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House Service Connector

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(71) Applicant(s)

Fulton Industries Australia Pty Ltd

(72) Inventor(s)

Fulton, Robert; Sexton, Francis; Donnelly, Mark

(74) Agent/Attorney

Hodgkinson McInnes Patents, Level 21 201 Elizabeth Street, Sydney, NSW, 2000

(56) Related Art

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ABSTRACT

A service connector is disclosed for making connections between a utility power line and at least one consumer location. The service connector comprises: a block having a plurality of cavities, each adapted to receive a respective cable end. At least a portion of the block is transparent to allow at least partial visual inspection of the disposition of at least one cable end within the block. A bridging means is disposed within the block and adapted to electrically bridge the cable ends to one another. The connector also comprises a plurality of fasteners, each disposed adjacent a respective one of the cavities for fastening the cable end against the bridging means within the cavity. The bridging means comprises a first type teeth array disposed within at least one of the cavities and adapted to pierce the insulation of the cable end when compressed by the fastener, thereby making electrical contact between the cable end and the bridging means.

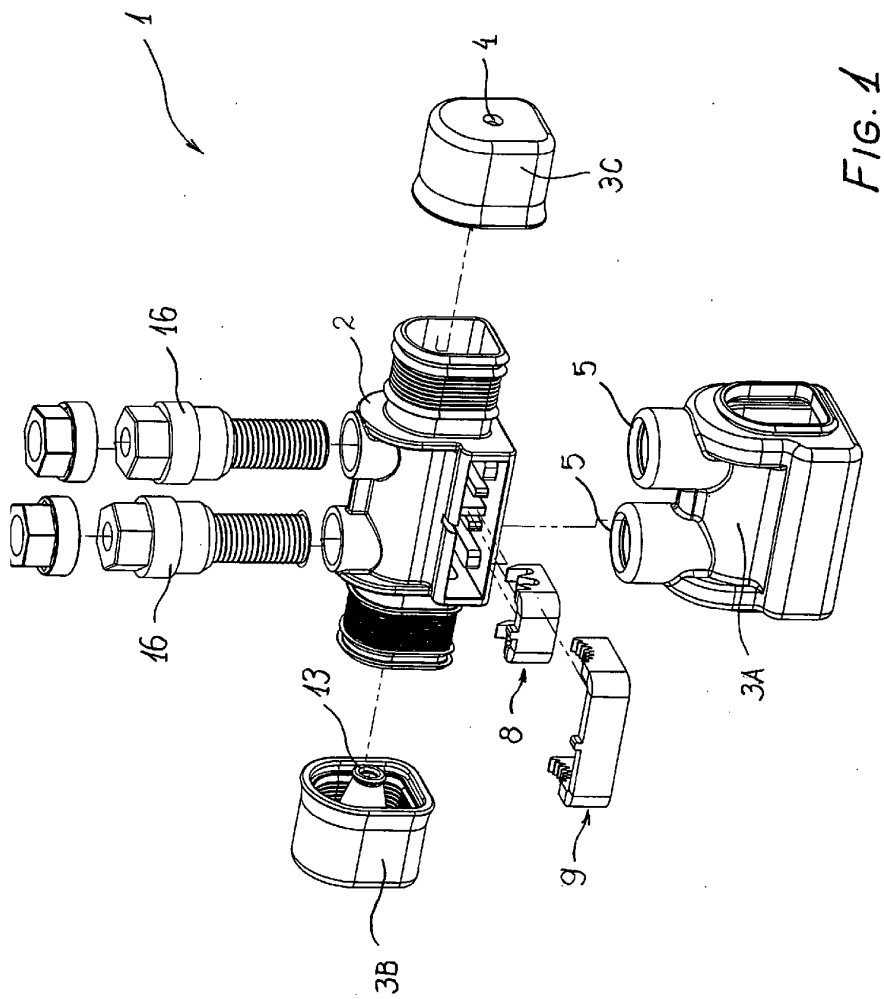

FIG. 1

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HOUSE SERVICE CONNECTOR

TECHNICAL FIELD

The present invention relates to service connectors, and more particularly to aerial and underground service connectors for connecting cables from a utility power line to those from consumer locations.

BACKGROUND

Aerial and underground service connectors have long been used to connect cables from a consumer location such as a residence or commercial premise to the service cables of an electrical utility provider. In order to be electrically safe, the service connectors must be properly installed and their electrical connections must remain intact over time. This is particularly challenging given that the metals used in the prior art are susceptible to galvanic and other types of corrosion, reducing the quality of the electrical and mechanical connection with age. Furthermore, aerial service connectors are subjected to continual cyclic pull out forces due to weather, only exacerbated by the weight of the service connector itself. Of particular importance is maintaining the electrical connections of the service connectors used to connect safely neutral conductors. When a neutral connection fails, little indication is given to the consumer as electrical power is not interrupted. However, continued operation without the neutral conductor significantly increases the likelihood of hazards such as electrical shock or fire to the consumer or technician. Indeed, fatal electrocutions of both consumers and technicians have been attributed to the problems inherent in prior art service connectors.

The service side cables in place have generally standard characteristics, for example, in Australia they typically consist of aluminium conductors disposed in a spiral lay pattern with a cross-sectional area up to 35 mm^2. However, because residences and commercial premises have been built in different time periods according to widely differing electrical standards, the cables coming from the house side frequently differ in size, material and conductor lay pattern. House side cables in Australia are typically copper and range between 2.5 to 25 mm^2. Connection in both the house and service side of the service connector is made by inserting the cable into an aluminium block and securing it using a

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threaded bolt. The house and service side cables are then electrically bridged via the aluminium block.

Due to the relative uniformity of the service side cables, prior art service connectors are able to use elongate knife-edges to cut through the service cable's insulation and make contact with the conductor strands underneath. Due to the appreciable length of the knife-edges, they usually do not penetrate the strands and the knife-edges effectively form only one or a few point/s of contact with the conductor strands. However, the variety in house side cables has precluded using such knife-edges on the house side of the service connectors. For example, a small house cable would simply fall between large knife-edges, never cutting through the cable's insulation and thus not making electrical contact. Conversely, narrowly spaced knife-edges would not sufficiently penetrate the insulation of large house cables. With knife-edges on the service side and a plain bolted connection on the house side, the installing technician has been required to strip back insulation from the house cable and then ensure they connect the correct cable in the correct side of the service connector. Two attempts to indicate correct orientation have been screen-printing on the side of the service connector and using different colour shear bolts. The screen-printing is susceptible to wearing off and the colour coded shear bolts are easily removed and mistakenly replaced in the wrong holes. Careless technicians may also ignore the printing or coloured shear bolts altogether. These mistakes are even more likely in an aerial situation, especially given that installation commonly takes place during storms and in the dark.

Furthermore, proper connection of prior art service connectors has been difficult to verify. The conductive block of the service connectors has been manufactured from a metal such as aluminium in order to provide conductivity between the cables. The metallic block is then encased in an opaque insulator, often carbon black moulded rubber. Neither the metallic block nor the opaque insulating casing allows viewing of the connections made therein. Installing technicians are relied upon to deduce the position of the cable conductors, for example by measuring out the cable insertion length. The ability of technicians to successfully execute these tasks varies and is prone to human error. In cases where the installer fails to properly strip the house side cable, installs the cables out of order, or does not install the cable deep enough in the service connector, no electrical

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connections are made, resulting in unsafe power delivery, which may be undetectable until a mishap occurs.

Assuming proper installation, prior art service connectors may still become disconnected over time. On the house side of the connector, the plain bolted connection allows the wire to work loose and fall out. The problem is worsened by galvanic corrosion between the house cable, which is typically copper, and the aluminium block of the service connector. To prevent the corrosion reaction from occurring, the manufacturer has been relied upon to coat the interior of the service connector with grease. Grease only mitigates the corrosion and may not be retained properly in the service connector through installation.

