

Jan. 11, 1966

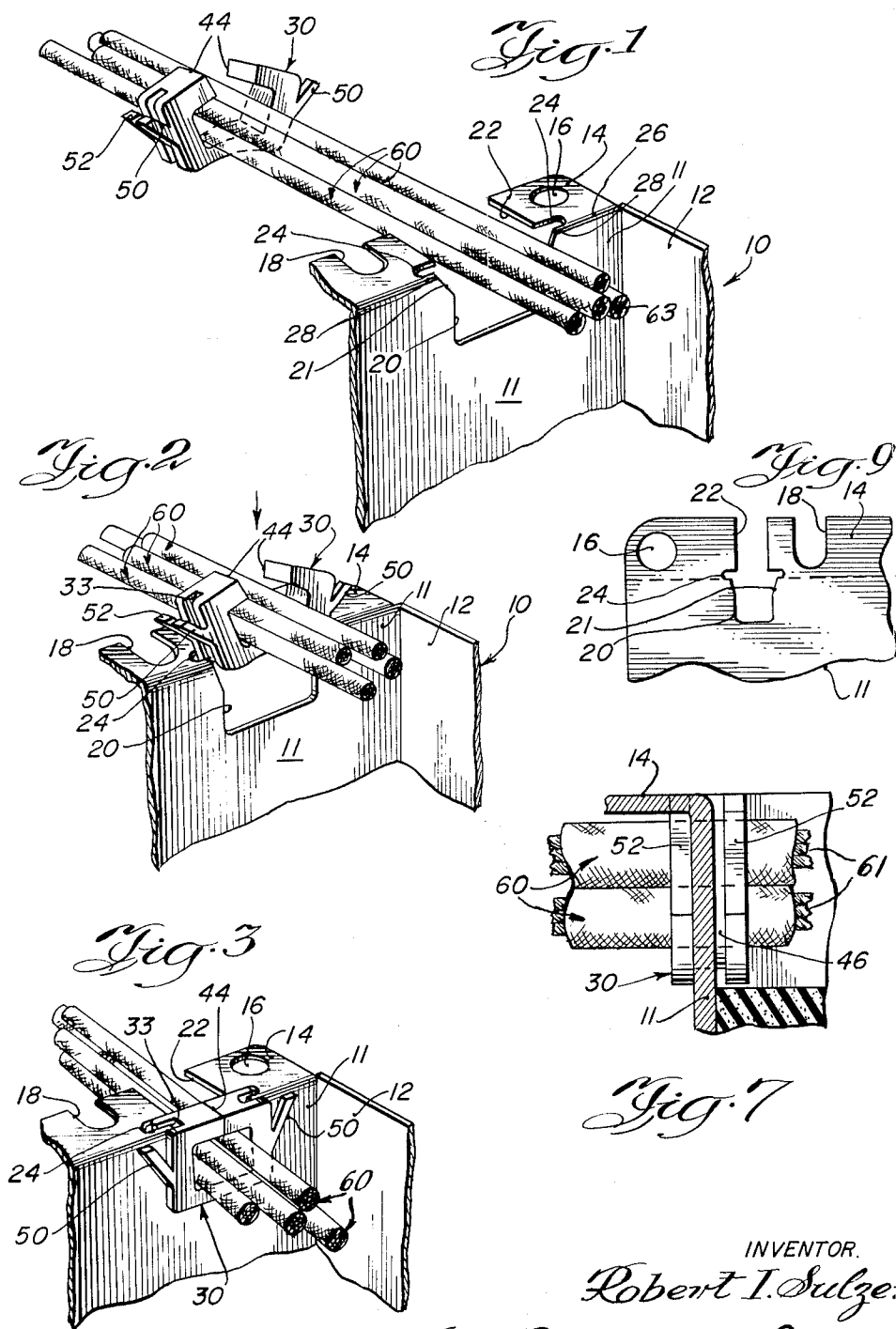
R. I. SULZER

3,229,026

GROMMET AND CANISTER CONSTRUCTION

Filed July 30, 1964

2 Sheets-Sheet 1



INVENTOR.

Robert I. Sulzer

By Silverman + Cass
ATTORNEYS.

