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(56) Related Art
US 4 500 746 A
US 2004/0169420 A1
US 6 095 848 A
US 6 666 712 B1

ABSTRACT

An electrical connector for making electrical connection to insulated conductors, the connector having a first connector part which has lengthwise extending wire channels for receiving portions of the insulated conductors; insulation displacement contacts for making separate electrical connections to the conductors, when received in the lengthwise extending wire channels, under relative movement between the insulation displacement contacts and the wires, so that the insulation covering the conductors is cut and the insulation displacement contacts make electrical connections to the conductors; transverse wire channels intersecting with said lengthwise extending wire channels and being shaped to receive portions of insulated conductors of another electrical cable from which the outer covering of the cable has been removed; and a second connector part relatively moveable with respect to the first part for effecting said relative movement, wherein the insulation displacement contacts are located at intersections of the transverse wire channels and the lengthwise extending wire channels for electrically connecting conductors seated in the transverse wire channels with respective ones of the conductors seated in the lengthwise extending wire channels during said relative movement, and said insulation displacement contacts form parts of contact elements which form socket contacts of a socket formed on the first part, said socket being adapted to receive and make electrical connection to an electrical plug.

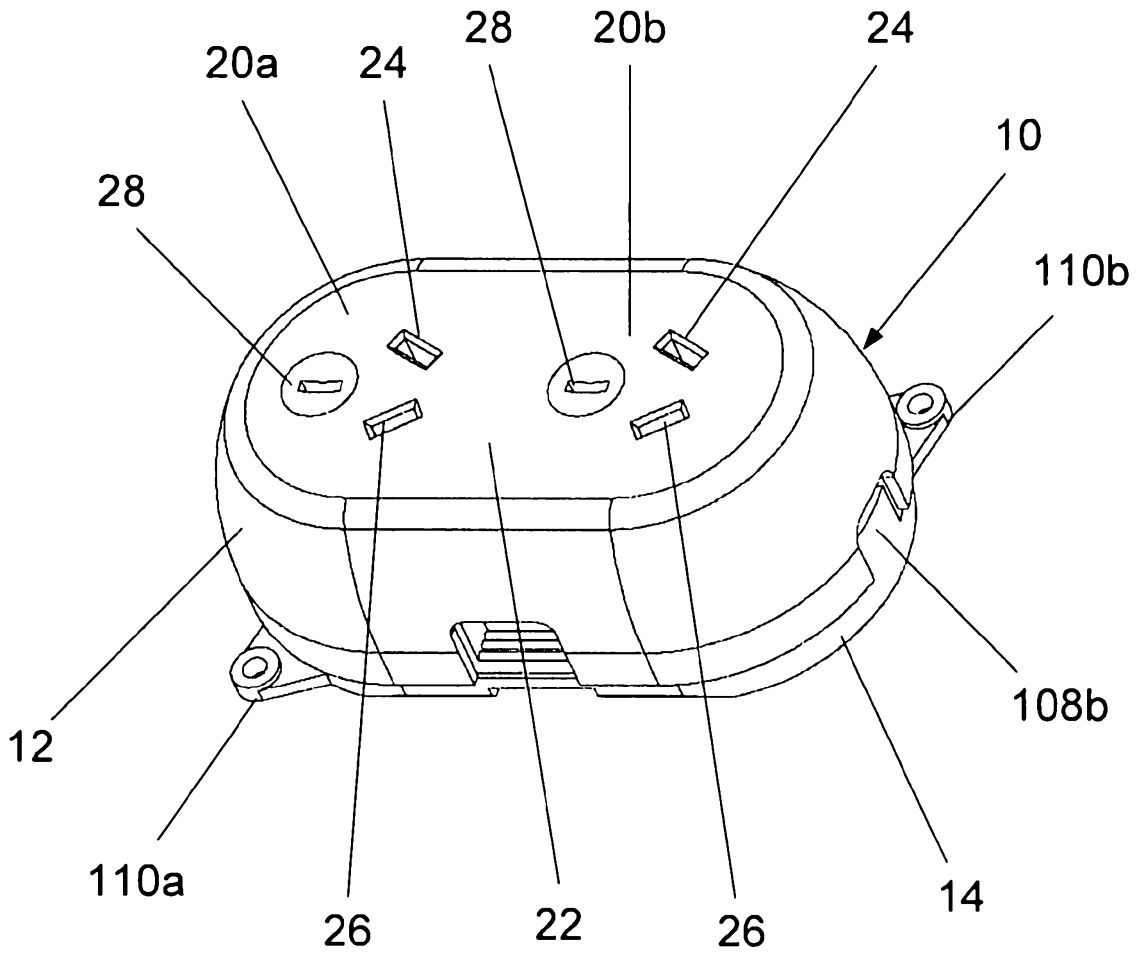


Figure 1

**ORIGINAL COMPLETE SPECIFICATION
STANDARD PATENT**

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Invention Title

"Electrical connector"

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

ELECTRICAL CONNECTOR

Cross Reference to Related Applications:

- 5 The disclosure of the complete specification of Australian Patent Application No. 2007247541, as originally filed, is incorporated herein by reference.

Field of the Invention:

10

This invention relates to an electrical connector.

Background of Invention:

- 15 Electrical connectors, useful in electrical power wiring, have previously employed screw contacts for effecting electrical connections. The connectors may be somewhat inconvenient to use, requiring the following steps to be performed:

- 20
1. Stripping of insulation from end portions of wires;
 2. Inserting stripped end portions of the wires into receiving openings of the connector; and
 3. Screwing down of screws of the connector in order to make the connections.

25

Performing the above-described steps to install an electrical connector may be labour intensive, and inconvenient.

- 30 Electrical connectors may not have previously included means for controlling their operation. It may be difficult to control the operation

of the individual connectors in a plurality of such connectors coupled together in series.

