# United States Patent [19]

**Gibbons**

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[54] **QUICK CONNECT TERMINAL APPARATUS AND DEVICE FOR PROVIDING TERMINALS AND SPLICES ON COAXIAL CABLE LEADS**


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[52] **U.S. Cl.** ..... **339/100,** 339/101, 339/107

[51] **Int. Cl.** ..... **H01r 7/04**

[58] **Field of Search** ..... 339/59–63, 339/100, 177, 196, 200 P, 218, 101, 107



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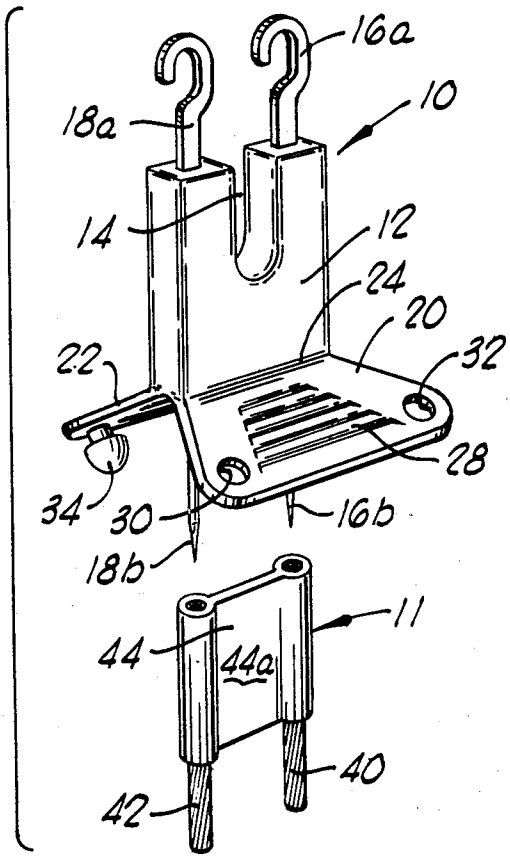
*Primary Examiner*—Joseph H. McGlynn
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[57] **ABSTRACT**

A quick connect terminal and splicing device for rapidly effecting connection of a terminal or another coaxial cable to the raw end of a coaxial cable, the device including a body having embedded therein, a pair of spaced, metal conductor elements. A pair of flexible clamp jaws project from one side of the body, and the metal conductor elements embedded in the body each have end portions formed as elongated contact pins which project from the body between the clamp jaws. Similar clamp jaws and contact pins are provided at the opposite side of the body when the device of the invention is to be used for splicing coaxial cable. Alternatively, the metal conductor elements embedded in the body may be projected from the body on the opposite side thereof from the contact pins as a pair of metal tie hooks which can be utilized for quickly and easily attaching the device of the invention to the screw type contact terminals provided on an electronic device, such as a television set. The clamp jaws include means allowing them to be interlocked in flatly abutting relation to each other to clamp between them the end of a coaxial cable.


