United States Patent

[11] **3,546,364**

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[54] **MIDSPAN SERVICE CONNECTOR**
10 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **174/72,** 339/242, 339/272
[51] **Int. Cl.** **H02g 3/00,** H01r 7/12
[50] **Field of Search** ..... 339/198, 242, 265, 272, 14(L); 174/71, 43

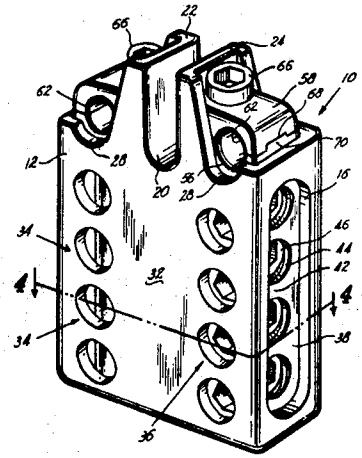
[56] **References Cited**

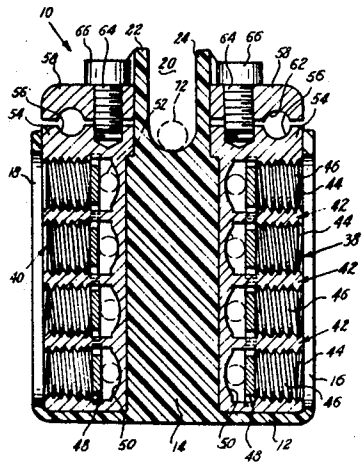
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Primary Examiner—Marvin A. Champion
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ABSTRACT: A midspan connecter for multiplex electrical cables particularly adapted for use with the triplex cable. This new connecter features a single unit to connect the electrically energized or hot wires and the neutral wire of one or more service lines to the corresponding wires in the secondary or main cable with all connections being made in the same plane to improve the aesthetic appearance of such connection locations. All connections are secured by a single type Allen screw requiring only the use of a single size Allen wrench. A neutral connecter of an improved design is used in combination with the secondary midspan connecter in improving the ease and facility for effecting these midspan connections. This connecter unit is designed to accommodate at least four service connections.