Insulation displacement contacts may be formed from a contact element which is bifurcated so as to define two opposed contact portions separated by a slot into which an insulated wire may be pressed so that edges of the contact portions engage and displace the insulation and such that the contact portions resiliently engage and make electrical connection with the conductor of the wire. Such a contact is described in, for example US patents 4,452,502 and 4,405,187.

While, in some cases, making electrical connection to a single wire in the above way is all that is necessary, occasions arise where it would be useful to make connection to more than one wire by inserting the wires, one after the other, into the slot. With a carefully designed contact it may be possible to make connections in this way to two wires, but it is difficult to make effective connections to several wires. This arises because, during the process of introducing a first wire into the slot, the contact portions are resiliently deformed, such that the gap between them is to some extent increased. The resultant increase in slot width may still permit an adequate connection to be made to a second wire when inserted into the slot. However, the increased slot width may even be such that the contact portions fail to properly pierce the insulation, or it may otherwise leave the second wire unreliably gripped. This problem becomes worse as more wires are inserted.

The above problem is alleviated in Krone LSA-PLUS connectors by arranging that the contact portions are torsionally twisted during

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insertion of the wires. That is, the wires are introduced into the slot with their directions of extent arranged at an angle of about 45 degrees to the side to side direction of the slot, so that insertion of the wires tends to deflect contacting edges of the respective contact portions outwardly
 5 away from each other, in opposite directions relative to the general plane of the contact. In that case, it is possible to achieve good connection to two wires but even in this construction more than two wires may not be adequately accommodated.

10 US patent 5,492,484 also describes a particular form of contact that is indicated as being able to terminate more than a single conductor. This is however complicated in form.

15 It is generally desirable to overcome or ameliorate one or more of the above-described difficulties, or to at least provide a useful alternative.

Summary of Invention:

According to the present invention, there is provided an electrical
 20 connector, comprising: (a) a first connector part defining: (i) control, active, and ground lengthwise extending wire channels for receiving lateral sections of insulated conductors of a first cable extending through the connector; and (ii) control and active transverse wire channels respectively intersecting with the control and active
 25 lengthwise extending wire channels; (b) a second connector part coupled to the first connector part so as to move between open and closed positions; (c) a plurality of insulation displacement contacts (IDCs) including: (i) a control IDC positioned at an intersection of