**10 Claims, 6 Drawing Figures**



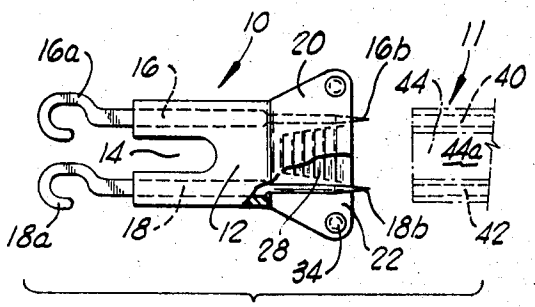



FIG. 1

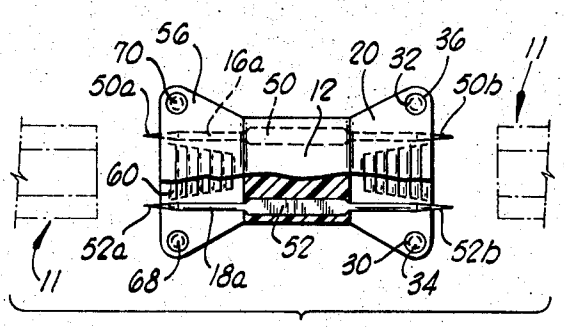



FIG. 3

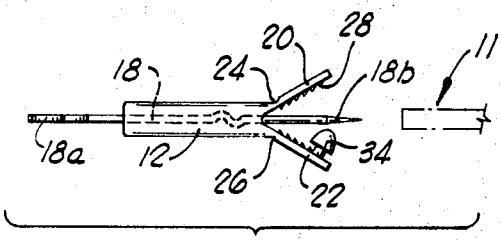



FIG. 2

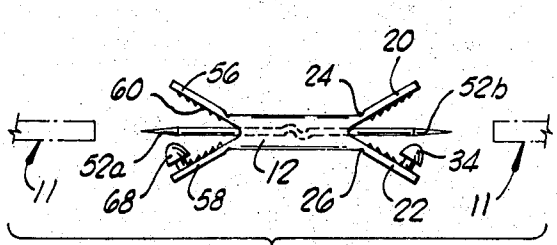



FIG. 4

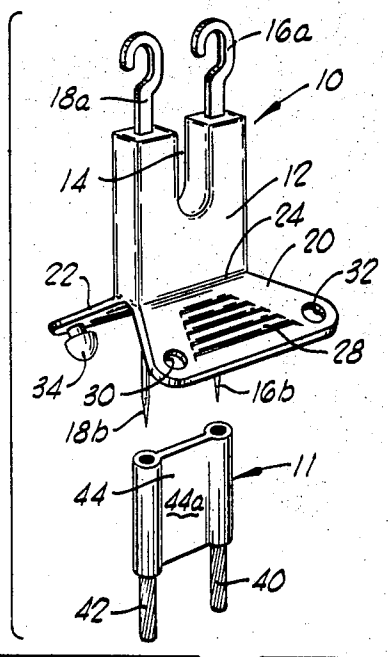



FIG. 5

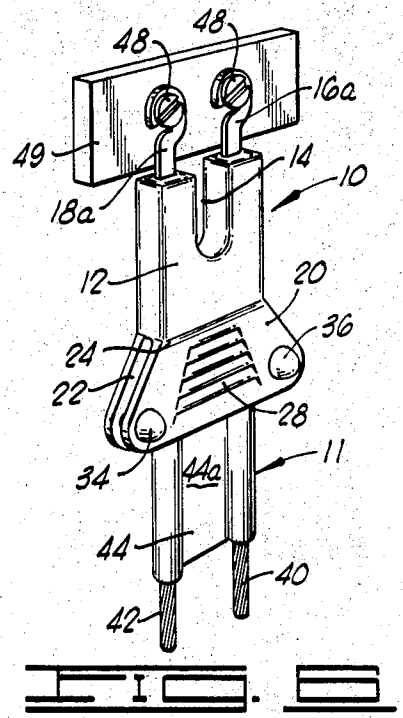



FIG. 6

# QUICK CONNECT TERMINAL APPARATUS AND DEVICE FOR PROVIDING TERMINALS AND SPLICES ON COAXIAL CABLE LEADS

## BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to devices adapted for quick connection to the raw end of an electrical lead for the purpose of splicing the electrical lead to another electrical lead, or for the purpose of providing a useful terminal connection on the end of the electrical lead. More particularly, but not by way of limitation, the present invention relates to a quick connect terminal or splicing device which can be quickly and easily attached to the raw end of a broken or severed coaxial cable of the type used for transmitting a received signal to a television set.