Even on the service sides having knife-edges, prior art connectors are susceptible to failed connections. The individual conductors of the service side cables are disposed in a spiral lay pattern; however, the knife-edges of the prior art are aligned with the axis of the service connector, not the spiral lay pattern. As a result of this construction, as well as, as a result of the configuration and dimension of the knife-edges, they often do not penetrate between and separate the individual conductors of the cable. Thus, the prior art knife-edges often make only one or several point/s of contact with the outer periphery of the cable's conductors. This results in the undesirable traits of high electrical resistance and low mechanical strength. In general, both sides of the service connectors have provided poor pull out strength both initially and over time.

A multitude of further deficiencies exist in the prior art. For example, the service connector is required to be water sealed by its encasing. The casings have moulded sealing ports through which house and service cables penetrate. However, the point of contact in both the service side and the house side is below the centre line of the outer moulding sealing port. A sharp kink in the cable thus allows water to enter through the sealing port. Furthermore, on the service side, the incoming cable may foul on the front of the knife-edges. The installing technician may mistakenly believe that the cable is fully inserted and secure the fastening bolts. The sealing ports of the outer casing will hold the cable temporarily, appearing as if a connection has been made. Electrical testing performed to verify the connection may still indicate a false positive connection, if the exposed end of the cable even partially contacts the aluminium interior.

A further problem with the prior art connectors has been that the installing technician imparts too great a torque on the threaded bolts and shears the cable. To overcome the problem, the threaded bolts have plastic shear caps that are injection moulded over typically aluminium bolts. However, performance characteristics of the plastic shear caps vary with temperature change. On hot days, the cap tends to shear at a lower torque than on a cold day. Thus, the installing technician may be limited to install the connectors at too low a torque, leading to loose connections, or be allowed to apply too high a torque, shearing the cable. The aluminium bolts are further used to provide an exposed electrical test point for the service connectors. The drawback being that the exposed conductive material is an electrical hazard, exposing the electrical potential of the inner aluminium body. In summary, prior art service connectors are difficult and unsafe to use.

The present invention seeks to provide a service connector that will overcome or alleviate at least one of the deficiencies of the prior art.

SUMMARY OF THE INVENTION

According to a first aspect the invention consists in a service connector for making connections between a utility power line and at least one consumer location, said service connector comprising:

a block having a plurality of cavities each adapted to receive a respective cable end at least a portion of said block being transparent to allow at least partial visual inspection of the disposition of at least one cable end within said block;

a bridging means disposed within said block and adapted to electrically bridge said cable ends to one another;

a plurality of fasteners, each disposed adjacent a respective one of said cavities for fastening said cable end against said bridging means within said cavity;

wherein said bridging means further comprises a first type teeth array disposed within at least one of said cavities and adapted to pierce the insulation of said cable end when compressed by said fastener, thereby making electrical contact between said cable end and said bridging means.

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Preferably, said bridging means further comprises a second type teeth array disposed adjacent said first type teeth array in said cavity, said first and second type teeth arrays being configured for different types and sizes of said cable ends, and wherein in use the insulation of said cable end is pierced by at least one of said first and second type teeth arrays when compressed by said fastener.

Preferably, said cavities contain the same set of said first and second type teeth arrays, allowing a user to insert said cable end indiscriminately into any one of said cavities. Even more preferably, said cavities are identical to each other and each is adapted to receive multiple types and sizes of said cable ends.

Preferably, said bridging means comprises a first conductive plate having at least a pair of said first and/or second type teeth arrays disposed along portions of an edge of said first conductive plate. Even more preferably, said bridging means further comprises at least a second conductive plate having a plurality of one or more of said first and second type teeth arrays disposed along portions of an edge of said second conductive plate.

Preferably, said bridging means further comprises at least a second conductive plate comprising at least a pair of said first and/or second type teeth arrays disposed along portions of an edge of said second conductive plate.

Preferably, at least one of said first and second conductive plates is substantially U shaped.

Preferably, at least one of said cavities has an associated guiding formation disposed at its entrance for guiding said cable end as it is inserted into said cavity along said guiding formation into position for fastening between said fastener and said bridging means. Even more preferably, either a first or second type teeth array is disposed adjacent the top portion of said guiding formation. Most preferably, the type of teeth array adjacent said guiding formation is preselected to allow a test probe to be inserted into said cavity beyond said guiding formation to make contact with said bridging means without being blocked by said guiding formation.

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Preferably, the length of the cutting edge of at least some of the teeth in said teeth arrays is short relative to the pattern of individual conductors of said cable ends to allow at least partial penetration of the respective teeth between said pattern.

Preferably, a casing is disposed around said block substantially preventing ingress of liquids therein and includes bell mouth entry ports and fastener ports via which said cable ends and said fasteners respectively penetrate said casing, at least a portion of said casing being transparent to allow at least partial visual inspection of the disposition of at least one of said cable ends within said block. Even more preferably, each of said bell-mouth entry ports has at least one ring disposed circumferentially about its interior to prevent ingress of liquids along said cable ends into said block.

Preferably, the casing comprises more than one separate section.

Preferably, the casing comprises:

block casing configured for receiving and sealingly encapsulating at least a portion of the block;

a plurality of caps, each cap arranged for sealingly engaging a corresponding portion of the block and/or the block casing associated with a cable entry point, each cap comprising the corresponding bell mouth entry port associated with the corresponding cable entry point.

Preferably, said fasteners are threaded bolt type fasteners made of insulating material. Even more preferably, the maximum inward travel of said fasteners is predetermined to be less than a distance that could shear said cable ends. Even more preferably, a cap on each of said fasteners is adapted to shear off when a predetermined maximum torque is applied to said cap. Most preferably, said cap is made of zinc alloy.

Preferably, said insulating material is made of polycarbonate.

Preferably, said bridging means is made of brass electroplated with tin.

Preferably, said block is made of polycarbonate.

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Preferably, said casing is made of silicon.

Preferably, said transparent portion of said block is colour tinted in accordance with a predetermined electrical colour-coding scheme.

Preferably, said transparent portion of said casing is colour tinted in accordance with a predetermined electrical colour-coding scheme.

In one preferable embodiment, said service connector has two said cavities and is an aerial service connector. In a second preferable embodiment, said service connector has four said cavities and is an underground service connector.

Preferably, the connector is arranged for connecting single insulated copper cables in the range of 2.5 – 50 mm^2 or double insulated copper cables in the range of 2.5 – 25 mm^2.

In a second aspect the present invention consists in an aerial service connector for making connections between a utility power line and a consumer location, said aerial service connector comprising:

a block having substantially identical first and second cavities, each adapted to receive cable ends of multiple types and sizes;

a bridging means disposed within said block and adapted to electrically bridge said cable ends to one another, at least a portion of said block being transparent to allow at least partial visual inspection of the disposition of at least one of said cable ends within said block;

a first and second fastener disposed adjacent to respective first and second cavities, each for fastening one of said cable ends against said bridging means;

wherein said bridging means comprises a first U shaped conductive plate having at least a pair of, first type teeth arrays disposed spaced apart along an edge thereof.

Preferably, said bridging means further comprises at least a second U shaped conductive plate having at least a pair of, second type teeth arrays disposed spaced apart along an edge thereof.

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Preferably, at least one of said cavities has an associated guiding formation disposed at its entrance.

Preferably, a casing is disposed around said block substantially preventing ingress of liquids therein and includes cable apertures and fastener apertures via which said cable ends and said fasteners respectively penetrate said casing, at least a portion of said casing being transparent to allow at least partial visual inspection of the disposition of at least one of said cable ends within said block.

Also preferably, the length of the cutting edge of at least some of the teeth in said teeth arrays is short relative to the pattern of individual conductors of said cable ends to allow at least partial penetration of the respective teeth between said pattern.

