

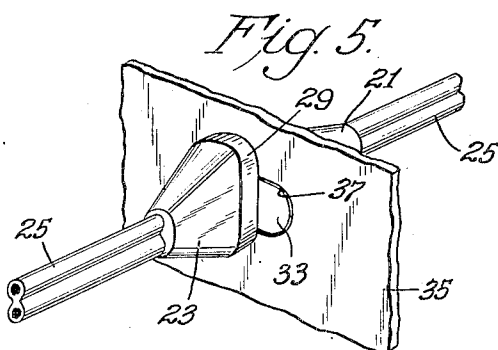
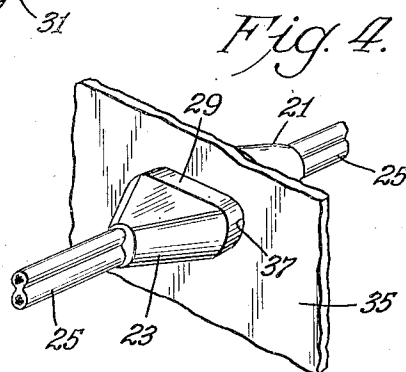
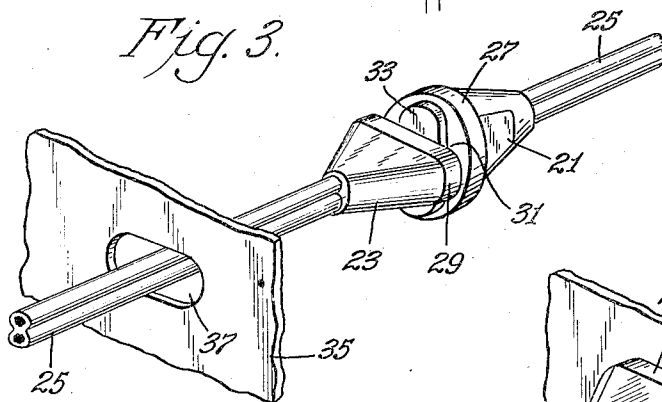
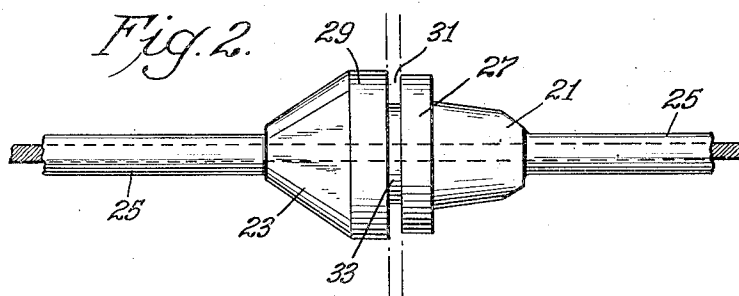
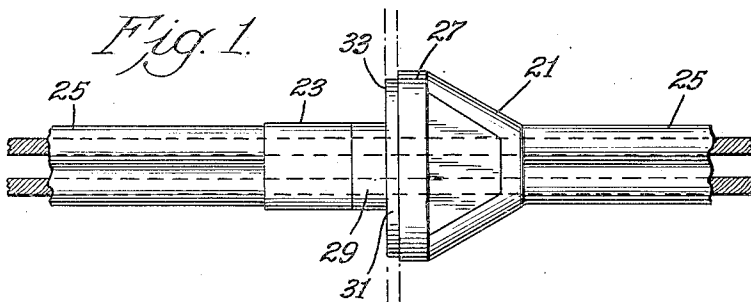
Jan. 17, 1950