2. Brief Description of the Prior Art

Many types of connector devices for electrical conductors and cables have heretofore been proposed. Many of these devices include one or more prongs or tines which stab through the insulation of a raw ended or severed electrical lead or cable to establish conductive communication between a metallic eye or contact element carried by the connector device and the wire conductor elements in the severed lead or cable. Many of the prior devices proposed for this usage also have, as a part thereof, some portion which is flexible, and which can be easily bent or crimped about a portion of the severed electrical lead or cable to assure good physical connection between the device being used to provide a terminal or splice, and the body of the severed lead or cable.

300 ohm coaxial cables are widely used as transmission lines of the antenna systems used for television and radio receivers. The coaxial cable used for this purpose generally has a pair of electrical conductors which are spaced a substantial distance from each other, and which are retained in this spacial relationship by molded insulation material which extends around the conductors, and provides a web of insulation material between the conductors. Coaxial cables of the type described, because of their different geometry from many types of common electrical leads, require a different type of device for splicing or for providing a terminal than those which are available and quite useful for other types of electrical leads.

In many instances, the cost and complexity in use of devices which have been devised for quickly attaching a terminal to a severed coaxial cable have prevented the procurement and retention of such devices in the home, and where a coaxial cable has been broken, it has been a common practice to manually strip away the insulation from the raw end of the cable to expose the conductors so that they can then be re-attached to the television or radio set. This procedure is time consuming and is more difficult in the case of 300 ohm coaxial cable than with ordinary electrical leads, such as extension cords and the like.

The problem of providing an inexpensive and relatively easily used connector device for quick attachment to the raw end of a coaxial cable to provide a useful terminal has been considered, and several solutions have been offered in recent years. One of the proposals for a device of this type is that which is shown in Hayworth U.S. Pat. No. 3,042,892. In the Hayworth connector, a relatively rigid body of synthetic resin is molded to have a hollow interior which is complementary in configuration to the exterior configuration of the coaxial cable to which the connector is to be attached. Projecting through one end of the body into the recess forming the hollow interior of the body are a pair of contact pins which are tapered to points at their ends located in the recess within the body, and which are spaced from each other on a spacing equivalent to the spacing of the electrical conductors in the coaxial cable. At their ends outside of the body, the pins are bent into a hook like configuration so that they may be easily attached by screws to the terminal or contact bar of a television receiver.

In the use of the Hayworth device, the coaxial cable is cut transversely to square off the end thereof, and this end is then inserted into the recess forming the hollow interior of the synthetic resin body. Upon insertion of the end of the coaxial cable, the sharpened ends of the contact pins which extend into the body stab into the side portions of the cable so that the pins contact the electrical conductors in the cable. When the insertion of the cable has been accomplished, and electrical communication established in the manner described, a securing screw is passed transversely through the body of the connector, and through the central web portion of the coaxial cable so as to lock or retain the cable securely within the body.

Connector devices of the type described have the advantage of low cost and relative ease in use. On occassion, however, the contact pins provided in devices of this type, where the pins are extended straight through a body of synthetic resin, are pulled out of the body, destroying the connection. Moreover, the connection between the body and the coaxial cable is susceptible to relatively easy inadvertent severance if the cable is suddenly placed in tension, as by someone tripping over it or stumbling into it. Also, if the end of the coaxial cable is ragged or roughened to any degree, it is sometimes difficult to insert the end of the cable into the complementary recess or hollow interior provided in the synthetic resin body of the connector.

## BRIEF DESCRIPTION OF THE PRESENT INVENTION

The present invention provides an improved quick connect device for providing a functional terminal connector on the end of a coaxial cable, or, in a different embodiment of the invention, for quickly and easily connecting two raw ended sections of coaxial cable to each other through a neat, strong splice. The connection which is effected to the coaxial cable using the quick connect device of the present invention is a strong and durable connection which cannot be easily severed or released, and the device of the invention is relatively inexpensive and extremely simple to use.

