

Aug. 23, 1966

W. C. LINTON

3,268,693

FUSEHOLDER

Filed June 17, 1964

2 Sheets-Sheet 1

FIG. 1.

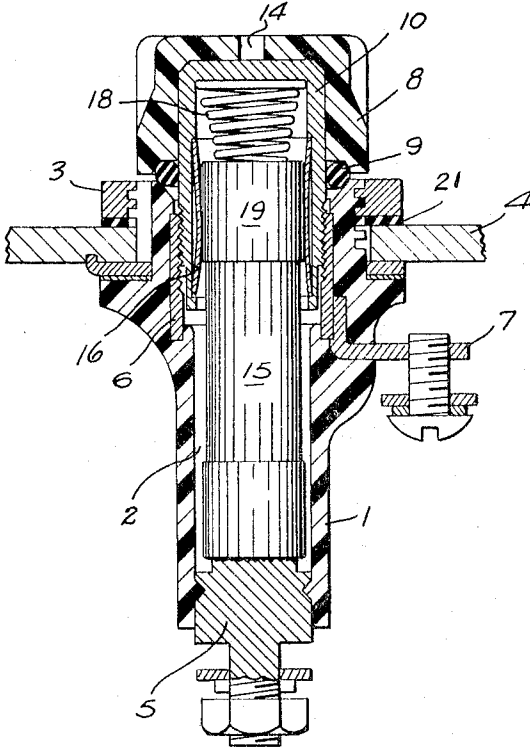


FIG. 2.

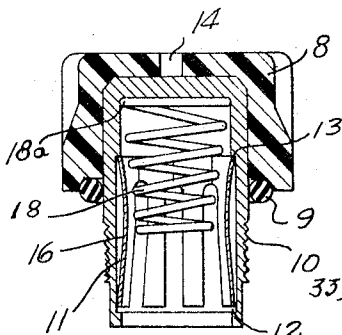
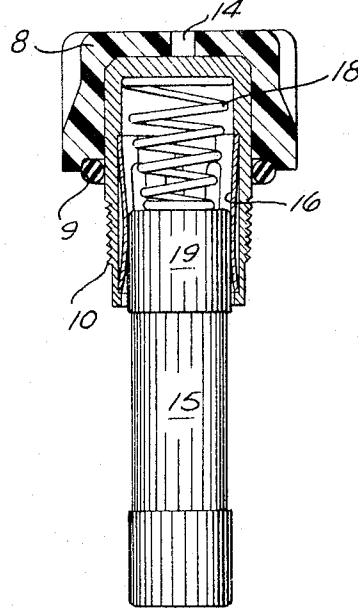


FIG. 3.

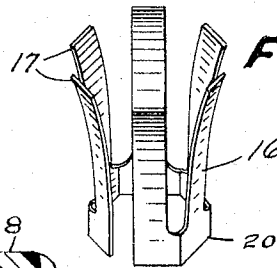


FIG. 4.

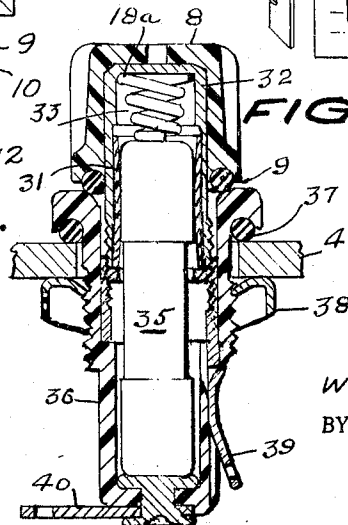


FIG. 5.

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FIG. 6.