C. M. HUTH
STRAIN RELIEF

2,494,814

Filed May 31, 1946

3 Sheets-Sheet 1



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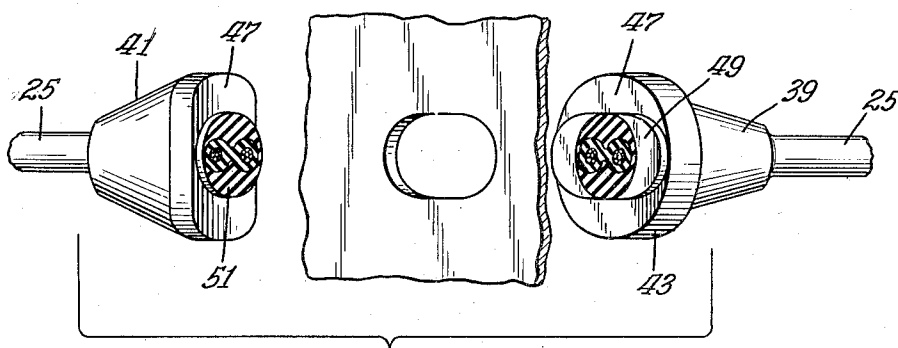
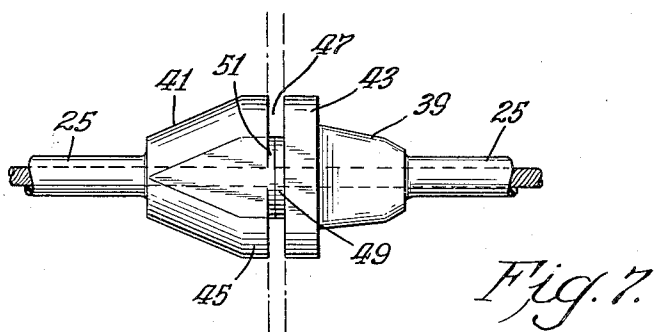
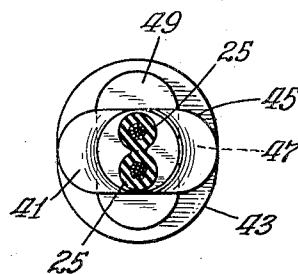
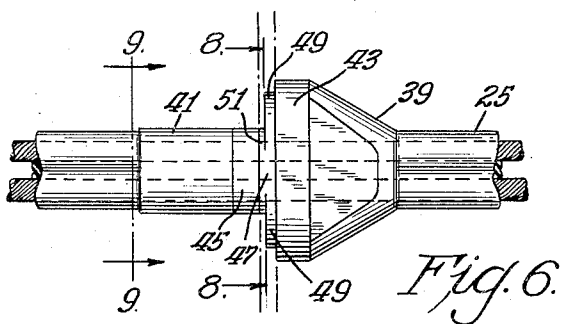


Fig. 8.

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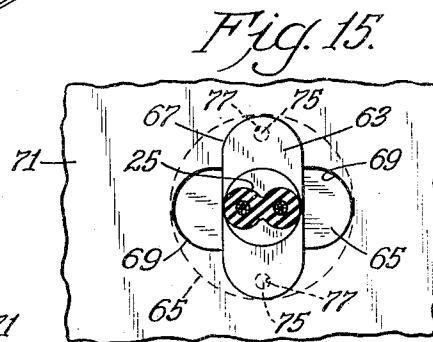
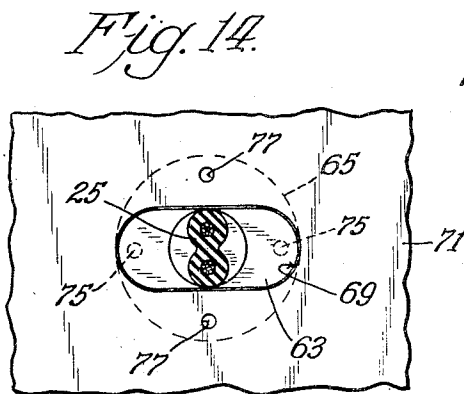
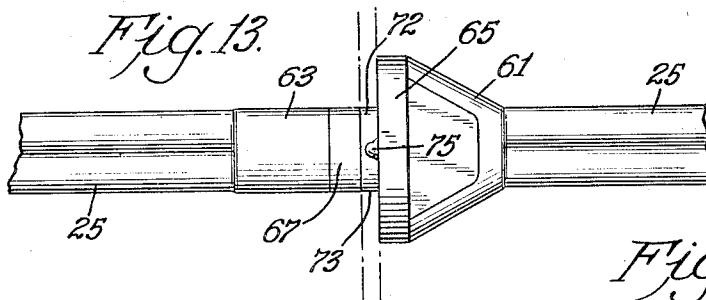
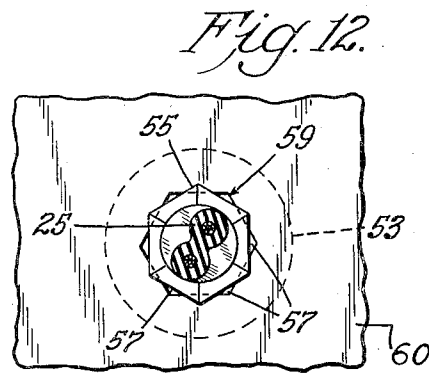
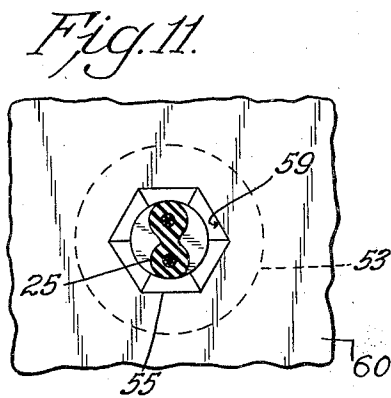
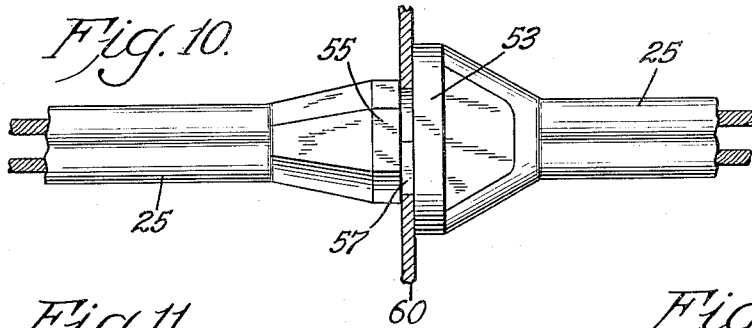
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,494,814

