from one side of said strip to form a wire gripping cam of J configuration extending in from the opposite side of said strip and the end of the short arm of the J cam being bent up to provide a wire contact cam and wire entry ports in the insulating housing adjacent said bent up end.

To aid in the clarity of understanding of the invention in the describing of the contact and switch structures of the present invention, reference will be made to the accompanying drawings in which:

FIG. 1 is a front elevation of a switch structure as provided pursuant to one aspect of the present invention.

FIG. 2 is a side elevation of the switch shown in FIG. 1.

FIG. 3 is a partial vertical section of the switch structure of FIG. 1 taken along the line 3—3 of FIG. 1.

FIG. 4 is an exploded perspective view of the switch of FIG. 1 showing the several parts superposed one over the other.

FIG. 5 is a detail perspective view in part in section of a contact structure provided pursuant to the present invention.

FIG. 6 is an elevational view in part in section of the contact structure of FIG. 5 taken along the line 6—6 of FIG. 5.

FIG. 7 is a top plan view of the contact structure of FIG. 5 emphasizing the layout of the cam configuration and omitting the wire shown in FIGS. 5 and 6.

FIG. 8 is a plan view of the strip from which the contact of FIGS. 5, 6, and 7 is formed.

Referring first to FIGS. 5 and 6, a contact **10** is shown mounted on an insulating base **12** which for the purpose of clarity and illustration of wire engagement is shown in part in section as a simple planar base. A wire **14** having an insulating sheathing **16** is passed through a wire entry port **18** in the insulating base aligned with a wire gripping cam end **50** described below. As also explained below, the contact structure **10** is preferably nested into a switch housing as illustrated in FIG. 4 but FIGS. 5 and 6 show more clearly the relation of the

wire to the contact. Accordingly the illustration of FIGS. 5 and 6 present the contact in an exposed arrangement.

The contact structure **10** is made up from a flat section of metal strip such as is illustrated in FIG. 8 and reference is made to the three figures in the description of the structural aspects of the contact **10**. The upper portion **20** of the strip is provided with a threaded aperture **22** to receive a screw to serve as a wire terminal screw **24** of the contact structure. The aperture is seen to be located to one side of the upper section of the strip so as not to interfere with wire inserted into gripping contact with the wire gripping cam **50**. The lower portion of the strip as shown in FIG. 8 comprises a tab **24** on which may be mounted a contact **26** or a contact arm as explained below. The tab may be elongated and bent to present the contact at a different level as illustrated at **62** of contact **60** of FIG. 4.

An intermediate portion **28** of the contact strip **10** is provided with a J configuration of slits with the longer slit **30** of the J extending into the intermediate portion of the strip from the right hand edge as shown in FIG. 8. It will be apparent that the J configuration is best seen from the reverse side of the strip **10** as illustrated in FIG. 8 so that the bottom slit **32** of the J and the shorter arm **34** of the J will be seen in the more readily apparent J form when viewed from the reverse side of the figure.

Similarly when viewed from the reverse side, the cam structure consisting of a long arm **40**, a short cross piece **42**, and a shorter arm **44**, constitute a J form of cam when viewed from the reverse side of FIG. 8.

To form the strip as illustrated in FIG. 8 into the contact structure as illustrated in FIG. 5, the upper section **20** of the strip is bent at approximately right angles to the intermediate portion **28** of the strip approximately along the line **46**.

Also, in forming the contact structure of FIG. 5 from the strip of FIG. 8, the end **50** of the shorter arm **44** of the J form of cam is bent approximately along the dotted line **48** of FIG. 8 to bring the end **50** out of the plane of the intermediate portion **28** of strip **10**.

Returning now to FIG. 5, it is seen that once the bends are formed along the line **46** and along the line **48** of FIG. 8, the contact structure is in the form suitable for mounting in an insulating housing or on a base such as insulating base **12** for use in a wiring device as a structure contact element thereof. Insertions of the wire **14** through the hole **18** in the base **12** results in a deflection of the end portion **50** of the J form cam structure comprising the end **50**, the short leg **44**, the cross piece **42**, and the long leg **40**. For the illustration of the manner in which electrical contact is made between the elements of the contact and a wire pushed into the cammed wire gripping contact reference is made to FIG. 6 wherein it is seen that the wire **14** is held between the ledge **28** of the intermediate section of the contact and the edge of the upturned cammed end **50**. The insertion of the wire causes a further upward deflection of the cam end **50** and accordingly the development of a spring bias between the edge of intermediate section **28** and the edge of upturned cammed end **50**.

A tool entry port **19** as seen best in FIG. 6 provides access to the short arm **44** of the wire gripping cam and permits upward deflection of the cam arm to release the grip of cam end **50** on the wire **14** and accordingly permits withdrawal and disconnection of the wire from the contact.