Jan. 11, 1966

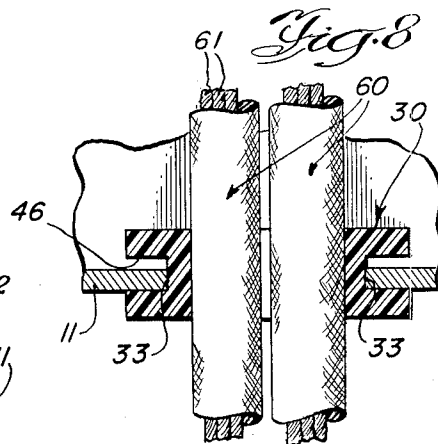
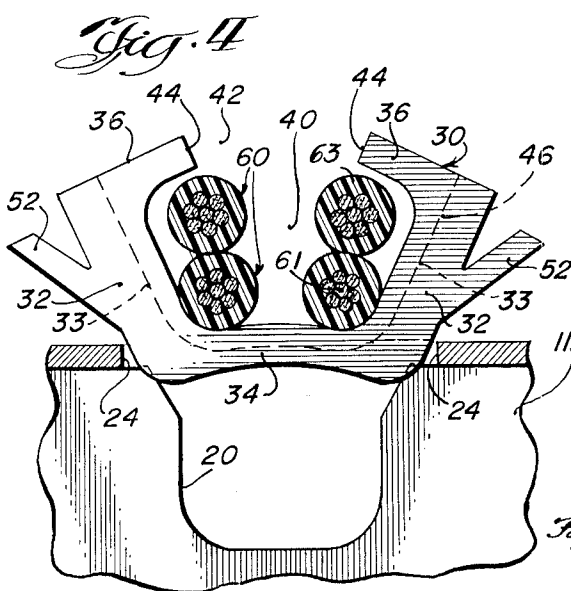
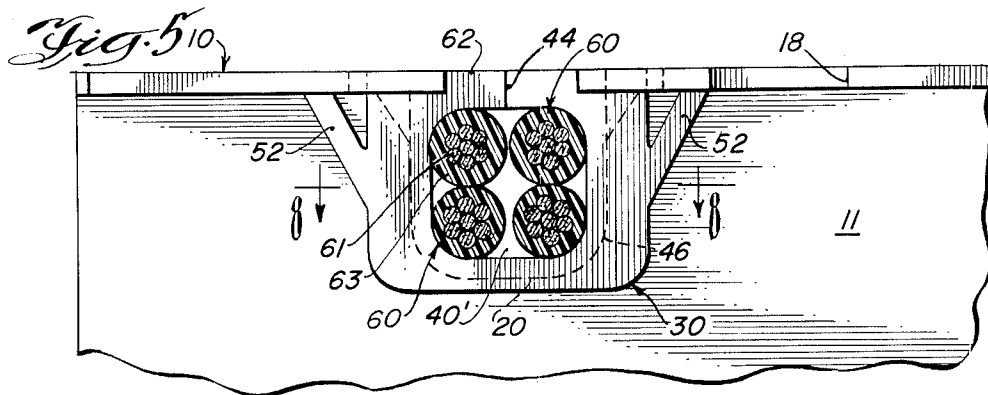
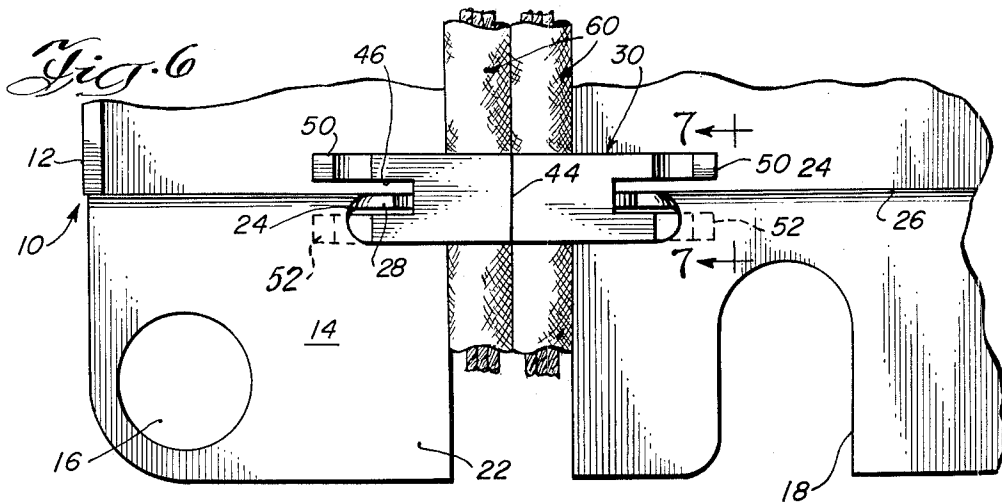
R. I. SULZER