STRAIN RELIEF

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Application May 31, 1946, Serial No. 673,584

15 Claims. (Cl. 174-70)

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The present invention relates to strain reliefs, and particularly to bushing-type strain reliefs adapted for use in connection with electrical conductor cords.

Strain reliefs are widely utilized to prevent damage to the electrical connections between conductor cords and the appliances or other electrical apparatus with which such cords are customarily employed. In its simplest form, the usual strain relief comprises an enlargement, such as a sleeve or bushing, which mechanically engages the cord, usually the device is bonded to the insulation disposed on the outside of the cord conductors, and means for mechanically connecting the strain relief to the frame or some other portion of the structure of the associated apparatus. Bushing-type strain reliefs are particularly desirable, due to their low cost and ease of manufacture, but the bushing-type strain reliefs heretofore known in the art have not proven entirely satisfactory. While the cost of the known devices is low, they are inherently rather difficult to assemble into the associated apparatus, unless that apparatus includes a multipart means for receiving the strain relief; and once the known devices are assembled, they are very difficult to disassemble.

The present invention, therefore, is concerned with the provision of an improved bushing-type strain relief, and has for its principal object, the provision of an improved bushing-type strain relief which shall be much easier to attach to the structure of the associated apparatus, and which shall be capable of much more convenient disassembly, when desired, than the known devices of this general type. As will hereinafter appear, this object is accomplished by the provision of a bushing-type strain relief which is so constructed that one end thereof may be readily inserted into an opening provided in the associated apparatus, whereupon rotation of the strain relief will cause it to engage the associated apparatus with a strain-resisting engagement. The device may thus be assembled more easily than the prior art structures, since very little force is required to put the strain relief into place, and it is likewise susceptible of equally convenient disassembly. The various features and advantages of the invention will be made more apparent in the accompanying drawings and the following description of certain perfected embodiments thereof.

In the drawings,

Fig. 1 is a side elevational view of a strain re-

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lief, in accordance with the invention, applied to a two-conductor, electrical conductor cord;

Fig. 2 is a plan view of the strain relief shown in Fig. 1;

Figs. 3, 4 and 5 are perspective views showing the manner in which the strain relief illustrated in Figs. 1 and 2 is put into use;

Figs. 6 and 7 are, respectively, side elevation and plan views of a second illustrative embodiment of the strain relief of the invention;

Fig. 8 is a perspective view of the strain relief shown in Figs. 6 and 7. The view shows the strain relief cut away along the general line 8-8 of Fig. 6, and the parts have been angularly displaced to clarify the showing;

Fig. 9 is a sectional view on the line 9-9 of Fig. 6;

Fig. 10 is a side elevational view of a third illustrative embodiment of the invention;

Figs. 11 and 12 are views showing two steps in the assembly of the strain relief shown in Fig. 10;

Fig. 13 is a side elevation view of another embodiment of the invention; and

Figs. 14 and 15 are views similar to Figs. 11 and 12, showing the assembly of the Fig. 13 embodiment.

The strain relief means illustrated in Figs. 1 to 5 is of the bushing or sleeve type, and includes two main body portions 21 and 23, which are securely attached to the conductor cord 25 with which the device is used. The body portion 21 of the strain relief tapers in the direction of the outer end thereof and has an inner end or abutment portion 27 which is of substantially uniform thickness longitudinally of the bushing. The abutment portion 27 has the cross-sectional outline of a slightly flattened circle, or oval, as is shown particularly in Fig. 3.

The body portion 23 of the strain relief also tapers in the direction of the outer end thereof, and also terminates in an inner end or abutment portion 29 of uniform thickness. The abutment portion 29 is also oval in cross section, but the oval is much narrower and the cross-sectional area is much less than the cross-sectional area of the abutment portion 27. The major axis of the narrower abutment portion 29 is rotated 90° relative to the major axis of the other abutment portion 27, as shown. The two main body portions 21 and 23 of the strain relief are partially separated from each other by an intermural space 31, which has the general form of an interrupted, annular groove, and which defines opposed, spaced-apart, parallel,

abutment surfaces at the inner ends of the abutment portions 27 and 29.

