May 23, 1950 H. D. STECHER 2,508,476

CABLE CONNECTOR

Filed Sept. 19, 1947 2 Sheets-Sheet 1

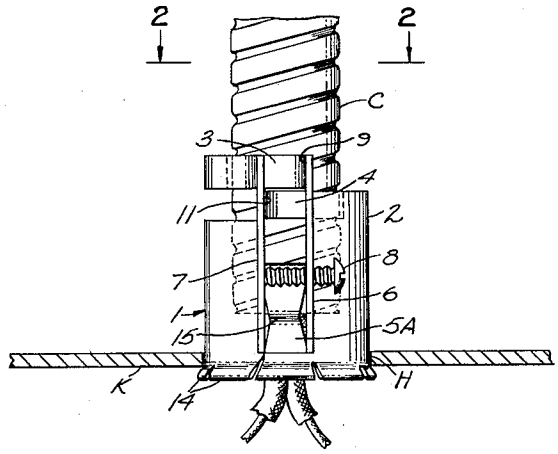


FIG. 1

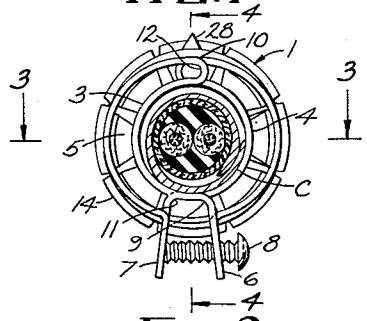


FIG. 2

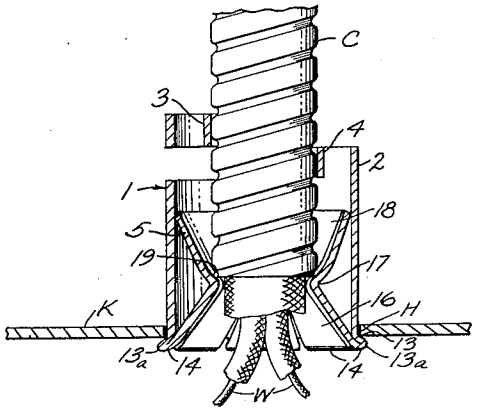


FIG. 3

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CABLE CONNECTOR

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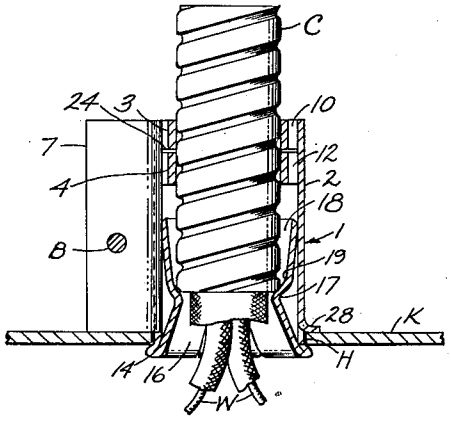