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the control lengthwise extending wire channel and the control transverse wire channel; (ii) an active IDC positioned at an intersection of the active lengthwise extending wire channel and the active transverse wire channel; (iii) a ground IDC positioned in the ground lengthwise extending wire channel, wherein the insulated conductors are coupled to respective IDCs when the first connector part and the second connector part are moved to the closed position; (d) an electrical power socket defined on the first connector part, the electrical power socket being configured to receive an electrical plug, the electrical power socket including electrically conductive contact elements that are respectively electrically connected to the active IDC and the ground IDC; and (e) a control circuit for remotely controlling operation of the power socket without affecting operation of additional electric devices electrically connected to the first power cable downstream of the electric connector, including: (i) a first insulated conductor including an end section seated in the active transverse wire channel and electrically coupled to the active IDC; (ii) a second insulated conductor including an end section seated in the control transverse wire channel and electrically coupled to the control IDC; and (iii) a switch located remotely from a main body portion of the connector, the switch being electrically coupled between the first and second insulated conductors for selectively electrically connecting the active IDC to the control IDC so as to electrically connect the active IDC to an active insulated conductor of the first power cable extending through the connector via the control channel.

Preferably, the control circuit is adapted to electrically isolate the socket from a power source.

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Preferably, the control circuit is adapted to electrically isolate the socket from a power source without effecting the operation of electric devices also electrically connected to said conductors.

- 5 Preferably, the control circuit is adapted to electrically isolate electric devices also electrically connected to said conductors without effecting the operation of the socket.

According to the present invention, there is also provided an electrical
10 connector, comprising: (a) a first connector part defining: (i) control, active and ground lengthwise extending wire channels for receiving lateral sections of insulated conductors of a first cable extending through the connector; and (ii) control and active transverse wire channels respectively intersecting with the control and active lengthwise
15 extending wire channels; (b) a second connector part coupled to the first connector part so as to move between open and closed positions; (c) a plurality of insulation displacement contacts (IDCs) including: (i) a control IDC positioned at an intersection of the control lengthwise extending wire channel and the control transverse wire channel; (ii) an
20 active IDC positioned at an intersection of the active lengthwise extending wire channel and the active transverse wire channel; and (iii) a ground IDC positioned in the ground lengthwise extending wire channel, wherein the insulated conductors are coupled to respective IDCs when the first connector part and the second connector part are
25 moved to the closed position; (d) an electrical power socket defined on the first connector part, the electrical power socket being configured to receive an electrical plug, the electrical power socket including electrically conductive contact elements that are respectively electrically connected to the active IDC and the ground IDC; and (e) a control

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circuit for remotely controlling operation of one or more electric devices separately electrically connected to the first power cable downstream of the connector without affecting operation of the electrical power socket including: (i) a first insulated conductor including an end section seated
5 in the active transverse wire channel and electrically coupled to the active IDC; (ii) a second insulated conductor including an end section seated in the control transverse wire channel and electrically coupled to the control IDC; and (iii) a switch located remotely from a main body portion of the connector, the switch being electrically coupled between
10 the first and second insulated conductors for selectively electrically connecting the active IDC to the control IDC so that a first section of an active insulated conductor extending into the connector through the active lengthwise wire channel to the active IDC can be selectively electrically connected to a second section of the active insulated
15 conductor extending from the connector via the control IDC through the control lengthwise extending wire channel.

Brief Description of the Drawings:

20

The invention is further described, by way of example only, with reference to the accompanying drawings, in which:-

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Figure 1 is a perspective view of an electrical connector;

Figure 2 is another perspective view of the electrical connector shown in Figure 1;

5 Figure 3 is a perspective view of the connector of Figure 1 arranged in an open condition of use;

Figure 4 is an exploded view of the connector shown in Figure 1;

Figure 5 is a perspective view of a set of electrical contact elements of the connector shown in Figure 1;

10 Figure 6 is a perspective view of the electrical connector shown in Figure 3 electrically coupled to a double insulated electrical cable;

Figure 7 is a perspective view of the set of electrical contacts shown in Figure 5 electrically coupled insulated wires of the double insulated electrical cable in the manner shown in Figure 6;

15

Figure 8 is a perspective view of the electrical connector shown in Figure 6 electrically coupled to another double insulated electrical cable;

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Figure 9 is a perspective view of the set of electrical contact elements shown in Figure 7 electrically coupled to another double insulated electrical cable in the manner shown in Figure 8;

Figure 10 is a sectioned view of part of the wire channel plate of the electrical connector shown in Figure 1;

Figure 11 is a perspective view of a part of the connector electrically connected to a power cable;

Figure 12 is a perspective view of the part shown in Figure 11 electrically connected to a power cable and to a control circuit;

Figure 13 is a perspective view of the part shown in Figure 11 electrically connected to a power cable and to another t; and

Figure 14 is a perspective view of the part shown in Figure 11 electrically connected to a power cable and to yet another control circuit.