3,229,026

GROMMET AND CANISTER CONSTRUCTION

Filed July 30, 1964

2 Sheets-Sheet 2



INVENTOR.

INVENTOR.
Robert I. Sulzer
By Silverman & Cross
ATTORNEYS.

By *Silverman & Cross*
ATTORNEYS

ATTORNEYS.

1

3,229,026

GROMMET AND CANISTER CONSTRUCTION
Robert I. Sulzer, Skokie, Ill., assignor to Advance Trans-
former Co., Chicago, Ill., a corporation of Illinois
Filed July 30, 1964, Ser. No. 386,250
10 Claims. (Cl. 174—65)

This invention relates generally to electrical devices which are enclosed in housings and have electrical leads extending out of the housings and more particularly is concerned with the construction of a grommet for use in protecting and insulating said electrical leads at the point of emergence from the housing, as well as a canister having the said grommet associated therewith.

The invention is applicable to a wide variety of electrical apparatus but more particularly is advantageous in association with the type of electrical apparatus known as a ballast. Accordingly, the description which follows, as well as the drawings, will be concerned with the application of the invention to a ballast for use in igniting and operating fluorescent lamps since the problems there involved are particularly acute.

Fluorescent lamps normally require a voltage much higher than line voltage to operate the same in an ignited condition; require a voltage for ignition which is generally of the order of twice the operating voltage; require means of a reactive nature to limit the flow of current through the lamp once it has been ignited; and may be connected in multiple lamp circuits requiring special circuitry for igniting and operating the same. Most fluorescent lamps therefore utilize an auxiliary apparatus which provides for all of these and usually several additional functions, this auxiliary apparatus being known as a ballast. Most ballasts have transformers, condensers, chokes, and the like contained therein and generate a substantial amount of heat during use thereof. It is customary to house the ballast within a steel canister of rectangular, box-like configuration provided with mounting flanges to enable the canister to be secured to a metal plate comprising part of a lighting fixture.

In constructing the ballast, the electrical windings on their magnetic core along with condensers, resistors, terminals, terminal mountings and the like are placed within the open top canister, the electrical leads making connection to the circuit being brought out through the end walls of the canister, and the canister being filled with an asphaltic potting compound fully to immerse the electromagnetic unit, condensers and the like. The compound when run into the box or canister is quite hot, and some effort is normally made to assure that the entire interior of the canister is filled so that there are no air spaces, since the potting compound assists in conducting heat of operation from the electromagnetic apparatus to the canister itself and thence to the metal plate upon which the canister is mounted. After the canister has been filled with the potting compound, its open top is covered with the metal plate that is crimped or otherwise secured in place.

The electrical leads which are connected with an electromagnetic unit of this type are subject to considerable strain. These electrical leads normally are heavy cotton insulated wires which have been soldered to terminals provided on terminal strips and boards that are taped to the electromagnetic portion of the ballast, and for the most part, tensile strain is not as serious a problem as other difficulties. During the manufacture of the apparatus, the ballast passes through its several operations with the electrical leads protruding from each end, or sometimes from one end only, and these leads often become an improvised handle for the workmen. The leads are subject to scraping at the point where they emerge

2

from the canister as well as undue bending in addition to tensile strain. These effects continue in the handling of the ballast up to and including the time that the ballast is mounted in a fluorescent lamp fixture.

Where the electrical leads are fabric insulated, the protection of the wires from the effects of lateral strain and scraping is not too difficult. Such leads are made of stranded copper wire covered with a coating of rubber and cotton braid. Such leads are relatively tough insofar as handling is concerned. With one end secured to a terminal board and the lead extending out of a slot or hole in the canister, the only protection provided by most ballast constructions is to roll the edges of the metal holes or slots. Even the use of well-known rubber grommets is not common in the ballast industry. Other types of electrical appliances may use grommets of the annular washer-like type.