Preferably, the connector is arranged for connecting single insulated copper cables in the range of 2.5 – 50 mm^2 or double insulated copper cables in the range of 2.5 – 25 mm^2.

In a third aspect the present invention consists in an underground service connector for making connections between a utility power line and three consumer locations, said underground service connector comprising:

a block having substantially identical at least first, second, third and fourth cavities, each capable of receiving cable ends of multiple types and sizes;

a bridging means disposed within said block and adapted to electrically bridge said cable ends to one another;

at least first, second, third and fourth fasteners, each disposed adjacent to respective first, second, third and fourth cavity, each fastener being configured for fastening one of said cable ends against said bridging means;

wherein at least a portion of said block is transparent to allow at least partial visual inspection of the disposition of at least one of said cable ends within said block.

Preferably, said bridging means comprises a U shaped conductive plate having at least four teeth arrays of a first type, the teeth arrays being disposed spaced apart about its periphery.

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Preferably, said bridging means further comprises at least a second conductive plate having at least four teeth arrays of a second type, the teeth arrays being disposed spaced apart about the periphery of the second conductive plate.

Preferably, a casing is disposed around said block, substantially preventing ingress of liquids therein and including cable apertures and fastener apertures via which said cable ends and said fasteners respectively penetrate said casing, at least a portion of said casing being transparent to allow at least partial visual inspection of the disposition of at least one of said cable ends within said block.

Preferably, the casing comprises more than one separate section.

Preferably, the casing comprises:

block casing configured for receiving and sealingly encapsulating at least a portion of the block;

a plurality of caps, each cap arranged for sealingly engaging a corresponding portion of the block and/or the block casing associated with a cable entry point, each cap comprising the corresponding bell mouth entry port associated with the corresponding cable entry point.

Also preferably, the length of the cutting edge of at least some of the teeth in said teeth arrays is short relative to the pattern of individual conductors of said cable ends to allow at least partial penetration of the respective teeth between said pattern.

Preferably, the connector is arranged for connecting single insulated copper cables in the range of 2.5 – 50 mm^2 or double insulated copper cables in the range of 2.5 – 25 mm^2.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig 1 is an exploded schematic perspective view of an aerial service connector in accordance with a first embodiment of the present invention.

Fig 2 is a schematic perspective view of the aerial service connector shown in Fig 1, the connector being in an assembled configuration.

Fig 3 is a schematic perspective cross-sectional view of the aerial service connector of figures 1 and 2.

Fig 4 is a schematic perspective view of the main structural block of the connector of figures 1 to 3, without the securing bolts, the teeth plates and the casing.

Fig 5 is schematic perspective, plain and front elevation view of a first conductor plate of the connector of Figures 1 to 3.

Fig 6 is schematic perspective, plain and front elevation view of a second conductor plate of the connector of Figures 1 to 3.

Fig 7 is an exploded schematic perspective view of an underground service connector in accordance with a second embodiment of the present invention.

Fig 8 is a schematic perspective view of the underground service connector shown in Fig 7.

Fig 9 is a schematic perspective, plain and front elevation view of a first conductor plate used in the underground service conductor shown in Fig 7.

Fig 10 is a schematic perspective, plain and front elevation view of a second conductor plate used in the underground service conductor shown in Fig 7.

BEST MODE OF CARRYING OUT INVENTION

Referring to Figs 1 and 2, there is shown an aerial service connector 1 used to connect a service cable of an electrical utility power line to one of the house cables coming from a consumer location (not shown). While the consumer location mentioned is a house, it may just as easily be some other type of residence or commercial premise. Structure and insulation is provided to aerial service connector 1 by block 2, which is made from injection-moulded polycarbonate. The connector also includes casing that provides a watertight enclosure of block 2 and is made from transparent formulated moulded silicon. Block 2 and casing 3 are ultraviolet stable, capable of withstanding exposure to high and low temperatures. For easy manufacturing and assembling, casing 3 comprises several separate components. Block casing 3A is configured for receiving and sealingly encapsulating the side walls of the body of block 2. Caps 3B and 3C are arranged for sealingly engaging the corresponding side portions of block 2 and block casing 3A. The

arrangement is such that, once block casing 3A and caps 3B and 3C have been assembled and the cables have been connected, block 2 and the included cable connections are substantially waterproofed.

In use, terminating ends of house and service cables (not shown) are inserted into bell mouth entry ports 4 included in caps 3B and 3C. The cable ends are each pressed onto portions of first and second conducting plates 8 and 9 (Fig 5 and Fig 6) by tightening a respective threaded bolt passing through fastener ports 5. The cable ends are electrically bridged to one another via plates 8 and 9, and held in place by their adjacent threaded bolts 16 shown in Figs 1 to 3. The transparency of block 2 and casing 3 allows at least partial visual inspection as to the disposition of the cable ends within block 2 to determine, for example, whether the cable ends have been inserted to the proper position, have begun to come loose, have been sheared off and their relative condition.

Plates 8 and 9 nest against each other within tracks 10 and extend between cavities 6 and 7 of block 2 as indicated in Fig 1 and Fig 3. In this embodiment, plates 8 and 9 are inserted inside block 2 via a side opening in block 2, as shown in Fig 1 and Fig 4. Plates 8 and 9 are punched from brass and electro-tinned plated with at least 8μm thick tin plating. For best results, the tin plating should be.15 –20 μm, or even thicker. The tin plating prevents galvanic corrosion from occurring between plates 8 and 9 and the differing metal conductors of the house and service cables. Plates 8 and 9 are both formed into a U shape, the legs of which either have first or second type teeth array 11 or 12 disposed along their upward facing edge, as shown in Fig 5 and Fig 6.

Block 2 and bell mouth entry ports 4 of aerial service connector 1 are sized to accommodate cables between 2.5 to 50 mm^2. However, plates 8 and 9 are adapted to accommodate cables in a nominal range of 2.5 to 95 mm^2, with their respective teeth arrays intended for cable sizes in different sub-portions of that range. First type teeth array 11, shown in Fig 5, has three large teeth in a pitched curved profile and is designed for cable ends approximately 25 to 120 mm^2. Second type teeth array 12, shown in Figure 6, consists in seven small teeth arranged in a pitched curved profile and is designed for cable ends approximately 2.5 to 95 mm^2. The curved profile of first and second type teeth arrays 11 and 12 urges the cable to nest in the middle of the arrays, making sure the cable is

central. As the threaded bolt tightens the cable against the opposing teeth arrays, the tendency of the cable to flatten is mitigated by the pitched curved profile of the teeth. Variations to the number, size, and profile of the teeth array may be made to suit the given application. More than two types of teeth arrays may also be incorporated. The use of teeth arrays in aerial service connector 1 removes the need to strip insulation from an inserted cable because all or at least some of the teeth within the teeth array are appropriately sized and configured so as to be able to penetrate the insulation and make electrical contact not only with the external surface of the conductor, but also with the cable's interior conductor strands. By including both first and second type teeth arrays 11 and 12 together, each of the cavities 6 and 7, can accommodate a relatively wide range of cable types and sizes. This arrangement also makes aerial service connector 1 advantageously reversible, with teeth arrays in either cavity being able to accommodate the desired range of cable ends. Being reversible, aerial service connector 1 prevents faulty installation by removing the possibility of connecting the cables in the wrong side of aerial service connector 1.