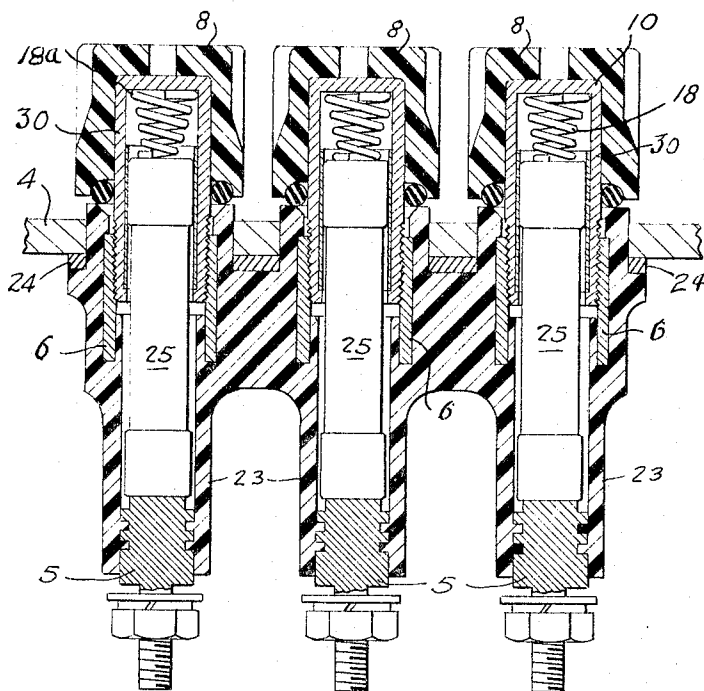


FIG. 7.

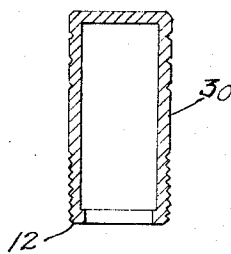
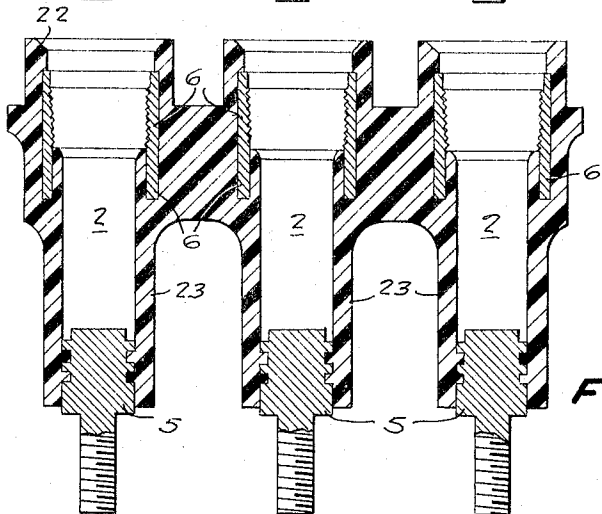
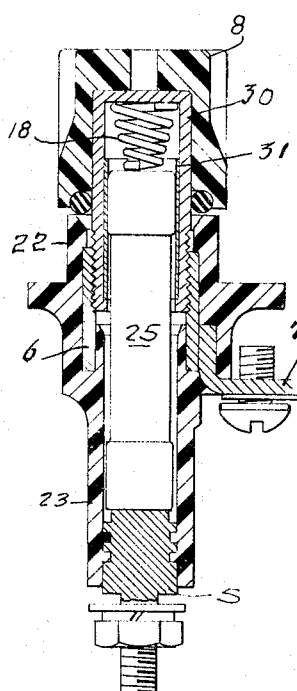


FIG. 9.

FIG. 8.

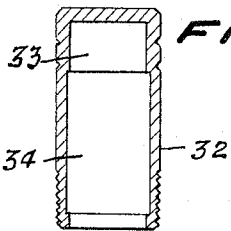


FIG. 10.

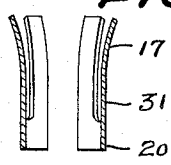


FIG. 11.

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3,268,693

FUSEHOLDER

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3 Claims. (Cl. 200-133)

This is a continuation-in-part of my abandoned patent application, filed November 29, 1962, under Serial No. 240,974.

The present invention relates to dead front fuseholders for housing standard cartridge type fuses whereby they will meet the qualification requirements of standard military specifications with respect to endurance, vibration and shock, as well as being rendered impervious to moisture to guard against environmental conditions to which aircraft having these fuseholders installed thereon, are subjected to when flying at very high altitudes.

Other objects of the invention will be in part obvious and in part pointed out hereinafter as the description continues.

FIG. 1 is a vertical sectional view of a complete non-indicating fuseholder having a standard ferrule type mid-gest size fuse housed therein.

FIG. 2 is a sectional view of the cap with the fuse retained thereby to illustrate how the fuse may be lifted or removed from the cavity in the body of the fuseholder.

FIG. 3 is another sectional view of the cap with the fuse released therefrom.

FIG. 4 is an inverted perspective view of the fuse clip.

FIG. 5 is a sectional view of a modified fuseholder for retaining little fuses other than the larger mid-gest fuse as illustrated in FIG. 1.

FIG. 6 is a vertical sectional view of a complete fuseholder for three fuses.

FIG. 7 is a vertical sectional view taken at right angles to FIG. 6.