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SHEET 1 OF 2

FIG. 1

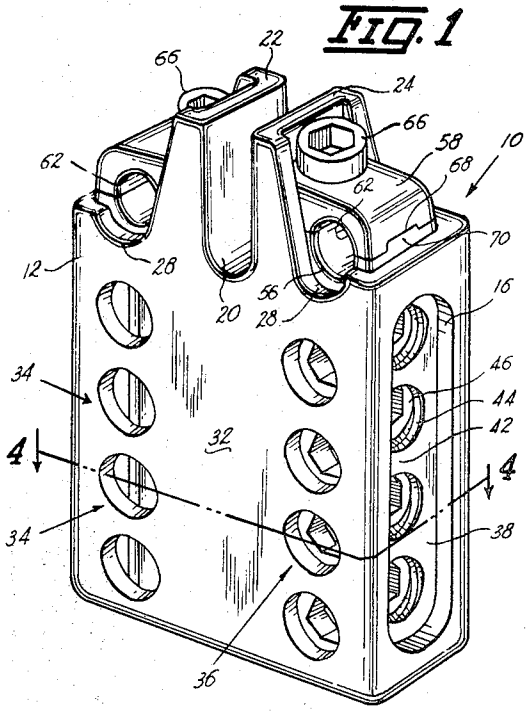


FIG. 2

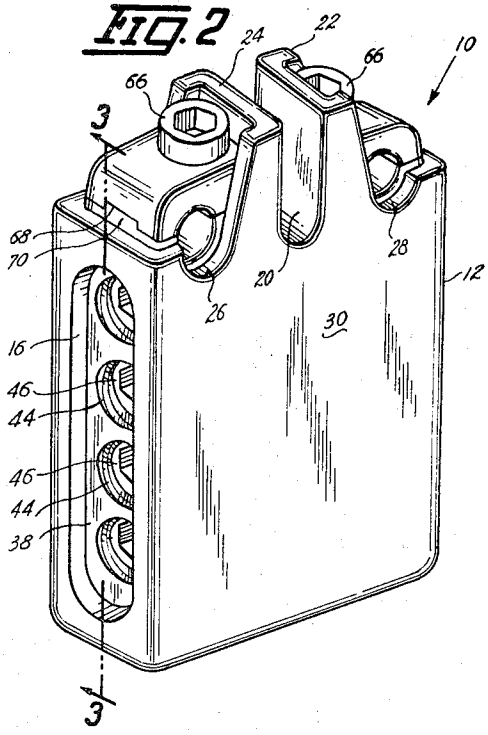


FIG. 3

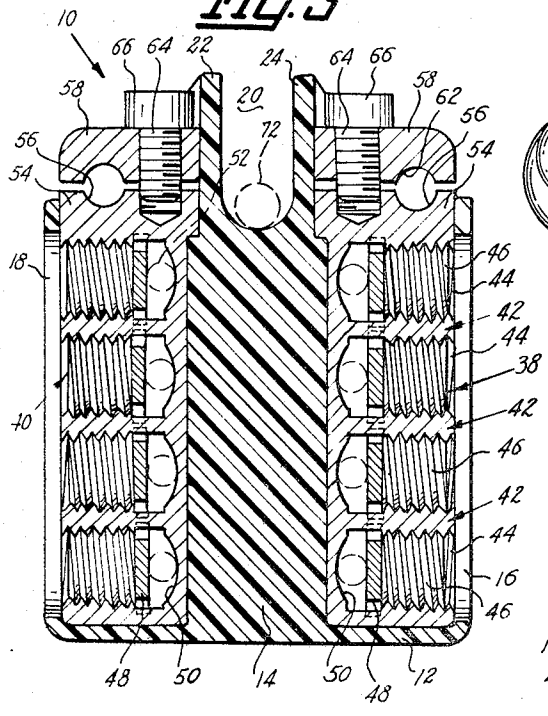


FIG. 5

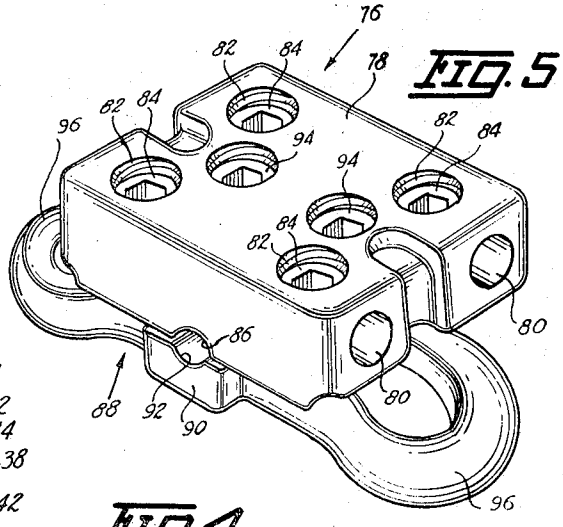
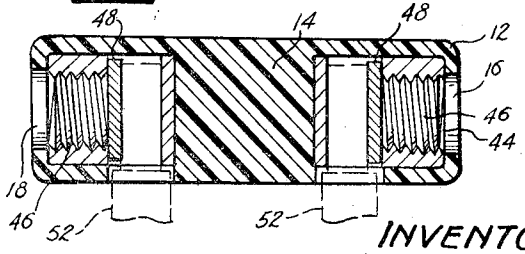