15

Detailed Description of Preferred Embodiments of the Invention:

The connector 10 shown in Figures 1 and 2 includes two parts 12 and 14 which are hinged together so that they may be manipulated between the condition shown in Figures 1 and 2, at which the connector 10 is in a closed condition for use, and the condition shown in Figure 3, at which the connector 10 is in an open position, for connection to electrical conductors of an electrical cable (not shown).

25 The electrical connector 10 includes a wire channel plate 16 and a set of electrical contact elements 18 seated in the part 12 in the manner shown in Figure 4, where the set of contact elements 18 is interposed between the part 12 and the wire channel plate 16. The wire channel plate 16 and the set of contact elements 18 are housed within the parts

12, 14 when the parts 12, 14 are arranged in a closed condition of use, as shown in Figures 1 and 2.

Part 12 of connector 10 is formed of electrically insulate material. It has first and second electrical power sockets 20a, 20b arranged side by side on a generally planar exterior surface 22 of the part 12. Each power socket 20a, 20b includes three apertures 24, 26, 28 that are each shaped to receive conductive pins of an electric power plug (not shown). For example, the apertures 24, 26, 28 are shaped to respectively receive the active, neutral and earth pins of the electric power plug.

The set of electrical contact elements 18 includes:

1. An active contact element 30;
2. A neutral contact element 32; and
3. An earth contact element 34.

As particularly shown in Figure 5, the active contact element 30 includes two end portions 36a, 36b which are located within part 12 behind the active apertures 24 of the first and second power sockets 20a, 20b. The end portions 36a, 36b of the active contact element 30 are arranged to make electrical connection with the active pins of electrical power plugs (not shown) as they pass through the active apertures 24 of the electrical power sockets 20a, 20b. The end portions 36a, 36b are electrically connected by an elongate strip of electrically conductive material extending therebetween.

The neutral contact element 32 includes two end portions 38a, 38b which are located within part 12 behind the neutral apertures 26 of the first and second power sockets 20a, 20b. The end portions 38a, 38b of the neutral contact element 32 are arranged to make electrical
5 connection with the neutral pins of electrical power plugs (not shown) as they pass through the neutral apertures 26 of the sockets 20a, 20b. The end portions 38a, 38b are electrically connected by an elongate strip of electrically conductive material extending therebetween.

10 The earth contact element 34 includes two end portions 40a, 40b which are located within part 12 behind the earth apertures 28 of the first and second power sockets 20a, 20b. The end portions 40a, 40b of the earth contact element 34 are arranged to make electrical connection with the earth pins of electrical power plugs (not shown) as they pass through
15 the earth apertures 28 of the sockets 20a, 20b. The end portions 40a, 40b are electrically connected by an elongate strip of electrically conductive material.

Part 12 has, at a face thereof opposite the power socket 20a, 20b, a
20 cable channel 42 which is open to that opposite face, and which extends lengthwise from side-to-side of the part 12. Cable channel 42 has parts at the ends thereof which are sized so as to neatly accommodate spaced portions a double insulated electrical cable 44 which may be laid therein in the manner shown in Figure 6. The cable 44 has therewithin
25 three wires 46, 48, 50 which each have inner conductors and outer surrounding insulation. These wires 46, 48, 50 are arranged side-by-side within an outer cover 52 of the cable 44. Prior to fitting the cable in the cable channel 42, part of the outer cover 52 is removed, over the length labelled "L" in Figure 6 so that, over this length "L", the three

insulated wires 46, 48, 50 have no cover 52 over them, but the inner conductors still retain their insulation.