FIG. 8 is a vertical sectional view of only the molded body for said triple fuseholder with its metal terminal inserts.

FIG. 9 is a vertical sectional view of a modified fuse socket.

FIG. 10 is a vertical sectional view of another modified fuse socket, and

FIG. 11 is an inverted sectional view of a fuse clip for use only with those fuse sockets as illustrated in FIGS. 9 and 10.

The non-indicating fuseholders as shown in the drawings are for housing the small standard ferrule cartridge type fuse 15 of the mid-gest size $1\frac{1}{2}$ " long and $1\frac{3}{32}$ " in diameter; the little fuse 35 of $1\frac{1}{4}$ " long and $\frac{9}{32}$ " in diameter and the little fuse 25 of the 3AB or 3AG class which are $1\frac{1}{4}$ " long and $\frac{1}{4}$ " in diameter.

The fuseholder as illustrated in FIGS. 1 to 4 inclusive of the drawings is for housing a mid-gest fuse 15 and comprises a base or body 1 molded from thermosetting plastic compositions and preferably such as glass fiber alkyd or diallyl phthalate insulating materials impregnated with a sealant so as to render the body 1 impervious to moisture or air passing into the opened end cavity 2 formed therein. Aircraft when flying at very high altitudes are known to be subjected to certain environmental conditions which force moisture through ordinary plastic materials rendering fuses housed therein inoperative. A sealant such as a transparent colorless copolymer or liquid styrene monomer is preferably used as no visible signs of impregnation can be found on the closest examination when applied to a fuseholder under a process as is set forth in U.S. Patent No. 2,684,307, dated July 20, 1954. A lock nut 3 retains the body 1 upon a panel board 4. The bottom terminal 5 is molded within the body at one end thereof and an an-

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nular terminal 6 is molded within said body adjacent to the upper opened end of the cavity 2 and has a side terminal 7 connected thereto. These known processes for applying sealants to molded plastic materials require heat and cold applications and when these processes are applied to the body 1 to render it impervious to moisture, the metal terminal inserts 5 and 7 expand and contract leaving spaces between these inserts and the plastic material which cannot be sealed with such sealant processes. Thereupon, it becomes necessary to apply another conventional type of sealant preferably a transparent colorless polyester resin with a hardener, to the outer face of the body 1 at points only around the terminals 5 and 7 so as to prevent any moisture or air passing through the spaces so formed in the body into the fuse cavity thereof. At times it becomes necessary to create a better and more permanent seal around the terminals 5 and 7 then the foregoing and to accomplish this a nozzle of a suction or vacuum pump (not shown) is connected to the ring nut 6 for drawing the sealant into the body 1 and completely around that portion of the terminals imbedded therein.

A cap or closure 8 carries an "O" ring 9 for sealing the upper opened end of the cavity 2 when the fuse socket engages the ring nut of the body 1. A flat washer 21 is provided for effecting a waterproof seal from the front of the panel 4.

An annular groove 11 is formed within the inner wall of the fuse socket 10 having its lower end terminating adjacent the opened end of the fuse socket forming an annular shoulder or ledge 12 and the upper or opposite end 13 of the groove terminates a short distance from the inner closed end of the fuse socket. A test hole 14 is formed within cap 8 whereby access may be gained to the fuse socket with a suitable testor for indicating the flow of current between the terminals 5 and 7 when a fuse 15 is housed within the fuseholder.

A fuse clip 16 is of the same construction and design as that numbered 25 in my Patent No. 2,989,610, but its arms 17 are shorter in length so as to have a snap fit within the annular groove 11 of the fuse socket 10 whereby when once placed within the groove 11 the fuse socket of the fuse clip cannot be removed without breaking or damaging the same. The arms 17 of the fuse clip have an overall length slightly less than that of the annular groove 11 as shown in FIG. 3 when the arms 17 are expanded to their normal preset shape. The ledge 12 of the fuse socket prevents the withdrawal of the fuse clip 16 and no other separable fasteners are needed such as solder as disclosed in my aforesaid patent.

A conical shaped coil spring 18 having its larger or opened upper coil 18a of larger preset diameter than the interior diameter of the fuse socket is forced into the closed end of the latter, as shown, so as to provide a frictional engagement with the fuse socket sufficient as to prevent its withdrawal under normal working conditions. This coil spring has about 6 coils so as to create a pressure of approximately six pounds per square inch upon the upper end of the fuse 15 for retaining the latter in constant contact with the terminal 5 when the fuseholder is subject to undue vibrations and shock of around 200 pounds per square inch. The upper ferrule 19 of the fuse is in sliding contact with the arms 17 and yet the six arms 17 of the fuse clip extend entirely around this ferrule 19 with a spring pressure sufficient to at all times insure a good contact therewith as shown in FIG. 1.