FIG. 4



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FIG. 7

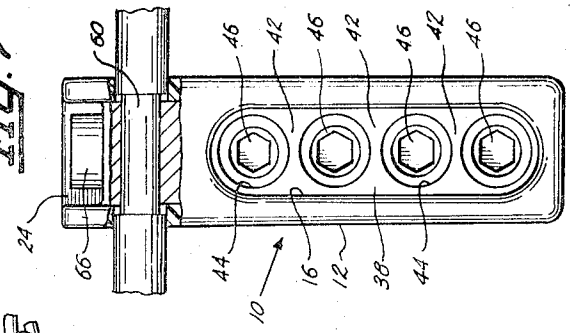


FIG. 6

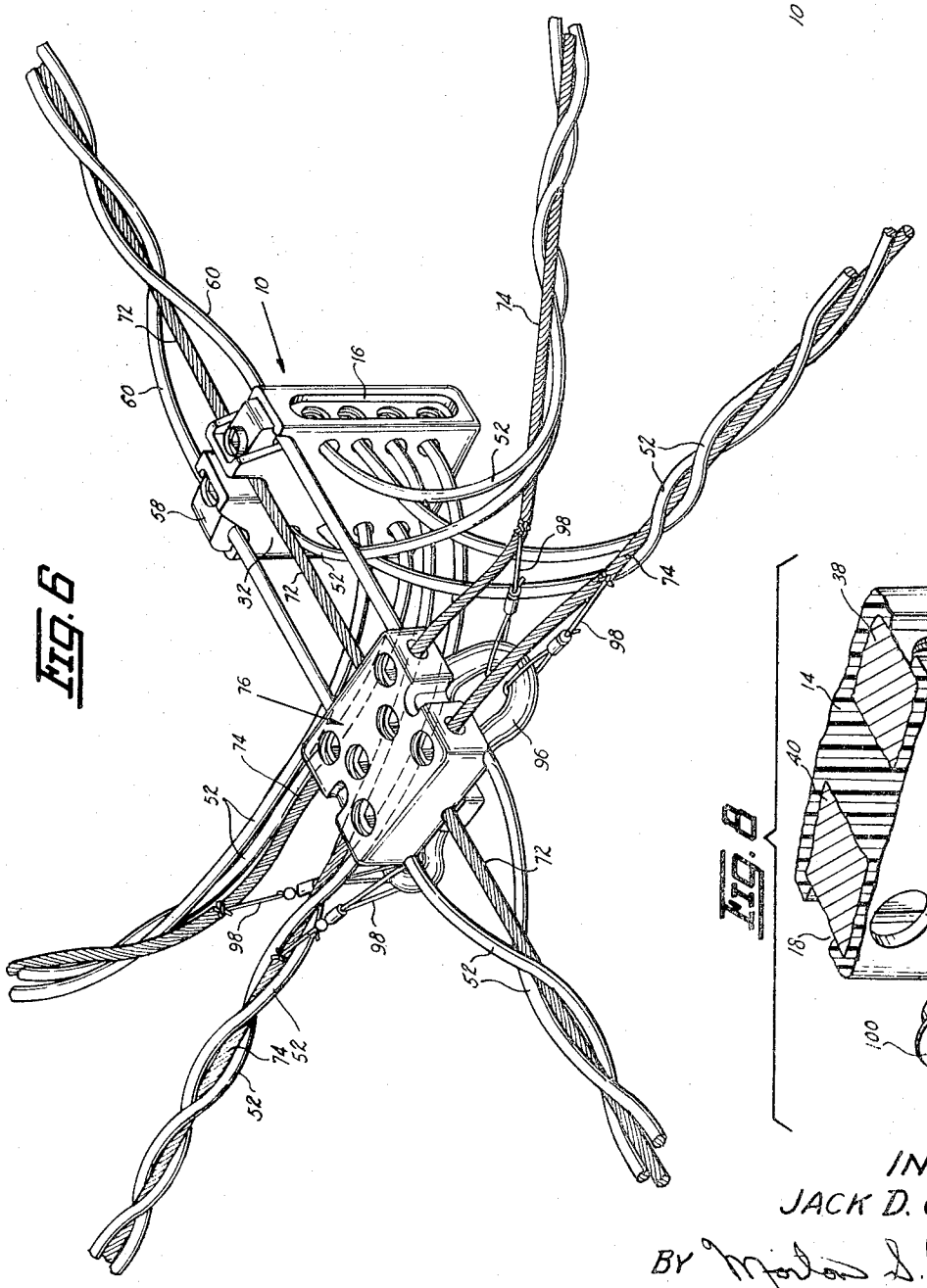
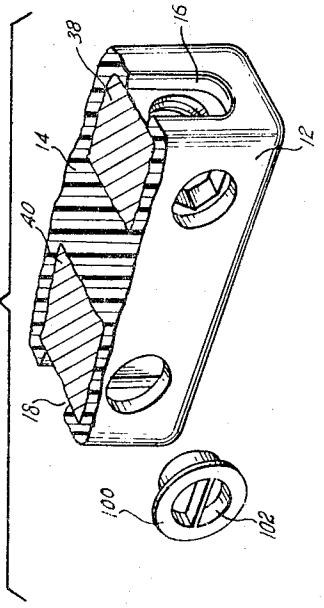