The wire channel plate 16 includes first 54, second 56 and third 58 walls upstanding from a base section of the plate 16 that extend along the cable channel 42, in the manner shown in figure 3. The walls 54,56, 58 are generally parallel to the length of the cable channel 42, and are positioned at an intermediate part of the cable channel 42, along the length thereof. The first wall 54 is adjacent to, but spaced from, an upstanding side wall portion 60 of cable channel 42. The second wall 56 is adjacent to, but spaced inwardly from, the first wall 54. The third wall 58 is adjacent to, but spaced inwardly from, the second wall 56. Similarly, the third wall 58 is adjacent to, but spaced inwardly from, the second wall 56. The third wall is also spaced apart from an opposite sidewall portion 62 of cable channel 42. The spacing between adjacent walls 54, 56, 58, 60, 62 is generally the same, and substantially equal to the diameter of the insulated wires 46, 48, 50. The side wall portion 60 and the first wall 54 define therebetween a neutral wire channel 66; the first wall 54 and the second wall 56 define therebetween an earth wire channel 68; the second wall 56 and the third wall 58 define therebetween an active wire channel 70; and the third wall portion 58 and the opposite side wall portion define therebetween a control wire channel 72.

Disposed within the lengthwise extending wire channels 66, 68, 70, 72 are insulation displacement contacts (IDCs) 74, 76, 78, 80, 140. These IDCs form part of the set of contact elements 18. The first IDC 74 is electrically coupled to the neutral contact element 32; the second IDC 76 is electrically coupled to the earth contact element 34; and the third

and fourth IDCs 78, 80 are electrically coupled to the active contact element 30. The fifth IDC 140 is electrically electrically isolated from the other contact elements 30, 32, 34. The IDC 140 is used to couple the connector to a control circuit. The operation of the control circuit is
5 described in detail below.

Each insulation displacement contact 74, 76, 78, 80, 140 is formed as a generally upstanding planar conductive portion of the respective contact element, being bifurcated so as to form two opposed upstanding
10 contact portions 82a, 82b which are separated by an upwardly open space 84. The spacing between the contact portions 82a, 82b is such as to be slightly less than the diameter of the inner conductors of the wires 46, 48, 50.

15 Part 14 of the electrical connector 10 is formed of electrically insulative material and has an elongate somewhat planar form, shaped such that it can be positioned over the top of part 12 so as to close the cable channel 42 at the open side thereof. It thus has a generally elongate planar roof portion 86 with side rim portions 88 extending along
20 opposed side-to-side edges thereof.

Restraining means, in the form of a hinge 90 is provided for pivotally coupling parts 12, 14 together. Thus, part 12 has two sidewardly extending lugs 92 between which extends a hinge pin 94. The axis of
25 this hinge pin 94 is arranged to be generally parallel to, and to one side of, the cable channel 42 and lengthwise extending wire channels 66, 68, 70. Part 14 has at one side thereof a part-tubular elongate portion 96 of length only slightly less than the length of pin 94. The part-tubular elongate portion 96 has a lengthwise extending inner part-tubular

portion, of side-to-side width slightly less than the diameter of the pin 94. The part-tubular portion 96 is of sufficient flexibility and resilience that it can be attached to the hinge pin 94 by aligning its opening with the pin axis, and then pressing the portion 96 with respect to the pin 94. After this, due to natural resilience, the pin 94 is captured in the portion 96 for rotation of the part 14 with respect to the part 12, about the axis of the pin 94. Figures 1 and 2 show the parts 12, 14 in closed condition; and Figure 3 shows the parts 12, 14 in a closed condition.

10 At a portion of the part 14, on the side thereof which is innermost when parts 12 and 14 are in the closed condition, there are a plurality of lengthwise extending projections 98. In the closed position, the projections 98, reckoned in the lengthwise direction of the cable channel 42, are brought to positions where they are located over, and
15 at least partially within, respective ones of the lengthwise extending wire channels 66, 68, 70, 72. When the parts 12, 14 are hinged to the closed position, the projections 98 are likewise located in respective ones of the lengthwise extending wire channels 66, 68, 70, 72.

