IN THE UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF PENNSYLVANIA

ARLINGTON INDUSTRIES, INC., Plaintiff, v. BRIDGEPORT FITTINGS, INC. Defendant.	Civil Action No.: 06:CV:1105 (ARC) **JURY DEMAND** **INJUNCTIVE RELIEF SOUGHT** **ELECTRONICALLY FILED**

SECOND AMENDED COMPLAINT WITH INJUNCTIVE RELIEF SOUGHT

In support of its Second Amended Complaint against Defendant BRIDGEPORT FITTINGS, INC. ("BRIDGEPORT"), Plaintiff ARLINGTON INDUSTRIES, INC. ("ARLINGTON") states as follows:

THE PARTIES

1. Plaintiff ARLINGTON is a corporation organized and existing under the laws of the State of New York, having a principal place of business at 1 Stauffer Industrial Park, Scranton, Pennsylvania 18517.

2. Defendant BRIDGEPORT is a corporation organized and existing under the laws of the State of Connecticut, having its headquarters and principal place of business at 705 Lordship Boulevard, Stratford, CT 06615.

JURISDICTION AND VENUE

3. This action arises under the Patent Laws of the United States, 35 U.S.C. § 100 *et seq*.

4. This Court has original Federal Question jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338.

5. Venue is proper in this District under 28 U.S.C. § 1391 as defendant BRIDGEPORT regularly conducts business throughout this District.

CLAIM 1
INFRINGEMENT OF U.S. PATENT NO. 6,521,831

6. ARLINGTON repeats and incorporates by reference the allegations set forth in Paragraphs 1-5.

7. ARLINGTON is the owner by assignment of United States Patent No. 6,521,831 ("the '831 patent"). The '831 patent was duly and legally issued by the United States Patent and Trademark Office on February 18, 2003. A true and correct copy of the '831 patent is attached as Exhibit A.

8. BRIDGEPORT is infringing the '831 patent. Upon information and belief, BRIDGEPORT makes, uses, sells, offers to sell, or imports the following products with designated catalog numbers: 3838ASP and 3838SP ("the Accused

Products"). BRIDGEPORT infringes and continue to infringe the '831 patent by making, using, selling, offering to sell, or importing the Accused Products.

9. BRIDGEPORT's infringement of the '831 patent is willful. BRIDGEPORT knew or should have known that by making, using, selling, offering to sell, and/or importing the Accused Products that there was a high likelihood that its actions constituted infringement of the '831 patent.

10. This is an exceptional case warranting an award of treble damages to ARLINGTON under 35 U.S.C. § 284, and an award of ARLINGTON's attorney fees under 35 U.S.C. § 285.

11. ARLINGTON has been irreparably and monetarily damaged by BRIDGEPORT'S infringement of the '831 patent. If BRIDGEPORT'S actions are not permanently enjoined, ARLINGTON will continue to be irreparably and monetarily damaged.

CLAIM 2
INFRINGEMENT OF US. PATENT NO. 5,266,050

12. ARLINGTON repeats and incorporates by reference the allegations set forth in Paragraphs 1-11.

13. ARLINGTON is the owner by assignment of United States Patent No. 5,266,050 ("the '050 patent"). The '050 patent was duly and legally issued by the United States Patent and Trademark Office on September 11, 1992. A true and correct copy of the '050 patent is attached as Exhibit B.

14. BRIDGEPORT is infringing Claim 8 of the ‘050 patent. Upon information and belief, BRIDGEPORT makes, uses, sells, offers to sell, or imports the Accused Products. BRIDGEPORT infringes and continue to infringe the ‘050 patent by making, using, selling, offering to sell, or importing the Accused Products.

15. BRIDGEPORT’s infringement of the ‘050 patent is willful. This is an exceptional case warranting an award of treble damages to ARLINGTON under 35 U.S.C. § 284, and an award of ARLINGTON’s attorney fees under 35 U.S.C. § 285.

16. ARLINGTON has been irreparably and monetarily damaged by BRIDGEPORT’S infringement of the ‘050 patent. If BRIDGEPORT’s actions are not permanently enjoined, ARLINGTON will continue to be irreparably and monetarily damaged.

CLAIM 3
DECLARATION THAT BRIDGEPORT IS BARRED FROM A FINDING OF INEQUITABLE CONDUCT AND ANY OTHER EQUITABLE RELIEF BY THE DOCTRINE OF UNCLEAN HANDS

17. ARLINGTON repeats and incorporates by reference the allegations set forth in Paragraphs 1-16.

18. BRIDGEPORT has unclean hands when it comes into this Court and requests equitable relief such as a finding that the ‘831 patent is unenforceable due to inequitable conduct.

19. BRIDGEPORT has not been frank and fair with the Court and the United States Patent and Trademark Office in its representations.

20. BRIDGEPORT is barred from a finding that the ‘831 patent is unenforceable due to inequitable conduct or any other equitable relief due to its unclean hands.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff ARLINGTON prays for a judgment:

A. That BRIDGEPORT has infringed the ‘831 patent;

B. Awarding damages for infringement of the ‘831 patent;

C. Awarding treble damages for willful infringement of the ‘831 patent;

D. That BRIDGEPORT has unclean hands and is barred from a finding that the ‘831 patent is unenforceable due to inequitable conduct.

E. Preliminarily and permanently enjoining and restraining BRIDGEPORT from further infringement of the ‘831 patent;

F. That BRIDGEPORT has infringed the ‘050 patent;

G. Awarding damages for infringement of the ‘050 patent;

H. Preliminarily and permanently enjoining and restraining BRIDGEPORT from further infringement of the ‘050 patent;

I. Awarding treble damages for willful infringement of the ‘050 patent;

J. That this is an exceptional case under 35 U.S.C. § 285 warranting an award of ARLINGTON'S attorney fees;

K. Awarding pre-judgment interest to compensate ARLINGTON for the damages it has sustained;

L. Awarding costs for this lawsuit; and

M. Awarding ARLINGTON such other and further relief as the Court deems just and proper.

JURY DEMAND

Plaintiff ARLINGTON demands trial by jury on all issues.

Date: September 24, 2007

Respectfully submitted,

By:/s/ Robert J. Tribeck

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Exhibit A

US006521831B1

(12) **United States Patent**
Gretz

(10) **Patent No.: US 6,521,831 B1**
(45) **Date of Patent: *Feb. 18, 2003**

(54) **DUPLEX ELECTRICAL CONNECTOR WITH SPRING STEEL CABLE RETAINER**

(75) Inventor: **Thomas J. Gretz**, Clarks Summit, PA (US)

(73) Assignee: **Arlington Industries, Inc.**, Scranton, PA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **09/941,341**

(22) Filed: **Aug. 29, 2001**

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/792,185, filed on Feb. 23, 2001, now Pat. No. 6,355,884, which is a continuation-in-part of application No. 09/373,427, filed on Aug. 13, 1999, now Pat. No. 6,194,661.

(51) **Int. Cl.**[7] **H02G 3/18**

(52) **U.S. Cl.** ..... **174/65 R**; 439/552; 174/153 R

(58) **Field of Search** ..... 174/65 R, 153 R, 174/59, 60, 61, 62, 151, 65 G, 153 G; 439/552

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,373,106 A * 12/1994 O'Neil et al. ..... 174/65 R
6,080,933 A * 6/2000 Gretz ..... 174/65 R