Broadly described, the present invention comprises a body of synthetic resin having elongated, substantially parallel electrical conductor elements embedded in the body. Each of the conductor elements has portions projecting from opposite sides of the body. At one side of the body, the projecting portion of each of the conductor elements constitutes a necked down, elongated contact pin which is tapered to a point at its exposed end outside the body. That portion of each of the connector elements which projects from the opposite side of the synthetic resin body may take one of two forms.

In one embodiment of the invention, this portion of each of the connector elements is formed in the shape of a hook, and forms a tie hook to permit the quick connect device of the invention to be attached by screws to the terminal or contact bar of a television set or other electronic receiver device. In a different embodiment of the invention, the projecting ends of the conductor elements located on the opposite side of the synthetic resin body from the side from which the contact pins project are also formed as contact pins identical in shape to the opposite ends of the conductor elements. In this embodiment of the invention, the quick connect device of the invention can be utilized for quickly and easily splicing two sections of coaxial cable to each other.

At the side or sides of the body portion of the quick connect device of the invention which carries the pointed contact pins, a pair of divergent clamp jaws are formed integrally with the synthetic resin body, and project therefrom so as to flare or diverge from each other on opposite sides of the contact pins. The clamp jaws are flexible and resilient and carry means to permit the jaws to be pressed together in flatly abutting contact with each other, and locked in this position. It will be understood that where the quick connect device of the invention is provided with the described contact pins projecting from both sides of the synthetic resin body, so as to adapt the device for splicing purposes, the body then also carries a second pair of the divergent clamp jaws on its second side from which the second pair of contact pins project.

The described quick connect terminal and splicing device of the invention may be economically manufactured, is very easy to use, and establishes a firm, tenacious engagement between the conductor elements of the device and the conductor elements of a coaxial cable to which the device is connected.

Accordingly, an object of the invention is to provide a relatively inexpensive, easily used, quick connect terminal device for use in providing a useful terminal at the end of a coaxial cable which has been broken or severed to leave a raw end.

A further object of the invention is to provide a quick connect splicing device which can be used for quickly establishing a conductive path between the raw ends of two sections of coaxial cable.

A further object of the invention is to provide a quick connect terminal device for quick attachment to the raw end of a severed coaxial cable, which attachment can be effected without the use of hand tools, and which forms a tight and strong connection which is not severed or disengaged when the coaxial cable is placed in tension through the quick connect device.

Additional objects and advantages of the invention will become apparent as the following detailed description of a preferred embodiment of the invention is considered in conjunction with the accompanying drawings which illustrate the invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of a quick connect terminal device constructed in accordance with the present invention. A portion of the device is broken away for clarity of illustration. A coaxial cable to be connected at its end to the quick connect terminal device is shown in phantom, and contact pins and conductor elements, forming a portion of the device are shown in dashed lines at the location where they are embedded within the body of the device.

FIG. **2** is a side elevation view of the quick connect terminal device shown in FIG. **1.**

FIG. **3** is a plan view of a quick connect splicing device constructed in accordance with the present invention.

FIG. **4** is a side elevation view of the splicing device shown in FIG. **3,** with the jaws of the device in their open position.

FIG. **5** is a perspective view showing the quick connect terminal device of the invention as it is positioned preparatory to connection to a coaxial cable.

FIG. **6** is a perspective view illustrating the quick connect terminal device secured to a coaxial cable and positioned for attachment to a television set.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Referring initially to FIG. **1** of the drawings, a quick connect terminal device constructed in accordance with the present invention is illustrated, and is designated generally by reference numeral **10.** Also shown in FIG. **1,** in phantom, is the end of a coaxial cable **11** of the type used for transmission of a received signal from an antenna to a television set or the like. The end of the coaxial cable **12** has been squared off by cutting transversely across the cable to provide a well defined blunt end.

The quick connect terminal device **10** includes a body **15** which is constructed of rubber, a synthetic resin material or other suitable dielectric, nonconducting material, such as glass. Preferably, however, the body **12** is constructed of a synthetic resin material. As illustrated in FIG. **1** of the drawings, for purposes of saving material of construction. the body **12** may conveniently be formed with a bifurcation **14** extending thereinto so as to define a pair of substantially parallel legs.