20 The following steps are performed to use the connector 10 to coupled the power socket 20a, 20b to the cable 44:

1. The connector 10 is arranged in the open position shown in Figures 1 and 2, where the part 14 is swung clear of the
25 cable channel 42;
2. The cable 44, having the above-described portion of its outer cover 52 removed, is laid in the cable channel 42, as shown in Figure 6, so that end portions 100 of the outer

covering 52 of the cable 44 are positioned within outer end portions of the cable channel 42;

3. The wires 46, 48, 50 are positioned so as to extend over respective ones of the first, second and third lengthwise extending wire channels 66, 68, 70;
4. The wires 46, 48, 50 are then lightly pressed into the first, second and third lengthwise extending wire channels 66, 68, 70;
5. The part 14 is swung about the axis of the pin 94 so that it overlies the part 12 and so that the projections 98 engage the wires 46, 48, 50 and press them into their respective channels 66, 68, 70; and
6. Part 14 is then pressed fully down so that portions of the part 14 away from the hinge axis are firmly engaged with the part 12.

During the described closing action, the projections 98 bear against portions of the wires 46, 48, 50 and force them into corresponding insulation displacement contacts 74, 76, 78, 80. In doing so, the insulation of the wires 46, 48, 50 is cut by the insulation displacement contacts 74, 76, 78, 80, and the internal conductors are forced into electrically conductive connection with the insulation displacement contact, as shown in Figure 7. That is, the wires 46, 48, 50 are pressed into the space between the upstanding contact parts 82a, 82b of the insulation displacement contacts 74, 76, 78, 80, and are firmly engaged by these. Also during the above process, the projections 98 press down upon the wires 46, 48, 50 to further assist in locating these in the channels 66, 68, 70. The electrical connector 10 need only be terminate once to provide a double socket outlet.

As will be observed particularly from Figure 6, that because a rotary action about an axis offset from, but generally parallel to, the direction of extent of the cable 44 is used to bring the projections 98 into engagement with the wires 46, 48, 50 for pressing these into the channels 66, 68, 70, at least initially, contact between the projections 98 and respective ones of the wires does not occur all at once. That is to say, at first the projection 98a is brought into contact with the wire 50 located in the third channel 70; then the projection 98b is brought in to contact with the wire 48 located in the second channel 68; and, lastly, the projection 98c is brought into contact with the wire 46 located in the first channel 66. As a result, the wires are forced into the IDCs 74, 76, 78, 80 sequentially, and the forces which need to be applied to effect the making of electrical connection to the IDCs 74, 76, 78, 80 are also sequentially applied. By this, at any one time, it is sufficient to generally apply a force which would be enough to force only one wire at a time into position.

As shown in Figures 1 and 2, the parts 12, 14 may be latched in the closed position by resilient clips 102 coupled to the part 14 which releasably grip corresponding portions of the part 12. The parts 12, 14 can otherwise be fastened together using any other suitable means.

The part 14 includes first and second cable restraining flanges 108a, 108b arranged at opposite ends of the part 14. The flanges 108a, 108b extend from the planar roof portion 86 towards the end portions 100 of the outer covering 52 of the cable 44 when the connector is arranged in the closed position shown in Figure 1. When so arranged, the flanges 108a, 108b bear against respective end portions 100 of the cable 44

and inhibit movement of the cable 44 in direction "L". The flanges thereby reduce wear and tear on the electrical connections formed by the IDCs 74, 76, 78, 80 with the wires 46, 48, 50.

- 5 The connector 10 described is useful as a general purpose outlet for supply of electricity via the set of contact elements 18 from cable 44 to electrical devices which may be plugged into the sockets 20a, 20b. However, the invention may be applied to other types of connector.
- 10 While, in the described connector 10, the parts 12, 14 are connected together for relative swinging movement by restraining means formed as a simple hinge having the hinge pin 94 and cooperating part tubular portion 96, other forms of restraining means may be employed. For example, the parts 12, 14 may be integrally moulded with a connecting
- 15 flexible hinge element.

While it has been found useful to align the planes of the insulation displacement contacts 47, 76, 78, 80 angularly with respect to the directions of extent of lengthwise extending wire channels 66, 68, 70

20 (at 45° in the illustrated embodiment) this is not necessarily essential to the invention.