FIG. 8



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MIDSPAN SERVICE CONNECTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to improvements in secondary and neutral midspan service connectors for electric service lines and is particularly designed for use with triplex cables.

2. Description of the Prior Art

The triplex form of cable including two hot conductors supported by a messenger or neutral strand is in common use as a service line for supplying electricity to dwellings and the like. Such service lines have generally been connected into the secondary or main cable at the point of supporting poles for said main cable and where such service lines are numerous, a plurality of service connections have been required at individual poles. In recent years, criticism has been directed to the cluttered up aspect of such service lines at their point of connection to the secondary and, accordingly, more emphasis has been placed on improving the aesthetic appearance of electric distribution facilities. The midspan connector has been one of the responses to this criticism and this type of connector is illustrated in U.S. Pat. Nos. 2,887,524, 3,087,006 and 2,935,550. The concept of the midspan connector includes certain inherent problems in attaching the service lines due to minimal clearances between the phase conductors and the neutral carrier. Separation must be provided at these tap locations to allow for tool space and electrical clearances. This normally requires a spread of several inches especially when the line is worked "hot" and when squeeze-on connections are used as shown in U.S. Pat. No. 2,887,524,for example. If the lines are not worked "hot," several of the locations receiving service will experience appreciable outage time during maintenance activities.

In the multiplex conductors where one or more insulated conductors are wrapped around a supporting bare neutral messenger or carrier, there are mechanical limitations involved due to the relatively higher tension required and the force necessary to spread the conductors to the desired spacing. This difficulty increases with larger conductor sizes.

Some of the problems encountered with present midspan connectors include insufficient safety features required by necessary use of connecting tools for which adequate clearance between the wires must be maintained together with the manipulation and sometimes removal of parts which increases installation time. In addition, the construction of such connectors frequently results in a rather unsightly appearance of the mass of interwoven loops. Accordingly, it is one of the objects of the present invention to provide a midspan connector unit as characterized which will permit the greatest number of service lines to be attached thereto in a minimum of space by incorporating into a single body unit, the service connection terminals in a manner which provides for the required electrical clearance.

Another object herein is to provide such a connector that requires no dismantling for its operative attachment to the appropriate lines and one which can be safely installed on or removed from an energized line.

It is a further object herein to provide a midspan connector in which all wires are uniformly aligned in the same direction so as to substantially improve the appearance by reducing the apparent mass of connections.

Still another object herein is to provide a midspan connector of the above class in which all wire securing means are designed to be operated by a single tool of a fixed size with the design of the connector being such that adequate tool clearance is provided and the possibility of tool contact between any conductive terminal and neutral is eliminated for all practical purposes.