FIG. 4

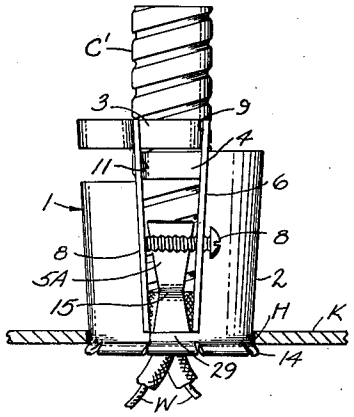


FIG. 5

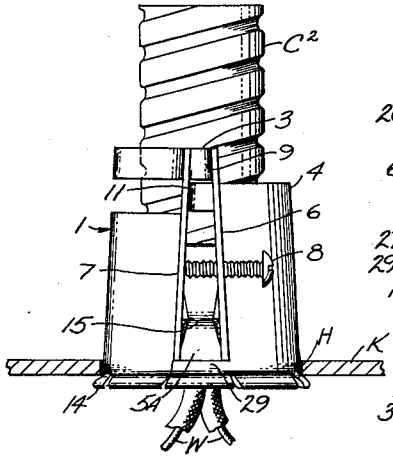


FIG. 6

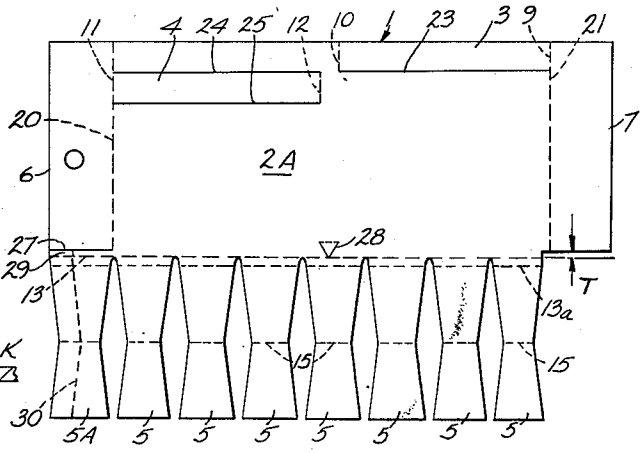


FIG. 7

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2,508,476

CABLE CONNECTOR

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10 Claims. (Cl. 285—6.5)

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This invention relates to conduit connectors and more particularly to improvements in BX conduit connectors which are adapted to secure and connect flexible armored BX conduits or the like to terminal or outlet boxes or to perforate walls or plates.

An object of my invention is to provide an improved connector in which a single adjusting force or action causes one part of the connector to contract and grip a BX or like conduit and another part to expand and grip within an apertured wall of an outlet box. Another object is to provide a connector which is adapted to receive conduits of various sizes and be received in apertures of various sizes. Another object is to provide a connector which correctly positions the end of a BX conduit in place within the connector and which presents a smooth rounded surface suitable for guiding the electrical leads from the conduit into the box without danger of abrading, cutting, or otherwise damaging the leads. Another object is to provide a connector in which conically disposed resilient fingers provide abutting surfaces which position and hold the end of the conduit sheath and by their resilience enable accommodation of the connector for use with conduits of varying size. A further object is to provide a connector of wide range of adaptability which grips a BX or like conduit and outlet box tightly and firmly, which is conveniently made from a single stamping, providing economy of manufacture, which itself presents no problem of assembly in manufacture or use and which can be easily and quickly assembled with a conduit, its conductors and a terminal box.

Other objects include the provision of a BX connector which will securely engage the apertured wall of an outlet box and have a positive engagement perpendicular thereto without tendency to wobble or tip and which will constrain the conduit engaged by the connector to coaxial alignment therewith and desirable perpendicularity to said wall. Another object is to provide a connector in which the gripping action on the conduit and on the apertured wall resulting from a single applied force is advantageously balanced and apportioned. Another object is to provide a connector through which conductors may be easily inserted and guided and in which the severed, often jagged, end of the conduit sheath is secured and constrained from deleterious contact with the conductors or from hazardous contact with the fingers of the workman using the connector. Another object is to provide a connector that is neat and attractive in appearance

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and which in operative engagement with a conduit and outlet box cleanly joins the two and inhibits the intrusion of extraneous material into the box through the apertured wall thereof.

Other objects and advantages will appear from the following description of a preferred form of my invention with reference to the accompanying drawings in which Figure 1 is a side elevation of a preferred form of my connector in operative engagement with a conduit and an outlet box; Figure 2 is a top plan view of the connector of Figure 1; Figure 3 is a longitudinal sectional view of my connector taken in the plane of the line 3—3 of Figure 2; Figure 4 is a longitudinal sectional view of my connector taken in the plane of the line 4—4 of Figure 2; Figures 5 and 6 are side elevations illustrating the mode of operation of my connector, and Figure 7 is a plan view of the sheet metal blank from which my connector is formed.

A preferred form of my connector, referred to generally at 1, comprises a split cylindrical sleeve portion 2 formed from light gauge resilient sheet metal stock having an internal diameter larger than the largest conduit with which it is to be used and adapted upon expansion from its minimum external diameter to secure itself firmly within a hole H in the wall K of a terminal or outlet box. The sleeve 2 is provided internally with crossed over conduit clamping elements or strap portions 3 and 4 which are adapted to be contracted toward each other and to clamp the conduit C tightly between them as the sleeve 2 is expanded. The positioning of the conduit within the connector preparatory to such clamping is facilitated by a plurality of bent resilient fingers 5 which form a seating surface for the end of the sheath of conduit C and which by reason of their resilience help the clamping elements hold the conduit securely within the sleeve when it is expanded.