The face of the abutment portion 27 is provided with an integral boss or projection 33 which is of substantially the same form and cross-sectional area as the abutment portion 29. The boss or projection 33 is disposed with its major axis rotated 90° from the major axis of the oval-shaped, abutment portion 29. As will hereinafter appear, the boss or projection 33 is employed to prevent axial rotation of the strain relief bushing when the end surfaces of the abutments 27 and 29 are in strain relieving engagement with the associated apparatus.

The strain relief can be most conveniently manufactured by molding it directly onto the cord with which it is to be used, and to make possible the attainment of all of the advantages of the invention, at least part of the strain relief should be of a resilient, yieldable material. Moldable rubber compounds similar in composition to those commonly used for molding the bodies of electrical connector plugs, electrical insulation and the like are suitable for this purpose. While the particular conductor cord illustrated at 25 in the various figures of the drawings is of the two-conductor type and is provided with a molded-on rubber insulation, it will be understood that the strain reliefs of the invention are suitable for use with almost any type of conductor cord.

The frame, or some other portion of the structure of the apparatus with which the strain relief device is to be used, is provided with an opening which is most conveniently of substantially the same outline as one of the abutment portions, and that opening is adapted to receive one of the main body portions of the device during the assembly operation. The exact manner in which the particular strain relief illustrated in Figs. 1 and 2 is put into use is shown particularly in Figs. 3, 4 and 5. In these figures, a portion of the frame or other structure of the associated apparatus, which might be the chassis of a radio set, is illustrated at 35. The frame structure 35 is provided with an oval opening 37 of suitable form and dimension to receive freely the body portion 23, including the oval-shaped abutment portion 29 of the strain relief, and during assembly, the body portion 23 is pushed entirely through the opening 37 to the position shown in Fig. 4. When in this position, the entire strain relief is rotated 90° to bring the parts into the position shown in Fig. 5, which is the normal operating position of the device. In this position, the oval abutment portion 29 is at right angles to the oval opening 37 provided for receiving the strain relief, and the oval-shaped boss or projection 33 on the inner face of the other abutment portion 27 of the strain relief snaps into, and is seated within, the opening 37, so as to resist turning of the strain relief.

Desirably the width of the intermural space 31 provided between the abutment surfaces is slightly less than the thickness of the plate or other structural element with which the strain relief coacts. This provides a good snug engagement of the parts and aids in holding the strain relief in place. Depending upon requirements, the intermural space 31 can be made as narrow as desired, with increasing tightness of engagement between the end wall surfaces of the strain relief and the support therefore, due to the longitudinal displacement of the resilient material of which the strain relief is made. In an extreme

case, as where the strain relief is used with a thin, sheet metal, frame member, the intermural space may constitute simply a cut separating the abutment surfaces.

It will be apparent that when the strain relief is in the strain resisting position, there is a very considerable body of material in the abutments 27 and 29 which is available to transmit any strain which may be placed on the cord to the structure of the apparatus with which the cord and strain relief are used. Stressing of the electrical connections to the cord conductors is thereby effectively prevented. At the same time, should it be desired to remove the cord for repair or service, this may be readily done by rotating the strain relief so as to bring the narrower body portion 23 and the abutment 29 into alignment with the opening 37 in the frame or other cooperating structure. In this position the strain relief and cord may be freely disengaged from the associated apparatus.

Some yielding and relative movement between the component parts of the strain relief bushing is required during either the installation or removal in order to seat and unseat the locking boss or projection 33. However, the force required to effect this is relatively small, and in practical sizes of the device, using ordinary molding compounds, may be readily applied by a slight twist of the hand.

The embodiment of the invention illustrated in Figs. 6 through 9 is, in general, similar to the embodiment just described. This device includes a pair of opposed, outwardly tapering, body portions 39 and 41 having abutment sections 43 and 45, which are generally oval in cross section and which are separated by an intermural space 47 so as to provide opposed, spaced-apart, abutment surfaces for engaging the wall structure of the apparatus with which the device is used. Similar to the previously-described strain relief, the abutment end of the body portion 41 is somewhat narrower in cross section and has a somewhat smaller cross-sectional area than the abutment 45 which constitutes a part of the body portion 39. This facilitates easy assembly of the device and improves the appearance of the assembled unit. Also, in this embodiment, the inner face of the larger abutment 43 is provided with a boss or locking projection 49, having substantially the same cross-sectional outline and area as the narrower abutment 45 of the device.

