Aug. 2, 1949. W. D. BOYNTON 2,477,955

CONNECTOR

Filed May 8, 1946

FIG. 2

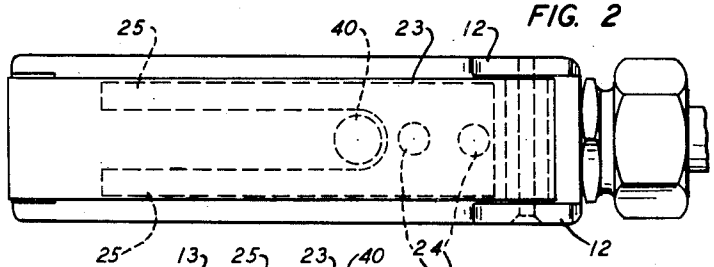
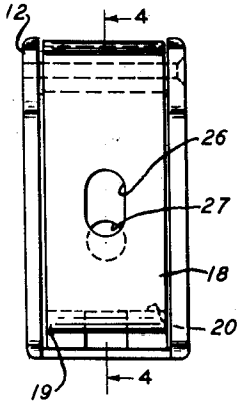


FIG. 3



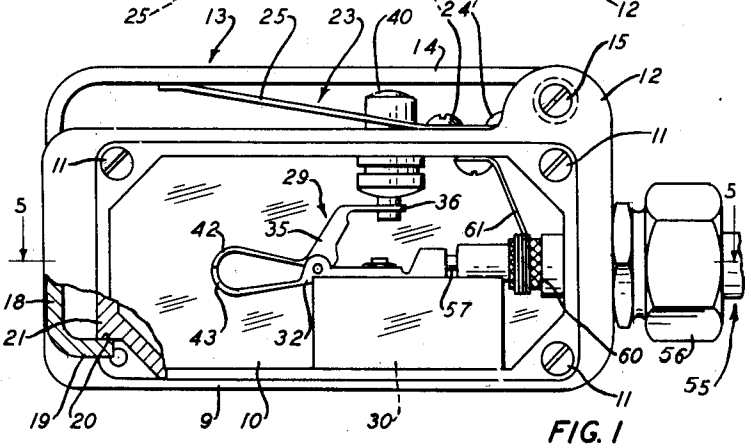
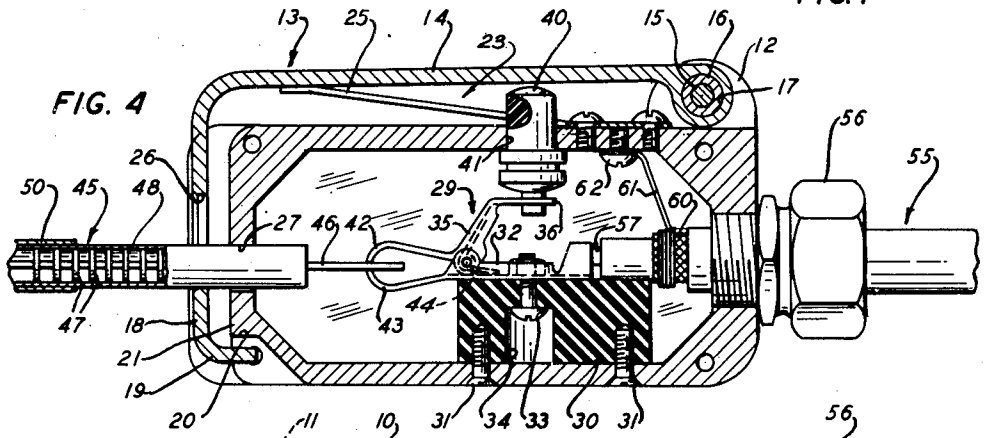
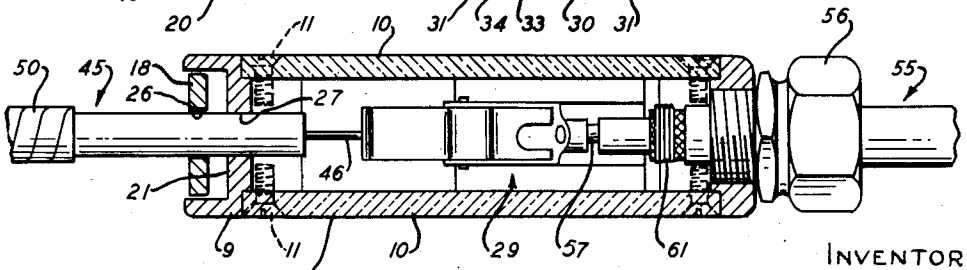


FIG. 1

FIG. 4





TRANSPARENT WINDOW

FIG. 5

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CONNECTOR

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11 Claims. (Cl. 174—21)

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This invention relates to connectors, and more particularly to connectors for connecting coaxial cable units to electrical testing apparatus.