Extending into the body **12** and embedded therein are a pair of metallic conductor elements designated generally by reference numerals **16** and **18.** The embedded portion of each conductor element **16** and **18** includes an S-shaped section to prevent the conductor element from being pulled out of the body. A portion of each of the metal conductor elements **16** and **18** projects outwardly from the body **12** through one of the legs thereof and terminates externally of the body in a tie hook. The tie hooks of the metal conductors are referred to by reference numerals **16*a*** and **18*a***, and are shaped to receive fastening screws extended therethrough for a purpose hereinafter described. At the opposite ends of the conductor elements **16** and **18** from their tie hook end portions **16*a*** and **18*a***, the conductor elements are necked down to form elongated contact pins **16*b*** and **18*b***, respectively. It will be perceived in referring to FIGS. **1** and **2** that the contact pins **16*b*** and **18*b*** are tapered to sharp points, and that the contact pins extend substantially parallel to each other.

At that side of the body **12** from which the contact pins **16*b*** and **18*b*** project, the body has secured thereto, or formed integrally therewith, a pair of divergent clamp jaws **20** and **22.** In a preferred embodiment of the invention, the clamp jaws **20** and **22** are molded integrally with the body **12,** with the entire structure being formed of rubber or a synthetic resin. The material of construction of the body **12** and the clamp jaws

20 and 22 is flexible and has an elastomeric property such that the jaws 20 and 22 may be flexed toward each other and forced into a substantially parallel, abutting relationship to each other for a purpose hereinafter described. To aid the flexing ability of the clamp jaws 20 and 22 when they are molded integrally with the body 12, grooves or depressions 24 and 26 are preferably formed at the junction of the respective jaws 20 and 22 with the body of the quick connect terminal device.

Each of the clamp jaws 20 and 22 carries on that surface thereof which faces or is opposed to the other clamp jaw, a plurality of parallel ribs or ridges 28 which are triangular in cross sectional configuration and disposed to bite into and engage, the insulation material of the end of the coaxial cable 11 when such end is placed between the jaws in a manner hereinafter described. The clamp jaw 20, which in plan view is flared and trapezoidal in configuration as shown in FIG. 1, has formed through the ears at the opposite sides thereof, a pair of apertures 30 and 32 for receiving snap buttons 34 and 36 carried on the jaw 22 at a corresponding location thereon. It will be perceived in referring to FIG. 2 that the clamp jaws 20 and 22, when in their relaxed, divergent positions, form an angle which is bisected by the contact pins 16*b* and 18*b* projecting from the side of the body 12.

As is well understood in the art, a typical 300 ohm coaxial cable of the type widely used for connecting an antenna to a receiver set includes a pair of spaced, metallic, electrical conductor elements 40 and 42 which are embedded in an insulating material 44. The insulating material 44 spaces the conductor elements 40 and 42 from each other and forms a flat web portion 44*a* in the intervening space between the locations of the embedded conductor elements. It will be perceived in referring to FIGS. 1 and 2 that the spacing between the contact pins 16*b* and 18*b* corresponds to the spacing between the conductor elements 40 and 42 carried by the coaxial cable 11, and that the contact pins are sufficiently small in diameter that they may be pressed into the small sleeve formed by the portions of the insulating material 44 which surrounds and encloses the conductor elements of the cable.