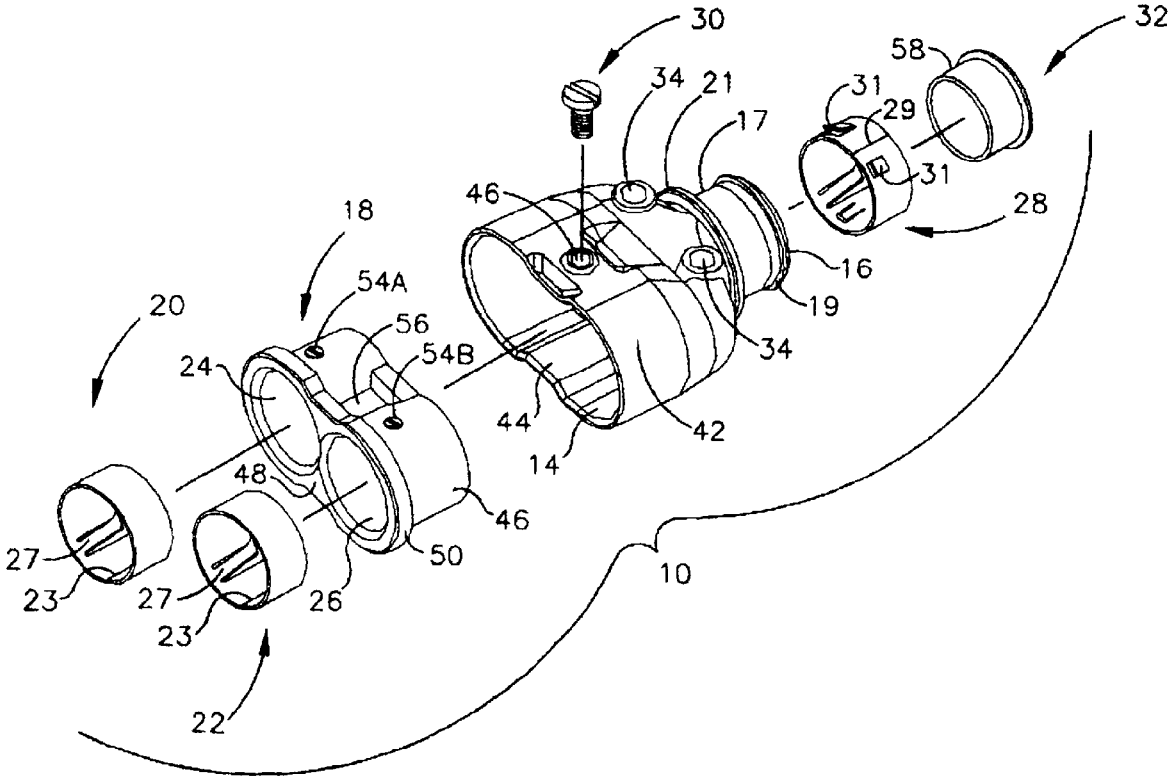
* cited by examiner

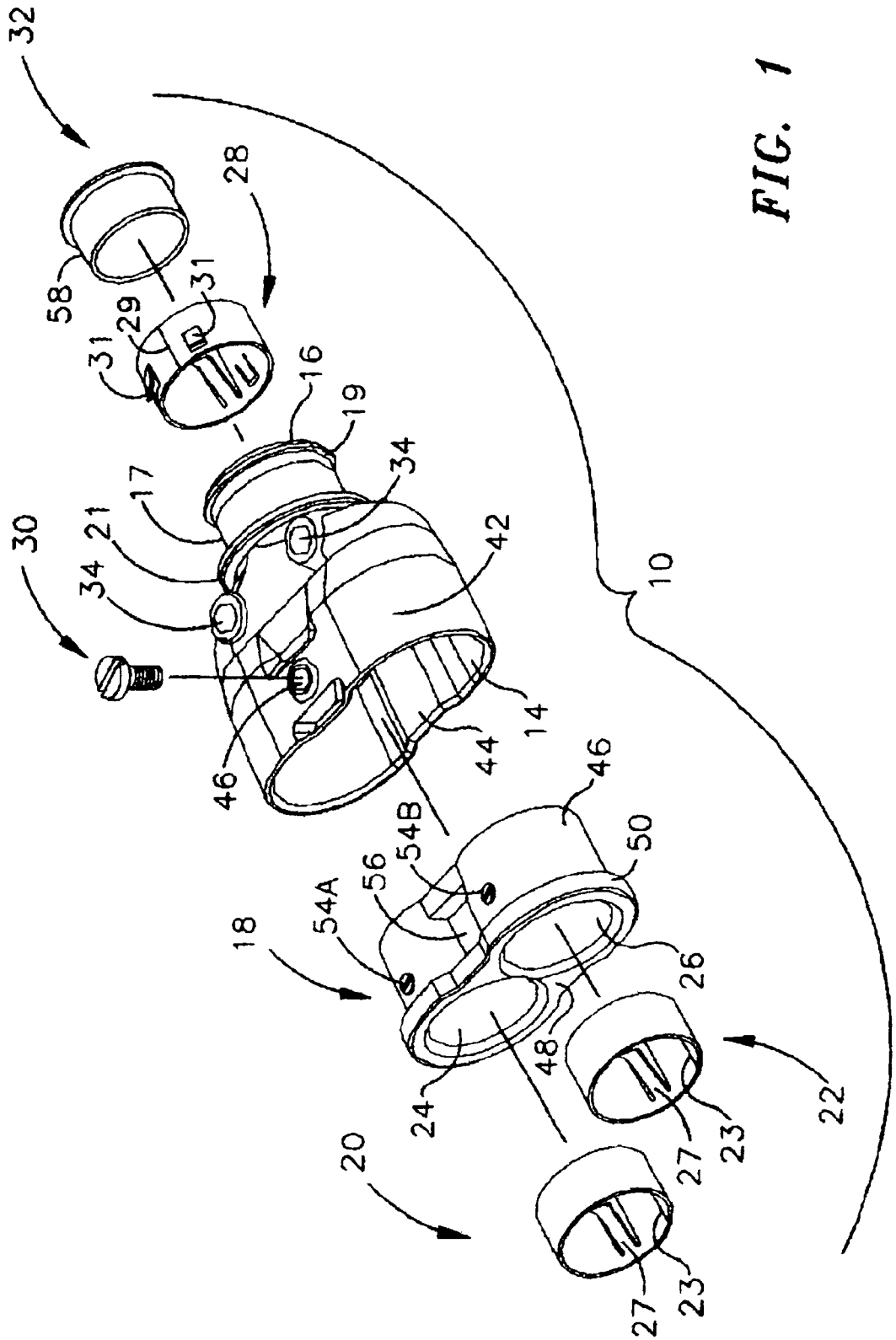
Primary Examiner—Javaid Nasri

(57) **ABSTRACT**

A duplex electrical connector providing two inbound end apertures to conduct two helically wound armored or metal clad electrical cables through a single hole in an electrical junction box and secure it thereto. The duplex connector includes a housing with spring steel cable retainers at its inbound end to secure the cables and prevent their forceful withdrawal from the box. A spring steel adapter is included at the outbound end of the housing to provide easy snap-in attachment to the box. Two embodiments include an insert for attaching the cable retainers to the housing and a third embodiment includes a housing that accepts the cable retainers without the need for a separate insert.

6 Claims, 5 Drawing Sheets

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54B
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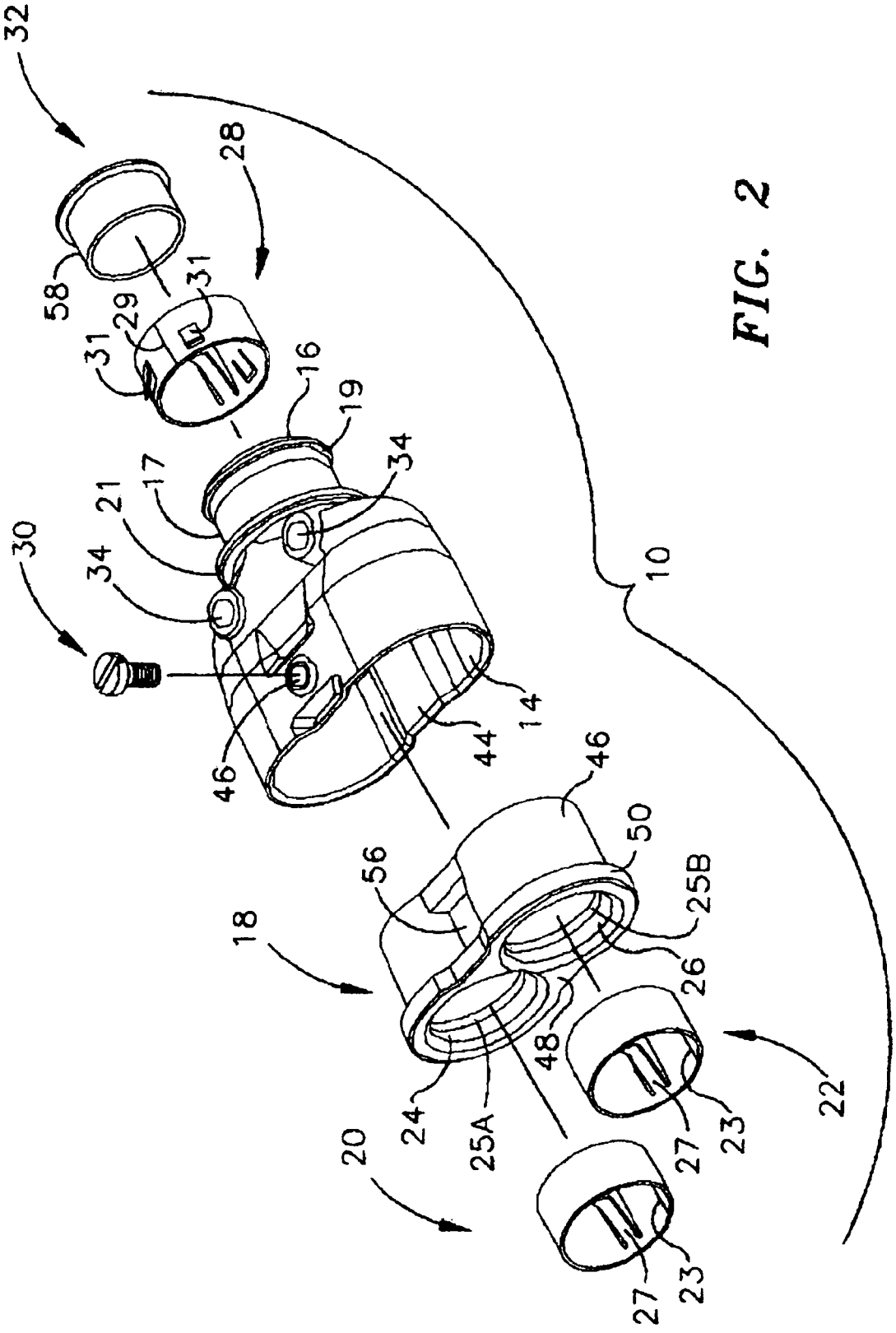
FIG. 1


32
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25B
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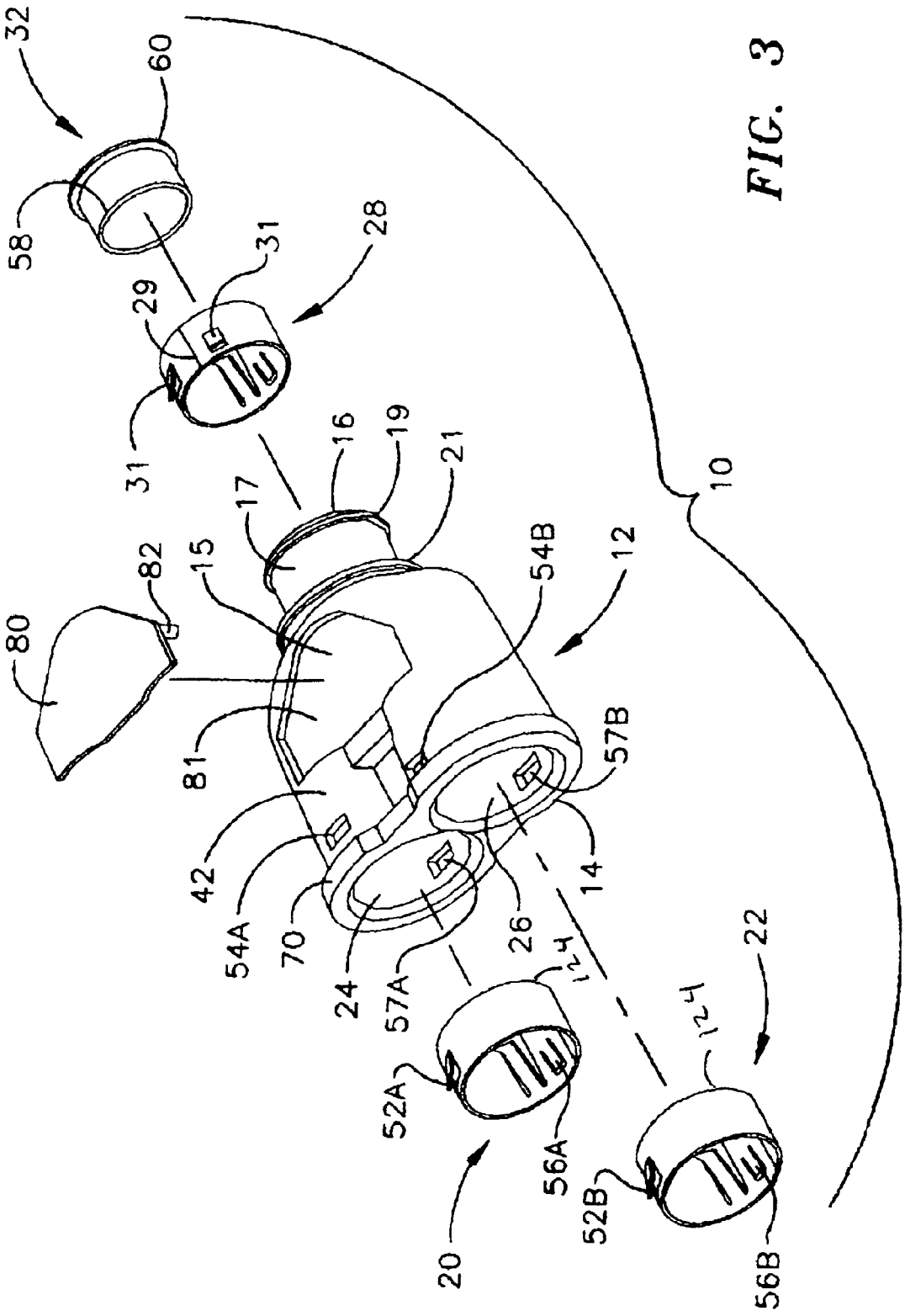
FIG. 2


32
60
58
31
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16
19
21
17
10
82
15
54B
12
80
81
57B
42
14
54A
70
24
26
57A
124
22
124
52A
20
56A
52B
56B