Coaxial cables are employed in high frequency telephone and television transmission systems because of the many structural and electrical advantages inherent therein. These coaxial cables usually comprise a composite core consisting of a plurality of individual coaxial units each of which includes a solid central conductor, a plurality of insulating discs spaced uniformly thereon, an outer tubular conductor formed completely around the insulating discs and a steel tape wrapped spirally around the outer conductor. The composite cores are usually enclosed in an extruded lead sheath, which may have various kinds of protective coatings applied thereover where a particular field installation requires such treatment.

During the manufacture of such coaxial cables, convenient lengths of the composite cores are stored on reels preparatory to extruding a lead sheath over the core. This same procedure is followed with the lead sheath cables preparatory to further treatment of the cables.

However, to assure the production of commercially acceptable coaxial cables, the general practice is to conduct an electrical test on each individual coaxial unit of a cable after the composite core has been formed and again after the lead sheath has been applied thereover. Due to the unusual mechanical construction of the coaxial units, there arises the problem of providing a satisfactory means for electrically connecting the central conductor and the outer conductor thereof to the electrical testing apparatus.

The object of the invention is to provide new and improved connectors.

In accordance with a preferred embodiment of the present invention, there is provided a connector which comprises a housing, means positioned within the housing for engaging the central conductor of a coaxial unit, and means associated with the housing for engaging the outer conductor of the coaxial unit.

A complete understanding of the invention may be had from the following detailed description of a specific embodiment thereof, when read in conjunction with the appended drawing, in which:

Fig. 1 is a side view of a connector comprising a preferred embodiment of the invention;

Fig. 2 is a top plan view of the connector shown in Fig. 1;

Fig. 3 is a left end view of the connector shown in Fig. 1;

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Fig. 4 is a vertical section taken along line 4—4 of Fig. 3, and

Fig. 5 is a horizontal section taken along line 5—5 of Fig. 1.

Referring in detail to the drawings and particularly to Fig. 1, there is shown a connector for engaging the inner and outer conductors of a coaxial unit, which comprises a rectangular housing 9 provided with a pair of transparent sides 10—10 secured to the sides of the housing by a plurality of screws 11—11. The transparent sides 10—10 are made from "Plexiglass" or other similar transparent plastic material and are mounted on the housing 9 so as to be flush with the sides thereof.

The housing 9 is provided with a pair of ears 12—12 (Fig. 2) between which an L-shaped arm 13 is pivotally mounted at one end of a long leg 14 thereof by means of a bolt 15 threadedly secured in the left hand ear 12, as viewed in Figs. 2 and 3. The pivoted end of the leg 14 is provided with a hardened bushing 16 having a bore 17 therethrough to slidably receive the bolt 15. A short leg 18 of the arm 13 is provided with a turned in end 19, which engages a shoulder 20 provided on the lower portion of a left hand wall 21 of the housing 9. A U-shaped leaf spring 23 (Figs. 1 and 2) has the base end thereof secured to the top of the housing 9 adjacent to the ears 12—12 by a plurality of bolts 24—24. The legs 25—25 of the leaf spring 23 are offset at their ends and engage the underside of the leg 14 of the arm 13. The spring 23 urges the arm 13 upwardly and normally maintains the end 19 against the shoulder 20, in which position an elongated opening 26 provided in the leg 18 is misaligned with a bore 27 provided in the wall 21 of the housing 9 (Figs. 3 and 4).

A conventional spring-loaded contacting clip 29 is mounted within the housing 9, as shown in Figs. 1 and 4, on a block 30 made of suitable insulating material and secured on the inner side of the bottom of the housing 9 by a plurality of screws 31—31. The height of the block 30 is such that the clip 29 positioned thereon is aligned horizontally with the bore 27 provided in the wall 21 of the housing 9. A stationary arm 32 of the clip 29 is rigidly secured to the block 30 by means of a bolt 33 which is positioned in a counterbore 34 provided in the block. The counterbore 34 is provided in the block 30 so that the head of the bolt 33 is positioned a substantial distance away from the bottom of the housing 9 thereby keeping the bolt 33 and the clip 29 completely insulated from the housing 9.