There is however, one important difference in this embodiment of the invention. The thickness of the boss or locking projection 49 is substantially less than the thickness of the intermural space 47 separating the abutting surfaces of the two opposed body portions 39 and 41 of the strain relief. As a result, the face of the narrower abutment 45 is connected to the boss or locking projection 49, and to the remainder of the device, through a molded section 51 which may be substantially circular in outline and which may have the same or a slightly smaller diameter than the width of the narrower body portion 41, as shown particularly in Fig. 8. Decreasing the thickness of the locking projection or boss 49 facilitates the assembly of the device since it limits the amount of material which must be distorted when the strain relief is rotated into strain resisting position.

This construction is particularly useful when the strain relief engages a relatively thick structural section of the associated apparatus with accompanying increase in the width of the inter-

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mural space 47. When the construction of the apparatus with which the cord and strain relief are to be used is such that the strain relief may engage a relatively thin metal plate, which is the preferred arrangement, decreasing the thickness of the locking boss or projection 49 may not be necessary, and will prove of little advantage. However, as above stated, in instances where a thick section must be engaged, the thinning of the locking projection may be highly desirable to assure easy assembly and disassembly of the device.

It will be evident from the foregoing descriptions that the two body portions and the two opposed abutments may take various shapes, other than the broad and narrow ovals there illustrated. The advantages of the invention will be obtained, at least in part, in any construction wherein abutment surfaces, angularly disposed relative to each other, can be obtained, and in general, this condition will be fulfilled by the use of one abutment which is of non-circular shape or outline. For example, as shown in Figs. 10, 11 and 12, one of the body portions of the strain relief may be provided with a cylindrical end or abutment section 53, and the other body portion may have an abutment section 55 which is hexagonal in shape, with a hexagonally shaped locking projection 57, displaced 30° from the hexagonal abutment section 55, mechanically connecting the two body portions. This construction is adapted to fit a hexagonal opening 59 in the frame or other structure 60 of the associated apparatus, as shown in Fig. 11, and during use the body portion having the hexagonal abutment section 55 is slipped through the opening 59 and is then rotated 30° so as to effect resilient, locking engagement of the hexagonal locking projection 57 with the opening 59. This construction does not make available as much material for strain resistance in a direction toward the circular abutment section 53, but in certain instances, the construction may be desirable.

A somewhat different structural arrangement of the invention is illustrated in Figs. 13, 14 and 15. This device includes oppositely disposed, outwardly tapering, body portions 61 and 63, similar to the previously described constructions. The body portion 61 is provided with a cylindrically-shaped abutment section 65, and this is adapted to coact with an abutment section 67 formed integrally with the body portion 63. The body portion 63 and the abutment 67 are oval in cross-section and are adapted to fit within an oval opening, such as the opening illustrated at 69, provided in a plate section or other part 71 of the structure of the apparatus with which the cord and strain relief are used.

The two abutment sections 65 and 67 are separated by an intermural space or groove 72 which defines spaced-apart abutment surfaces, as in the previously described embodiments. The two body portions 61 and 63 are connected by a cylindrical central section 73 having a diameter which desirably is approximately equal to, or somewhat smaller than, the minor axis of the oval-shaped abutment 67.

The locking means used for locking the strain relief bushing against rotation when the abutment surfaces are in strain relieving position, in this instance, comprises two cylindrically-shaped projections 75 having rounded ends, which extend outwardly from one of the abutment surfaces and which are adapted to engage suitable circular openings 77 provided in the plate structure 71

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when the strain relief has been placed in the opening 67 and rotated to the strain resisting position illustrated in Fig. 15.

In this construction, as in the previously described embodiments of the invention, the provision of locking means for preventing rotation of the strain relief when it is in operative position, makes it necessary that the component parts of the bushing shall be constructed of material which permits yielding and relative movement between the parts when the bushing is being rotated into the strain-resisting position. Otherwise, it would not be possible to effect seating of the locking means. It is most convenient, as has been previously indicated, to manufacture the entire strain relief bushing in one piece of a resilient, yieldable material, such as one of the moldable rubber compounds used for electrical insulating purposes. When made in this manner the bushing may be molded directly onto the associated cord 25 and will be securely attached thereto as an incident of the molding operation. In a construction such as is illustrated in Figs. 13, 14 and 15, it may be desirable to utilize locking projections which are of a somewhat harder material than the usual molding compound. It is desirable, in this construction, that the length of the locking projections or bosses shall be less than the width of the intermural space which separates the opposed abutment surfaces, and this is especially true when the bosses or other locking projections are made of a hard material.

