Oct. 2, 1962 C. N. ANDRES 3,056,870

FUSE SWITCH

Filed Jan. 26, 1959

FIG. 1

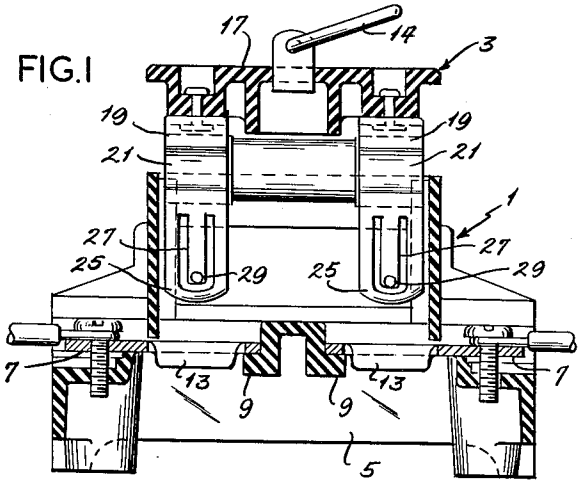


FIG. 2

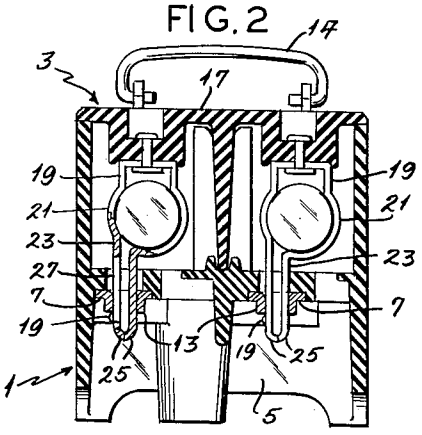


FIG. 3

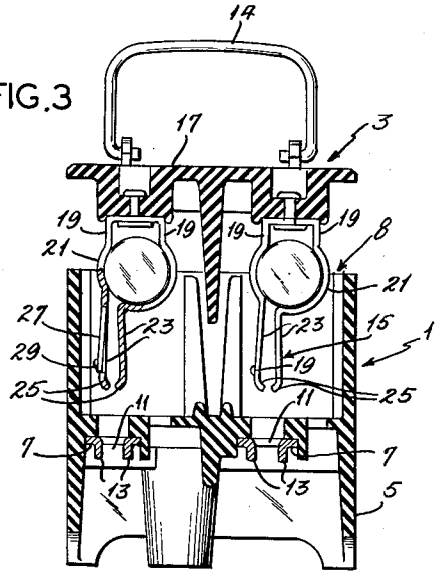


FIG. 4

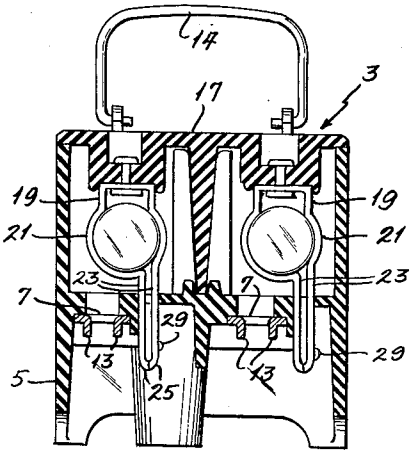
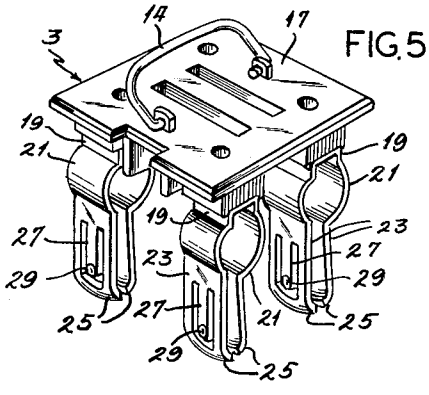


FIG. 5



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FUSE SWITCH

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1 Claim. (Cl. 200—114)

This invention relates to fuse cut-out switches of the type disclosed in Patent 2,186,813, wherein a pull-out member functions as a support for switch blades, the fuse being carried directly by the switch blades.