A movable arm 35 of the clip 29 has its operating end 36 engaged by a non-conducting plunger 40 slidably positioned in a bore 41 provided in the top wall of the housing 9. The upper portion of the plunger 40 passes between the legs 25—25 of the spring 23 and has its upper end in close proximity to the underside of the leg 14 of the arm 13. The lower portion of the plunger 40 positioned between the top wall of the housing and the arm 36 of the clip 29 is serrated in order to provide a long leakage path between the clip 29 and the housing 9. When the arm 13 is depressed against the action of the spring 23, it engages the plunger 40 and urges it downwardly against the movable arm 35 of the clip 29, which raises a contacting end 42 thereof out of engagement with a contacting end 43 of the stationary arm 32 against the action of a torsion spring 44 positioned on the clip 29. At the same time the leg 18 is moved downwardly until the bottom wall of the opening 26 provided therein is substantially below the lower side of the bore 27 provided in the housing 9.

When the arm 13 is in this position, a coaxial unit such as coaxial unit 45 may be readily passed through the opening 26 and the bore 27 (Fig. 4), whereby a substantial portion of the end of the coaxial unit may be positioned within the housing 9. Such coaxial units generally comprise a solid central conductor 46, a plurality of insulating discs 47—47 spaced uniformly along the conductor, an outer tubular conductor 48 surrounding the insulating discs, and a steel tape 50 wrapped spirally over the tubular conductor.

A flexible cable 55 has one end thereof attached to suitable high voltage testing apparatus (not shown) and its other end is secured to the housing 9 by a conventional cable grip 56 (Figs. 4 and 5). The cable 55 illustrated in Figs. 4 and 5 is a single conductor shielded cable having a central insulated conductor 57 and a tubular metallic braid 60 surrounding the insulating jacket of the conductor 57. This metallic braid 60 is also enclosed in a suitable insulating jacket. The end of the cable 55 which projects through the grip 56 into the housing 9 is prepared so that the bare end of the central conductor 57 may be clamped in the end of the stationary arm 32 of the clip 29. A portion of the metallic braid 60 is exposed and a wire 61 is wrapped therearound, soldered thereto and secured to the housing 9 by means of a screw 62.

The metallic braid 60 of the cable 55 is connected to the grounded side of the high voltage testing apparatus to which the cable 55 is connected. By virtue of the electrical connection between the metallic braid 60 and the housing 9, the entire connector is grounded, with the exception of the insulated clip 29. In this way the housing 9 acts as the grounded terminal and the clip 29 which is insulated therefrom acts as the high potential terminal of the high voltage testing apparatus in which the coaxial unit 45 is to be connected. When the connector is positioned on the end of a coaxial unit, as shown in Figs. 4 and 5, the outer tubular conductor 48 is connected to the grounded metallic braid 60 by means of the housing 9 and a wire 61, and the central conductor 46 is connected to the high potential central conductor 57 by means of the clip 29.

The above-described connector operates in the following manner:

Whether the high voltage insulation test is to be conducted on the composite core of a coaxial cable or on the coaxial cable after the lead sheath is applied, the ends of the individual coaxial units are prepared as follows:

A substantial portion of the steel tape 50 is removed from the end of each coaxial unit so as to expose a workable portion of the tubular conductor 48. A smaller portion of the tubular conductor 48 is removed so as to expose a portion of the central conductor 46. All the insulating discs 47—47 which are uncovered by this last step are removed from the central conductor.

In order to position the connector over the end of any one of the individual coaxial units of a core or cable, such as a unit 45, it is necessary to depress the arm 13 so that the leg 18 clears the bore 27 and the elongated opening 26 therein is aligned with the bore 27. When the arm 13 has been depressed to this position, it has also urged the plunger 40 downwardly against the movable arm 35 of the clip 29 so as to disengage the contacting end 42 thereof from the contacting end 43 of the arm 32. With the arm 13 held in this position, the connector may be positioned on the prepared end of the coaxial unit 45 to be tested by passing the end of the unit through the opening 26 and the bore 27. Through the transparent sides 10—10, it is possible to see when the connector is properly positioned on the end of the unit so that a substantial portion of the outer conductor 48 projects into the housing 9, and a portion of the central conductor 46 projects between the contacting ends 42 and 43 of the clip 29.