SUMMARY

This new connector includes a molded plastic single nonconductive body unit which permits connection to both "hot" wires of a 120/240 volt secondary circuit without danger from a hazardous short circuit being caused by the use of a connecting tool. The plastic body unit houses a conductive terminal block assembly for the connection of at least four pairs of service wires and the charged wires of the secondary. All service wires are connected to the terminal block assembly on the same side of said unit in the same plane so as to avoid the unpleasant appearance of interwoven loops which are so predominant in presently available midspan connectors. All terminal openings for the reception of service lines and the connections for the secondary hot wires are provided with bolts with all of said bolts being designed for turning by a single sized Allen wrench which is the only tool required. The plastic body unit also includes a supporting cradle for the secondary neutral line and associated with this new connector in relatively close spaced relationship is an improved and newly designed neutral connector which will be attached to the secondary.

The neutral connector is designed so that the terminal openings for receiving the neutral wire from service lines are oriented perpendicular to the axis of the neutral in the secondary and thereby provides for a straight-on connection of the service line neutrals to the neutral connector. The neutral connector also includes means for attaching a suitable bail to the service line neutrals as is well known.

With the terminal connecting means disposed within an integral body unit, there is no disassembly and reassembly of parts required in making the necessary wire connections as is present in many similar devices.

The objects of this invention together with details of the structure outlined and the advantages of the same will be more fully described and developed in relation to the more detailed description of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing this new midspan connector and illustrating that side of this connector on which there is provided the terminal openings for the service lines.

FIG. 2 is a perspective view of this connector showing the opposite side from that illustrated in FIG. 1.

FIG. 3 is a longitudinal sectional view taken on the line 3–3 of FIG. 2.

FIG. 4 is a cross-sectional view taken on the line 4–4 of FIG. 1.

FIG. 5 is a perspective view of the neutral connector used with the connector shown in FIG. 1.

FIG. 6 is a perspective plan view of the connector of FIG. 1 and the neutral connector of FIG. 5 in operative connected relationship to the secondary and to a plurality of service lines.

FIG. 7 is an end view of the connector in FIG. 6 without the service lines but being broken away at the top to illustrate the attachment thereto of one of the hot lines on the secondary.

FIG. 8 is a fragmentary bottom portion of the connector shown in FIG. 1 showing the interior thereof and illustrating the use of a removable plug for one of the terminal openings.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, this new connector is designated generally by the numeral **10** and includes a nonconductive high impact molded plastic body or housing **12** which, except for the top portion to be referred to later, is substantially rectangular in shape as best seen in FIG. 4. Body **12** includes the central plastic core portion **14** (FIG. 3) and is provided with the elongated recesses **16** and **18** which communicate with the respective opposed side edges of body **12** as seen in FIG. 8. The use of molded plastic for body **12** provides the necessary mechanical strength and electrical insulation characteristics desired in this product.

Body **12** is provided at its top central portion with the deep groove **20** defining the opposed and spaced wall portions **22** and **24**, each of which have configuration extending away from groove **20** downwardly and outwardly to terminate in the arcuate seats **26** and **28** as shown.

One side of body 12 is closed as indicated in FIG. 2 at 30 and the other side 32 is provided with a row of vertically spaced openings 34 which communicate with recess 18 and said side is likewise provided with a second row of vertically spaced openings 36 which communicate with the recess 16. Holes in rows 34 and 36 are equal in number and corresponding holes on the same plane are designed to accommodate the respective hot wires in a single service line.

Recesses 16 and 18 are adapted to receive respective conductive terminal block connector assemblies which are shown best arranged in FIG. 3 and designated generally by the numerals 38 and 40. Assemblies 38 and 40, as will later be referred to in more detail, are an integral terminal connecting unit for the charged wires in both the service lines and the secondary as distinguished from the separate terminal connection means for the service lines and secondary as presently used on other devices of this type. Such terminal assemblies 38 and 40 may be either cast or bonded into body 12 as shown. Both assemblies 38 and 40 are of like construction so that a description of assembly 38 will suffice for assembly 40 where like numbers are given to like parts.