In order to assist the installing technician in properly inserting the cable ends into cavities 6 and 7 without fouling the cable on teeth arrays 11 and 12, guiding formations 14 (Fig 3) of frusta conical shape are formed as part of caps 3B and 3C and, when assembled, are disposed at the cavity entrances. When a cable end is inserted, it smoothly slides along guiding formation 14 over first and second type teeth arrays 11 and 12 of plates 8 and 9 for fastening by a threaded bolt. The other end of each guiding formation 14 is adjacent to the teeth of plates 8 and 9. This encourages the cable to nest properly after connection is made, seating the cable in the centre line of the bell mouth entry port 4 while enhancing the pullout strength of the connection. When the cable is inserted, it passes over the second type teeth array 12 of second conductor plate 9 and the first type teeth array 11 of first conductor plate 8. This sequence advantageously allows a test probe to be inserted through bell mouth entry port 4 to make electrical contact with second conductor plate 9 without being blocked by guiding formation 14, enabling the installer to electrically test if the connection is made correctly.

The cutting edges 15 (Fig 5 and Fig 6) of the individual teeth used in aerial service connector 1 are short in length in order to penetrate between the spiral lay pattern of the

cable's individual conductor strands. Short cutting edges 15 are more likely to penetrate other conductor patterns as well, such as a weave or braid, for example. As a result, the teeth penetrate into the conductor strands making electrical contact along the face of the teeth while mechanically engaging into the conductor pattern, as opposed to making point contact along the cable's periphery. The increase in surface contact area decreases the electrical resistance of the connection, minimising power losses and overheating hazards, while the mechanical penetration increases the connection's pull out strength. The short length of cutting edges 15 also significantly reduces the pressure required for the threaded bolt to achieve a proper penetrating connection.

In this particular embodiment, the actual upper allowance of aerial service connector 1 is $50mm^2$, due to the sizing of block 2 and bell mouth entry ports 4. A wider block 2 and bell mouth entry port 4 would be used if larger cable sizes were anticipated. Bell mouth entry ports 4 provide structural support to the cables and minimize the amount of force transferable to the electrical connections within block 2. Caps 3B and 3C also have sealing rings 13 moulded circumferentially around their interior, which form seals around the entering cable. The sealing rings substantially prevent ingress of liquids, even when submerged, that would otherwise travel along the surface of the cable ends into block 2. Sealing rings 13 are resilient, expanding to form a substantially watertight seal around cables sized within the 2.5 to 50 mm^2 range.

Threaded bolts 16, shown in Fig 1 entering via fastener ports 5, are preferably made of injection-moulded polycarbonate. As the bolts, casing 3 and block 2 are all made of insulating material; electrical potential cannot be transferred between them, reducing the electrical hazard to adjacent people and equipment. The threaded bolts are positioned to screw down evenly over the top of plate 8 and 9 teeth arrays, not between them. Fastener ports 5 only allow the threaded bolts to travel to a predetermined maximum inward distance that precludes shearing small cables. The caps used to tighten the threaded bolts are also designed to shear off when a predetermined maximum torque is applied to the bolt in order to prevent excessive forces being exerted on the cable ends. The caps are made of die cast zinc alloy, which advantageously exhibits uniform shear characteristics over the expected range of ambient temperatures.

Figs 7 to 10 depict a second embodiment of the present invention in which the service connector is an underground service connector 21. The main difference from the above described aerial connector is in that, instead of two, there are four or more inlet/outlets which are reversibly interconnected so that each can be used as an input/output, thus eliminating the problem of connecting a cable to a wrong end of the connector. Components similar to those of aerial service connector 1 are depicted with similar reference numerals, starting from number 21. In use, a service cable carrying either a power phase or the neutral conductor from the electrical power line enters underground service connector 21 and can be connected, in a single electrical node, to house cables from each of three consumer locations. Underground service connector 21 is adapted to accommodate the expected range of cable sizes between 2.5 and 50 mm^2. While the consumer locations mentioned are houses, they may just as easily be some other type of residence or commercial premise.

The first and second conductor plates 28 and 29, in this embodiment, are shown in Figures 9 and 10. Each of the opposing ends of plates 28 and 29 is fitted with a pair of first-type teeth arrays 31. Similarly, each of the opposing ends of plate 29 is fitted with a pair of second-type teeth arrays 32. The teeth profile of teeth 35 of arrays 31 and 32 are the same as that of teeth 15 of arrays 8 and 9. When installed in underground service connector 21, plates 28 and 29 are disposed in the parallel tracks 30 of block 22, such that each of the internal cavities corresponding to cavities 6 and 7 in Fig 3, has both a first and second type teeth array 31 and 32 exposed therein.

In use, a plurality of aerial service connectors 1 or underground service connectors 21 would be used in combination to connect the necessary power phases and neutral conductors from the utility distribution to the household or commercial premise. Because electrical colour coding is used to distinguish between these phases, the transparent portions of the service connectors may be colour tinted accordingly.

In other not shown embodiments, service connectors may include only portions of the features described in order to suit a particular application. Service connectors could just as easily be adapted to use three or more types of teeth arrays, in two or more cavities. In addition, instead of four cable ends, a connector can be easily designed to include 6, 8 or

even more ends, by simply extending the length of the conducting plates or by introducing additional plates.

The foregoing describes only preferred embodiments of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope of the present invention.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A service connector for making connections between a utility power line and at least one consumer location, said service connector comprising:

a block having a plurality of cavities each adapted to receive a respective cable end at least a portion of said block being transparent to allow at least partial visual inspection of the disposition of at least one cable end within said block;

a bridging means disposed within said block and adapted to electrically bridge said cable ends to one another;

a plurality of fasteners, each disposed adjacent a respective one of said cavities for fastening said cable end against said bridging means within said cavity;

wherein said bridging means further comprises a first type teeth array disposed within at least one of said cavities and adapted to pierce the insulation of said cable end when compressed by said fastener, thereby making electrical contact between said cable end and said bridging means.

2. A service connector as claimed in claim 1, wherein said bridging means further comprises a second type teeth array disposed adjacent said first type teeth array in said cavity, said first and second type teeth arrays being configured for different types and sizes of said cable ends, and wherein in use the insulation of said cable end is pierced by at least one of said first and second type teeth arrays when compressed by said fastener.

3. A service connector as claimed in claim 2, wherein each of said cavities contains the same set of said first and second type teeth arrays, allowing a user to insert said cable end indiscriminately into any one of said cavities.

4. A service connector as claimed in claim 2, wherein said cavities are identical to each other and each is adapted to receive multiple types and sizes of said cable ends.

5. A service connector as claimed in claim 2, wherein said bridging means comprises a first conductive plate comprising at least a pair of said first and/or second type teeth arrays disposed along portions of an edge of said first conductive plate.

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6. A service connector as claimed in claim 5, wherein said bridging means further comprises at least a second conductive plate comprising at least a pair of said first and/or second type teeth arrays disposed along portions of an edge of said second conductive plate.

7. A service connector as claimed in claim 5 or 6, wherein at least one of said first and second conductive plates is substantially U shaped.

8. A service connector as claimed in claim 1, wherein at least one of said cavities has an associated guiding formation disposed at its entrance for guiding said cable end as it is inserted into said cavity along said guiding formation into position for fastening between said fastener and said bridging means.

9. A service connector as claimed in claim 8, wherein the guiding formation is of a substantially frusta conical or frusta pyramidical shape.

10. A service connector as claimed in claim 9, wherein either a first or second type teeth array is disposed adjacent the top portion of said guiding formation.

11. A service connector as claimed in claim 10, wherein the type of teeth array disposed adjacent said guiding formation is preselected to allow a test probe to be inserted into said cavity beyond said guiding formation to make contact with said bridging means without being blocked by said guiding formation.

12. A service connector as claimed in any of the preceding claims, wherein the length of the cutting edge of at least some of the teeth in said teeth arrays is short relative to the pattern of individual conductors of said cable ends to allow at least partial penetration of the respective teeth between said pattern.

13. A service connector as claimed in claim 1, wherein a casing is disposed around said block substantially preventing ingress of liquids therein and includes bell mouth entry ports and fastener ports via which said cable ends and said fasteners respectively penetrate said

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casing, at least a portion of said casing being transparent to allow at least partial visual inspection of the disposition of at least one of said cable ends within said block.