When the connector has reached the desired position on the end of the coaxial unit 45, the arm 13 is released, whereupon the spring 23 urges the arm 13 upwardly so that the leg 14 thereof is disengaged from the plunger 40, whereby the spring 44 causes the contacting end 42 of the arm 35 to resiliently clamp the conductor 46 against the contacting end 43 of the arm 32. The leaf spring 23 urges the arm 13 upwardly until the bottom of the opening 26 engages the outer tubular conductor 48 and clamps it against the upper side of the bore 27 provided in the wall 21 of the housing 9. With the connector in this position, the central conductor 46 of the coaxial unit 45 is electrically connected to the high potential central conductor 57 of the cable 55 and the tubular conductor 48 of the unit is electrically connected to the grounded metallic braid 60 through the housing 9 and the conductor 61. When the connector is positioned on the cable, as described above, the testing apparatus (not shown) associated with the test lead 45 may be used to conduct suitable electrical tests such as a high voltage insulation test on the coaxial unit 45. Since the metallic braid 60 is the grounded side of the testing apparatus, the entire connector, except the clip 29, is thereby grounded and injury to the operator in the handling of the connector is prevented.

The above-described connector has several inherent advantages over connectors heretofore used for similar purposes. It completely protects the operator from injury because all parts thereof which must be operated by hand are grounded and insulated from the high potential contacting clip. It is extremely simple and easy to operate, in that the actuation of the outside lever makes the connector ready for attachment on the coaxial unit. The transparent sides further increase the ease with which the connector may be operated. Finally, the spring pressed clip firmly grips the central conductor so that a low resistance contact is made therebetween, which fact is essential

to the performance of an accurate electrical test of the coaxial unit.

Although the connector described hereinabove was designed primarily for use in connecting individual coaxial units of a composite core on a reel or the completed cable on a reel to electrical testing apparatus, it is obvious that the connector could just as well be used for connecting the individual units to a testing apparatus before such units are formed into the composite core. While the above-described connector is particularly adapted for connecting individual coaxial units to high voltage testing apparatus, it can be readily adapted for connecting other types of cables to similar apparatus without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. A connector for engaging a coaxial cable unit including a central conductor and an outer tubular conductor, which comprises a housing, a spring clip positioned within the housing and insulated therefrom for engaging the central conductor of the coaxial unit, and an arm pivotally mounted on the housing and having a portion for engaging the outer conductor of the coaxial unit, and means associated with the arm for actuating the spring clip when the arm is moved.

2. A connector for engaging a coaxial cable unit including a central conductor and an outer tubular conductor, which comprises a housing, a spring clip positioned within the housing and insulated therefrom for engaging the central conductor of the coaxial unit, an arm pivotally mounted on the housing and having a portion for engaging the outer conductor of the coaxial unit, and a non-conducting element positioned between the arm and the spring clip for actuating the clip when the arm is moved.

3. A connector for engaging a coaxial cable unit including a central conductor and an outer tubular conductor, which comprises a box-like metallic housing having transparent sides and having an opening at one end slightly larger than a coaxial unit to be engaged, a spring clip mounted within the housing in alignment with the opening and insulated from the housing, an arm pivotally mounted on the housing and provided with an opening adjacent to the opening in the housing, a spring for normally maintaining the arm in such a position that the two openings are misaligned, a non-conducting plunger associated with the clip in the path of movement of the arm for actuating the clip, and means for connecting the clip to a testing apparatus and the housing to ground, whereby when the arm is moved against the force of the spring the openings are aligned to permit a coaxial unit to be inserted therethrough and the spring clip is opened, and when the arm is released the spring moves the arm in the opposite direction and causes the sides of the openings to engage the outer conductor of a coaxial unit inserted in the connector and the spring clip to engage the central conductor of the unit.

4. A connector for connecting the outer and inner conductors of a coaxial cable unit to electrical testing apparatus, which comprises a housing, electrical contacting means positioned within said housing for engaging only the central conductor of such a coaxial unit, and spring-pressed means pivotally mounted on said housing for operating said contacting means and for resiliently engaging only the outer conductor of the unit to force the outer conductor against a portion of the housing.

5. A connector, which comprises an enclosing casing having a bore provided in one end thereof for receiving the end of a coaxial unit having a central conductor and an outer tubular conductor, spring-pressed means pivotally mounted on the casing for engaging only the outer conductor of such a unit to hold the outer conductor against the bore in said casing, and contacting means positioned within and insulated from said casing and operable by movement of said pivotally mounted means for engaging only the central conductor of the coaxial unit.