For the best view of the relationship of the parts of the cam prior to insertion of a wire and with reference to FIG. 7, it is seen that the intermediate portion **28** of the contact as a J form of cam comprising the upturned cammed end **50**, the short arm **44** of the J configuration, the cross piece **42**, and the long arm **40** of the J configuration. The upper portion **20** of the strip and the lower tab **24** bearing contact **26** are disposed on opposite sides of the cammed structure of the intermediate portion **28**.

With reference now particularly to FIG. 4, it is evident that the contact structure **10** described with reference to FIGS. 5 through 8 is shown as one of the elements of the switch structure shown in the exploded view of FIG. 4. It is also evident that two additional contact structures **60** and **80** have combinations of elements essentially the same as those described with reference to FIGS. 5 through 8. In fact, the contact structure **60** is essentially interchangeable with that of **80** being placed in opposite corners of the rectangular switch housing **100**. The insulating switch housing **100** has three side openings **10'**, **60'**, and **80'** which are formed to receive and retain the contacts **10**, **60**, and **80** respectively.

Bosses **122** and a third not seen, depending from cover **120**, assist in holding the contacts within the respective side openings **10'**, **60'**, and **80'**. A trigger **110** adapted to fit through the opening **124** in cover **120**, operates in conjunction with spring **112** to provide an over center toggle motion to trigger **100**. Coil spring **112** is compressed in operation of the device between depending boss **115** on the underside of trigger **110** and protuberance **106** formed in the base **100** of insulating switch housing **100**. Trigger pivot motion is facilitated by the mounting of trigger trunnions **117** in trunnion mounts **127** in cover **120**.

Trigger cams **114** on the undersurface of the trigger **110** cooperate with the contact carrying spring arm **82** of contact **80** to dispose the contact-bearing end **84** of the spring arm into a spring biased contact between the make and break switch contact **26** of contact structure **10** or switch contact structure **62** of contact **60**. In other words, when the spring arm **82** is moved to its uppermost position, it is in contact with the switch contact **62** and when it is urged to its lower position it is in contact with switch contact **26**, the positioning to either of these upper or lower positions being the result of the action of the cam **114** on the spring arm **82**.

Mounting strap **130** has an opening **132** which nests over a raised platform **126** of cover **120** and has depending locking elements **134** which cooperate with similarly shaped shoulders **11** on the exterior ends of the insulating housing **100**. The strap is provided with plaster ears described in detail in copending application for patent S.N. 626,616, filed Mar. 28, 1967, and now abandoned, and assigned to the same assignee as this application.

Rubber bumper **116** is mounted between the underside of cover **120** and pedestal **102** in base **100**. Two surfaces of trigger **110** at approximately right angles contact the upper and side surfaces **116*a*** and **116*b*** respectively of the bumped to provide motion and noise dampening at the end of the trigger toggle motion in each direction. This affords a soft touch and quiet action as the toggle goes to its two at rest positions at the end of each stroke after acceleration by the overcenter action.

What is claimed is:

1. An electrical contact
said contact comprising a metal strip,
one end of said strip provided wtih a threaded opening to receive a wire terminal screw
the other end of said strip provided with a tab for attachment of a switch contact, and
an intermediate portion of said strip having a J formation of slits extending in from one side thereof to form a wire gripping cam of J configuration extending in from the opposite side of said strip, and
the end of the short arm of said J cam being bent up to provide a wire contact cam.

2. The electrical contact of claim **1** in which the strip is folded at approximately right angles along a laterally extending line proximate the long arm of the J slit.

3. The electrical contact of claim **1** in which the threaded opening is disposed laterally remote from the bottom of the J slit.

4. The contact of claim **1** in which the terminal end of the short arm of the J slit is rounded to provide strain

relief from flexing of the centrally disposed wire contact cam arm of said contact.

5. A switch providing both push-in and screw terminal wire gripping means which comprises

an insulating housing

at least two contacts in said housing each of said contacts comprising a metal strip

one end of each strip provided with a threaded opening to receive a wire terminal screw

the other end of said strip provided with a tab for attachment of a switch contact

and an intermediate portion of said strip having a J formation of slits extending in from one side of said strip to form a wire gripping cam of J configuration extending in from the opposite side of said strip, and

the end of the short arm of the J cam being bent up to provide a wire contact cam.

6. The switch of claim 5 wherein

the contact is bent to a right angle form along a line proximate the long slit of the J formation of slits.

7. The switch of claim 5 wherein the threaded opening is located laterally proximate the end of the short arm of the J formation of slits.

8. The switch of claim 5 wherein each strip is of essentially the same form so as to be essentially interchangeable.

9. The switch of claim 5 wherein tool access openings

are provided in the back of the housing to permit manipulation of the cam for release of a wire gripped therein.

10. The switch of claim 8 wherein the housing is rectangular and the contacts are in opposite corners of said housing.

11. The switch of claim 10 wherein a centrally disposed spring contact arm extends between the tabs of said contacts and

a trigger spring is mounted centrally in said housing to one side of said spring contact arm.

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U.S. Cl. X.R.

339—33, 95