In ballasts, tensile strain is no problem, as previously stated. The grommet of the invention is not a strain relief grommet in the sense that this term is understood in the art. The electrical leads are free to move relative to the grommet when installed, unless the grommet is so dimensioned as to crowd the wires within the available space so that their own frictional engagement, one with the other and with the grommet, resists pulling or pushing. No teeth or pinching means are provided, with a result that the grommet of the invention is very small in size.

Fabric covered wires with rubber insulation deteriorate through age. The fabric rots and the rubber hardens. Thus, handling a ballast or the like after it has been in use, may result in breaking of the insulation of the fabric covered wire. The insulation qualities also decrease with age. Plastic coated wire is much more economical and has a longer insulation life. But plastic coatings on wire are economically made of thermoplastic resins and hence soften with heat. The hard edges of holes or slots in sheet metal wreak havoc with plastic coated wires, even with the edges rolled. During construction of the ballast, the plastic coating is soft and may easily be scraped or parted to expose the bare wire.

The handling of the ballast is not the only source of trouble. In crimping the closure in place, the crushing of the wire covering can easily render an expensive ballast or other electrical device inoperative.

The invention has an important object thereof the provision of a grommet and canister construction which, while especially advantageous for use with plastic coated wire, equally provides full protection and confinement for any type of electrical leads emerging from a sheet metal canister.

Still another object of the invention is the provision of a grommet and canister construction in which the grommet is inserted into a notch or slot provided in an end wall of the canister in a simple edge-wise movement in the plane of the end wall.

Still another object of the invention is to provide a grommet which is adapted to be inserted into a suitable notch in the end wall of a canister and locked in place, but which is of a symmetrical construction so that it is immaterial which way the grommet faces when inserted.

It is another object of the invention to provide a grommet and canister construction for use in connection with an electrical device, such as, a ballast for fluorescent lamps, in which there is a pre-formed grommet that is split or divided on one side thereof so as easily to receive wires but which is adapted when pressed into the end wall of the canister fully to enclose and protect the wires, while itself being locked in position in the canister wall.

Still a further object of the invention is to provide a novel construction of grommet which may be molded in

a wire receiving configuration that is capable of being inwardly flexed during association with the canister end wall fully to enclose the wires by forming a loop thereabout.

Still a further object of the invention is to provide a novel construction of grommet that eliminates the time-consuming assembly operation of threading or lading the wires emerging from the canister through a hole in the canister end wall.

Still a further object of the invention is to provide a novel construction of canister to receive the type of grommet of the invention, and another object of the invention is to provide a novel article of manufacture in a grommet which will have the advantages suggested above and many more.

Other objects of the invention are concerned with some of the novel features of the grommet and canister construction, including but not limited to, the structure for holding the grommet locked in place after installation, the simplicity of the grommet, the configuration and arrangement of the various parts of the grommet and canister.

Many other objects and advantages will become apparent to those skilled in the art as a description of the preferred embodiment is set forth hereinafter in detail in connection with which the drawings illustrate the same.

In the said drawings:

FIG. 1 is a fragmentary perspective view illustrating a step in associating electrical lead wires with the grommet of the invention prior to connecting the grommet itself to the canister of the invention.

FIG. 2 is an illustration similar to that of FIG. 1 but showing another method of using the invention.

FIG. 3 is a perspective view similar to that of FIG. 2 but showing the grommet and wires locked in place.

FIG. 4 is a fragmentary side elevational view on an enlarged scale, of the grommet of the invention prior to its being pushed home into the receiving notch of the canister end wall, portions being shown in section.

FIG. 5 is a view similar to that of FIG. 4 but illustrating the appearance of the grommet and electrical lead wires from the end of the canister after the grommet has been locked in place.

FIG. 6 is a fragmentary top plan view of the grommet and canister construction after the grommet has been locked in place.

FIG. 7 is a fragmentary sectional view taken generally along the line 7—7 of FIG. 6 and in the direction indicated.

FIG. 8 is a fragmentary sectional view taken generally along the line 8—8 of FIG. 5 and in the direction indicated.