FIG. 3

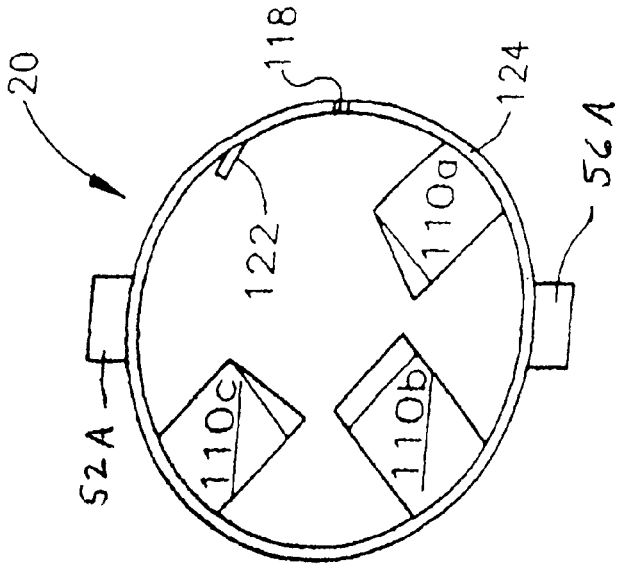
20
118
124
122
110a
56A
52A
110c
110b

FIG. 5

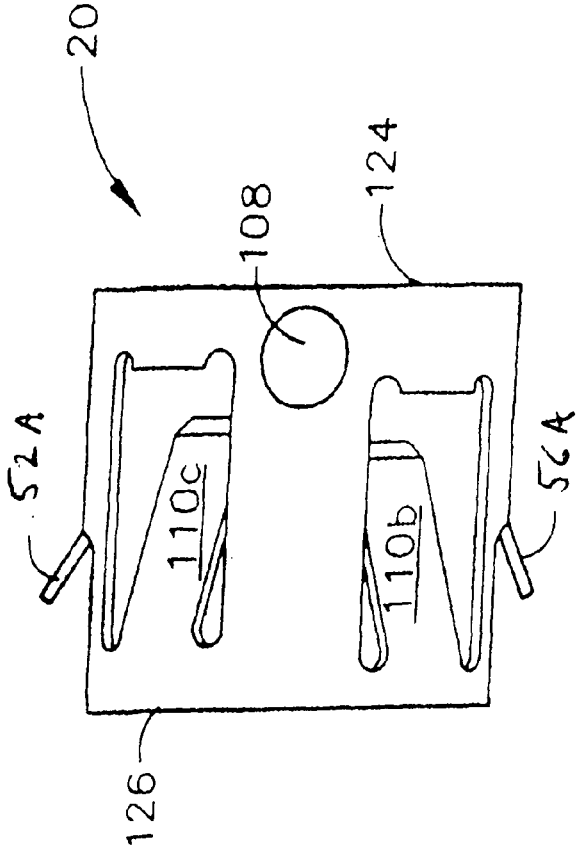
20
124
108
52A
110c
110b
56A
126

FIG. 4

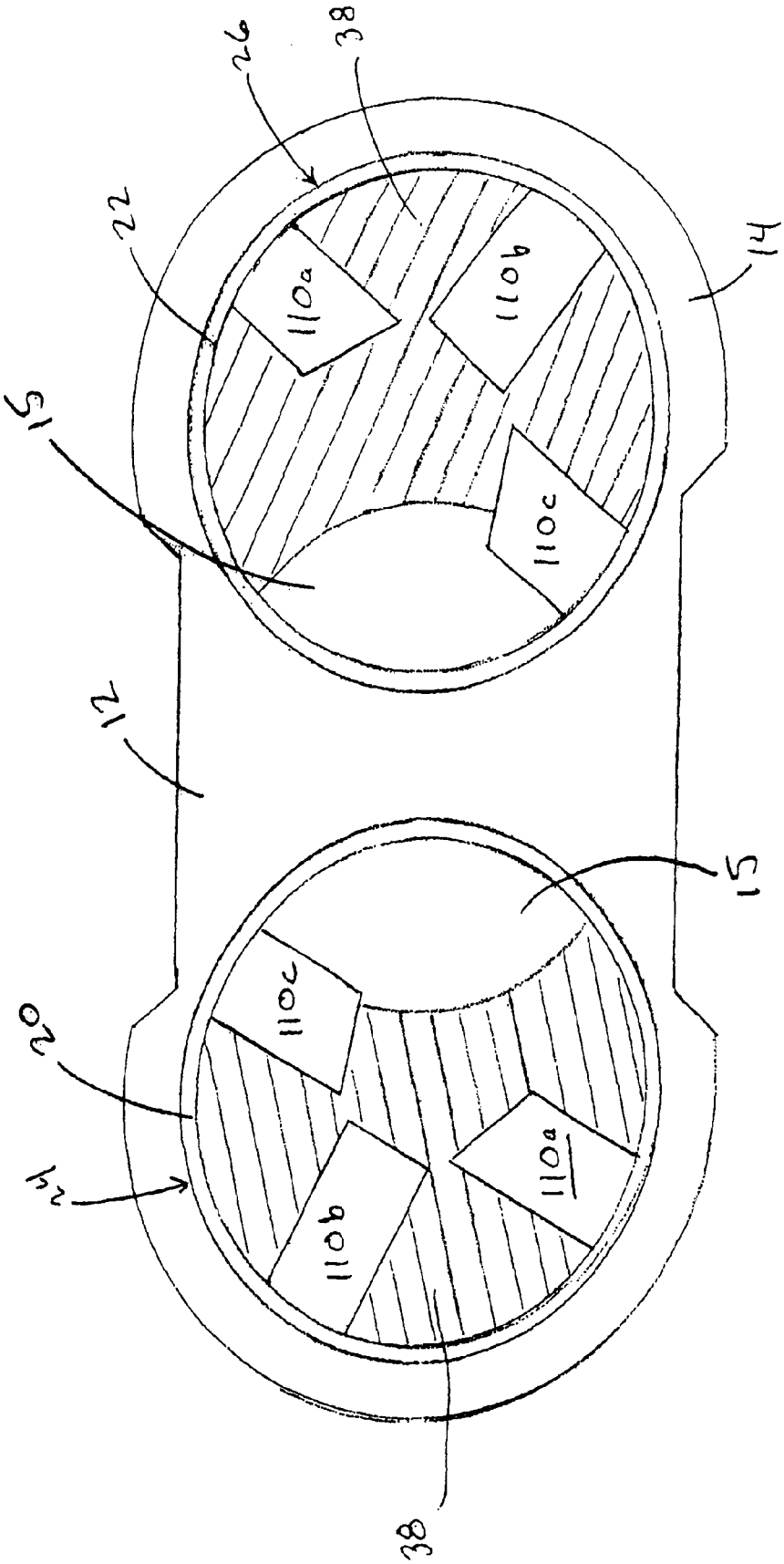

Fig. 6

DUPLEX ELECTRICAL CONNECTOR WITH SPRING STEEL CABLE RETAINER

This application is a Continuation-In-Part of U.S. Patent Application entitled "Duplex Connector" filed Feb. 23, 2001, application Ser. No. 09/792,185 now U.S. Pat No. 6,355,884 which is a Continuation-In-Part of U.S. Patent Application entitled "Duplex Connector" filed Aug. 13, 1999, application Ser. No. 09/373,427 now U.S. Pat. No. 6,194,661.

FIELD OF THE INVENTION

The present invention relates to cable terminations and more particularly to duplex or two-wire cable terminations that snap into place and include snap-on cable retainers, neither of which requires twisting for locking.

BACKGROUND OF THE INVENTION

U.S. Pat. No. 6,080,933 issued Jun. 27, 2000 in the name of Thomas J. Gretz for "Snap in Cable Connector", and herein incorporated by reference in its entirety, describes a locking cable connector composed of three mating pieces that snap together and provide a connector for connecting helically wound armored or metal clad electrical conductors to junction boxes or electrical panels. The first piece of the snap in locking cable connector is a die cast member including at its inner end a smooth outer cylindrical section having an outer diameter with flanges that accommodates a second piece comprising a spring steel adapter. The spring steel adapter is used to secure the connector to a junction box. The third piece is a spring steel locking ring provided to receive a helically wound shielded cable that is inserted into the outer end of the die cast member. The locking ring has outwardly directed tangs that snap into the die cast member and secure it thereto. The locking ring also has inwardly directed tangs to receive the armored cable through its inner bore and restrict its removal by a rearward applied force. The part named "spring steel locking ring" of U.S. Pat. No. 6,080,933 is hereinafter referred to as "spring steel cable retainer" in this disclosure.

U.S. Pat. No. 6,194,661 issued Feb. 27, 2001 in the name of Thomas J. Gretz for "Duplex Connector", and herein incorporated by reference in its entirety, discloses a duplex connector that combines the spring steel locking ring and spring steel adapter of U.S. Pat. No. 6,080,933 with a novel connector to connect two helically wound armored or metal clad electrical conductors to a junction box or an electrical panel through a single access hole or knockout. The duplex connector includes a housing having a generally oval or race track-shaped inbound end and a cylindrical outbound end. The inbound end of the housing is adapted to accept an insert containing two spring steel cable retainers that are analogous to the spring steel locking rings of U.S. Pat. No. '933 with the outbound end adapted to accept a spring steel adapter analogous to the spring steel adapter of U.S. Pat. No. '933. The insert is secured to the housing in U.S. Pat. No. '661 by a screw or similar fastening device.

Although the duplex connector of U.S. Pat. No. '661 provides an easy way to connect two conductors through a single access hole in a junction box or panel, it can be improved. A simpler design of the duplex connector of '661 could be created by removing the outward tangs on the cable retainers and replacing the apertures on the insert with a threaded hole sized to accept a set screw. Set screws could then be inserted to secure the spring steel cable retainers to the insert. Another simpler design of both the spring steel cable retainers and the insert would be achieved by forming annular ridges at the inboard end of the insert to hold the cable retainers inside the insert. In this manner the outward tangs on the cable retainers could be eliminated along with the tang apertures on the insert.

The duplex connector of the present invention could be made even simpler by modifying the inbound end of the connector housing to hold the cable retainers. Modified in this manner, the insert could be eliminated thereby reducing the number of required parts.

SUMMARY OF THE INVENTION

The present invention provides several simplified designs of the duplex connector disclosed in U.S. Pat. No. 6,194,661 issued Feb. 27, 2001 to Gretz. U.S. Pat. '661 discloses a duplex connector that combines the spring steel locking ring and spring steel adapter of U.S. Pat. 6,080,933 with a novel connector to connect two helically wound armored or metal clad electrical conductors to a junction box or an electrical panel. The duplex connector includes an insert that is fastened to its inbound end and includes spring steel cable retainers to secure two inbound cables.

A first embodiment of the present invention simplifies the design of the duplex connector of U.S. Pat. No. '661 by removing the outward tangs on the cable retainers and replacing the apertures on the insert with a threaded hole sized to accept a set screw. Set screws are then inserted to secure the spring steel cable retainers to the insert. In this manner the machining of the spring steel cable retainers are simplified by eliminating the requirement to form outwardly extending tangs. Machining of the insert is also simplified by eliminating the apertures to accept the tangs of the cable retainers.

A second embodiment of the duplex connector simplifies the connector even further by providing annular ridges at the inbound end of the insert to act as a retainer for holding the spring steel cable retainers. The cable retainers are then simply snapped into place within the inbound end of the insert thereby eliminating the need for tangs or set screws to hold them in place.

A third and preferred embodiment simplifies the duplex connector of U.S. Pat. No. '661 even further by eliminating the need for an insert. In this embodiment, the inbound end of the connector housing is modified to accept the spring steel cable retainers without the need for an insert. This greatly simplifies the construction of the duplex connector by completely eliminating the need for a separate part.

Another simpler design of both the spring steel cable retainers and the insert would be achieved by forming annular ridges at the inboard end of the insert to hold the cable retainers inside the insert. In this manner the outward tangs on the cable retainers could be eliminated along with the tang apertures on the insert.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a blown apart view of a first embodiment of the duplex connector of the present invention in which tangs and tang apertures are eliminated from the cable retainers and insert respectively.

FIG. **2** is a blown apart view of a second embodiment of the duplex connector of the present invention in which cable retainers are held in the insert by annular ridges.

FIG. **3** is a blown apart view of a third and preferred embodiment of the duplex connector of the present invention in which the insert is eliminated.

FIG. **4** is a side view of spring steel cable retainer **20** or **22** of FIG. **3**.

FIG. **5** is an end of spring steel retainer **20** or **22** as viewed from forward edge **124** of the retainer shown in FIG. **4**.

FIG. **6** is an end view of the inbound end of the housing of the preferred embodiment of FIG. **3**.