It is not essential that the strain relief be molded on, or otherwise integrally joined to, the associated conductor cord. The dimensions of the strain relief may be such that it will tightly grip the cord with which it is to be used by virtue of its own resilience. As another alternative construction, the dimensions and shape of the portion of the strain relief which connects the two opposed abutment surfaces may be so correlated with relation to the cooperating opening in the strain relief support, that the rotative positioning of the strain relief in such opening will cause the central portion of the strain relief to be compressed so as to tightly engage the associated cord.

In the foregoing, there have been described the features of certain illustrative embodiments of an improved bushing-type strain relief which is particularly adapted for use in connection with electrical conductor cords. As has been previously pointed out, strain reliefs in accordance with the present invention may be assembled with a minimum of effort and with very slight deformation of the component parts thereof. Each of the devices provides for the provision of means for positively locking the strain relief in operative position, yet at the same time, the nature of the locking means is such that the strain relief may be readily disengaged from the associated apparatus at any time. The invention, therefore, obviates the defects and disadvantages of the prior art constructions. The broad concept of rotating a member of resilient construction to snap it into an irregular or non-circular opening, and thereby effect a resilient interlocking of the parts is, of course, applicable to other devices than bushing-type strain relief, as herein disclosed, and the right to claim such devices in this or other applications is expressly reserved.

I claim the following as my invention:

1. In combination, a wall structure having a non-circular opening formed therein, an electrical conducting cord, and a bushing-type strain

relief which is disposed about said cord and which is adapted to be received within said opening to provide a strain relief for said cord, said strain relief bushing being constructed at least in part of resilient material and having two main body portions which terminate in opposed, abutment surfaces which are separated by a narrow, intermural space, the shape and the cross-sectional dimensions of said body portions being such that at least one of said body portions can be inserted into the non-circular opening provided in said wall structure and, following such insertion, can be rotated to bring said abutment surfaces into strain resisting position, the width of said intermural space being less than the thickness of said wall structure in order that said surfaces shall resiliently engage said wall structure to prevent rotation of said strain relief bushing from the strain resisting position.

2. In combination, a plate member having a non-circular opening formed therein, an electrical conducting cord, and a bushing-type strain relief which is disposed about said cord and which is adapted to be received within said opening to provide a strain relief for said cord, said strain relief bushing being constructed at least in part of resilient material and having two main body portions which terminate in opposed, substantially parallel, abutment surfaces which are separated by a narrow, groove-like, intermural space, the shape and the cross-sectional dimensions of said body portions being such that at least one of said body portions can be inserted into the non-circular opening provided in said plate member and, following such insertion, can be rotated to bring said abutment surfaces into strain resisting position, the width of said intermural space being less than the thickness of said plate member in order that said surfaces shall resiliently engage said plate member to prevent rotation of said strain relief bushing from the strain resisting position.

3. In combination, a wall structure having a non-circular opening formed therein, an electrical conducting cord, and a bushing-type strain relief which is disposed about said cord and which is adapted to be received within said opening to provide a strain relief for said cord, said strain relief bushing being constructed at least in part of resilient material and having two main body portions which terminate in opposed abutments, having end surfaces which are separated by a narrow, groove-like, intermural space, the cross-sectional area of one of said abutments being substantially greater than the cross-sectional area of the opening provided in said wall structure, and the cross-sectional dimensions and area of the other abutment being substantially the same as the corresponding dimensions and area of said opening whereby one end of said bushing can be freely inserted in said opening and then rotated to bring said abutments into strain resisting position, the width of said intermural space being less than the thickness of said wall structure in order that said abutment surfaces shall resiliently engage said wall structure to prevent rotation of said bushing from the strain resisting position.

4. In combination a wall structure having a non-circular opening formed therein, an electrical conducting cord, and a bushing-type strain relief which is disposed about said cord and which is adapted to be received within said opening to provide a strain relief for said cord, said strain relief bushing having two main body portions

which terminate in opposed, abutment surfaces which are separated by a narrow, groove-like, intermural space, the shape and cross-sectional dimensions of said body portions being such that at least one of said body portions can be inserted into the non-circular opening provided in said wall structure and, following such insertion, can be rotated to bring said abutment surfaces into strain resisting position, the width of said intermural space being such that said abutment surfaces are at least in close proximity to the surfaces of said wall structure when said bushing is in strain resisting position, and means for resiliently locking said bushing in strain resisting position, said means comprising a boss or projection which projects from one of said abutment surfaces and which is adapted to engage and lock with said wall structure when said abutment surfaces are in strain resisting position, the component parts of said bushing being constructed of material which permits yielding and relative movement between said parts when said bushing is being rotated into strain resisting position.