To facilitate expansion of the sleeve 2 and the contraction of the clamping elements 3 and 4, the sleeve is provided with a pair of outstanding radial wings 6 and 7. A screw 8 threadedly extends through one wing 6 and is adapted to thrust against the other wing 7. When the screw 8 is advanced inwardly the wings are forced apart, the sleeve is expanded within the hole H and the clamping elements are constricted upon the conduit. When the screw is threadedly withdrawn so that the wings are no longer forced apart, the inherent resiliency of the sleeve preferably tends to contract it to its idle minimum

exterior diameter and simultaneously expand the clamping elements to a wide open position.

The armored flexible conduit C is, as mentioned above, gripped in an advantageous manner at a point spaced from its extreme end by the clamping elements or straps 3 and 4 respectively. One element takes the form of a narrow strap or band 3, see Fig. 7, severed throughout its length from the upper edge of the sleeve and integrally joined to and bent away from the root of the wing 6 as at 9, then following the opposite side of the sleeve and around the conduit C (when the conduit is disposed therein as shown in Figure 2) for approximately half the circumference of the sleeve, and finally bending back to terminate in the wall of the sleeve at 10, see Figures 2 and 4. The other clamping element takes the form of a strap 4 cut from the wall of the sleeve at a level below the strap 3 and integrally joined to and bent away from the root of the wing 7 as at 11 and following around the other half of the sleeve and the conduit C, the sleeve and the conduit C, finally bending back upon itself and terminating in the wall of the sleeve at 12, see Figures 2, 4 and 7.

The clamping elements or straps 3 and 4 as best seen in Figures 2 and 3 hold the conduit C in the center of and concentric with the sleeve and themselves are or become spaced from the wall of the sleeve as the sleeve is constricted. When the screw 8 spreads the wings 6 and 7 apart, the force exerted by the screw is transmitted by the wings to the wall of the sleeve to expand it circumferentially and ipso facto to spread apart the points 9 and 11 which thereby draws the straps 3 and 4 toward each other to clamp the conduit forcibly between them. The constriction of contraction of the straps is thus simultaneous with the expansion of the sleeve and follows from the crossing of the straps interiorly of the sleeve and their respective dispositions on opposite sides of the axis of the sleeve and conduit.

The circumferential and diametrical expansion of the sleeve causes it to be wedged tightly within the hole H in the wall of the box in which it fits. This expansion is such as to hold the connector firmly to the box, yet upon release of the screw 8 permits easy removal therefrom. Analysis of the manner in which the wings 6 and 7 and screw 8 impose and transmit force to the sleeve and clamping straps, will show that uniform displacement is not necessary over the longitudinal length of the sleeve but may vary depending on the conduit size, the diameter of the unexpanded sleeve and the diameter of the hole H. I prefer that the straps lie near the upper end of the sleeve, as viewed; that the opposite and lower end of the sleeve engage the hole H and that the screw 8 be disposed about midway between the ends whereby to apportion the hole and conduit gripping forces respectively about equally. If the diameter of the unexpanded sleeve is only slightly smaller than the hole H and the diameter of conduit C is about as small as can be conveniently used with the particular connector, see Figure 5, then application of force with the screw will initially expand the sleeve within hole H without bringing the straps into substantial clamping engagement with the conduit. Thereafter additional advance of the screw in the same direction will in part act to increase the gripping force between the sleeve and the periphery of the hole H but in greater part will distort the sleeve so that further expansion of the sleeve and corresponding constriction of the straps takes place

at the top of the sleeve. Further expansion of the sleeve entails continued constriction of the straps 3 and 4 and proceeds until the straps clamp the conduit with the desired force.

On the other hand, if the conduit should be large in relation to the size of the connector and the hole so that the clamping straps tend to engage the conduit before the sleeve is fully expanded within the hole H, the connector will expand in the manner indicated in Figure 6, i. e., the initial turns of the screw 8 will result first in a clamping of the conduit by the straps 3 and 4, the sleeve expanding but at first remaining loose in the hole H. After the conduit has been clamped further turns of the screw will distort the sleeve, so that expansion takes place primarily at the bottom of the sleeve since the conduit prevents further contraction of the straps and the upper part of the sleeve. The screw then is turned until the bottom of the sleeve expands sufficiently to grip the wall of the hole H with satisfactory force. Such ability to expand non-uniformly permits great flexibility of operation and enables my connector to be used with a great variety of conduits and conduit boxes without any adjustment except that inherent in the mode of operation of my invention.