14. A service connector as claimed in claim 13, wherein each of said bell-mouth entry ports has at least one ring disposed circumferentially about its interior to prevent ingress of liquids along said cable ends into said block.

15. A service connector as claimed in claim 13 or claim 14, wherein the casing comprises more than one separate section.

16. A service connector as claimed in claim 15, wherein the casing comprises

block casing configured for receiving and sealingly encapsulating at least a portion of the block;

a plurality of caps, each cap arranged for sealingly engaging a corresponding portion of the block and/or the block casing associated with a cable entry point, each cap comprising the corresponding bell mouth entry port associated with the corresponding cable entry point.

17. A service connector as claimed in claim 1, wherein said fasteners are threaded bolt type fasteners made of insulating material.

18. A service connector as claimed in claim 17, wherein the maximum inward travel of said fasteners is predetermined to be less than a distance that could shear said cable ends.

19. A service connector as claimed in claim 17, wherein a cap on each of said fasteners is adapted to shear off when a predetermined maximum torque is applied to said cap.

20. A service connector as claimed in claim 19, wherein said cap is made of zinc alloy.

21. A service connector as claimed in claim 17, wherein said insulating material is made of polycarbonate.

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22. A service connector as claimed in claim 1, wherein said bridging means is made of brass electroplated with tin.

23. A service connector as claimed in claim 1, wherein said block is made of polycarbonate.

24. A service connector as claimed in claim 13, wherein said casing is made of silicon.

25. A service connector as claimed in claim 1, wherein said transparent portion of said block is colour tinted in accordance with a predetermined electrical colour-coding scheme.

26. A service connector as claimed in claim 13, wherein said transparent portion of said casing is colour tinted in accordance with a predetermined electrical colour-coding scheme.

27. A service connector as claimed in any of the preceding claims, wherein said service connector has two said cavities and is an aerial service connector.

28. A service connector as claimed in any of the preceding claims, wherein said service connector has four said cavities and is an underground service connector.

29. An aerial service connector for making connections between a utility power line and a consumer location, said aerial service connector comprising:

a block having substantially identical first and second cavities, each adapted to receive cable ends of multiple types and sizes;

a bridging means disposed within said block and adapted to electrically bridge said cable ends to one another, at least a portion of said block being transparent to allow at least partial visual inspection of the disposition of at least one of said cable ends within said block;

a first and second fastener disposed adjacent to respective first and second cavities, each for fastening one of said cable ends against said bridging means;

wherein said bridging means comprises a first U shaped conductive plate having a pair of first type teeth arrays disposed spaced apart along an edge thereof.

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30. A service connector as claimed in claim 29, wherein said bridging means further comprises at least a second U shaped conductive plate having a pair of second type teeth arrays disposed spaced apart along an edge thereof.

31. A service connector as claimed in claim 29, wherein at least one of said cavities has an associated guiding formation disposed at its entrance.

32. A service connector as claimed in claim 29, wherein a casing is disposed around said block substantially preventing ingress of liquids therein and includes cable apertures and fastener apertures via which said cable ends and said fasteners respectively penetrate said casing, at least a portion of said casing being transparent to allow at least partial visual inspection of the disposition of at least one of said cable ends within said block.

33. A service connector as claimed in claim 29, wherein the casing comprises more than one separate section.

34. A service connector as claimed in claim 33, wherein the casing comprises

block casing configured for receiving and sealingly encapsulating at least a portion of the block;

a plurality of caps, each cap arranged for sealingly engaging a corresponding portion of the block and/or the block casing associated with a cable entry point, each cap comprising the corresponding bell mouth entry port associated with the corresponding cable entry point.

35. A service connector as claimed in any of the claims 29 to 34, wherein the length of the cutting edge of at least some of the teeth in said teeth arrays is short relative to the pattern of individual conductors of said cable ends to allow at least partial penetration of the respective teeth between said pattern.

36. An underground service connector for making connections between a utility power line and three consumer locations, said underground service connector comprising:

a block having substantially identical at least first, second, third and fourth cavities, each capable of receiving cable ends of multiple types and sizes;

a bridging means disposed within said block and adapted to electrically bridge said cable ends to one another;

at least a first, second, third and fourth fastener disposed adjacent to respective first, second, third and fourth cavities, each for fastening one of said cable ends against said bridging means;

wherein at least a portion of said block is transparent to allow at least partial visual inspection of the disposition of at least one of said cable ends within said block.

37. A service connector as claimed in claim 36, wherein said bridging means comprises a U shaped conductive plate having at least four teeth arrays of a first type, the teeth arrays being disposed spaced apart about its periphery.

38. A service connector as claimed in claim 37, wherein said bridging means further comprises at least a second conductive plate having at least four teeth arrays of a second type, the teeth arrays being disposed spaced apart about the periphery of the second conductive plate.

39. A service connector as claimed in claim 36, wherein a casing is disposed around said block, substantially preventing ingress of liquids therein and including cable apertures and fastener apertures via which said cable ends and said fasteners respectively penetrate said casing, at least a portion of said casing being transparent to allow at least partial visual inspection of the disposition of at least one of said cable ends within said block.

40. A service connector as claimed in claim 36, wherein the casing comprises more than one separate section.

41. A service connector as claimed in claim 40, the casing comprises

block casing configured for receiving and sealingly encapsulating at least a portion of the block;

a plurality of caps, each cap arranged for sealingly engaging a corresponding portion of the block and/or the block casing associated with a cable entry point, each cap comprising the corresponding bell mouth entry port associated with the corresponding cable entry point.

42. A service connector as claimed in any of the claims 37 to 41, wherein the length of the cutting edge of at least some of the teeth in said teeth arrays is short relative to the pattern of individual conductors of said cable ends to allow at least partial penetration of the respective teeth between said pattern.

43. A service connector as claimed in any one of the preceding claims, wherein the connector is arranged for connecting single insulated copper cables in the range of 2.5 – 50 mm^2 or double insulated copper cables in the range of 2.5 – 25 mm^2.

44. An aerial service connector, as herein described with reference to accompanying drawings 1 to 6.

45. An underground service connector, as herein described with reference to accompanying drawings 7 to 10.

Dated this 6th day of February 2006

FULTON INDUSTRIES AUSTRALIA PTY LIMITED

By:

HODGKINSON McINNES PAPPAS
Patent Attorneys for the Applicant

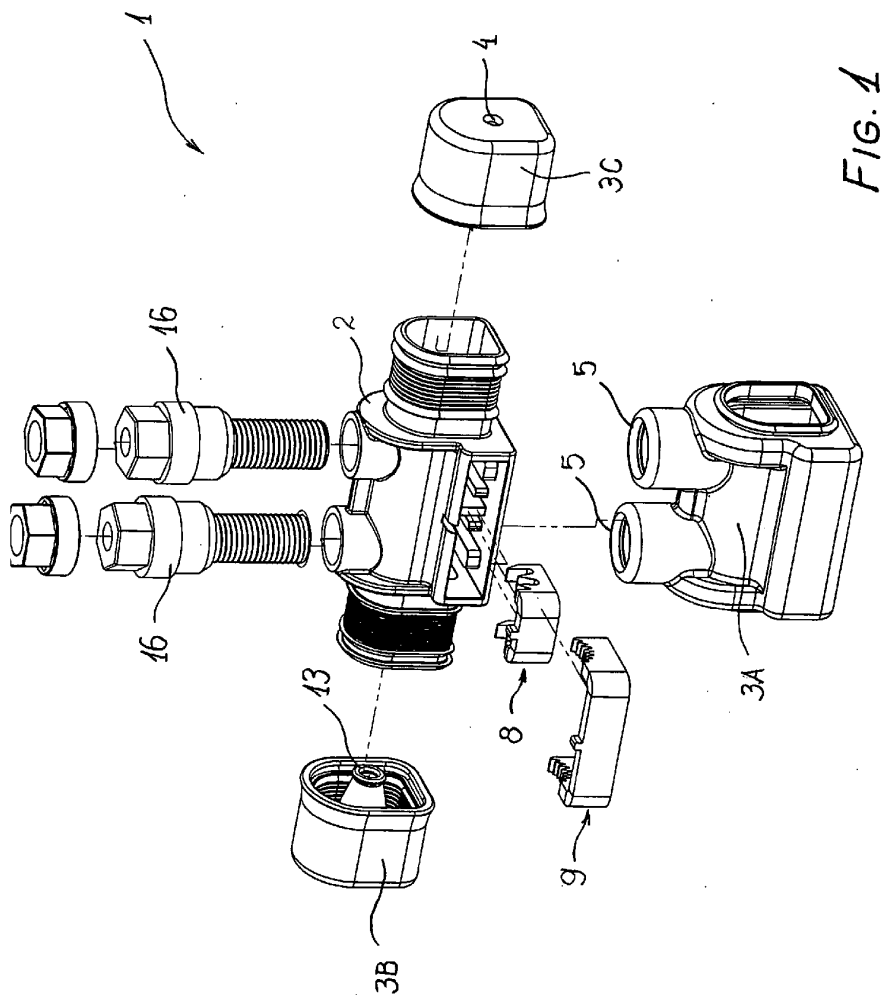


FIG. 1

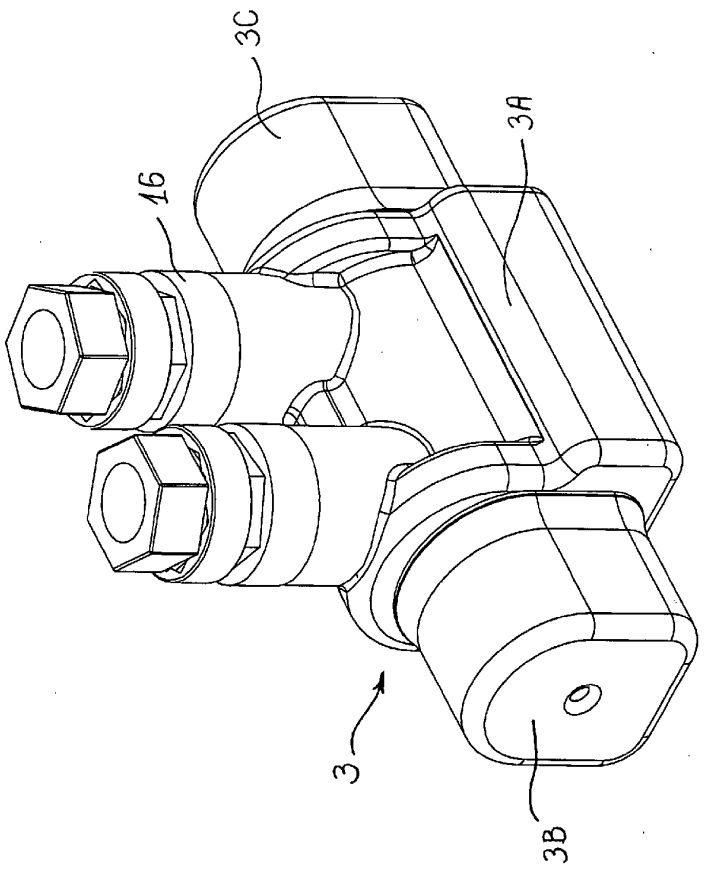


FIG. 2

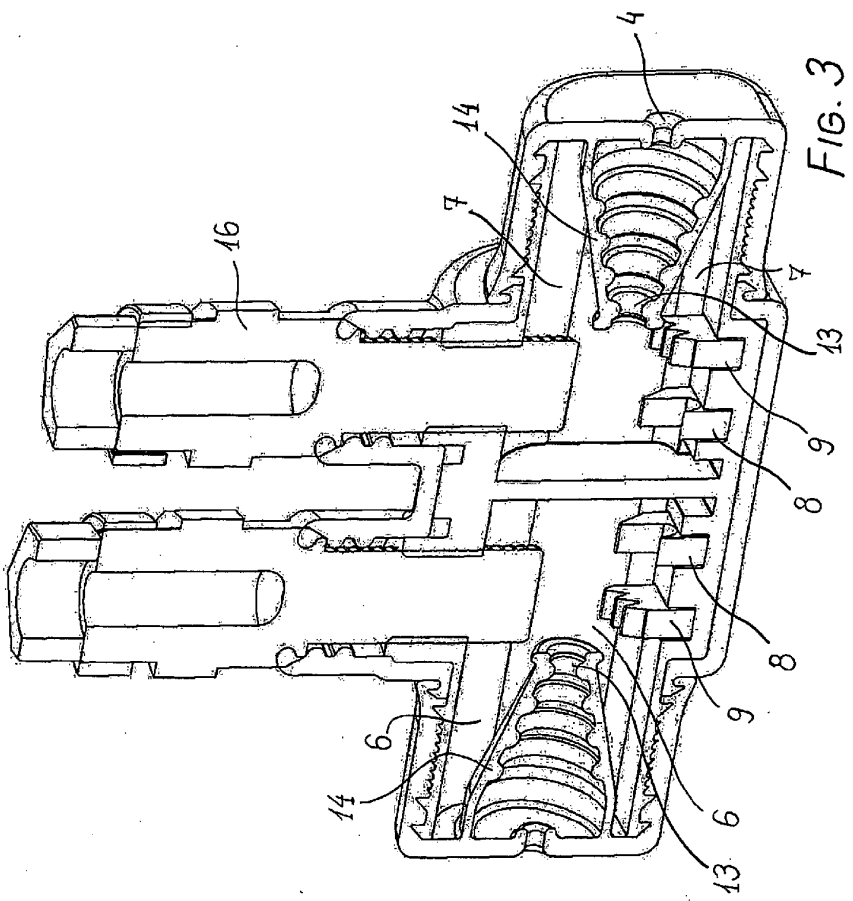


FIG. 3