Thus, for purposes of fastening the quick connect terminal device 10 to the end of the cable 11, with electrical communication established between the contact pins 16*b* and 18*b* and the conductor elements 40 and 42, the end of the cable is forced against the sharpened ends of the contact pins and moved inwardly between the clamping jaws 20 and 22. As the cable 11 is forced toward the body 12, the sharpened contact pins 16*b* and 18*b* press into the exposed end of the cable 11 until physical contact is established between the contact pins and the conductor elements 40 and 42. Inward movement of the end of the cable 11 is continued until the cable end is immediately adjacent the side edge of the body 12 from which the clamp jaws 20 and 22 project. By the time that the cable 11 has reached this position, a good, reliable electrical connection has been established between the contact pins 16*a* and 16*b* and the conductor elements 40 and 42. At this time, the clamps jaws 20 and 22 are then pressed toward each other until the snap buttons 34 and 36 are forced through, and lockingly engage, the apertures 30 and 32 formed in the ears of the clamp jaw 20. At this time, the sharpened ridges 28 carried by the clamp jaws 20 and 22 will have been forced into the insulation material 44 of the cable 11 to tenaciously engage the cable and prevent it from being retracted from between the clamp jaws.

The securement of the quick connect terminal device 10 to the end of the coaxial cable 11 has now been completed, and an electrically conducted path has been established from the conductor elements 40 and 42 of the cable to the tie hooks 16*a* and 18*a* of the terminal device. The tie hooks may then be secured by means of conventional screws to the appropriate antenna lead connection panel on a television set or other electronic device. This final step in the use of the quick connect terminal device 10 is illustrated in FIG. 6 of the drawings where such screws 48 are shown securing the terminal device to a contact panel 49 at the back of a television set.

A different embodiment of the invention is shown in FIGS. 3 and 4. Since the embodiment of the invention here illustrated includes some structural elements which are common to the embodiment depicted in FIGS. 1 and 2 and hereinbefore described, identical reference numerals have been employed to refer to such identical structures as they appear in the two embodiments. Thus, the embodiment of the invention illustrated in FIGS. 3 and 4, which is a quick connect splicing device, includes a body 12 which is generally similar to the body 12 depicited in FIGS. 1 and 2 except that the bifurcation 14 has been omitted, and the body is rectangular shaped in configuration. There are further included in the quick connect splicing device, a pair of clamp jaws 20 and 22 which carry ribs or ridges 28 and which are formed integrally with the body 12 in the manner hereinbefore described. Again, the clamp jaw 22 carries a pair of snap buttons 34 and 36, and the clamp jaw 20 is provided with a pair of apertures 30 and 32 at the locations illustrated.

Embedded within the body 12 and having portions projecting from opposite sides thereof, are a pair of metallic conductor elements 50 and 52. As in the case of the conductor elements 16 and 18, the conductor elements 50 and 52 have a sinuous or S-shaped bend formed therein at the portion of the respective conductor elements embedded within the body 12 to prevent the conductor elements from being pulled out of the body during usage of the quick connect splicing device.

Each of the opposite ends of the conductor elements 50 and 52 is necked down to form an elongated contact pin, with these pins being designated by reference numerals 50*a* and 52*a* where they project from one side of the body 12, and 50*b* and 52*b* where they project from the other side of the body. At the side of the body 12 opposite that side from which the clamp jaws 20 and 22 project, a second pair of substantially identically formed clamp jaws 56 and 58 project divergently from the body 12. The clamp jaws 56 and 58 are also each of trapezoidal configuration and carry on their internal or facing surfaces, a plurality of ribs or ridges 60. The clamp jaw 56 has a pair of apertures 62 and 64 formed through the ears thereof for receiving snap buttons 68 and 70 projecting substantially normal from the interior surface of the clamp jaw 58.

It will thus be perceived that the quick connect clamping device embodiment of the invention is, in essence, a device in which the side of the quick connect terminal device embodiment used for clamping the coaxial cable to the device has been duplicated or re-

peated to the opposite side of the body **12**. This construction facilitates the electrical connection of one section of coaxial cable to another through the intervening conductive path afforded by the quick connect splicing device. The manner of securement of the cable ends between the paired clamping jaws provided at opposite sides of the body of the splicing device is identical to that which has been described in referring to the quick connect terminal device shown in FIGS. **1** and **2**.