Block 38 is essentially an elongated rectangular unit having spaced partitions 42 to define a plurality of vertically spaced compartments 44 which are each internally threaded to receive a like size Allen head screw 46. The inner end portion of each compartment 44 is provided with a vertically disposed removable contact or pressure plate 48 which is in juxtaposition to an arcuate inner end 50 in each compartment 44. Each arcuate portion 50 is disposed to register with one of the openings 36 in body side 32 and thus arranged, is designed to receive in a dead end connection the end of one of the service line hot wires 52. It will be appreciated that insulation will be stripped from the end of such wire and such end is suitably held in place in block 38 by the tightening of the screw 44 against plate 48 as seen in FIG. 3.

The upper integral portion 54 of terminal block assembly 38 is disposed adjacent the lower outer side of wall 24 and has the notch portion 56 substantially in register with the seat 28. A clamp member 58 for securing one of the hot lines 60 in the secondary contains the undercut notch 62 which is complementary with groove 56 in forming a clamp means for conductor 60. Clamp 58 is attached to terminal section 54 by a suitable bolt means 64 which is provided with a head 66 adapted to receive an Allen head wrench of the same size as that which will turn screw 46. The tightening of bolt 64 will cause the secondary clamp 58 to move downwardly on the outer inclined edges of wall 24 to effect a suitable tightening action against conductor 60. In this regard, one end of clamp 58 is notched as at 68 to register with an alignment tab 70 provided on the outer upper edge of terminal block 38.

In attaching the conductor 60 to the terminal clamp 58, it is not necessary to cut any wires since only a small portion of insulation need be removed as is best seen in FIG. 7. Also, in attaching lines 60 of the secondary, it is pointed out that the walls 22 and 24 form a nonconductive barrier between the secondary neutral 72 that will be in groove 20 and the bolt heads 66 so that with the use of an Allen wrench as described, there is no danger of the wrench being simultaneously in contact with the conductive assemblies 38 or 40 and the neutral 72 and this provides an important safety factor in working with triplex cables.

The operative position of this new conductor 10 is best illustrated in FIG. 6 where it is seen that the neutral 72 of the secondary is supported in groove 20 and the hot wires 60 of the secondary are arranged as previously described. The respective pairs of hot wires from the service lines are all mounted in a dead end connection to side 32 of housing 12 so as to present a neat appearance and avoid the mass of interwoven and intermingled lines which are so common in other types of midspan connectors. It will be appreciated that in connecting the secondary and the service lines to connector 10 that only an Allen head wrench of a single size is necessary for tightening the like size screws 44 and the bolt 66.

To support the neutral line 74 from the service lines, I have provided the newly designed neutral connector 76. This connector includes the substantially square connector block 78, on two opposed ends of which there is provided the laterally spaced recesses 80 for a dead end connection with the neutral lines 74. For this purpose, there is provided a threaded opening 82 in the top of the connector block 78 for registration with each of the respective recesses 80 and in each opening 82 there is provided a screw 84 of the type to receive the same size Allen head wrench usable on screws 46. The bottom of block 78 is provided with a longitudinal groove 86 which extends transversely of the longitudinal axis of recesses 80 and is designed to receive and secure the neutral line 72 of the secondary. Block 78 also includes a complementary lower portion 88 which includes a central section 90 provided with a longitudinal groove 92 which will be complementary with groove 86 for supporting the neutral 72. Block 78 is attached to the lower portion 88 by a pair of screws 94 adapted to receive a like size Allen wrench as the other screws described. Projecting from each side of the center section 90 of the lower member 88 of the neutral connector are the loops 96 to which there may be attached the bails 98 which are secured to the line 74 of the service lines in a well known manner. It will be noted that recesses 80 are oriented transversely of the longitudinal axis of neutral line 72 in the secondary so that a straight-on connection of the neutral 74 in the service lines can be made as best seen in FIG. 6 to further avoid the appearance of an unsightly interwoven maze of curving wires.