An inexpensive type of fuse switch is made with a base or housing for a pull-out member. Combination line terminals and fixed switch contacts are mounted on the back of the housing for cooperation with switch-blades projecting rearwardly from a pull-out fuse holder. The switch-blades are formed each by a pair of coextensive arms, portions of which are proportioned to embrace the ferrules at the ends of the ferrule type of cartridge fuse, and the end portions of the arms are adapted to enter openings in the fixed contact members at the back of the housing. The ends or tip portions of the arms are normally spaced apart a slight amount, and are otherwise tapered, so that they yield inwardly upon entering the fixed contact members, thereby to develop a tight frictional engagement with the fixed contacts. This inward movement of the arms of each switch-blade also results in a tighter gripping action on the fuse. On the other hand, when the pull-out member is withdrawn, the two arms of a switch blade tend to spread, thereby facilitating removal from and insertion of a fuse between the arm portions thereof remote from the tips. In practice, the pull-out member is adapted to be reinserted in a reversed position, wherein the switch blades do not contact the terminals, thereby achieving a switch-off condition.

Although this type of fuse switch has numerous advantages, the pull-out member thereof is normally retained in the "on" position merely by frictional engagement between the switch blades and the fixed contacts. The degree of retaining action is limited, since the pull-out member must be readily removable for convenient operation, and this fact accounts for a malfunctioning, which is particularly encountered when the device is mounted on a piece of vibrating equipment. The vibrations of the switch housing tend to cause the frictionally restrained blades to work loose from the fixed contacts, with the result that the pull-out member may then fall from the housing.

Accordingly, one object of the invention is to provide an improved fuse switch of this type wherein the plug is more positively locked in the plugged in "on" condition.

Another object of the invention is to provide a fuse switch of this type with a locking condition which permits easy insertion or withdrawal of the pull-out member and which does not adversely reduce the contact pressure between the switch blades and the fixed contacts. A further object of the invention is the provision of a fuse switch of the general character referred to, wherein the easily replaceable fuse condition is retained, i.e., the arms of the switch blades move outwardly when the pull-out member is withdrawn. Additionally, the invention includes among its objects the provision of a locking condition which involves a minimum amount of modification of the existing structure, manufacturing processes and equipment.

In the attainment of these objectives, briefly, the invention contemplates that one arm of each switch blade is formed with a narrow elongate tongue cut therein, the tongue having its free end projecting toward and disposed adjacent the tip of the switch blade. A detent is formed at the free end of the tongue and the tongue may

be initially deformed inwardly a slight amount, although the detent should still project beyond the surface of the main portion of the switch blade. The detent is then disposed so as to engage beyond the edge of the fixed contact, the free end of the tongue being forced inwardly upon insertion of the switch blade, and the detent then snapping outwardly behind the fixed contact after full insertion. Since the tongue is relatively narrow in comparison with the arm of the switch blade, it is more resilient and hence interferes little with the insertion or with the removal of the pull-out member. Conversely, the arms of each switch blade may retain a high degree of outward bias in the "on" condition so as to insure adequate contact pressure with the fixed contacts. In other words, the flexibility of the detent-bearing tongue is relatively independent of the flexibility of the arms of the switch blade.

Other objects will be in part apparent from and in part pointed out in the following detail description, taken in connection with the drawings, in which:

FIG. 1 is a sectional view taken generally on the line 1—1 of FIG. 2 and showing a fuse switch embodying the present invention;

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1;

FIG. 3 is a sectional view similar to that of FIG. 2, but showing the pull-out member partially removed;

FIG. 4 is a view similar to that of FIG. 2, but showing the pull-out member in its reversed switch-off position; and

FIG. 5 is a perspective view illustrating the pull-out member.

Referring to the drawings, the pull-out fuse switch of the present invention is shown to comprise a housing generally designated **1** and a pull-out member generally designated **3**. The housing **1** is molded from plastic insulating material to form a base or back portion **5** containing certain line terminals and fixed contact members **7**. The front portion **8** of the housing is in the form of an open box for accommodating the pull-out member **3** with the attached fuses and switch-blades. The terminal members **7** are elongate conductive parts extending outwardly at the ends of the box portion **8** and have a screw or other means for attaching a conductor thereto. The members **7** are arranged in pairs, the number of pairs being determined by the number of poles or circuits to be controlled by the switch. For example, a single-phase switch would have two pairs of terminal members and a three-phase switch would have three pairs of terminal members.

The terminal members **7** otherwise project inwardly into the back area of the box-like housing **8**, where they are supported by lips **9** of insulating material formed on the housing. These members **7** define the fixed contacts of the switch and have elongate openings **11** formed therein. The openings **11** can be conveniently manufactured by upsetting portions **13** rearwardly.

The pull-out member **3** is likewise formed as a member molded from plastic insulating material with a front wall which normally abuts against and closes the front part **8** of the housing. An insulated handle **14** may be attached to the front of the pull-out member for facilitating its removal or insertion. Certain switch-blades **15** are then attached to the back surface of the pull-out member so as to project inwardly for cooperation with the fixed contacts **7**, there being one such switch-blade for each terminal member, or a pair of switch-blades for each pair of terminal members. The switch blades are formed of resilient conductive metal to define a back base portion **17**, which is attached to the pull-out member **3**, and coextensive arms **19** which project therefrom. These arms **19** are configurated and proportioned in the form of an

approximate circle in the region **21** adjacent the pull-out member. The end portions **23** of the arms are then extended in relatively close parallel spaced relationship to inwardly tapered tips **25**.