Table of Nomenclature

Part No.	Part Description
10	duplex connector
12	housing
14	inbound end (of housing 12)
15	aperture in outbound end of housing
16	outbound end (of housing 12)
17	outer diameter (of outbound end of housing)
18	inbound end insert
19	flange (of outbound end of housing)
20	spring steel cable retainer
21	flange (of inner portion of outbound end of housing)
22	spring steel cable retainer
23	slots (in cable retainers 20, 22)
24	inbound insert aperture
25a	annular ridge
25b	annular ridge
26	inbound insert aperture
27	inward cable-gripping tangs (in cable retainers)
28	spring steel adapter
29	slot (in spring steel adaptor)
30	locking screw (to secure inbound end insert)
31	tangs (on outer circumference of adapter 28)
32	bushing
34	peepholes
36	shoulder portions (of housing)
38	interior surface (of shoulder portions)
40	internal volume (of housing)
42	top wall
44	bottom wall
46	insertion end (of insert 18)
47	threaded hole (for screw 30)
48	end (of insert 18)
50	flange (of insert 18)
52A	outward projecting tang (of cable retainer)
52B	outward projecting tang (of cable retainer)
54A	tang aperture (for tang 52a)
54B	tang aperture (for tang 52b)
56A	outward projecting tang (of cable retainer)
56B	outward projecting tang (of cable retainer)
57A	tang aperture (for tang 56A)
57B	tang aperture (for tang 56B)
58	cylindrical body (of bushing)
60	flange (of bushing)
70	flange (of housing)
80	panel
81	viewing window
82	projections (from panel)
108	aperture (in cable retainer)
110a	inwardly extending tang (of cable retainer)
110b	inwardly extending tang (of cable retainer)
110c	inwardly extending tang (of cable retainer)
118	gap (of cable retainer)
124	forward edge (of cable retainer)
126	trailing edge (of cable retainer)

DETAILED DESCRIPTION OF THE INVENTION

As shown in FIG. **1** and FIG. **2**, the duplex connector **10** of the first two embodiments of the present invention comprises many of the same components as the duplex connector of U.S. Pat. No. 6,194,661 including a housing **12** having a generally oval or race track-shaped inbound end **14** and a cylindrical outbound end **16**, an inbound end insert **18**, spring steel cable retainers **20** and **22** that insert into a pair of parellel apertures or openings **24** and **26** in the inbound

end, spring steel adapter **28** about the outer diameter **17** of cylindrical outbound end **16** and retained by flanges **19** and **21**, locking screw **30**, a bushing **32** inserted into the inner circumference of outbound end **16** and a pair of peepholes **34** that permit viewing of the interior of housing **12** to determine the presence and/or location of cable inserted into housing **12** through insert apertures **24** and **26**.

Housing **12**, in addition to previously described generally oval inbound end **14**, peepholes **34**, and cylindrical outbound end **16** incorporating outer diameter **17** and flanges **19** and **21** includes shoulder portions **36** whose interior surfaces **38** are smooth to guide cables inserted through inbound end **14** via insert apertures **24** and **26** toward and through internal volume **40** of cylindrical outbound end **16**. Additionally, housing **12** includes, in at least one of its relatively flat top or bottom walls **42** and **44**, a threaded hole **47** for rotational engagement of screw **30** as described hereinafter. Flange **19** has a slight inward incline to ease insertion of housing **12** into a junction box aperture and to ease the application of spring steel adapter over outer diameter **17**. Flange **21** is of a greater diameter than flange **19** to prevent over insertion of spring steel adapter **28**.

In the first two embodiments of the duplex connector shown in FIGS. **1** and **2**, insert **18** comprises a binocular shape and has outer dimensions at insertion end **46** that are matched to the inner dimensions of generally oval inbound end **14** of housing **12**. End **48** of insert **18** includes a flange **50** about both insert apertures **24** and **26** that serves as a stop to limit insertion of insert **18** into inbound end **14** of housing **12**.

Referring to FIG. **1**, the first embodiment of the duplex connector **10** of the present invention includes the spring steel cable retainers **20**, **22** aligned with the central axis of each of their respective inbound insert apertures **24**, **26**. The cable retainers **20**, **22** are each discontinuous at slots **23**. When inserted into insert **18**, the cable retainers **20**, **22** are compressed until slots **23** become essentially closed and allow them to be inserted into their respective insert aperture **24**, **26**. A plurality of inwardly directed tangs **27**, one of which is in view in FIG. **1** on each cable retainer **20**, **22**, are oriented toward the insert **18** and extend into the central core of the retainers **20**, **22**. The cable retainers **20**, **22**, after being compressed and inserted into their respective insert apertures **24**, **26**, snap outwardly and are held in the insert **18** by tightening of the respective set screws **55**A, **55**B. The first embodiment of the present invention thereby reduces the amount of machining required by eliminating the need to form outward tangs in the cable retainers **20**, **22** and tang accepting apertures in the insert **18**.

As shown in FIG. **1**, a bushing **32** comprising a cylindrical body **58** having a flange **60** is inserted at the outbound end **16** of the housing **12** to prevent accidental damage to inserted cable (not shown in FIG. **1**). Bushing **32** is designed to frictionally engage the interior of cylindrical outbound end **16** of housing **12** and is preferably made of a polymeric material that serves to cushion cable inserted into housing **12** and exiting through cylindrical outbound end **16**.

As shown in FIG. **1**, spring steel adapter **28** includes a slot **29** to permit expansion prior to being fitted over diameter **17**, and includes a plurality of tangs **31** to prevent removal of adapter **28** from the aperture of a junction box (not shown) after installation into such an aperture. A more detailed description of adapter **28** and its operation can be found in U.S. Pat. No. 6,080,933 entitled "Snap In Cable Connector", assigned to the same assignee as the present invention and incorporated herein by reference.

Referring to FIG. **2**, the second embodiment of the duplex connector **10** is a simplified design that eliminates the need for tangs or set screws to secure the spring steel cable retainers **20**, **22** to the insert **18**. In this embodiment, the cable retainers **20**, **22** are held in place by annular ridges **25**A, **25**B in each respective inbound insert aperture **24**, **26**. To insert the cable retainers **20**, **22** in the insert apertures **24**, **26**, the discontinuous cable retainers **20**, **22** are each compressed until each slot **23** is minimized. The compressed cable retainers **20**, **22** are then slipped past the annular ridges **25**A, **25**B into the insert apertures **24**, **26** and then allowed to relax to their unbiased shape. The cable retainers **20**, **22** therefore snap outwardly to their larger unbiased diameters and are held in the insert **18** by their respective annular ridges **25**A, **25**B. Peepholes **34** are provided in the top wall **42** of the insert **18** to assist in viewing the wiring after it is installed inside the connector **10**. The second embodiment of the present invention thereby reduces the amount of machining required by eliminating the need to form outward tangs, tang accepting apertures, or set screws to hold the cable retainers **20**, **22** in place.

A blown apart view of the third and preferred embodiment of the duplex connector **10** is depicted in FIG. **3**. The insert, as shown in FIG. **3**, has been eliminated and its functionality has been built into the housing **12**. In the duplex connector of U.S. Pat. No. 6,194,661, tang accepting apertures were formed in the insert. In the present embodiment of the duplex connector **10**, the tang accepting apertures **54**A, **54**B, **57**A, **57**B are formed in the inbound end **14** of the housing **12**. As cable retainer **20** is compressed, inserted into inbound insert aperture **24** and then released, outward extending tang **52**A snaps into tang aperture **54**A and outward extending tang **56**A snaps into tang aperture **57**A. Cable retainer **22** is held in a similar manner by tangs **52**B and **56**B and tang apertures **54**B and **57**B. This preferred embodiment of the duplex connector **10** thereby simplifies the design of the connector even further by eliminating the need for a separate insert and housing and including the functionality of the insert in the housing. The inbound end **14** of the housing includes a flange **70** that adds structural rigidity to the housing.

The preferred embodiment of the duplex connector shown in FIG. **3** also has an advantage of a larger viewing area for internal connections. A viewing window **81** is provided in the top wall **42** of the housing **12**. A snap-fit panel **80** is provided with the duplex connector **10** and snapped into place in the viewing window **81**. Projections **82** on the panel provide a means for panel **80** to snap fit into the viewing window **81**. The panel **80** may later be removed if desired for later viewing the cables within the connector **10**.

FIG. **4** is a side view of the spring steel cable retainer **20** or **22** of FIG. **3**. The cable retainer **20** is depicted with a forward edge **124** and a trailing edge **126**. When inserted into the housing, as shown in FIG. **3**, forward edge **124** will slide into inbound insert aperture **24**. Referring again to FIG. **4**, cable retainer **20** includes outward projecting tangs **52**A and **56**A and two of the inward projecting cable tangs **110***a* and **110***c* at staggered distances from forward edge **124**. Although aperture **108** is depicted, it is not functional in the present invention but is used to hold the blank during the manufacturing process when the spring steel blank (not shown in FIG. **4**) is formed into the tubular spring steel **20** cable retainers **20** and **22**.

FIG. **5** is an end view of spring steel retainer **20** or **24** as viewed from forward edge **124** showing staggered cable tangs **110**A, **110**B and **110**C oriented toward forward edge **124**. Outward projecting tangs **52**A, **56**A are oriented toward the trailing edge (not shown in FIG. **5**). The purpose of triangle-shaped gripper **122** is to secure the cable retainer during the manufacturing process and is not functional to the operation of the retainer in the present invention. During its manufacture, cable retainer **20** is formed from a flat blank and is therefore not continuous, as shown in FIG. **5**, with a gap **118** existing between the two ends of the blank that has been formed into a circular shape.

Referring to FIGS. **4** and **5**, the spring steel cable retainer **20** is adapted to receive a helically wound shielded cable (not shown in FIGS. **4** and **5**) when inserted from trailing edge **126** toward forward edge **124**. The inwardly extending tangs **110***a*, **110***b*, **110***c* are staggered at distances from trailing edge **126** that permit them to find and seat in the existing grooves in the helically wound shielded cable. Once the cable is inserted fully in the cable retainer **20**, past all the inwardly extending tangs **110***a*, **110***b*, **110***c*, the cable retainer **20** will resist removal of the cable by any rearward force applied to it. The cable retainer **20** is shown in FIGS. **4** and **5** prior to its insertion in the inbound insert aperture **24** of the present invention to aid in describing its function in the present invention. The reader should realize that the cable retainer **20** will function best to grip the cable when secured in the inbound insert aperture of the housing or insert described previously. When later secured in the inbound insert aperture, the gap **118** shown in FIG. **5** will be minimal and the outward expansion of the cable retainer **20** will be constrained by the cylindrical walls of the inbound insert aperture.

As shown in FIG. **5**, the inwardly extending cable tangs **110***a*, **110***b*, **110***c* are oriented as shown, about 90° apart. The orientation of tangs **110***a*, **110***b*, and **110***c* serve to receive and engage an armored cable inserted from the inbound end of the housing (not shown in FIG. **5**) and guide the cable toward the cylindrical outbound end of the housing in a manner that separate cables are advanced to the outbound end without mutual interference.

Referring to FIG. **6**, an end view of the inbound end **14** of the housing **12** of the preferred embodiment of FIG. **3**, the spring steel cable retainers **20**, **22** are shown locked into their respective inbound insert apertures **24**, **26**. As shown in FIG. **6**, tangs **110***a*, **110***b*, and **110***c* are oriented to receive and engage an armored cable (not shown in FIG. **6**) inserted from the inbound end **14** of the housing **12** and guide the cable toward the aperture **15** in the outbound end of the housing **12** in a manner that separate cables are advanced to the outbound end without mutual interference. The smooth interior surface **38** of the shoulder portions of the housing **12** also serve to guide the cables to the outbound end aperture **15**. The orientation of the inwardly extending tangs **110***a*, **110***b*, **110***c* of the cable retainers **20**, **22** are critical as cable retainer **22** on the right side of FIG. **6** guides its cable upward in the housing **12** and toward the outbound end aperture **15** while cable retainer **24** on the left side of FIG. **6** guides its cable downward in the housing **12** and toward the outbound end aperture **15**. The net result is that separation is maintained between the cables allowing them to slip by one another and through the housing **12** to the outbound end aperture **15**.

As the invention has been described, it will be apparent to those skilled in the art that the same may be varied in many ways without departing from the spirit and scope of the invention. Any and all such modifications are intended to be included within the scope of the appended claims.

What is claimed is:

1. A duplex electrical connector comprising:

a) a housing having a cylindrical outbound end, a generally oval inbound end, and an interior channel linking said inbound and said outbound end;

b) a pair of parallel openings in said inbound end;

c) a tubular spring steel cable retainer secured in each of said openings in said inbound end for accepting separate cables, said retainers including a set of inwardly extending tangs to receive and engage said separate cables inserted from said inbound end and guide said separate cables toward said cylindrical outbound end in a manner that said separate cables are advanced to said outbound end, said inwardly extending tangs restricting removal of said separate cables by force applied on said separate cables from said inbound end; and

d) a tubular spring steel adapter secured to said cylindrical outbound end of said housing, said adapter having outwardly extending tangs.