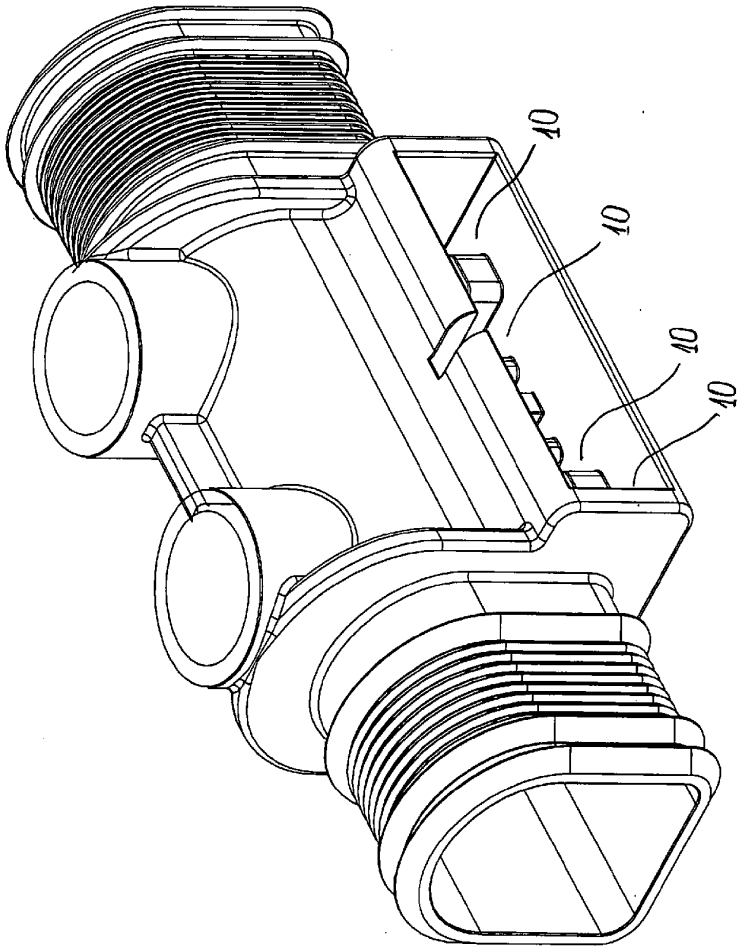
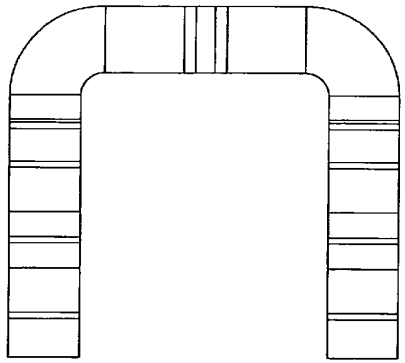
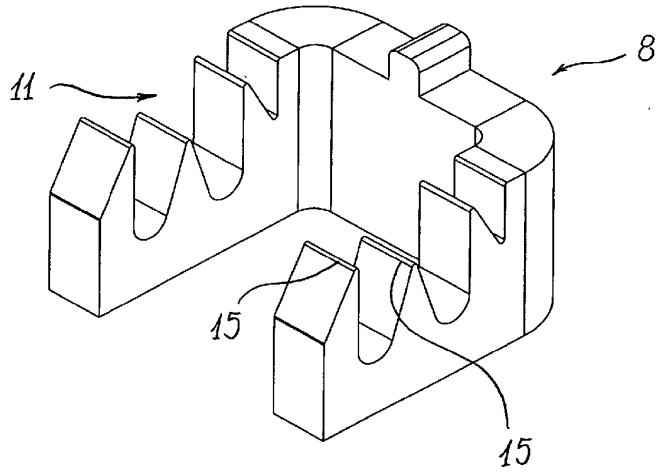


FIG. 4





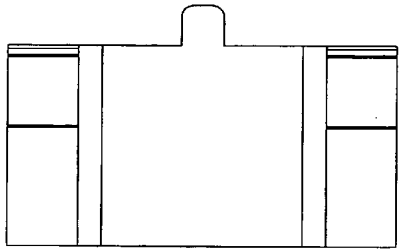
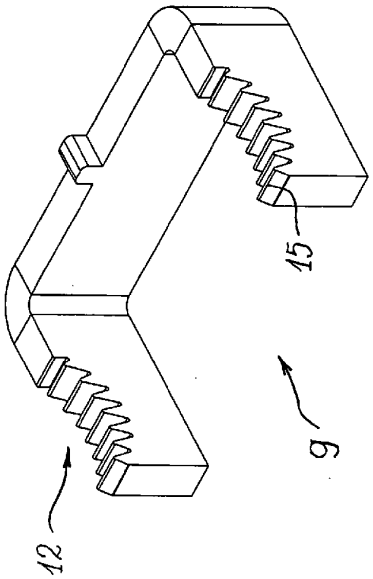