The electrical connector 10 also includes two lugs 110a, 110b coupled to and extending from opposite ends of the part 14. The lugs 110a,

25 110b include apertures through which screws or nails can be driven to secure the connector to a wall surface, for example. The connector 10, alternatively include three or four lugs to secure the connector to the mentioned wall surface.

The connector 10 can be used to effect a straight through connection for the electrical power sockets 20a, 20b. The connector 10 can also be used to effect a "T" connection for a second double insulated cable 120 at right angles to the first one 44, as shown in Figures 8 and 9.

5

As particularly shown in Figure 6, the wire channel plate 16 of the part 12 includes transverse wire channels 122, 124, 126 that intersect the lengthwise extending wire channels 66, 68, 70, 72 at an angle of 90 degrees, for example. In the illustrated example, the transverse wire channels 122, 124, 126 overlie the lengthwise extending wire channels 66, 68, 70. Alternatively, the transverse wire channels 122, 124, 126 could underlie the lengthwise extending wire channels 66, 68, 70. The transverse wire channels 122, 124, 126 are generally parallel and extend through the opposite side wall portion 62 of part 12 and terminate in the side wall portion 60 of the part 12. The width of the transverse wire channels 122, 124, 126 approximates the width of the insulated wires 128, 130, 132 of the second double insulated cable 120.

The IDCs 74, 76, 78, 80 are located at intersections of the transverse wire channels 122, 124, 126 and the lengthwise extending wire channels 66, 68, 70 for electrically connecting the conductors 128, 130, 132 seated in the transverse wire channels 122, 124, 126 with respective ones of the conductors 46, 48, 50 seated in the lengthwise extending wire channels 66, 68, 70. For example, the wire channel plate 16 has the following configuration:

1. The transverse active wire channel 122 passes through the insulation displacement contact 78 located in the active wire channel 70 of the part 12;

2. The transverse earth wire channel 124 passes through the insulation displacement contact 76 located in the earth wire channel 68 of the part 12; and
3. The transverse neutral wire channel 126 passes through the insulation displacement contact 74 located in the neutral wire channel 66 of the part 12.

The insulation displacement contacts 74, 76, 78, 80 are held within a side-to-side elongate slots 200 formed in the wire channel plate 16 at intersections of the transverse wire channels 122, 124, 126 and the lengthwise extending wire channels 66, 68, 70, as shown in Figure 10. The slot 198 extends through the plate 16 from an upper surface to a bottom surface. Viewed from above the slot 198 extends with its longer cross-sectional dimension arranged at 45° to the directions of extent of both the transverse channel 122, 124, 126 and the lengthwise extending wire channel 46, 66, 68 and crosses and breaks into these. The insulation displacement contact 74, 76, 78, 80 is thus located within slot 198 so that the side to side direction of the slot 84 of the IDC is substantially 45 degrees to the direction of extent of the lengthwise extending wire channel 66, 68, 70 and substantially 45 degrees to the direction of extent of the transverse wire channel 122, 124, 126. The upstanding contact portions of the IDCs 74, 76, 78, 80 are disposed within channels.

The insulated wire 128, 130, 132 of the second cable 120 can be electrically coupled to corresponding insulated wire 46, 48, 50 of the first cable 44 by performing the following steps to effect the "T" connection:

1. The connector 10 is arranged in the position shown in Figures 1 and 2, that is in an open condition where the part 14 is swung clear of the cable channel 42;
2. The first cable 44, having the above-described portion of its outer cover 52 removed, is laid in the cable channel 42, as shown in Figure 6, so that end portions 100 of the outer covering 52 of the cable 44 are positioned within outer end portions of the cable channel 42;
3. The wires 46, 48, 50 are positioned so as to extend over respective ones of the first, second and third lengthwise extending wire channels 66, 68, 70;
4. The wires 46, 48, 50 are then lightly pressed into the first, second and third lengthwise extending wire channels 66, 68, 70;
5. The outer cover of a terminal end of the second cable 120 is removed exposing a length of the terminal ends of the active, neutral and earth insulated wires 128, 130, 132;
6. The wires 128, 130, 132 are inserted into their respective transverse wire channels 122, 124, 126 through the opposite side wall portion 62 of the part 12 so that they overlie and intersect the active, earth and neutral wires 46, 48, 50 of the first cable 44;
7. The wires 128, 130, 132 are then lightly pressed into the transverse wire channels 122, 124, 126;
8. The part 14 is swung about the axis of the pin 94 so that it overlies the part 12 and so that the projections 98 engage the wires 46, 48, 50 and press them into their respective channels; and

9. Part 14 is then pressed fully down so that portions of the part 14 away from the hinge axis are firmly engaged with the part 12.