2. The duplex electrical connector of claim **1** including an insert secured within said inbound end, said insert is generally oval in shape and includes said pair of parallel openings, said openings having an insertion end, a rearward end, and interior walls with said retainers disposed in said openings, said walls each including a threaded hole and a screw disposed laterally therein so that tightening of said screws will secure said retainers in said openings.

3. The duplex electrical connector of claim **1** including an insert secured within said inbound end, said insert is generally oval in shape and includes said pair of parallel openings having an insertion end, a rearward end, and interior walls with said retainers disposed in said openings, said walls each including an annular ridge near said rearward end for securing said retainers in said openings.

4. The duplex electrical connector of claim **1** wherein said pair of parallel openings include interior walls, said walls including a plurality of tang accepting apertures, said retainers including a plurality of outward extending tangs that permit insertion of said retainers in a compressed state into said openings such that said tangs snap into said tang accepting apertures upon full insertion.

5. The duplex electrical connector of claim **1** wherein said inwardly extending tangs in each of said cable retainers consist of three tangs spaced approximately 90° apart such that said tangs cover approximately 180° of the opening through each of said retainers and the remaining 180° is essentially open and defines a cable passageway.

6. The duplex electrical connector of claim **5** wherein said generally oval inbound end contains two cable retainers centered along a central axis dissecting the oval lengthwise with the first of said retainers having said cable passageway oriented approximately 45° away from the center of said inbound end and the second of said retainers having said cable passageway oriented approximately 45° away from the center in the opposite direction of said first retainer.

* * * * *

Exhibit B

US005266050A

United States Patent [19]

O'Neil et al.

[11] Patent Number: 5,266,050

[45] Date of Patent: * Nov. 30, 1993

[54] **QUICK-CONNECT FITTING FOR ELECTRICAL JUNCTION BOX**

[75] Inventors: **Daniel J. O'Neil**, Moscow; **Thomas J. Gretz**, Clarks Summit, both of Pa.; **Thomas S. Stark**, Coral Springs, Fla.

[73] Assignee: **Arlington Industries, Inc.**, Scranton, Pa.

[*] Notice: The portion of the term of this patent subsequent to Dec. 15, 2009 has been disclaimed.

[21] Appl. No.: **943,886**

[22] Filed: **Sep. 11, 1992**

Related U.S. Application Data

[63] Continuation of Ser. No. 802,368, Dec. 4, 1991, Pat. No. 5,171,164.

[51] **Int. Cl.**[5] **H01R 13/79**

[52] **U.S. Cl.** ..... **439/552**; 174/65 R; 285/162

[58] **Field of Search** ..... 285/158, 162; 174/65 R; 439/552

[56] **References Cited**

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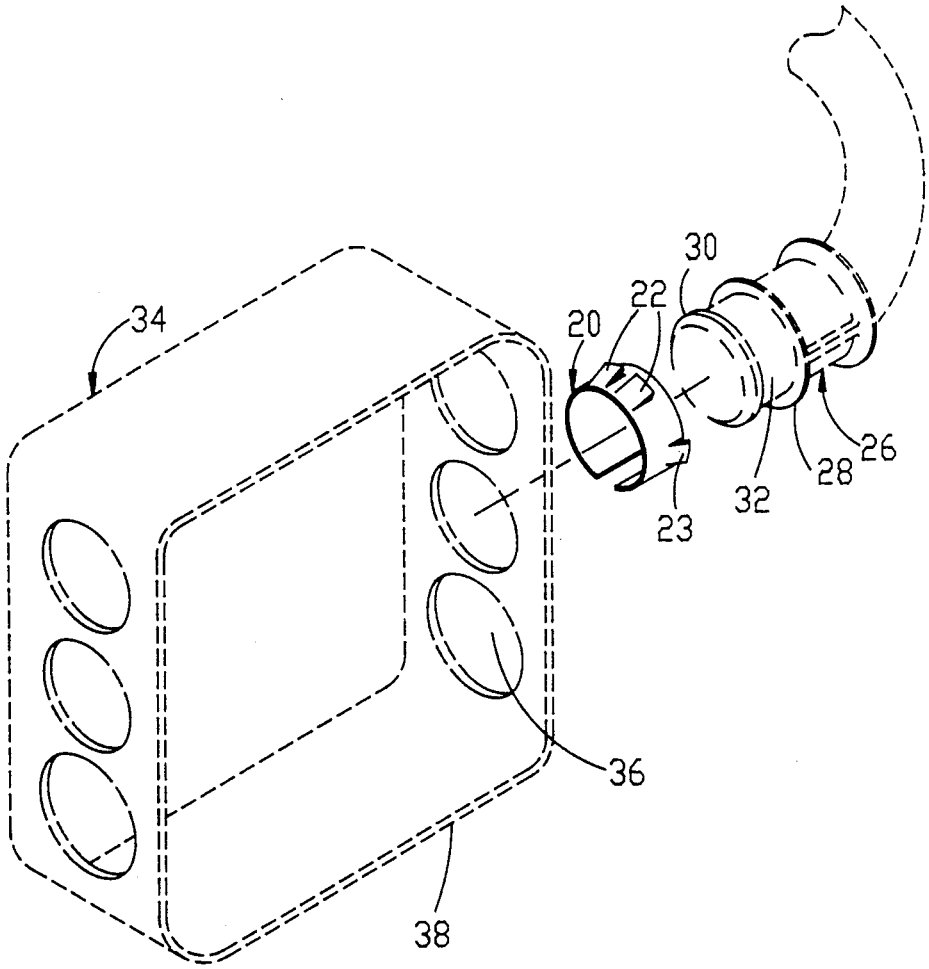
Primary Examiner—Eugene F. Desmond

[57] **ABSTRACT**

A spring steel adaptor (**20**) that improves the ease of use and reduces the time involved in securing electrical connectors to electrical junction boxes (**34**). Several embodiments are disclosed which require the use of a zinc die-cast connector (**26**) having a smooth central section (**32**) to accommodate the spring steel adaptor (**20**). A separate embodiment employs a spring steel adaptor (**20**) that is designed to be used in conjunction with any of the standard size threaded electrical connectors that are presently in use in the electrical industry.