FIG. 9 is a developed view of a blank used to form the end wall of a canister for receiving the grommet.

Generally speaking, the grommet of the invention is in the form of a flat U-shaped member but the arms of which diverge so as to provide an open entrance to a generally keystone shaped chamber on the interior of the grommet. The grommet has grooves formed in its edges to enable the same to be pushed into a piloted notch formed in the canister end wall, and the arms of the U-shaped member have spurs protruding laterally therefrom which are adapted to engage beneath the flange of the end wall of the canister so as to lock the grommet in place after it has been pushed home. The grommet is formed preferably of a resinous plastic material such as nylon or any of the other synthetic resins which are flexible, heat resisting and easily molded. Tetrafluorethylene may be used as well but is somewhat more expensive than nylon at this time.

During the installation of the grommet and before it has been pushed home into the notch formed in the canister end wall, the wire leads of the electromagnetic device in the canister are placed in the keystone shaped chamber inside the grommet after which, when the grommet

is pushed home, its two arms will flex toward one another and engage thereby fully enclosing the leads within a generally rectangular center passageway. Flexure is forced by the wedging action of the tapered pilot entrance of the notch.

Looking now at the drawings, reference character 10 designates generally a canister having an end wall 11 in the form of a metal plate secured to side walls 12 by any well-known sheet metal technique. For example, the end wall 11 may be spot welded to the side walls 12. The end wall has a mounting flange 14 which is provided with various holes and/or slots as shown at 16 and 18 in accordance with common practice to enable the ballast housed in the canister 10 to be secured to a fluorescent fixture or the like. A suitable sheet metal blank for making the end wall as a separate element before assembly is shown in FIG. 9, but it is intended in some constructions that the end wall 11 will be integral with at least some other walls of the canister 10.

In accordance with the invention, it is preferred that the end wall 11 and flange have notched means to accommodate the grommet of the invention which will be described and the wires which pass through the grommet. Accordingly, the end wall 11 has a generally rectangular notch 20 which opens to the upper edge of the said end wall 11, the flange 14 being arranged at right angle with said upper edge and having a recess 22 therein which, in effect, is a somewhat narrower continuation of the notch 20. In the flange 14, there is a pair of lateral slits 24 arranged adjacent the edge 26 which is defined by the junction of the plane of the end wall 11 and the flange 14. This edge is that line of FIG. 9 shown as a dash line along which the flange 14 will be bent during manufacture. The exposed edges which remain as a result of the cutting of the slits 24 are shown at 28, and these edges look like strips of metal on opposite sides of the notch 20 and are approximately the same thickness as the end wall 11 being, in effect, an upper edge of the said wall. Some distortion of the edge may occur in bending, but this has no effect upon the function.

The grommet 30 is best shown in side elevation in FIGS. 4 and 5 and its top plan configuration in FIG. 6. The condition of FIG. 4 is that in which the grommet 30 may be considered to be "open" while that in FIG. 5 is a condition in which the grommet may be considered "closed."

As previously stated, the grommet is made of nylon or other semi-rigid heat resistant material. The material of course must be a good insulator since in fluorescent lamp ballasts it is not unusual for voltages between electrical lead wires and other metal parts to exceed 1000 volts. The grommet 30 has a pair of side arms 32 which are divergent, as shown in FIG. 4, when the grommet is molded. The bottom ends of the arms 32 are connected by means of an arcuate bridge 34 while at their upper ends the grommets have inwardly extending angular extensions 36, each arranged at right angle to the respective arm 32 which with it is integrally connected, and the extensions 36 being juxtaposed. The interior chamber resulting from this configuration is of generally keystone configuration and is designated 40 in FIG. 4 having a rather large entrance 42 defined by the free ends 44 of the extensions 36. The side arms 32, as well as the bottom bridging portion 34, all have a part of a peripheral groove 46, the purpose of the groove being to enable the grommet 30 to be locked in the notch 20 against lateral movement out of the notch.

The groove 46 gives rise to a division of the outer edges of arms 32 as shown especially in FIGS. 6 and 8, and the slot 46 is wide enough to engage on opposite sides of the end wall 11 when it is in place. Each of the divided parts of the side arms 32 is provided with an upwardly and laterally extending spur as shown at 50 and 52. All of the spurs are alike, but in order to distinguish between them, those on the inside of the

5

wall 11 are designated 50 and those on the outside are designated 52. The grommet is reversible and symmetrical and hence, it is unimportant as to which of the spurs is which.