The resilient fingers 5, which as previously mentioned provide a seating surface for the end of the sheath of the conduit C, see Figures 3 and 4, serve to restrict the longitudinally inward disposition of the conduit into the connector, and the fingers 5 acting in cooperation with the clamping straps 3 and 4 hold the conduit concentrically and coaxially in place within the connector and normal to and coaxially of the hole H. The fingers 5 also participate in the adaptability of the connector to be used with a wide variety of conduit and hole sizes. The fingers preferably are turned upwardly from the bottom of the sleeve to lie interiorly thereof and are folded first slightly outwardly along the root line 13, Fig. 7, and then upwardly along the lines 13a which lines are preferably spaced a slight distance from the roots of the fingers to form ears 14, as best shown in Figures 1, 3 and 4. The fingers are folded again along their lateral center lines 15 at an obtuse angle; the fingers thus defining a conical passage 16 converging toward the interior of the sleeve to a throat 17 which is preferably smaller in diameter than the external diameter of the sheath of the smallest conduit to be used with the connector. From the throat 17 the fingers define a conically diverging passage 18 which merges into the interior surface of the sleeve in the mid-portion thereof. From the throat 17 to the ears 14 the fingers provide a smooth flaring mouth through which the conductors pass and are protected from deleterious contact with raw or sharp edges or corners. Preferably the portions of the fingers which define the passage 18 just above the throat 17 are slightly concave as at 19 to provide a seat or seating surface for the end of the sheath of the conduit. Preferably the fingers are resiliently stressed to tend to constrict the throat 17 so that insertion of a conduit, cf. Figs. 3 and 4, will tend to expand the throat and the seating portions 19 affording a yielding grip between the latter and the end of the sheath. If later expansion of the sleeve incident to gripping the hole H or the conduit by the crossed straps 3 and 4 increases or tends to increase the mean diameter of the upper and lower ends of the fingers and hence the throat 17 and seat 19 then the resiliency of the fingers

will continue the desired centering embrace and contact with the end of the sheath.

The diverging passage 16 enables the wires W leading from the conduit to enter the outlet box at a substantial angle without contacting or bending around any sharp edges. Therefore the danger of cutting or abrading the wires is substantially eliminated. If it should be necessary to bend the wires very sharply, i. e., at right angles, the only edges exposed for contact are the rounded folds of the ears 14 at the mouth of the passage 16.

Preferably my connector is formed from a blank of sheet metal, see Figure 7, having a main panel 2A which when rolled into cylindrical form comprises the sleeve 2 of the connector. Wings 6 and 7 are bent radially outward from the main panel along fold lines 20 and 21 respectively. The main panel is cut near its upper edge by slit 23 which defines the clamping strap 3 and by slits 24 and 25 which define clamping strap 4, the straps being bent at the points 9, 10 and 11, 12 respectively to the arcuate shape adapted to conform to the conduit C as previously described, see Figure 2. The fingers 5 are preferably slightly spaced apart at their root line 13, i. e., where they join the panel 2A, to facilitate their being bent upward into the sleeve. In order to give the several fingers their collective "hour glass" form each of the fingers 5 is sheared to taper inwardly from its root and also from its free end to a reduced middle dimension corresponding to the throat at fold line 15. This general shape of fingers ensures that, when the fingers are bent and bent upwardly with respect to the panel 2A and the latter bent or rolled to cylindrical form whereby the fingers form the tapering passages, the width of the fingers at the several points of their length will not exceed the available minimum circumferential space nor occupy substantially less than such available minimum space. The fingers being widest at the large open ends of the passages and being narrowest at the throat, the point of least circumference, the edges of the fingers will lie close together to define substantially continuous passage surfaces when the sleeve takes its minimum diameter and will not be inordinately or deleteriously spaced when the sleeve is greatly expanded.

The dimension T of that strip of the main panel 2A which lies between the lower edges of the wings 6 and 7 and the root line 13 of the fingers as shown in Figure 7 is preferably slightly smaller than the thickness of the wall K of the conduit box to facilitate a snug grip between my connector and the periphery of the hole H as will presently more fully appear. Preferably a small triangular tang 28 is struck outwardly from the blank about midway between the wings 6 and 7, as shown in Figures 4 and 7, and is adapted to be bent outwardly to help limit the insertion of the connector through the hole H by abutting the outer surface of the wall of the box adjacent the edge of the hole, see Figure 4. The lower surface of the bent tang 28 preferably is spaced above the root line 13 a distance equal to the dimension T wherewith to square the connector in relation to the wall K when the former has engaged the latter.