8 Claims, 7 Drawing Sheets



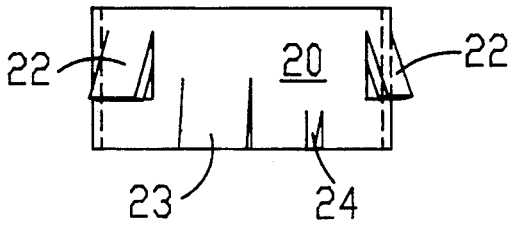


FIG. 1

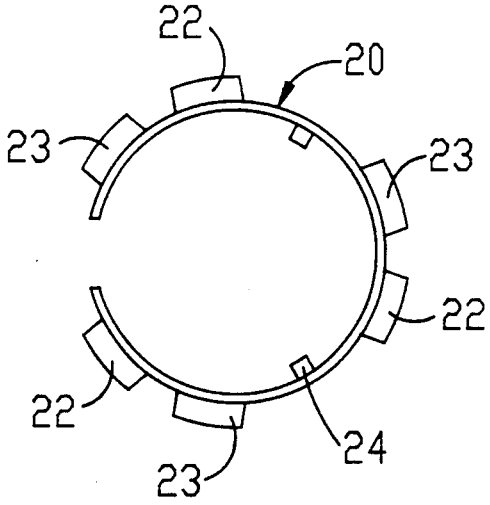


FIG. 2

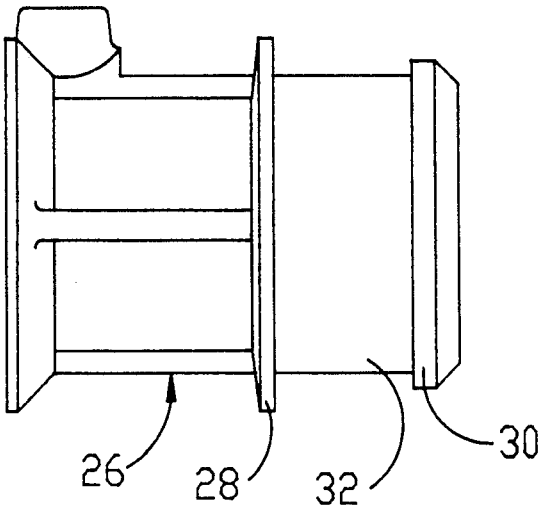


FIG. 3

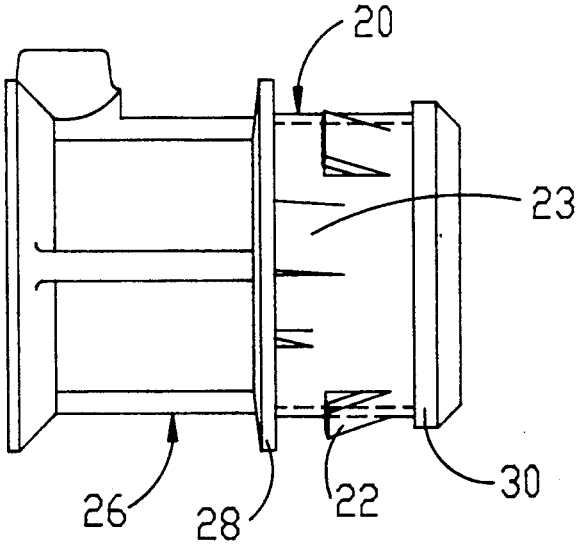


FIG. 4

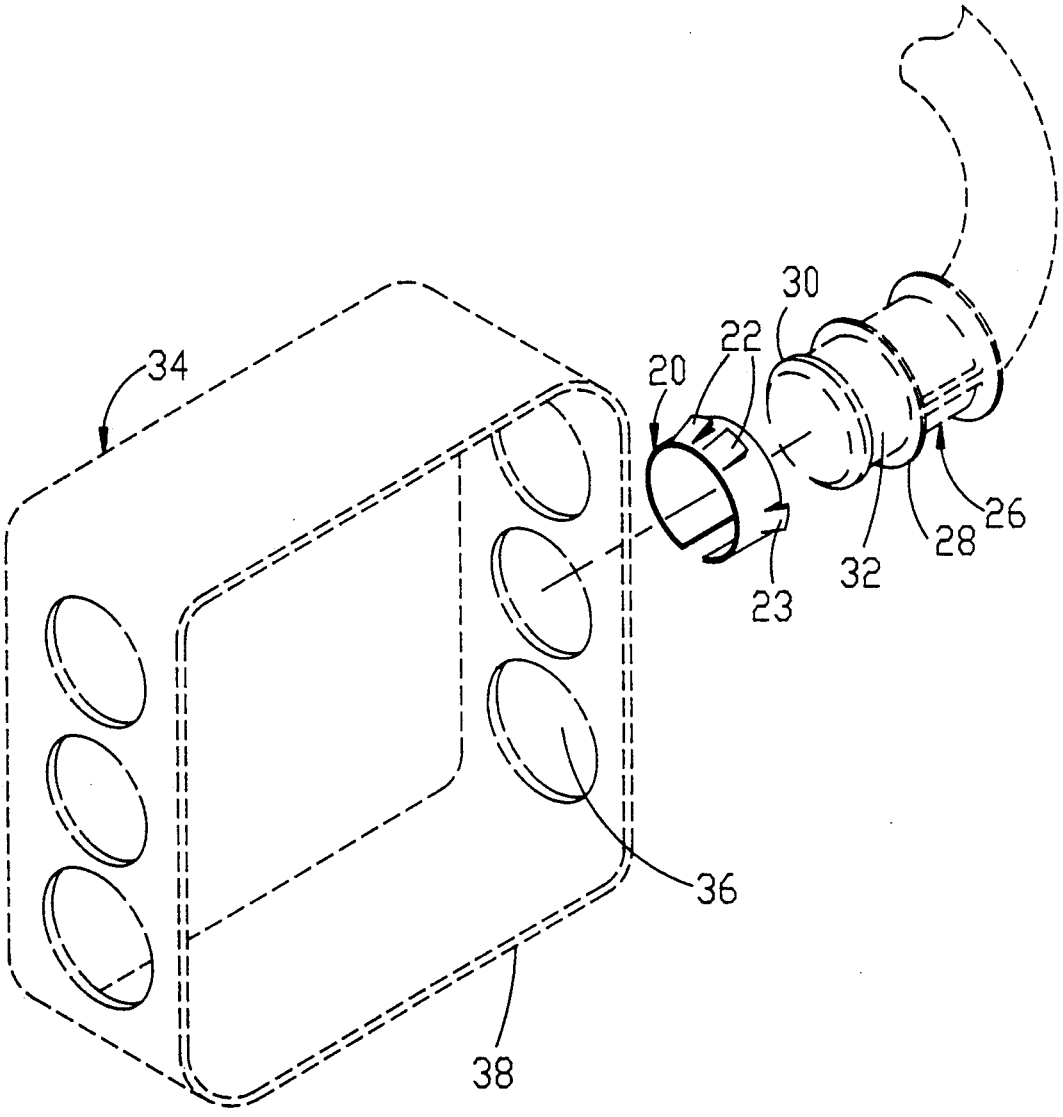


FIG. 5

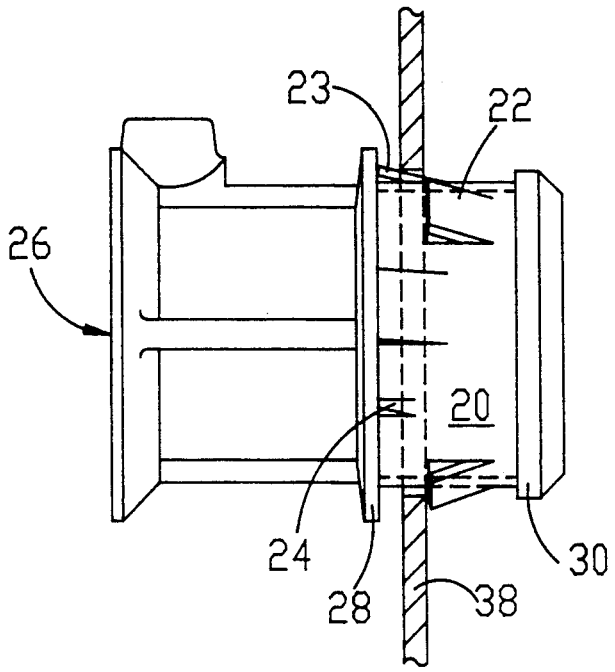


FIG. 6

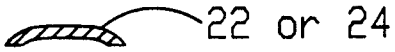


FIG. 7

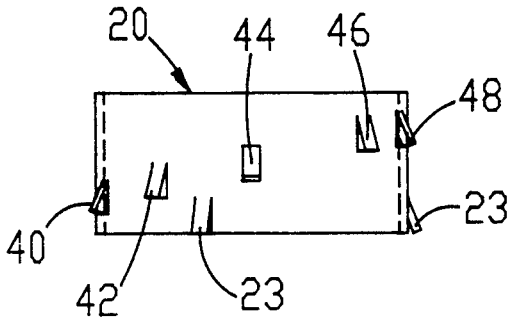


FIG. 8

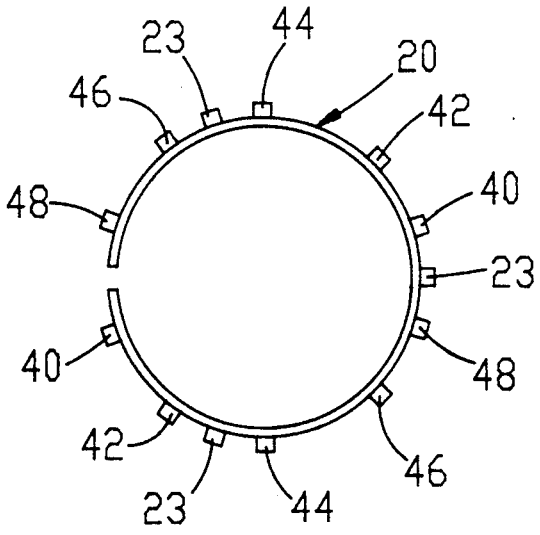


FIG. 9

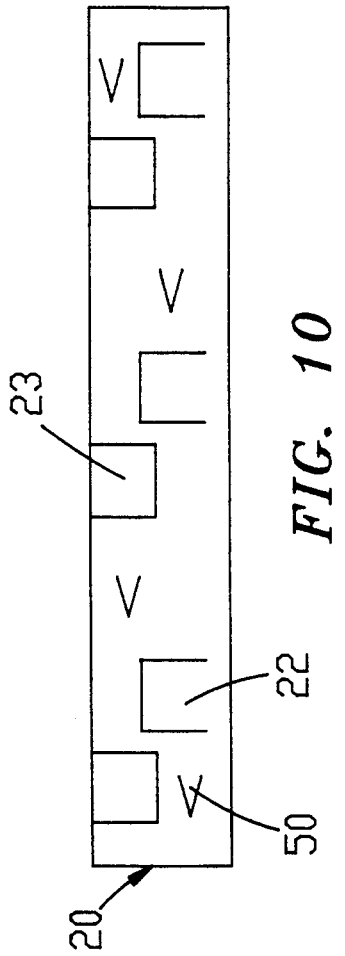


FIG. 10

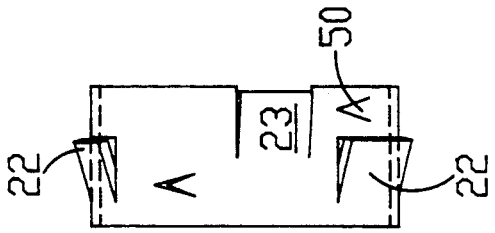


FIG. 13

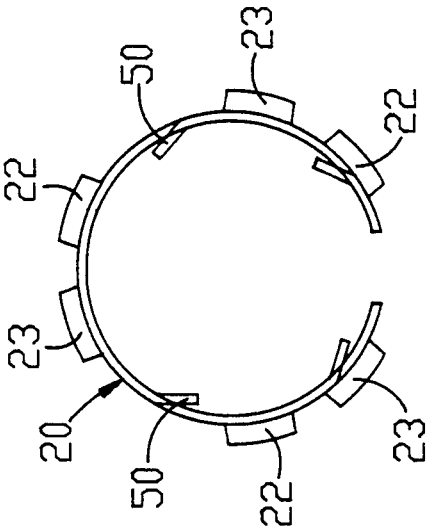


FIG. 12

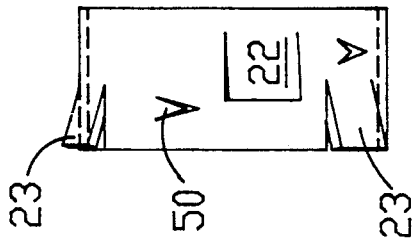


FIG. 11

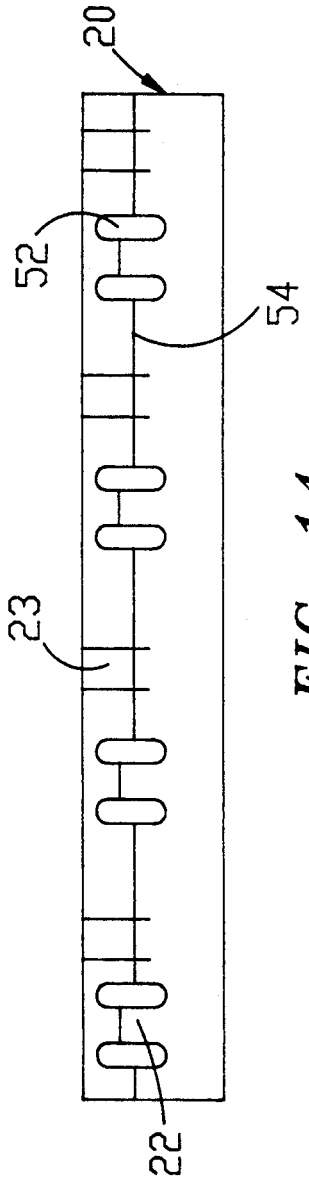


FIG. 14

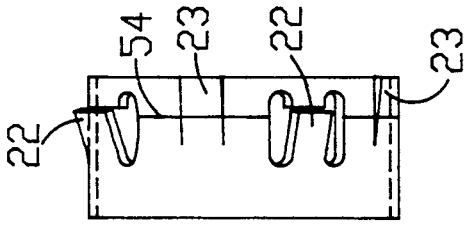


FIG. 17

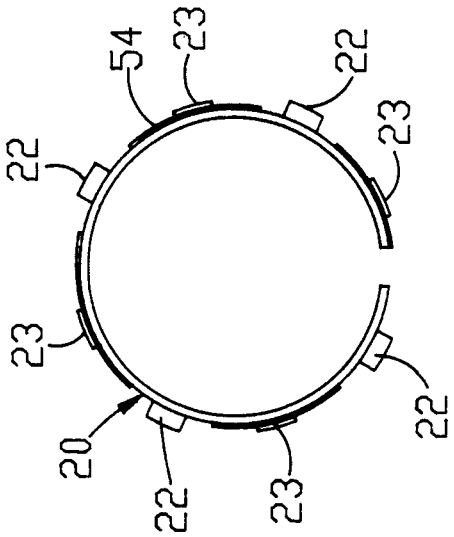


FIG. 16

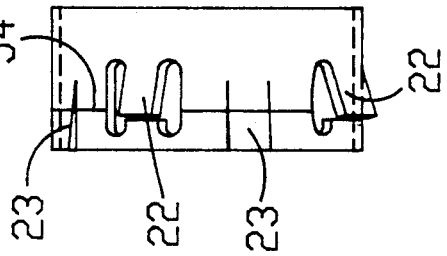


FIG. 15

QUICK-CONNECT FITTING FOR ELECTRICAL JUNCTION BOX

This application is a continuation of U.S. patent application No. 07/802,368 filed Dec. 4, 1991 which is now U.S. Pat. No. 5,171,164.

BACKGROUND—FIELD OF INVENTION

This invention relates to connectors for electrical junction boxes, specifically to an improved connector that can be easily attached to an anchored junction box by pushing with one hand.

BACKGROUND—DESCRIPTION OF PRIOR ART

Heretofore, the most common form of attaching cable and electrical metal tubing (EMT) to electrical junction boxes is by the use of an interior-threaded lock nut which is screwed onto the exterior-threaded electrical fitting that extends into the junction box.

The disadvantage of the common threaded type of electrical connector is that it requires the use of both hands to secure it in place in the junction box. The flexible cable or EMT with the connector attached must be held in one hand while the threaded lock nut is held in the other hand, matched up to the threaded barrel of the connector, and then turned clockwise with respect to the connector until the lock nut is secured tightly to the connector. Matching the threaded lock nut to the connector can be very difficult, especially when the electrical junction box is in a location that is difficult to reach, such as a junction box for an overhead light fixture. In situations such as this, when it is difficult to see or to reach the junction box, it is very difficult to match up the connector and the lock nut and start the lock nut on the connector.

OBJECTS AND ADVANTAGES

Accordingly, several objects and advantages of this invention are:

(a) to make it easy to insert electrical connectors into electrical junction boxes, with the use of one hand instead of two;

(b) to reduce the time involved to connect the electrical connector to the junction box; and

(c) to provide good electrical continuity, or ground, between the electrical connector, the junction box and the electrical source leading to the box as an integral part of the design of the connector.

DRAWING FIGURES

FIG. **1** shows a side view of the first embodiment of this invention, a spring steel adaptor. It includes a view of the outward-bent locking tang and the inward-bent tensioner tang.