If the arms 32 are pressed together bringing the free ends 44 in face-to-face engagement as shown in FIG. 5, the keystone shaped chamber 40 assumes a square configuration with rounded corners while the dimension across the top of the grommet including both of the arms 36 is substantially the same length as the portion 34 which now becomes substantially rectilinear. The resulting configuration is that shown in FIG. 5.

In order to press the arms 32 together, all that is needed is to insert the grommet into the notch 20 with the groove 46 engaged by the part 28. As the grommet is pressed downwardly carrying it into the notch 20, its groove 46 will ride into the sheet metal edges defining opposite sides of the notch 20. The upper portions of these side edge have a divergent configuration, giving rise to the tapered pilot portions 21. Thus, as the grommet is pushed downward, the pilot portions 21 exert a wedging action, bearing against the inner base 33 of groove 46 on the side arms 32 (see FIGS. 4 and 8) and flexing the same inwardly with substantial force. This arrangement enables the grommet to be inserted easily and quickly.

As the grommet is pushed home, it will close, thereby encircling any electrical wires which may have been laid in the chamber 40. In the illustrations, the wires 60 are shown engaged in the grommet. The resulting rather square chamber in the grommet in FIG. 5 is designated 40'.

The leads 60 are shown as plastic coated. The interior of the leads comprises several (usually seven) strands 61 of copper wire embedded in a plastic matrix 63 such as polyvinyl chloride which is extruded upon the group of strands 61. Other types of lead wire can be used, but the plastic coated are most vulnerable to abrasion because their covering becomes soft with heat. After the wires are installed, the hot potting compound is run into the canister practically up to the top and covering at least a few of the wires 60, if not all of them. Then the closure (not shown) is placed over the open top and crimped in position.

In pushing the grommet home in the notch 20, the spurs 50 will freely pass on the inside surface of the wall 11, but the spurs 52 will engage the ends of the slot 24 and be distorted or pushed inwardly much like a detent. Since the spurs 50 and 52 terminate below the upper edge 62 of the resulting fully enclosed grommet, and since the material is fairly resilient, as soon as the spurs 52 have cleared the slots 24, they will spring back laterally outward relative to the grommet 30 and engage beneath the flange 14 as best shown in FIGS. 5 and 6. In order to withdraw the grommet 30 with the spurs 52 in place, it will in many instances be necessary to shear these spurs 52, or radically distort them, and this is quite difficult in the case of the types of resins used. Of course, the exact dimensions and clearance will determine this. The important factor, however, is that the construction permits the locking in of the grommet.

From FIGS. 1 and 2, it may be noted that there are two ways of installing the grommet 30 and associating the wires 60 therewith.

Both of these installation methods eliminate the laborious step of threading or lacing the wires 60 through a hole in the canister, for the wires 60 can now be laid into the chamber 40 on the interior of grommet 30 and subsequently both the wires and grommet are snapped into fixed position with one motion in the plane of the canister end wall.

In FIG. 1, the wires 60 are engaged in the grommet 30 several inches away from the canister. Thereafter the grommet 30 is slid along the wires to the notch 20, put into position and pressed home.

In FIG. 2, the method is to just start pushing the

6

grommet 30 into the notch 20, and as soon as it is frictionally held in place, the electrical leads 60 may be inserted through the entrance 42 into the chamber 40 after which the grommet may be pushed home.

In both cases, the upper wall 36 of the grommet is protected when the cover member is attached so that the wires 60 are not likely to get pinched and cut or crushed. This is another advantage with the grommet 30.

It will be noted that the grommet may be made quite thin in the dimension considered parallel with that in which the wires extend so that it is not bulky, is cheap to make, easy to use and nevertheless quite effective. Furthermore, no teeth or projections are used to pinch the wires. The free passage of wires through the grommet is not objectionable, and in fact, may be desirable.