Although certain preferred embodiments of the invention have been herein described in order to illustrate the basic principles of the invention, it will be understood that various changes and modifications in the illustrated and described structures can be effected without departure from the basic principles which underlie the invention. Changes and innovations of this type are therefore deemed to be circumscribed by the spirit and scope of the invention, except as the same may be necessarily limited by the appended claims or reasonable equivalents thereof.

What is claimed is:

**1.** A quick connect device for connecting the raw end of a coaxial cable to a terminal board or other cable section comprising:

a body;

a pair of elongated, electrical conductor elements embedded in said body and each including a bend along the length thereof at a location within said body for preventing the conductor element from being pulled from said body, each of said conductor elements including:

a contact pin projecting from one side of said body; and

a tie hook projecting from the opposite side of said body;

a pair of flexible clamp jaws projecting divergently with respect to each other from said one side of said body with said contact pins disposed therebetween; and

means for interengaging said clamp jaws in substantially parallel relation to each other.

**2.** A quick connect device as defined in claim **1** wherein said clamp jaws are each of flared, trapezoidal configuration, and wherein the means for interengaging said clamp jaws includes:

a pair of apertures formed through one of said clamp jaws; and

a pair of snap buttons secured to and projecting from the other of said clamp jaws and aligned with said apertures.

**3.** A quick connect device as defined in claim **1** wherein said body and clamp jaws are integrally formed of a flexible, elastomeric material.

**4.** A quick connect device as defined in claim **1** wherein each of said clamp jaws is further characterized in having a series of ribs extending transversely thereacross in a direction substantially normal to the direction of extension of said elongated conductor elements.

**5.** A quick connect device as defined in claim **4** and further characterized as including a second pair of flexible clamp jaws disposed on the opposite side of said body from said first mentioned pair of clamp jaws and projecting divergently with respect to each other with said second portions of said conductor elements disposed therebetween.

**6.** A quick connect device as defined in claim **4** wherein said means for inter-engaging said clamp jaws comprises:

apertures through one of said clamp jaws; and

snap buttons carried by the second of said clamp jaws in a position of alignment with said apertures, and adapted for snapping engagement with said apertures to hold said clamp jaws in substantially parallel relation to each other.

**7.** A quick connect device for connecting the raw end of a coaxial cable to a terminal board or other cable section comprising:

a body;

a pair of elongated, electrical conductor elements embedded in said body, each of said conductor elements including a sharp pointed contact pin projecting from one side of said body, and a second portion in addition to said sharp pointed contact pins projecting from the opposite side of said body, said contact pins extending substantially parallel to each other;

a pair of flexible clamp jaws of flared, trapezoidal shape projecting divergently with respect to each other from one side of said body and formed integrally with said body with said contact pins disposed therebetween, one of said clamp jaws having a pair of apertures formed therethrough on opposite sides of said contact pins for clearing said contact pins when said clamp jaws are clamped together;

a pair of snap buttons secured to and projecting from the other of said clamp jaws at a location on opposite sides of said contact pins and aligned with said apertures for engaging said apertures when said clamp jaws are clamped together; and

a series of ribs extending transversely across at least one of said clamp jaws at a location to position said ribs between said contact pins when said clamp jaws are clamped together whereby said ribs are positioned to engage the central web portion of a coaxial cable having its conductors engaged with said contact pins when said clamp jaws are clamped together.

**8.** A quick connect device as defined in claim **7** wherein said second portion of each of said conductor elements is a tie hook.

**9.** A quick connect device as defined in claim **7** wherein each of said clamp jaws carries said rib series, and each of the ribs in each of said series is of triangular cross-sectional configuration with the ribs in the series on each of the two clamp jaws cooperating to bite into and engage an insulating material used in a coaxial cable clamped therebetween.

**10.** A quick connect device as defined in claim **7** wherein the second portion of each of said conductor elements is a contact pin whereby said conductor elements each have contact pins at the opposite ends thereof and projecting from opposite sides of said body.

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