The enlarged or circular portions **21** of the switch blade are adapted to embrace the ferrule of a ferrule type of cartridge fuse, and the two switch blades of a pair are spaced apart to a distance correspondingly to the length of the fuse for which the switch is designed.

Referring more particularly to FIG. 3, it will be noted that the end tips **25** of the switch-blade arms are normally spaced apart a slight distance when the pull-out member is withdrawn, and in this condition, the fuse may be readily removed or inserted. When the pull-out member is pushed inwardly, the tapering end tips **25** of the switch-blade arms enter the slots **11** in the fixed contacts, whereupon the opposite arm portions of each switch blade are forced inwardly into contacting engagement with one another. This inward movement of the switch blade arms has the function of tightening the embracing action of the arms about the fuses, thus improving the contact pressure between switch blade and fuse. Also, the outward bias of the end portions of the arms provides contact pressure between switch blade and fixed contact. The inward tapered condition at the tip **25** of the switch-blade arms also tends to increase the contact pressure at the switch contacts when the switch blades are fully inserted. In other words, the pressure at the fixed contacts is increased substantially after the tips of the switch-blade arms are brought into engagement with one another. A high degree of pressure engagement between switch blade and associated switch contact has heretofore been necessary because the pull-out member has been held in its pull-in "on" condition merely by the frictional engagement between the switch blades and the fixed contacts.

Referring now to that portion of the device which constitutes the present invention, one of the switch arms of each switch blade is modified to provide a tongue section **27** therein. This tongue is defined by a U-shaped cut such that the free end of the tongue projects toward and is disposed adjacent the tip of this blade, and a detent or dimple **29** is formed at the free end of the tongue for detent cooperation with the back of the switch contact at **13**. This tongue is relatively narrow in comparison with the switch-blade arms, hence is more resilient. Also, the tongue **27** may be initially deformed inwardly a slight amount, if desired, to further reduce the resistance to insertion and withdrawal of the pull-out member, but the dimple should project at least some distance beyond the outer surface of the arm.

In being inserted, the free end of the tongue yields inwardly so that the dimple **29** thereon clears the fixed contact, and when fully inserted, the tongue then snaps outwardly with the dimple engaged behind the fixed contact. In this position, the detent is clear of the space between lips **13**, so as not to interfere with the contact pressure of the switch blades with the fixed contacts. Accordingly, a detent action is achieved, and this action is especially desirable in holding the pull-out member in its "on" condition, particularly when the fuse switch is used in applications involving vibration. It will also be noted that the resiliency of the detent member **27** is relatively independent of the switch blade arms, and this is desirable. The significance of this feature will be apparent from the fact that over a period of prolonged use, perhaps with excessive heating, the original resiliency of the arms may change to an extent so that the normal bias is substantially reduced to a level such that the frictional holding action is no longer effective, although the electrical contacting action is effective. On the other hand, the action of the tongue is not completely independent of the resiliency of the arms.

From the foregoing description, it is apparent that those skilled in the art will understand the structure, function and mode of operation of the invention herein disclosed, and appreciate the advantages thereof. Although one embodiment has been disclosed in detail, it is to be understood that the invention is not limited thereto, but the drawings and description thereof are to be understood as being merely illustrative. It is realized that many modifications and variations will present themselves to those skilled in the art without departing from the spirit of the invention or the scope thereof as set forth in the appended claim.

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

In a pull-out fuse switch of the character having a pull-out fuse holder movable into and outwardly from a housing, the housing having narrow openings defined by fixed contacts and the fuse holder having resilient stabs which enter said openings; the improvement that comprises the fuse holder member and housing member each having detent means cooperating with one another releasably to hold the fuse holder within the housing, said detent means being constituted by a resilient tongue secured at one end to one member to extend parallel with said stabs and with its free end movable transversely relative to the stabs, said free end of the tongue being formed with a cam-like protuberance to engage with and move beyond an edge formed by a part of the other member as the fuse holder member is inserted, the end of the tongue being cammed outwardly of said edge against the bias of the tongue as the protuberance passes by said edge and then being spring biased inwardly to engage behind said edge when the fuse holder member is fully inserted, said protuberance being of a shape such that it is cammed outwardly upon withdrawal of the fuse holder member, thereby to provide a snap-out retention of the fuse holder within the housing.

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