When used, the components of the ballast carrying the lead wires 60 are installed in the canister 10 and at that time the grommet 30 is installed. The fact that it is installed edgewise not only reduces bulk and enables the grommet to be made quite thin, but likewise eliminates the difficulty of working under the flange 14 or from the inside of the canister. These latter problems arise with other types of grommets. With the grommet of the invention, obviously, the step of rolling the edges of the hole in the end wall of the plate 11 is eliminated. The edges of the notch 20 may be left raw.

Since the grommet 30 is in position when the hot potting compound is run into the canister, if desired, the interior configuration of the chamber 40 may be made conforming to the shape of the group of wires 60 to provide minimum compound leakage. For example, there may be as many arcuate recesses as wires to provide for seating of the group of wires. A maker of ballasts would have different grommets for different numbers of wires emerging from a canister wall.

It will be obvious that other variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

What is desired to secure by Letters Patent of the United States is:

1. A flexible, unitary axially symmetrical grommet for securement to a housing by engagement in a notch opening to the edge of a wall of the housing, said grommet comprising:

- (a) a pair of divergent side arms joined by a central bridging member,
- (b) said arms and said bridging member having a peripheral groove formed therein to enable insertion into the notch in the plane of the wall of the housing,
- (c) said side arms having juxtaposed extensions on the free ends thereof, said extensions being spaced apart prior to insertion of said grommet,
- (d) a chamber defined on the interior of said grommet by said side arms and said bridging member with an entrance to said chamber formed at the top thereof by the spacing between said extensions,
- (e) said extensions abutting to close said entrance to said chamber when said grommet is flexed during insertion,
- (f) and flexible detent means protruding outwardly from said side arms for enabling said grommet to remain in the notch.

2. A grommet as claimed in claim 1 in which the detent means consist of upwardly and laterally extending spurs.

3. A grommet as claimed in claim 2 in which said spurs are formed in pairs, one spur of each pair situated on each side of said peripheral groove.

4. A grommet as claimed in claim 1 wherein said chamber defined on the interior of said grommet by said side arms and extensions thereof and said bridging member has a keystone shape prior to installation, and said chamber assumes a substantially square configuration after installation.

5. In combination, a sheet metal canister having a

7

notch opening to an edge of a wall thereof, a flexible grommet inserted into said notch to protect electrical leads emergent from said canister, said grommet having a pair of side arms joined by a bottom bridging member, said side arms and bridging member having a peripheral groove in the edges thereof to prevent lateral displacement of said grommet within said notch, said side arms having detent means extending therefrom, stop means on said canister in the vicinity of said notch, said detent means and said stop means cooperating to lock said grommet in installed condition in said notch.

6. The combination of claim 5 in which said stop means consist of a flange extending from said wall at said edge thereof, and said detent means engage the underside of said flange to lock said grommet in said notch with the upper edge of said grommet coincident with the plane of said flange.

7. The combination of claim 6 in which there are slits in said flange, one on opposite sides of said notch at right angles thereto and adjacent the entrance thereof, there being at least a partial continuation of said notch in said flange and the slits being connected to said continuation, said detent means being thinner than the slits to enable the same to pass through the flange while being installed.

8. The combination of claim 5 in which said notch has a piloting taper at its entrance to facilitate insertion of said grommet.

9. The combination of claim 5 in which said detent

8

means consist of resilient spurs integrally formed with said side arms, said spurs being flexed toward said side arms during insertion of said grommet into said notch but springing outwardly to engage said stop means when said bottom bridging member is seated in said notch.

10. The combination of claim 5 in which said side arms of the grommet have juxtaposed angular extensions at their upper ends, said angular extensions being spaced apart prior to installation in said notch, said notch being lesser in width than the distance between said side arms of the grommet, said notch thereby compressing the grommet during installation so that said angular extensions abut against one another.

References Cited by the Examiner

UNITED STATES PATENTS

1,244,642	10/1917	Pruessman	174—52
2,324,791	7/1943	McLoughlin et al.	174—65 X
2,427,742	9/1947	Peterson et al.	174—65 X
2,573,600	10/1951	Pruehs	174—153
2,920,129	1/1960	Rapata	174—153
2,922,836	1/1960	Brown	174—153
3,163,882	1/1965	Falkenberg	174—135 X

FOREIGN PATENTS

201,688 1/1959 Austria.

BERNARD A. GILHEANY, *Primary Examiner*.

LARAMIE E. ASKIN, *Examiner*.