5. In combination a wall structure having a non-circular opening formed therein, an electrical conducting cord, and a bushing-type strain relief which is disposed about said cord and which is adapted to be received within said opening to provide a strain relief for said cord, said strain relief bushing having two main body portions which terminate in opposed, abutment surfaces which are separated by a narrow, groove-like, intermural space, the shape and cross-sectional dimensions of said body portions being such that at least one of said body portions can be inserted into the non-circular opening provided in said wall structure and, following such insertion, can be rotated to bring said abutment surfaces into strain resisting position, the width of said intermural space being such that said abutment surfaces are at least in close proximity to the surfaces of said wall structure when said bushing is in strain resisting position, and means for resiliently locking said bushing in strain resisting position, said means comprising a boss or projection of resilient material which projects from one of said abutment surfaces and which is adapted to yield when said bushing is being rotated to strain resisting position and to engage and lock with the sides of the opening in said wall structure when said bushing is in strain resisting position.

6. In combination, a wall structure having a non-circular opening formed therein, an electrical conductor cord, and a bushing-type strain relief of resilient material which is attached to said cord and which is adapted to be received within said opening, said strain relief bushing having two, main body portions, which terminate in opposed, abutment surfaces, which are separated by a narrow, groove-like, intermural space, the shape and cross-sectional dimensions of said body portions being such that one of said body portions can be freely inserted into said non-circular opening and, following such insertion, can be rotated to bring said abutment surfaces into strain-resisting position, and means for resiliently holding said strain relief bushing against rotation when said abutment surfaces are in strain-resisting position, said means comprising at least one boss or projection which projects from one of said abutment surfaces and which is adapted to engage and resiliently lock with the sides of said non-circular opening when said surfaces are in strain-resisting position.

7. In combination, a plate member having a non-circular opening formed therein, an electrical conductor cord, and a bushing-type strain relief which is attached to said cord and which is adapted to be received within said non-circular opening, said strain relief bushing having two, main body portions which terminate in opposed, abutment surfaces, which are separated by a narrow, groove-like intermural space, the cross-sectional area of one of said abutments being substantially greater than the cross-sectional area of said non-circular opening, the cross-sectional dimensions and area of the other body portion being substantially the same as the corresponding dimensions and area of said non-circular opening, whereby one end of said bushing can be freely inserted in such opening and then rotated to bring said abutments into strain-resisting position, and means for resiliently locking said bushing in strain-resisting position, said means comprising at least one boss or projection which extends from one of said abutment surfaces and which is adapted to engage and lock with said plate member, at least a part of said bushing being constructed of material which permits yielding and relative movement between said main body portions when said bushing is being rotated into strain-resisting position.

8. In combination, a plate member having a non-circular opening formed therein, an electrical conductor cord, and a bushing-type strain relief which is attached to said cord and which is adapted to be received within said non-circular opening, said strain relief bushing having two, main body portions which terminate in opposed, abutment surfaces, which are separated by a narrow, groove-like intermural space, the cross-sectional area of one of said abutments being substantially greater than the cross-sectional area of said non-circular opening, the cross-sectional dimensions and area of the other body portion being substantially the same as the corresponding dimensions and area of said non-circular opening, whereby one end of said bushing can be freely inserted in such opening, and then rotated to bring said abutments into strain-resisting position, the width of said intermural space being such that said abutment surfaces are at least in close proximity to the surfaces of said plate member when said bushing is in strain-resisting position, and means for resiliently locking said bushing in strain resisting position, said means comprising at least one boss or projection which extends from the surface of the abutment of greater area, which has the same general outline and cross sectional dimensions as said non-circular opening, and which is disposed with its major axis at an angle to the major cross sectional axis of said abutment of lesser area, said boss or projection being adapted to engage and lock with the sides of said non-circular opening in said plate member when said bushing is in strain-resisting position and said bushing being constructed of resilient material which permits yielding and relative movement between said main body portions when said bushing is being rotated into strain-resisting position.

9. In combination, a wall structure having a non-circular opening formed therein, an electrical conducting cord, and a bushing type strain relief which is disposed about and is attached to said cord and which is adapted to be received within said opening, said strain relief bushing having two main body portions which terminate in opposed abutment surfaces which are sepa-

rated by a narrow, groove-like, intermural space, the shape and cross sectional dimensions of said body portions being such that at least one of said body portions can be freely inserted into said non-circular opening and, following such insertion, can be rotated to bring said abutment surfaces into strain resisting position, the width of said intermural space being such that said abutment surfaces are at least in close proximity to the surface of said wall structure when said bushing is in strain resisting position, and means for preventing rotation of said strain relief bushing when said abutment surfaces are in strain resisting position, said means comprising a boss or projection which extends from one of said abutment surfaces and which is adapted to engage and lock with said wall structure, the component parts of said bushing being constructed of material which permits yielding and relative movement between said main body portions when said bushing is being rotated into strain resisting position, and the thickness of said boss or projection being substantially less than the width of the intermural space which exists between said spaced apart abutment surface.