FIG. **2** is a plan view of the spring steel adaptor of FIG. **1**, showing the location of the outward-bent locking tangs and inward-bent tensioner tangs.

FIG. **3** is a side view of the electrical connector that the spring steel adaptor of FIG. **1** is used with, including the smooth central section without the spring steel adaptor.

FIG. **4** shows a side view of the connector in FIG. **3** with the spring steel adaptor of FIG. **1** attached to the connector.

FIG. **5** is a broken away view of a typical electrical junction box, showing the connector of FIG. **3**, including the smooth central section and the raised shoulder which will accommodate the spring steel adaptor. The spring steel adaptor of FIG. **1** is also depicted.

FIG. **6** shows the wall of a typical electrical junction box including the connector of FIG. **3** with the spring steel adaptor of FIG. **1** inserted. It depicts the outward-bent tangs depressed to tighten the connector and maintain electrical continuity.

FIG. **7** is a detail drawing of a typical tang of the spring steel adaptor shown in FIG. **1**.

FIG. **8** shows a side view of a second embodiment, a spring steel adaptor with thirteen outward-bent tangs instead of **6**, as in the preferred embodiment.

FIG. **9** is a plan view of the second embodiment shown in FIG. **8**.

FIG. **10** is a laid out view of a third embodiment of this invention showing a spring steel adaptor before the tangs are lanced and pressed out and before the adaptor is formed into a circle.

FIG. **11** is a side view of the same third embodiment shown in FIG. **10**, after being formed into a circular shape.

FIG. **12** is a plan view of the same third embodiment shown in FIG. **11**.

FIG. **13** is a side view of the third embodiment, with this view showing the spring steel adaptor of FIG. **10** rotated 180 degrees from the view shown in FIG. **11**.

FIG. **14** is a laid out view of the fourth and preferred embodiment of this invention showing a spring steel adaptor before the tangs are lanced and pressed out and before the adaptor is formed into a circular shape.

FIG. **15** is a side view of the same preferred embodiment shown in FIG. **14**, after being formed into a circular shape.

FIG. **16** is a plan view of the same preferred embodiment shown in FIG. **15**.

FIG. **17** is a side view of the fourth and preferred embodiment, with this view showing the spring steel adaptor of

FIG. **14** rotated 180 degrees from the view shown in FIG. **15**.

REFERENCE NUMERALS IN DRAWINGS

20 spring steel adaptor
22 outward-bent locking tang
23 outward-bent tensioner tang
24 inward-bent tensioner tang
26 zinc die-cast connector
28 flange
30 raised shoulder
32 smooth central section or intermediate body of connector
34 electrical junction box
36 hole in electrical junction box to accommodate connector
38 wall of electrical junction box
40 outward-bent locking tang at narrowest depth from edge
42 outward-bent locking tang at second depth from edge
44 outward-bent locking tang at third depth from edge
46 outward-bent locking tang at fourth depth from edge
48 outward-bent locking tang at widest depth from edge
50 inward-bent tensioner/threading tang
52 oval-shaped slots
54 ridge

DESCRIPTION—FIGS. 1 TO 9

A side view of a portion of the first embodiment is shown in FIG. **1**. A typical spring steel adaptor **20** is shown, including the outward-bent locking tangs **22**, an outward-bent tensioner tang **23**, and an inward-bent tensioner tang **24**. The spring steel adaptor **20** is typically 0.024 inches thick and formed from spring steel such as SAE 1095 tempered spring steel or its equivalent. The adaptor has a leading end, trailing end and intermediate body between the ends. The leading end is the upper end in FIG. **1**.

A plan view of the spring steel adaptor **20** is shown in FIG. **2**. The preferred embodiment contains three outward-bent locking tangs **22**, three outward-bent tensioner tangs **23** and two inward-bent tensioner tangs **24**. The three outward-bent tensioner tangs **23** are formed flush with one edge of the spring steel adaptor **20** and are spaced typically 120 degrees apart around the outside circumference of the adaptor **20**. The circular metal spring adaptor **20** has an opening that results from not forming a complete circle. When the outward-bent tangs or spring locking members are bent inward to permit the adaptor to be inserted in a hole, there is also a slight reduction in the diameter by the opening narrowing, therefore, there are two spring actions involved during insertion.

The three outward-bent locking tangs **22** are formed in the center section of the adaptor **20** as shown in FIG. **1**. These three tangs are offset typically **40** degrees from the flush outward-bent tensioner tangs **23**, and are typically spaced 120 degrees apart around the outside circumference of the adaptor.

Two inward-bent tensioner tangs **24** are shown on the inside circumference of the steel spring adaptor **20** shown in FIG. **2**. These tangs are typically spaced **140** degrees apart.

FIG. **3** illustrates the zinc die-cast connector **26** including the smooth central section or intermediate body **32** that will accommodate the spring steel adaptor **20**. The spring steel adaptor **20** will be held in place on the zinc die-cast connector **26** by the flange **28** and raised shoulder **30**. The flange also serves to limit the insertion of the connector in a junction box hole. The connector shown is similar to a standard connector and can be of any suitable shape or design. There are approximately **30** different standard connectors.

FIG. **4** illustrates a view of the zinc die-cast connector **26** with the spring steel adaptor **20** attached. The flange **28** is the trailing end and raised shoulder **30** with bevel is the leading end. They are shown holding the spring steel adaptor in place.

A broken away view showing a typical electrical junction box **34** with the zinc die-cast connector **26** is shown in FIG. **5**. The smooth central section **32**, the flange **28**, and raised shoulder **30** of the connector **26** are depicted. A typical hole in the electrical junction box to accommodate the connector **36** is shown in the wall of the electrical junction box **38**. The spring steel adaptor **20** is shown detached from the zinc die-cast connector **26** but centered around the axis on which it will be guided onto the connector. An outward-bent tensioner tang **23** and two outward-bent locking tangs **22** are annotated on this drawing.

FIG. **6** depicts the wall of the junction box **38** showing the zinc die-cast connector **26** with the spring steel adaptor **20** of the first embodiment inserted. The connector **26** is locked in place by the outward-bent locking tangs **22**. The drawing depicts the outward-bent tensioner tangs **23** under tension. The flange **28**, the raised shoulder **30**, the outward-bent locking tangs **22**, the outward-bent tensioner tangs **23**, and an inward-bent tensioner tang **24** are all shown in relationship to the wall of the electrical junction box **38**.

A detail drawing of a tang is shown in FIG. **7**. The outward-bent locking tangs **22** and the outward-bent tensioner tangs **23** of this first embodiment are typically bent out to a 0.936 inch diameter. Inward-bent tensioner tangs **24** are typically bent in to a 0.695 inch diameter.

FIG. **8** is a side view of a second embodiment of this invention. It depicts five of the ten outward-bent locking tangs that are arranged at various locations on the circumference of the spring steel adaptor **20**. From left to right in FIG. **8**, there is depicted an outward-bent locking tang at the narrowest depth **40**, an outward-bent locking tang at the second depth **42**, an outward-bent locking tang at the third depth **44**, an outward-bent locking tang at the fourth depth **46**, and an outward-bent locking tang at the widest depth **48**. As shown in the drawing, the outward-bent tensioner tangs **23** are formed flush with the side of the spring steel adaptor **20**.

FIG. **9** depicts a plan view of the second embodiment showing the spring steel adaptor **20** with ten outward-bent locking tangs instead of 6 as in the first embodiment. Three outward-bent tensioner tangs **23** are located flush with one edge of the spring steel adaptor **20** and are spaced 120 degrees apart along its outer circumference. Two outward-bent locking tangs at the narrowest depth **40** are located approximately **180** degrees apart along the circumference of the adaptor. Likewise, two outward-bent locking tangs at the second depth **42**, two outward-bent locking tangs at the third depth **44**, two outward-bent locking tangs at the fourth depth **46**, and two outward-bent locking tangs at the widest depth **48** are each respectively located approximately 180 degrees apart from their same numbered complement around the outer circumference of the spring steel adaptor **20**.

FIG. **10** depicts a laid-out view of a third embodiment showing a spring steel adaptor **20** before the tangs are lanced and pressed out and before being formed into a circular shape. Depictions are made in the drawing to show where the outward-bent tensioner tangs **23**, the outward-bent locking tangs **22** and the inward-bent tensioner/threading tangs **50** will be lanced out.

In FIG. **11**, a side view of the spring steel adaptor **20** of FIG. **10** is shown, after being formed into a circle. Two outward-bent tensioner tangs **23**, an outward-bent locking tang **22** and an inward-bent tensioner/threading tang **50** are depicted.

FIG. **12** gives a plan view of the third embodiment. The three outward-bent tensioner tangs **23** are located approximately 120 degrees apart on the outer circumference of the spring steel adaptor **20**. The three outward-bent locking tangs **22** are also spaced typically 120 degrees apart on the outer circumference of the spring steel adaptor **20**. The outward-bent locking tangs **22** are offset typically 40 degrees from the outward-bent tensioner tangs **23**.

Four inward-bent tensioner/threading tangs **50** are depicted in FIG. **12** along the inner circumference of the spring steel adaptor **20**.

Two inward-bent tensioner/threading tangs **50** are shown spaced at different distances from the edge of the spring steel adaptor **20** in FIG. **13**.

FIG. **14** depicts a laid-out view of the fourth and preferred embodiment of this invention, a spring steel adaptor **20** containing oval-shaped slots **52**. The slots are cut in the spring steel adaptor **20** to form the edges of the outward-bent locking tangs **22**.

FIG. **14** also depicts a ridge **54** formed along the length of the laid-out spring steel adaptor **22**. Four outward-bent tensioner tangs **23** are also annotated in the drawing.

The spring steel adaptor **20** of the preferred embodiment is shown formed into a circular shape in FIG. **15**. This is a side view of the adaptor showing two outward-bent tensioner tangs **23** and two outward-bent locking tangs **22**.

FIG. **16** is a plan view of the adaptor of the preferred embodiment. As shown in the plan view, four outward-bent locking tangs **22** are located typically 90 degrees apart around the outer circumference of the spring steel adaptor **20**. Four outward-bent tensioner tangs **23**, spaced typically 90 degrees apart, are also depicted. The outward-bent tensioner tangs **23** and the outward-bent locking tangs are offset typically 45 degrees from each other around the outer circumference of the spring steel adaptor **20**.

FIG. **17** shows another side view of the fourth and preferred embodiment. Two outward-bent tensioner tangs **23** and two outward-bent locking tangs **22** are depicted in this view.

OPERATION—FIGS. 3, 4, 6, 8, TO 17

All the embodiments of this invention are used to connect electrical metal tubing or cable to electrical junction boxes.

The first embodiment, shown in FIG. **4**, is comprised of an electrical connector with a spring steel adaptor pressed onto its smooth central section, such as shown in FIG. **4**. The spring steel adaptor **20** typically has an outer diameter of 0.845 inches in its relaxed state. A slight force is required to push the spring steel adaptor **20** over the raised shoulder **30** which is typically 0.848 inches in diameter. The raised shoulder **30** is beveled from 0.848 inches to 750 inches to allow the spring steel adaptor **20** to easily center on the connector and to slip over the shoulder when it is pressed onto it. The adaptor, typically 0.375 inches in width, fits easily into the 0.380 inch space between the raised shoulder **30** and the flange **28** of the zinc die-cast connector **26**.

The electrical connector with adaptor is first secured to the EMT or cable by tightening a set screw. As shown in FIG. **5**, the electrical connector **26** is then simply attached to the wall of the electrical junction box **34** by pushing the connector into the box until the flange **28** contacts the wall **38**. The connector **26** enters the electrical junction box **34** easily as the raised shoulder **30** is beveled from a diameter of 0.848 inches to a diameter of 0.750 inches on the side that will first enter the electrical junction box **34**. The diameter of the standard hole in the electrical junction box to accommodate the connector **36** is 0.875 inches. Therefore the zinc die-cast connector **26** at a 0.750 inch diameter on the beveled edge easily enters the opening which has a 0.875 inch diameter.