FIG. 5



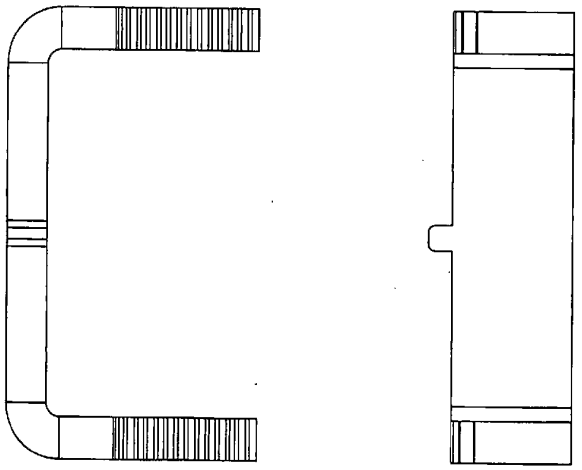


FIG. 6

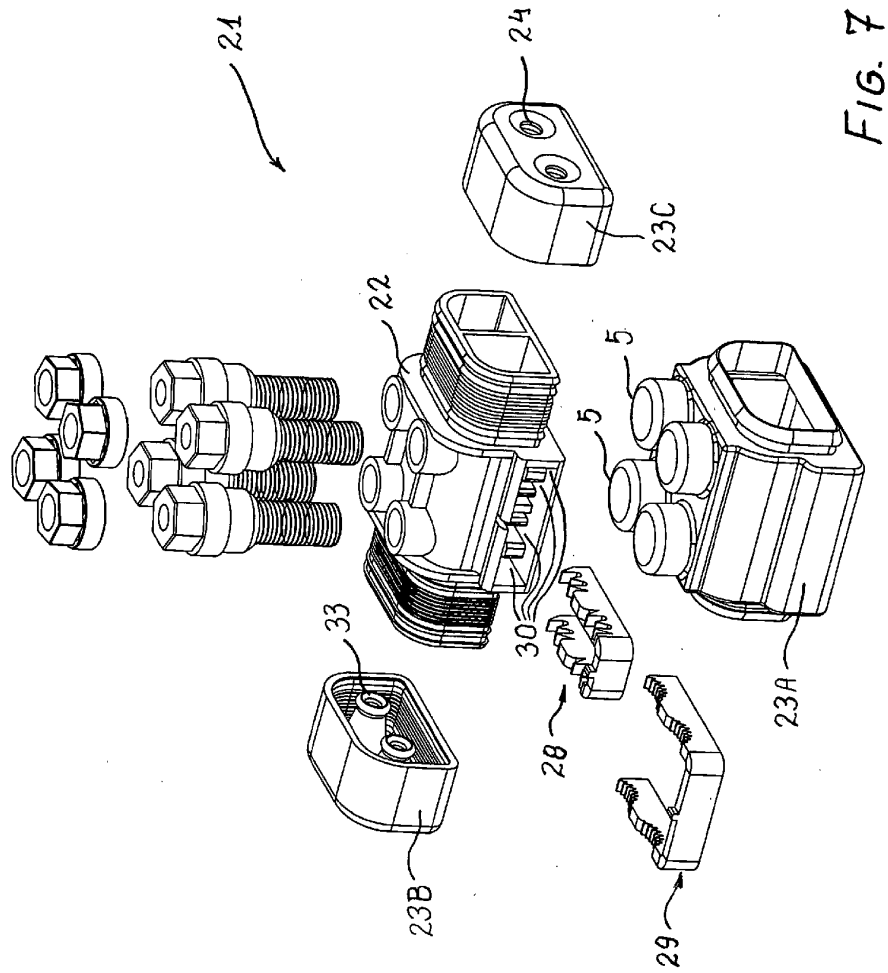


FIG. 7

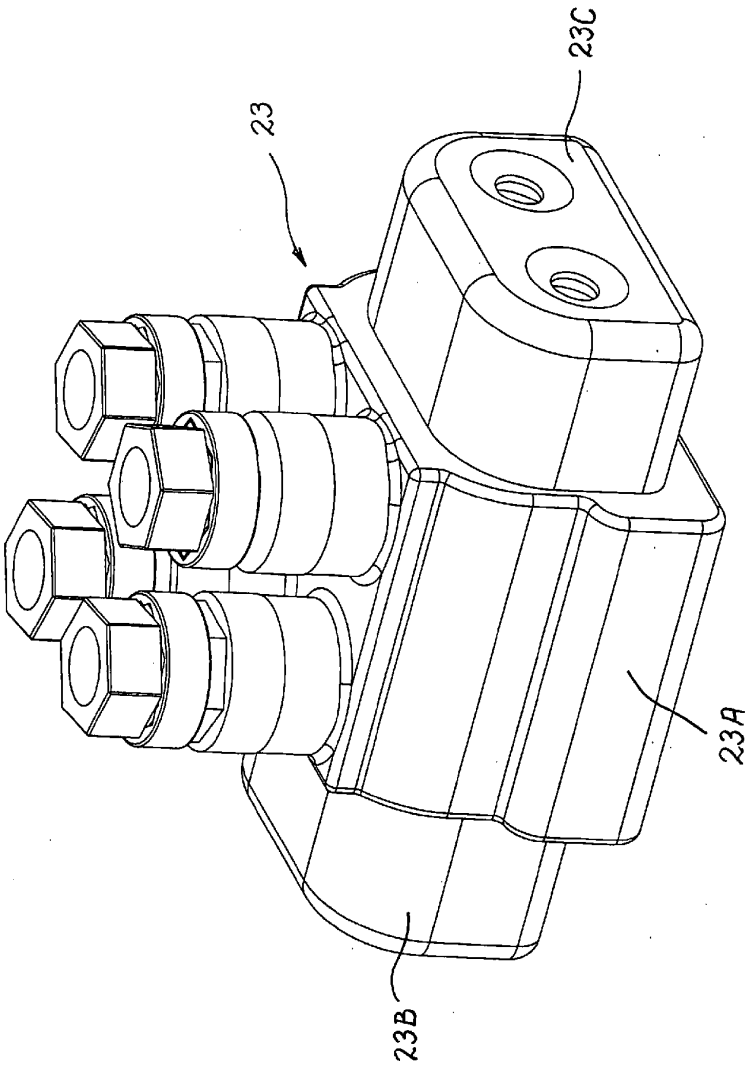


FIG. 8

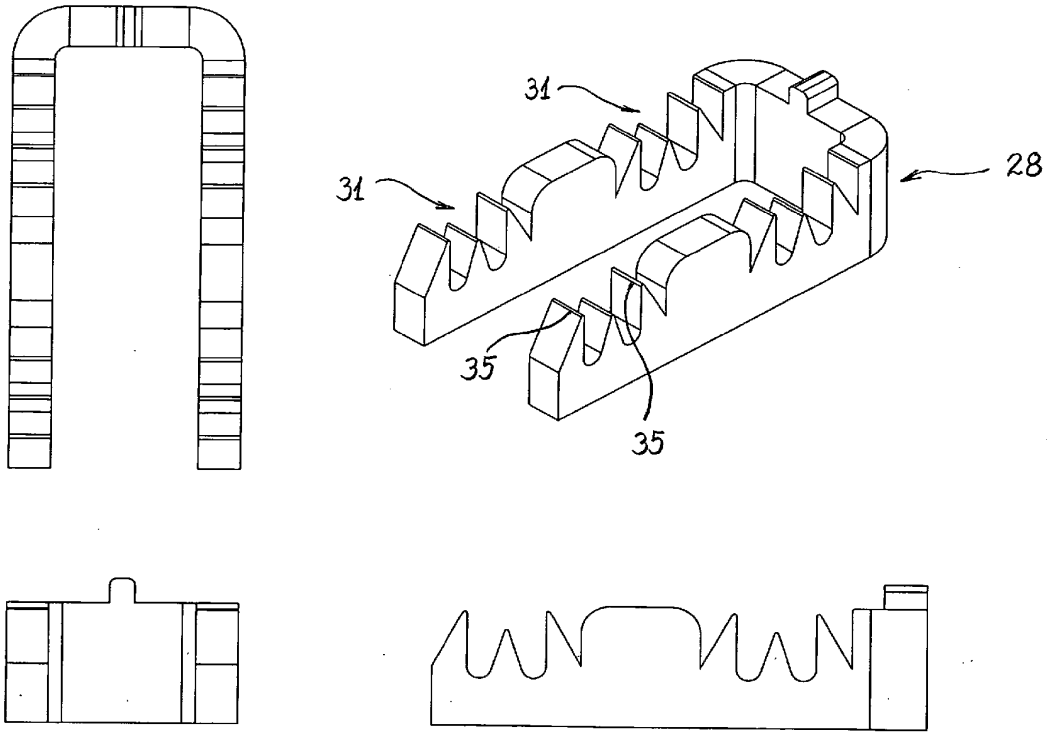


FIG. 9

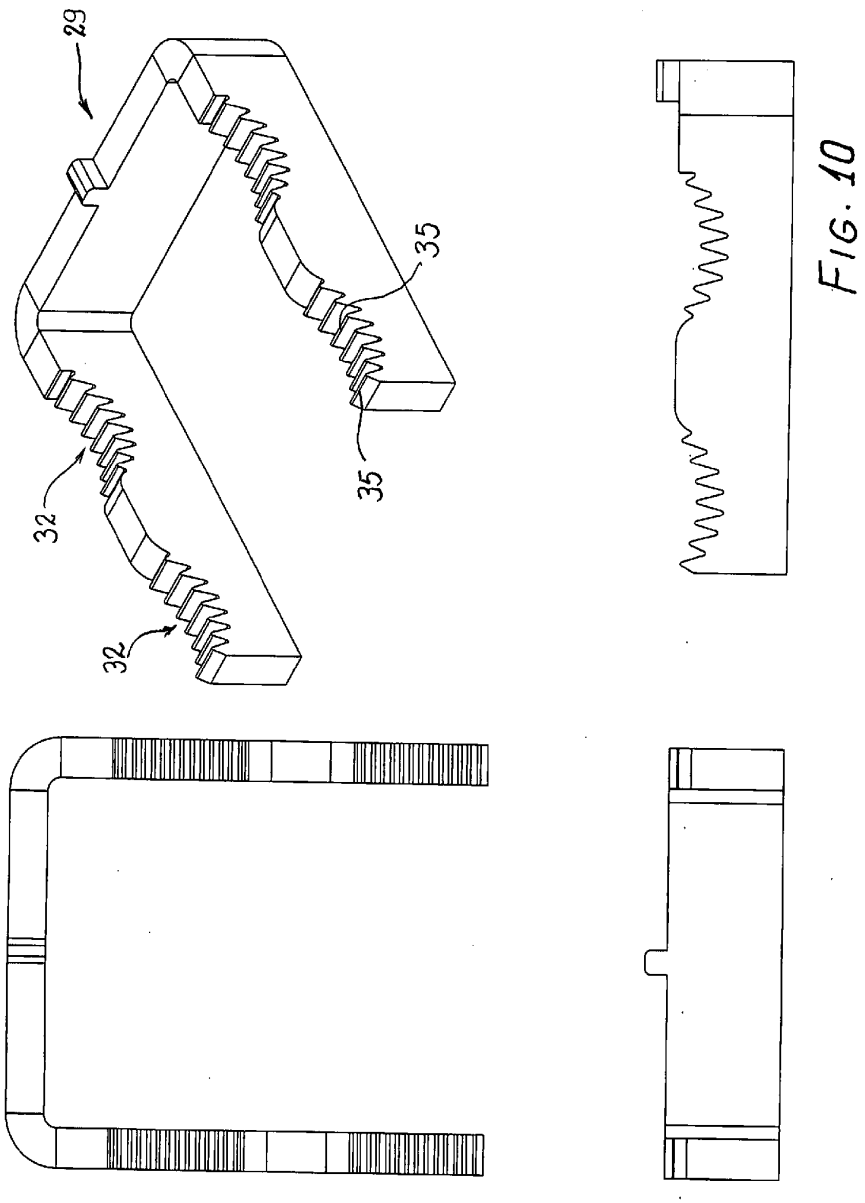


FIG. 10