One or more little fuses 25 may be housed in one fuseholder similar to that of the triple fuseholder illustrated in FIGS. 6 to 8, of the drawings, and the fuse socket 30 and fuse clip 31 which, due to the limited space provided, allows for the free sliding of this fuse clip within the fuse socket without contacting or interfering with the free action of the coil spring 18.

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This fuse socket 30 is preferably drawn from a tube of electrical conducting material with its inner wall of the same diameter throughout with the exception of having its lower opened end spun or bent inwardly to form the annular ledge 12.

This fuse clip 31 is of the same design as the fuse clip 16, but its end 20 of a preset unstressed polygonal configuration in cross-section, is smaller for assuming and maintaining substantially the same rectilinear elevational configuration upon flexed engagement with the inner wall of the fuse socket 30 to maintain under all conditions an electrical contact with the latter. The plurality of arms 17 formed with and extending from said end 20 of this fuse clip are of less length than those of the clip 16, but also have a polygonal configuration in cross-section. Each arm is preset in an outwardly flared configuration exceeding that of the outer flared extremities of the arms of the clip 16 whereby the inner face of the medial portions of each arm will grip and have direct electrical contact with the ferrule of the fuse 25 when inserted within the fuse socket. The outer or free extremities of each arm 17 will engage the inner cylindrical wall of the fuse socket when inserted therein and will be prevented from being withdrawn upon contact against the abutment or annular ledge 12.

To meet qualification tests, fuses are inserted and withdrawn from the fuse clips for a cycle of 1,000 times and must not become distorted and must remain in their original preset configuration. When inserting a fuse 25 within the fuse socket, its ferrule will be gripped by the arms 17 carrying the clip along until the lower coil of the spring 18 contacts the ferrule 19 of the fuse. However, this grip by the arms of the fuse clip upon the ferrule of the fuse will permit free sliding movement under the tension of the spring 18 when applying the cap to the fuseholder whereby the lower or opposite ferrule of the fuse will be retained in electrical contact with the terminal 5.

The larger opened end coil 18a of the spring 18 is forced within the fuse socket until it reaches the closed end thereof as shown and upon expansion it will frictionally grip the inner wall of the fuse socket and remain so anchored in that position as no pull is ever exerted upon the spring in its normal operation. The smaller coils are suspended down within the fuse clip, but are never in contact with the latter so as to prevent the free movement of the same.

When the cap 8 is released from the body of the fuseholder the coil spring 18 becomes fully expanded after forcing the ferrule 19 of the fuse to a position similar to that as shown in FIG. 2 and yet the fuse clip has a grip thereupon equal to about a 5 oz. pull which is sufficient to cause the fuse 15 to be withdrawn from the cavity 2 of the fuseholder. Thereafter, the fuse is manually removed from the cap as shown in FIG. 3.

It is the side walls 23 of this base that either become porous or the glass fibre fillers of the insulating molding materials convey by capillary attraction moisture into the fuse cavities 2 when aircraft having these fuseholders applied thereto travel at very high altitudes. The processes for applying sealants to the body of this triple fuseholder completely seals the same as well as its side walls 23, but as stated heretofore these known processes create very fine openings around the contact terminals 5 and 7 and therefore it becomes necessary to apply another known sealant upon the outer face of the body 2 only at points around the terminals 5 and 7 to seal said opening around the latter. However, this second mentioned sealant if applied externally to the walls 23 of the body would have no sealing effect, but will only seal where metal parts and plastic materials are in close contact with one another.

The panel 4 is provided with three openings through which extended the upper ends of the body 22 and a gasket 24 provides a waterproof seal from the outer face of this panel.

From the foregoing it will be understood that the "O"

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ring 9 renders the fuseholder drip-proof; the gasket 24 renders the fuseholder water-proof from the front of the panel 4 and by impregnating the body 1 with sealants a completely water-proof fuseholder is produced, even when mounted upon aircraft are subjected to environmental conditions at very high altitude.