6. A connector, which comprises a rectangular casing having a bore in one end thereof for receiving the end of a coaxial unit having a central conductor and an outer tubular conductor, means mounted exteriorly of the housing for resiliently clamping only the outer conductor of such a coaxial unit against the bore in said casing, and means positioned within the casing and operable by movement of said resilient clamping means for engaging only the central conductor of such a coaxial unit, said casing being provided with transparent sides so that the connector may be properly positioned on the end of the coaxial unit.

7. A connector for connecting a coaxial unit having a central conductor and an outer tubular conductor to electrical testing apparatus, which comprises a housing having a two-conductor cable from the testing apparatus secured thereto, spring clip contacting means positioned within the housing and connected to one of the conductors of said testing apparatus cable for engaging the central conductor of the coaxial unit to be tested, the other conductor of the cable from the testing apparatus being connected directly to the housing, spring pressed means mounted pivotally on the exterior of the housing for resiliently clamping the outer tubular conductor of the coaxial unit to be tested against a portion of the housing, whereby both conductors of the coaxial unit to be tested are electrically connected to the two conductors of the testing apparatus cable attached to the housing, and means associated with the spring pressed clamping means for actuating the spring clip contacting means when the clamping means is moved.

8. A connector, which comprises an enclosing casing having transparent sides secured thereon and a bore provided in one end thereof, a spring-pressed arm pivotally mounted on said casing and having an elongated opening therein normally misaligned with the bore in said casing, and spring-pressed contacting means positioned within said casing and insulated therefrom, said contacting means being operable by said arm, whereby said arm, when actuated in one direction, opens the contacting means and aligns the opening in the arm with the bore in the casing to permit a coaxial unit to be passed therethrough and when released causes the inner and outer conductors of a coaxial unit inserted in the connector to be resiliently engaged by said contacting means and said arm, respectively.

9. A connector for engaging a coaxial unit having a central conductor and an outer tubular conductor, which comprises a housing having transparent sides secured thereon, a spring clip positioned within the housing and electrically insulated therefrom for engaging the central conductor of the coaxial unit, said housing being provided with a bore in one end thereof hori-

zontally aligned with the spring clip, an arm pivotally mounted at one end of the housing and having an elongated opening therein adjacent to the bore provided in the housing, a spring for normally positioning the arm so that the two openings are misaligned, means positioned between the arm and the clip for opening the clip when the arm is actuated, whereby when the arm is actuated so as to align the two holes a coaxial unit may be passed therethrough and the transparent sides aid in manipulating the connector with respect to the end of the coaxial unit so that the central conductor thereof may be properly engaged by the clip.

10. A connector for engaging a coaxial unit having a central conductor and an outer tubular conductor, which comprises a housing having transparent sides secured thereon and a bore provided in one end thereof to receive a coaxial unit, a spring clip positioned within the housing and electrically insulated therefrom for engaging the central conductor of a coaxial unit, said clip being horizontally aligned with the bore provided in the housing, a two-conductor cable attached to the housing and having one conductor thereof connected to the insulated clip and the other conductor connected directly to the housing, said conductor connected to the housing being the grounded side of the cable so that the entire connector is grounded except for said clip, and means associated with the housing for operating the spring clip and engaging the outer conductor of the unit, whereby the two conductors of the unit are connected to the conductors of the cable attached to the housing and the outer conductor of said coaxial unit being grounded thereby.

11. A connector for engaging a coaxial unit including a central conductor and an outer tubular conductor, which comprises a rectangular,

metallic housing having transparent sides secured thereon, a spring clip positioned within the housing and insulated therefrom, an L-shaped arm pivotally mounted at one end of said housing and having an elongated opening in a portion thereof adjacent to the opposite end of the housing, a non-conductive plunger slidably positioned in the wall of the housing, said plunger having one end in engagement with an arm of the spring clip and the other end engageable by the L-shaped arm, said housing having a bore provided in the end wall thereof adjacent to the elongated opening in the arm and horizontally aligned with the spring clip, and a leaf spring secured to the housing for normally maintaining the arm in such a position that the opening therein is misaligned with the bore provided in the end of the housing, whereby when the L-shaped arm is actuated in one direction against the action of the spring the opening therein is aligned with the bore in the housing to permit the end of a coaxial unit to be inserted in the housing and the spring clip is opened to receive the central conductor of the unit, and when the arm is released the spring urges the arm in the opposite direction which clamps the outer conductor of the coaxial unit against the bore in the housing and causes the spring clip to engage the central conductor of the unit.

WENTWORTH D. BOYNTON.

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