Some force is required to push the remainder of the electrical connector of the first embodiment into the junction box, as the outer circumference of the adaptor **20** including the outward-bent locking tangs **22** is typically 0.936 inches. The outward-bent locking tangs **22** must therefore be depressed to the diameter of the opening, 0.875 inches, before passing through. With the leverage provided by the cable or EMT connected to the opposite end of the connector, the connector will easily enter the junction box.

When the flange **28** contacts the wall of the electrical junction box **34** a shown in FIG. **6**, the three outward-bent locking tangs **22** snap outward and prevent the connector from slipping out of the box. Typical wall thickness of a standard electrical junction box **34** is 0.070 inches. In this first embodiment, the distance from the outward-bent locking tangs **22** to the edge of the adaptor typically 0.135 inches.

After the connector is pushed in completely, the three outward-bent tensioner tangs **23** exert force on the exterior wall of the electrical junction box **38**, keeping the connector under tension and firmly in place against the wall. The diameter of the spring steel adaptor **20** inside the inward-bent tensioner tangs **24** is typically, 0.695 inches, which is smaller than the 0.735 inch diameter of the smooth central section of the connector **32**. This insures that good contact will be obtained between the spring steel adaptor **20** and the connector **26** when the connector is pushed into the junction box.

The outward-bent tensioner tangs **23** provide electrical continuity or ground between the spring steel adaptor **20** and the wall of the electrical junction box **38** by keeping the two in firm contact. In addition, the inward-bent tensioner tangs **24** provide electrical continuity between the zinc die-cast connector **26** and the spring steel adaptor **20** by keeping tension at two points of contact between the two.

The second embodiment of this invention provides the same function as the preferred embodiment but is designed to connect EMT or cable to electrical junction boxes of different wall thicknesses. As shown in FIG. **8**, five outward-bend locking tangs **40**, **42**, **44**, **46** and **48**, are arranged at various distances from the edge of the spring steel adaptor **20**. As shown in FIG. **9**, another five outward-bent locking tangs **40**, **42**, **44**, **46**, and **48** are arranged at the same distances from the edge of the spring steel adaptor **20** with the relationship that the outward-bent locking tangs that are 180 degrees apart are at the same distance from the edge.

Thus, two outward-bent locking tangs at the narrowest depth **40** are located typically 180 degrees apart on the circumference of the adaptor of the second embodiment and are typically 0.101 inches from its edge. These two tangs would hold the connector in place for electrical junction boxes of widths less than typically 0.096 inches.

The two outward-bent locking tangs at the second depth **42** are located typically 0.132 inches from the edge of the adaptor. The two outward-bent locking tangs at the third depth **44** are located typically 0.166 inches from the edge of the adaptor. The two outward-bent locking tangs at the fourth depth **46** are located typically 0.196 inches from the edge of the adaptor. The two outward-bent locking tangs at the widest depth **48** are located typically 0.225 inches from the edge of the adaptor. As the wall thickness of electrical junction boxes increases, the higher numbered outward-bent locking tangs are progressively employed as needed to lock the connector in place.

In operation, if the adaptor shown in FIGS. **8** and **9** is inserted into an electrical junction box, the adaptor will slide into the box until the flange contacts the wall of the junction box. At that time, all the outward-bent locking tangs that have passed through the wall of the

junction box will snap outward. The two outward-bent locking tangs that have snapped out and are closest to the wall of the function box will prevent the connector from backing out of the junction ox. All of the outward-bent locking tangs that have not passed through the wall of the junction box will become tensioner tangs and provide tension and electrical continuity between the spring steel adaptor **20** and the electrical junction box.

The third embodiment of this invention is shown in FIG. **10**. This embodiment is a spring steel adaptor that is designed to be used with a number of existing threaded electrical connectors that are in common use in the electrical industry today. FIG. **10** depicts a laid-out view of the third embodiment showing a spring steel adaptor **20** before the tangs are lanced and pressed out and before being formed into a circular shape.

As shown in the drawing, the outward-bent tensioner tangs **23** and the outward-bent locking tangs **22** are similar to those employed in the first and second embodiments of this invention. The distinguishing difference with this embodiment is the use of inward-bent tensioner/threading tangs **50** that will be lanced and pressed inward to provide a means of threading this adaptor onto the properly sized threaded electrical connector.

After being formed into a circular shape, the inside diameter of the spring steel adaptor **20** of FIGS. **11**, **12** and **13** is typically 0.782 inches. Both the outward-bent locking tangs **22** and the outward-bent tensioner tangs **23** are pressed outward to an outer diameter of 0.936 inches. The four inward-bent tensioner/threading tangs **50** are pressed inward to form a typical inner diameter for the spring steel adaptor **20** of 0.695 inches.

As shown in FIG. **10** in the laid-out view, the inward-bent tensioner/threading tangs are staggered in the distance from the edge to permit the tangs to follow the thread of the electrical connector that it will be threaded on. From right to left in FIG. **10**, the inward-bent tensioner/threading tangs are located from the top edge of the spring steel adaptor **20** typically 0.060 inches, 0.103 inches, 0.220 inches and 0.263 inches. The tangs at 0.060 and 0.103 inches will start the adaptor on the threaded electrical connector when used. The tangs at 0.220 and 0.263 inches will follow onto the threads of the electrical connector as it is screwed further on and provide a positive means of threading and locking the adaptor onto the threaded end of the connector.

After threaded onto the connector the adaptor of the third embodiment will be screwed in until the adaptor is tightened onto the connector. The electrical connector with the adaptor attached can then be easily inserted into an electrical junction box having a typical 0.070 inch wall thickness.

The fourth and preferred embodiment is shown in FIGS. **14**, **15**, **16** and **17**. This embodiment is designed to be pressed onto an electrical connector such as that shown in FIG. **3** and described in the operation section under embodiment **1**.

This embodiment is similar to the first embodiment in function as it will be pressed onto the smooth central section of the connector shown in FIG. **3**. It is an improvement over embodiment **1** in that less force is required to insert the fourth and preferred embodiment into an electrical junction box.

Less force is required to insert the fourth embodiment into a junction box as a result of the oval-shaped slots **52** depicted in FIG. **14**. These oval-shaped slots **52** are punched out of the spring steel adaptor **20** prior to pressing out the outward-bent locking tangs **22**. By removing the oval-shaped slots **52** of the spring steel adaptor **20**, less force is then required to push the connector with adaptor into the electrical junction box.

An oval-shaped slot **52** forms each side of the outward-bent locking tangs **22**. By having this portion of the spring steel adaptor removed, the outward-bent locking tangs **22** spring back and forth more freely, as there is no metal to metal contact when the tang is forced inward.

A ridge **54** is pressed into the spring steel adaptor 2.0 along its length as shown in FIG. **14**. The ridge **54** improves the springing action of the outward-bent tensioner tangs **23** and thereby improves the electrical continuity between the adaptor and the electrical junction box. The ridge **54** is typically pressed out to an outer diameter of 0.875 inches.

The spring steel adaptor **20** of FIG. **16** is typically 0.838 inches in outer diameter measured across the flat surface of the spring. Across its diameter from one outward-bent tensioner tang **23** to another, the spring typically measures 0.910 inches. The outer diameter of the spring measured across the outward-bent locking tangs **22** is typically 0.950 inches.

As the spring steel adaptor **20** of the fourth and preferred embodiment is inserted into a junction box, the outward-bent locking tangs **22**, at a 0.950 inch diameter, spring inward as they are forced into the 0.875 inch typical opening in the junction box. The outward-bent locking tangs **22** then spring outward again to their at rest position after being pushed past the wall of the junction box. Springing action of the tangs occurs very easily as the oval-shaped slots **52** eliminate metal to metal contact of the tangs with the spring body.

After the outward-bent locking tangs **22** are locked in place, the outward-bent tensioner tangs **23**, at 0.910 inch diameter, exert tension between the spring steel adaptor **20** and the inner circumference of the opening in the electrical junction box. The ridge, at 0.875 inch outer diameter, also exerts force on the inner circumference of the opening in the electrical junction box and improves the electrical continuity between the adaptor and the junction box.

SUMMARY, RAMIFICATIONS AND SCOPE

Accordingly, the quick connect fitting of this invention makes it easier to connect cable or EMT to electrical junction boxes. By using this invention, the amount of time required to connect cable or EMT to electrical junction boxes is reduced. Furthermore, the invention provides good electrical continuity or ground between the electrical connector, the junction box, and the source leading to the box as an integral part of the design of the connector.

A second embodiment of this invention performs the same function as the preferred embodiment but enables connection to electrical junction boxes with various wall thicknesses.

Although the description above contains many specificities, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the preferred embodiments of this invention. For example, the spring steel adaptor can have more tangs and the tangs can be of different dimensions.

Thus the scope of the invention should be determined by the appended claims and their legal equivalents, rather than by the examples given.

What is claimed is:

1. A quick connect fitting for an electrical junction box comprising:

a hollow electrical connector through which an electrical conductor may be inserted having a leading end thereof for insertion in a hole in an electrical junction box;

a circular spring metal adaptor surrounding said leading end of said electrical connector which has a leading end, a trailing end, and an intermediate body;

at least two outwardly sprung members carried by said metal adaptor near said trailing end of said adaptor which engage the side walls of the hole in the junction box into which said adaptor is inserted;

at least two spring locking members carried by said metal adaptor that spring inward to a retracted position to permit said adaptor and locking members to be inserted in a hole in an electrical junction box and spring outward to lock said electrical connector form being withdrawn through the hole;

said circular spring metal adaptor being less than a complete circle that is of a relaxed diameter less than the diameter of the hole into which it is to be inserted with said spring locking members extending radially outward beyond the diameter of the hole into which they are to be inserted; and

an arrangement on said connector for limiting the distance said connector can be inserted into the hole in the junction box.

2. The quick connect fitting of claim 1 wherein said spring locking members are integral with and lanced out of said circular spring metal adaptor.

3. The quick connect fitting of claim 2 wherein there are a series of spring locking members spaced longitudinally along said adaptor so as to enable the adaptor to be inserted in a hole in an electrical junction box having different wall thicknesses.

4. The quick connect fitting of claim 2 wherein said connector has a flange and shoulder with an intermediate portion there between with said adaptor carried on said intermediate portion and held in position by said flange and shoulder.

5. The quick connect fitting of claim 1 wherein said connector has a flange and shoulder with intermediate portion there between with said adaptor carried on said intermediate portion and held in position by said flange and shoulder.

6. The quick connect fitting of claim 3 wherein said connector has a flange and shoulder with intermediate portion there between with said adaptor carried on said intermediate portion and held in position by said flange and shoulder.

7. A quick connect fitting for an electrical junction box comprising:

a hollow electrical connector through which an electrical conductor may be inserted having a leading end thereof for insertion in a hole in an electrical junction box;

a circular spring metal adaptor surrounding said leading end of said electrical connector which has a leading end, a trailing end, and an intermediate body;

said connector has a flange and shoulder with an intermediate portion there between with said adaptor carried on said intermediate portion and held in position by said flange and shoulder;

at least two spring locking members carried by said metal adaptor that spring inward to a retracted position to permit said adaptor and locking members to be inserted in a hole in an electrical junction box and spring outward to lock said electrical connector form being withdrawn through the hole; and

an arrangement on said connector for limiting the distance said connector can be inserted into the hole in the junction box.

8. A quick connect fitting for an electrical junction box comprising:

a hollow electrical connector through which an electrical conductor may be inserted having a leading end thereof for insertion in a hole in an electrical junction box;

a circular spring metal adaptor surrounding said leading end of said electrical connector which has a leading end, a trailing end, and an intermediate body;

at least two outwardly sprung members carried by said metal adaptor near said trailing end of said adaptor which engage the side walls of the hole in the junction box into which said adaptor is inserted;

at least two spring locking members carried by said metal adaptor that spring inward to a retracted position to permit said adaptor and locking members to be inserted in a hole in an electrical junction box and spring outward to lock said electrical connector from being withdrawn through the hole; and

an arrangement on said connector for limiting the distance said connector can be inserted into the hole in the junction box.

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