10. In combination, a plate member having a non-circular opening formed therein, an electrical conductor cord, and a bushing type strain relief which is disposed about, and is attached to, said cord and which is adapted to be received within said non-circular opening, said strain relief bushing having two main body portions which terminate in opposed, substantially parallel, abutment surfaces which are separated by a narrow, groove-like intermural space, the cross sectional area of one of said abutments being substantially greater than the cross sectional area of said non-circular opening, the cross-sectional dimensions and area of the other body portion being substantially the same as the corresponding dimensions and area of said non-circular opening, whereby one end of said bushing can be freely inserted into the non-circular opening provided in said plate member and, following such insertion, can be rotated to bring said abutment surfaces into strain resisting position, the width of said intermural space being such that said abutment surfaces are at least in close proximity to the surfaces of said plate member when said bushing is in strain-resisting position, and means for resiliently locking said bushing in strain resisting position, said means comprising at least one boss or projection which extends from the surface of the abutment of greater area, which has the same general outline and cross sectional dimensions as said non-circular opening, and which is disposed with its major cross sectional axis at an angle to the major cross sectional axis of said abutment of lesser area, said boss or projection being adapted to engage and lock with the sides of said non-circular opening in said plate member when said bushing is in strain resisting position and being of a substantially less thickness than the width of said intermural space, said bushing being constructed of resilient material which permits yielding and relative movement between said main body portions when said bushing is being rotated into the strain resisting position.

11. In combination, an electrical conductor cord, and a bushing type strain relief which is disposed about, and is attached to, said cord, said strain relief bushing being constructed at least in part of resilient material, and having two main body portions which terminate in opposed abut-

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ments having substantially parallel abutment surfaces, which are separated by a narrow, groove-like, intermural space, one of said abutments being non-circular in outline, the other of said abutments being generally circular in outline and having a diameter which is at least substantially as great as the major cross sectional axis of the abutment which is non-circular in outline, and a boss or projection which extends into said intermural space from the surface of the abutment which is circular in outline, said boss or projection having the same general outline and cross-sectional dimensions as said non-circular abutment and being disposed with its major axis at an angle to the major cross sectional axis of said non-circular abutment.

12. In combination, an electrical conductor cord, and a bushing type strain relief which is disposed about said cord, said strain relief bushing being constructed at least in part of resilient material and having two main body portions which terminate in opposed abutments, said abutments having substantially parallel abutment surfaces, said surfaces being separated by a narrow groove-like intermural space, and a non-circular boss or projection which projects from one of said abutment surfaces into said intermural space, and at least a substantial portion of the other of said abutment surfaces being in superpositioned, overlying relation with respect to a substantial portion of said non-circular abutment surface.

13. In combination, an electrical conductor cord, and a bushing type strain relief which is disposed about, and is attached to, said cord, said strain relief bushing being constructed at least in part of resilient material, and having two main body portions which terminate in opposed abutments, said abutments having substantially parallel abutment surfaces and said surfaces being separated by a narrow, groove-like, intermural space, and a non-circular boss positioned within said intermural space so as to interconnect said abutment surfaces, at least one of said abutments being non-circular in outline and the other of said abutment surfaces having a substantial por-

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tion thereof in superpositioned, overlying relation with respect to said non-circular abutment surface.

14. In combination, an electrical conductor cord, and a bushing type strain relief which is disposed about, and is attached to said cord, said strain relief bushing being constructed at least in part of resilient material and having two main body portions which terminate in opposed abutments, said abutments having substantially parallel abutment surfaces, said surfaces being separated by a narrow groove-like intermural space, the area of one of said abutments being substantially greater than the area of the other of said abutments, the smaller of said abutment areas being non-circular in outline, and means comprising a boss or projection which extends from the surface of the abutment of greater area, said boss having substantially the same general outline and cross-sectional dimensions as said non-circular abutment surface, and being disposed with its major axis at an angle to the major cross-sectional axis of said abutment of lesser area.

15. In combination, an electrical conductor cord, and a bushing type strain relief which is disposed about said cord, said strain relief bushing being constructed at least in part of resilient material and having two main body portions which terminate in opposed abutments, said abutments having substantially parallel abutment surfaces, said surfaces being separated by a narrow groove-like intermural space, and a non-circular boss or projection which projects from one of said abutment surfaces into said intermural space.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,094,990	Havens	Apr. 28, 1914
2,115,495	Mapelsden	Apr. 26, 1938
2,165,952	Alsrom	July 11, 1939