The fuse socket 32 of FIG. 10 is of the same length and outer diameter as that of the fuse socket 30. The interior diameter 33 of the fuse socket 32 is also the same as that of the fuse socket 30, but beginning with the lower end of this section 33 and ending with the ledge 12 the interior diameter is enlarged to about $\frac{1}{32}$ " as at 34 in which the fuse clip 31 is mounted whereby either a fuse 25 or a fuse 35 may be housed in a fuseholder as illustrated in FIG. 5 of the drawings.

The body 36 of this fuseholder is sealed from the outer face of the panel board 4 by means of the "O" ring 9 and 37 and is locked to the panel board by means of a Palnut 38. This body 36 is not sealed as the side terminal 39 and the bottom terminal 40 are inserted and fastened therein after molding of the body.

I claim:

1. A fuseholder comprising in combination a body molded from insulating materials having an open end cavity formed therein for receiving standard cartridge type fuses of the same length, but with contact ferrules of different outside diameters, a bottom terminal contact extending within the cavity of said body for having contact with one ferrule of the fuse when inserted therein, a removable cap for closing the open end of the cavity within said body, a fuse socket carried by said cap and having an open end recess formed therein for receiving the opposite ferrule of said fuse, said fuse socket having detachable electrical connection with said side terminal, an annular shoulder formed with said fuse socket and extending inwardly within the open end of the recess formed therein, a conical coil spring insertable within the recess formed within said fuse socket, the large coil having a preset diameter greater than that of the interior diameter of the open end recess formed within said fuse socket whereby when inserted within said fuse socket will have frictional contact with the latter as to support said coil spring and have its smaller coils suspended therefrom, a fuse clip having one end in a preset unstressed polygonal configuration is cross-section assuming and maintaining substantially the same rectilinear elevational configuration upon flexed engagement with said fuse socket when inserted therein to maintain an electrical contact with the latter, a plurality of arms formed with and extending from said end of said fuse clip having a polygonal configuration in cross-section each arm being preset in an outwardly flared configuration whereby the inner face of the medial portion of each arm will have direct electrical contact with the ferrules of fuses having different outside diameters when a fuse of either diameter is inserted within said fuse socket, the outer free extremities of each arm being bent outwardly in a preset position whereby those extremities will engage the inner wall of said fuse socket and be prevented against withdrawal from the latter when contacting said annular shoulder, said fuse clip having free sliding movement within said fuse socket, said coil spring when compressed will exert pressure upon the fuse for forcing the latter in constant electrical contact with said bottom terminal and when completely expanded will release its pressure upon the fuse permitting said arms of the fuse clip to maintain their grip upon the fuse whereby the latter can be withdrawn from the cavity within said body when removing said cap therefrom, and said coil spring being suspended within said fuse clip and out of direct contact with the latter.

2. A fuseholder comprising in combination a body molded from insulating materials having an open end cavity formed therein for receiving a standard cartridge type fuse, bottom terminal extending within the cavity

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of said body, a side terminal extending within the cavity of said body, a removable cap for closing the open end of the cavity within said body, a fuse socket carried by said cap and having detachable electrical contact with said side terminal, said fuse socket having an open end recess formed therein, a coil spring mounted within said fuse socket for retaining the opposite end of the fuse in direct electrical contact with said bottom terminal, the improvement consisting of a fuse clip having an over all length less than that of the depth of the recess within said fuse socket whereby it will have free longitudinal sliding movement therein, a plurality of resilient preset arms formed with said fuse clip each having a sliding electrical contact between the fuse when inserted within said fuse clip and said fuse socket, and means for retaining said fuse clip within the recess of said fuse socket.

3. An electrically conductive fuse socket assembly for one ferrule end of a standard cartridge type fuse comprising in combination a body having an open end cylindrical recess formed therein, an open end fuse clip slideably mounted within the cylindrical recess of said body for electrical contact with the latter, stops extending within and spaced apart longitudinally of the cylindrical recess of said body and arranged at the opposite ends

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thereof for limiting the longitudinal sliding movement of said fuse clip therein, the ferrule end of the fuse being insertable within the open end of said fuse clip, a coil spring mounted in said body and engaging the ferrule end of the fuse for limiting the sliding movement of the latter within said fuse clip, a plurality of arms formed with said fuse clip, each arm being preset in an outwardly flared configuration whereby the inner force of the medial portion of each arm will have sliding contact with and at all times grip the ferrule end of the fuse when inserted within the fuse clip and yet have direct electrical contact with the fuse and the outer extremity of each arm being bent outwardly for engagement with said stops at one end of the recess of said body for preventing the withdrawal of the fuse clip from said body.

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