As best shown in Figure 7 the blank is slit along the line 27 to define the lower edge of the wing 6 and permit its free folding along the line 20 independently of the extreme leftward finger 5A and the narrow strip 29 of stock through which the finger 5A is attached to the panel 2A. It is

practicable to eliminate the finger 5A and the strip 29 entirely in the manufacture of my connector but I prefer to retain these parts or a portion thereof as suggested by the dotted line 30 wherewith to establish a "normal" idle condition of the connector with the wings spaced apart and the finger 5A with the strip 29 bridging the gap between the wings much as shown in Figure 1. With this arrangement a manual offsetting of the wings and corresponding distortion of the sleeve 2 permits the finger 5A and the strip 29 to be forced radially inward and in underlapping relation to the root of the wing 7 and the finger adjacent thereto and permits the wings to be brought close together with consequent "sub-normal" reduction in the diameter of the whole sleeve to permit the lower end of the sleeve with the out-turned ears 14 to be freely inserted into the hole H in the first instance. Thereupon spreading the wings 6 and 7 and withdrawing the finger 5A and strip 29 out to circumferential alignment with the other fingers and the lower portion of the sleeve 2 will bring the sleeve to its "normal" position within the hole H but short of gripping engagement therewith. Such a condition is suggested in Figure 1 and, as presently advised, is preferable preliminary to the insertion of the conduit C and preliminary to the forcible expansion of the sleeve to begin the gripping of the periphery of the hole and conduit as hereinabove described. This provision of what I term a normal state for the connector with the wings spaced apart also insures that the lower edges of the wings will bear at more widely spaced points on the surface of the wall K of the outlet box whilst the lower face of the tang 28 bears on the wall oppositely thereof whereby to give a three-point contact through which the connector is squared with respect to the wall K and more effectively restrained from wobbling or tipping with respect thereto. Furthermore in the "normal" idle state of the connector with the wings spaced and approximately parallel, and assuming the lower end of the connector to be loosely and properly located in the hole, the straps 3 and 4 can be given their maximum expansion for reception of a large conduit by manually squeezing the top of the wings, see Fig. 6, without necessarily contracting the bottom of the sleeve 2 or disturbing the relation of the connector with the hole H. This latter operation will be facilitated especially if the screw 8 have its end about midway between the wings to maintain the spread of the lower ends whilst the upper ends are contracted.

The blank of Figure 7 can be readily bent, rolled and formed to the shape and structure of the connector of Figures 1–6 and being of one piece requires no assembly of separable parts except the insertion of the screw 8. In use, the screw 8 is backed off and if the resiliency of the connector does not tend to full sleeve contraction, the wings 6 and 7 may be manually pressed together or to proximity for full or desirable contraction of the sleeve and expansion of the straps. With the connector contracted to its "normal" or "sub-normal" state it may be pushed in and through the hole H, depending on the size thereof, until the tang 28 and the lower edges of wings 6 and 7 strike the outer surface of the wall K and prevent further insertion; this contact and limitation being judiciously enhanced by permissive or induced expansion of the connector just after the ends of the ears 14 have passed beyond the lower or inner edge of the

periphery of the hole H. The conduit C may then be conveniently inserted into the connector and into the converging passage 18 until the end of its sheath abuts and seats on the concave surfaces 19 at a point above and adjacent the throat 17, the fingers 5 yielding somewhat under the thrust of the conduit. The screw 8 is then turned inwardly to separate the wings and expand the sleeve within the hole H and contract the clamping straps 3 and 4 upon the conduit. As the sleeve expands the fingers 5 by reason of their initial yielding maintain or tend to maintain snug yielding contact with the end of the conduit sheath and together with the clamping straps 3 and 4 continue to hold the conduit firmly to the connector and in coaxial alignment therewith normal to the plane of the wall K of the box.

Upon final expansion of the sleeve the connector is positively located and secured in the wall of the box by the tang 28 and the lower edges of the wings 6 and 7 bearing on the outside of the wall and by the ears 14 bearing oppositely on the inside of the wall. The ears 14 once the sleeve is expanded project into the box and project beyond the periphery of the hole H as shown and hold the connector against withdrawal outwardly. The tang 28 and the wing 6 and 7 abut the outer surface of the box on opposite sides of the hole H and opposite of the ears 14 and prevent the connector from moving into the box or moving relative to the wall. If the dimension T is somewhat less than the thickness of wall K the sloping outer sides of the ears 14 will engage the inner peripheral edge of the hole H and draw the connector into snug fit against the wall of the box, the wall being gripped between the tang and wings and the inclined ears.