When less than all of the openings 34 and 36 are in use, the unused openings may be enclosed by a suitable plastic plug 100 for frictional attachment to the required opening. The caps of such plugs are recessed with a transverse web 102 to facilitate their being grasped by a suitable tool such as pliers or the like for removal.

I claim:

1. A midspan service connector, comprising:
- a nonconductive housing;
- means only on one side of said housing to receive a plurality of pairs of charged wires from a plurality of service lines;
- conductive wire connecting means disposed within said housing for attachment to said respective pairs of wires;
- one end of said housing being provided with a relatively deep groove defining spaced nonconductive walls;
- said groove adapted to be engaged by the neutral wire in the secondary of a transmission line;
- said conductive wire connecting means being disposed adjacent said respective walls and out of communication with said groove; and
- said walls serving as nonconductive barriers between the neutral and charged wires in the secondary of a transmission line.

2. A midspan service connector as defined in claim 1 wherein:
- said nonconductive housing is generally rectangular having one closed side and provided with a respective recess in opposite edges;
- the other side of said housing being provided with two rows of spaced openings of a like number;
- the openings in each respective row in communication with one of said respective recesses;
- said conductive wire connecting means including:
  - a first respective wire connection means in each of said recesses having separate terminal connection means relative to each opening in communication therewith for electrically securing charged wires from a service line;
  - a second wire connection means integral with said first wire connection means for electrically securing the respective charged wires in the secondary of a transmission line; and
- means on said housing to support the neutral of a secondary transmission line in spaced relationship to the charged wires therein.

3. Apparatus as defined in claim 1 wherein said means to receive charged wires and said conductive wire connecting means are operatively effective without requiring any dismantling of the same.

4. A midspan service connector, comprising:

a nonconductive housing provided with spaced recesses;

a nonconductive core portion in said housing intermediate said recesses;

a terminal block assembly in each recess;

a plurality of wire connecting means in each terminal block assembly for electrically securing the charged wires in a service line;

separate wire connecting means integral with said terminal block assembly for electrically securing the charged wires in the secondary of a transmission line;

service line receiving openings only on one side of said housing whereby all service lines are operatively attached to said terminal block assembly from the same side of said housing;

one end of said housing being provided with a relatively deep groove defining spaced nonconductive walls;

said groove adapted to be engaged by the neutral wire in the secondary of a transmission line;

said separate wire connecting means being disposed respectively adjacent one of said walls and out of communication with said groove; and

said walls serving as nonconductive barriers between the neutral and charged wires in the secondary of a transmission line.

5. A device as defined in claim 4 wherein all of said wire connecting means have a tool engaging portion of a predetermined configuration so as to be operably by a single tool of a single size.

6. Apparatus as defined in claim 4 wherein said wire connecting means and said separate wire connecting means are operatively effective without requiring any dismantling of the same.

7. A midspan service connector, comprising:

a nonconductive housing provided with two spaced recesses;

a conductive terminal block secured in each recess;

at least one pair of openings in the same side of said housing with each opening in communication with a respective recess and with the opposite side of said housing being closed;

a respective wire anchoring means in said terminal block operatively disposed relative to each of said openings to act in a direction transversely of the axis of said openings;

a groove in one end of said housing defining spaced nonconductive walls with said groove designed to be engaged by the neutral wire of a secondary transmission line;

a respective conductive clamp means integral with said terminal block for securing the charged wires in the secondary and said clamp means being disposed adjacent the sides of said wall out of contact with said groove; and

a second wire anchoring means operatively disposed relative to each of said clamp means.

8. A device as defined in claim 7 wherein each of said wire anchoring means is a threadable bolt type member having a head of like design so that all such means are operable by a single tool of a fixed size.

9. A device as defined in claim 8 wherein the said heads all receive a single size Allen wrench.

10. Apparatus as defined in claim 7 wherein said respective wire anchoring means and said respective conductive clamp means are operatively effective without requiring any dismantling of the same.