While I have described a preferred form of my invention, changes, improvements and modifications will occur to those skilled in the art without departing from the spirit and substance of my invention or the teachings hereof, and I do not care to be limited in the scope of my patent in any manner other than by the claims appended hereto.

I claim:

1. A conduit connector adapted to receive and grip a conduit and be received within and expanded into gripping engagement with the peripheral edge of a hole in the wall of a connector receiving instrumentality comprising an integral sleeve incorporating two similarly formed relatively movable parts symmetrically disposed with respect to the longitudinal axis of the connector, each part having portions spaced apart longitudinally and disposed on opposite sides of said axis and lying diametrically opposite corresponding juxtaposed portions in the other part, one diametrically opposed pair of said portions lying near one end of said connector and being expansible and engageable externally with said edge when said parts are diametrically displaced, the other pair of said portions being contractable and engageable internally with said conduit when said parts are diametrically displaced, and means for displacing said parts relative to each other.

2. The connector of claim 1 in which one pair of said portions are formed from the stock of said sleeve and in part severed therefrom and crossed therewithin.

3. The connector of claim 1 in which said other pair of said portions comprise substantially semicircular crossing straps with their ends respectively connected to said parts on sides of said axis oppositely of the disposition of the middles of said portions.

4. The connector of claim 1 in which said pairs of portions each extend for substantially a full circle at approximately opposite ends of said connector.

5. The connector of claim 1 in which said parts are interconnected and relatively movable, each portion of a said pair when constrained against movement serving as a fulcrum about which said means moves a part and the other portion thereof.

6. A connector for connecting a conduit to an outlet box comprising a split sleeve adapted to be inserted within a hole in the wall of said outlet box, means for expanding said sleeve within said hole to secure said connector to said box, arcuately looped mutually crossed straps adapted to clasp said conduit between them, one end of each strap being secured respectively at adjacent points to the wall of said sleeve, said ends being relatively immovable upon expansion of said sleeve, the other ends of said straps being connected respectively adjacent the longitudinal edges of said split sleeve and adapted to move away from each other upon expansion of said sleeve to cause said straps to clamp said conduit between them.

7. The connector of claim 6 in which said sleeve has a plurality of fingers bent inwardly from and into one end thereof to lie therein, and define a tapered passage converging from the end toward the interior of said sleeve, said fingers being adapted to resiliently contact the sheath of said conduit and limit its insertion into said connector.

8. The connector of claim 6 in which said sleeve has a plurality of fingers bent inwardly from one end thereof to lie therein, and define an hourglass shaped passage converging to a throat of minimum diameter spaced from the end of said sleeve, said fingers inwardly of said throat defining a seat adapted to resiliently contact the end of the sheath of said conduit and limit its insertion in said connector and align the same coaxially thereof.

9. A connector adapted to be inserted within a hole in the wall of an outlet box for connecting a conduit thereto comprising means for expanding a part of said connector to secure said connector within said hole, and for simultaneously constricting a part of said connector to clamp said conduit within said connector, a plurality of reversely bent fingers lying within said connector and diverging from a zone spaced from their roots to form a passage flaring outwardly in the direction of said box, said passage terminating in ears projecting into said box and projecting beyond the periphery of said hole when said connector is expanded and preventing withdrawal of said connector from said hole.

10. A connector adapted to be inserted through a hole in the wall of an outlet box and removably secure a conduit thereto comprising a split sleeve, said sleeve having two substantially radial outstanding wings, a screw threadedly extending through one of said wings and adapted to thrust against the other of said wings and secure it within said hole and expand said sleeve forcibly circumferentially, the lower edges of said wings abutting said wall and limiting the insertion of the connector therethrough, a pair of crossed looped straps connected respectively to said wings embracing said conduit and upon expansion of said sleeve being adapted to constrict and clamp said conduit therebetween, a plurality of stiffly resilient fingers bent upwardly from the bottom of said sleeve interiorly thereof, said fingers being

tapered from both ends to a central narrow portion and adapted to be bent at said narrow portion at an obtuse angle to define a substantially conical converging passage, a throat, and a substantially conical diverging passage, the mouth of said diverging passage comprising ears adjacent the roots of said fingers projecting radially beyond said sleeve and into said box and adapted upon expansion of said sleeve to project beyond the periphery of said hole and prevent withdrawal of said connector therefrom, and a tang struck from said sleeve substantially diametrically opposite said wings and adjacent to and spaced from the roots of said fingers and engageable with said wall in opposition to said ears.

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