5 During the described closing action, the projections 98 bear against portions of the wires 46, 48, 50 and force them into the insulation displacement contacts 74, 76, 78, 80. In doing so, the insulation of the wires 46, 48, 50 is cut by the insulation displacement contacts 74, 76, 78, 80, and the internal conductors are forced into electrically
10 conductive connection with the insulation displacement contact, as shown in Figure 7. That is, the wires 46, 48, 50 are pressed into the space between the upstanding contact parts 82a, 82b of the insulation displacement contacts 74, 76, 78, 80, and are firmly engaged by these. Also during the above process, the projections 98 press down upon the
15 wires 46, 48, 50 to further assist in locating these in the channels 66, 68, 70.

As part 14 is closed over part 12, the elongate planar roof portion 86 bears against the transverse wires 128, 130, 132 and forces them into
20 respective ones of the insulation displacement contacts 74, 76, 78 as shown in Figure 9. Thus, the transverse wires 128, 130, 132 are electrically coupled to respective ones of the wires 46, 48, 50 of the first cable 44.

25 Relative movement of the upstanding contact portions 82a, 82b of the insulation displacement contacts 74, 76, 78, 80, 140 when the conductors are forced therebetween in the above described manner is limited by the shape of the slots 200 within which they are seated. The

slots 200 thereby assist the process of making good electrical connections between multiple conductors.

As above-mentioned, the parts 12, 14 may be latched in the closed position by resilient clips 102 coupled to the part 14 which releasably grip corresponding portions of the part 12. The parts 12, 14 can otherwise be fastened together using any other suitable means.

Control Circuit

10

As above-mentioned, the connector 10 also includes a spare insulation displacement contact 140 seated in the control wire channel 72, as shown in Figure 11. The spare IDC 140 allows the connector to interface with a control circuit 200. The control circuit 200 can be used to:

1. Control the electrical power outlets 20a, 20b of connector 10 and other electric devices also electrically connected to the power cable 44;
- 20 2. Control other electric devices also electrically connected to the power cable 44;
3. Control the electrical power sockets 20a, 20b of the connector 10 without interrupting power supply for other electric devices also electrically connected to the cable 44.

25

A description of the operation of the above configurations of the control circuit 200 and the connector 10 is set out below.

1. Control the electrical power outlets 20a, 20b of connector 10 and other electric devices also electrically connected to the power cable 44.

5 The connector 10 shown in Figures 12 is coupled to the control circuit 200. The circuit 200 is used to control the operation of the electrical power sockets 20a, 20b of the connector 10 and the operation of any other electric devices, such as additional connectors, electrically connected to the power cable 44.

10

In the arrangement shown, the active wire 50 of the power cable 44 has been cut. A first section 212 of the cut active wire 50 extends into, and is seated in, a left hand side of the control channel 72. An end portion of the first section 212 of the active wire 50 overlies the spare
15 IDC 140. The first section 212 of the active wire 50 can thereby be electrically connected to the spare IDC 140. A second section 214 of the active wire 50 extends into, and is seated in, a right hand side of the active wire channel 70. An end portion of the second section 214 of the active wire 50 overlies the IDC 80. The second section 214 of the
20 active wire 50 can thereby be electrically connected to the active IDC 80. The earth and neutral wires 48, 46 are respectively arranged in the earth and neutral wire channels 68, 66.

The control circuit 200 includes first and second insulated conductors
25 216, 218 electrically connected to respective sides of a switch 220. An end section of the first insulated conductor 216 extends into a spare traverse wire channel 222 through an opening in the opposite sidewall portion 62. The end section of the first insulated conductor 216 overlies the spare IDC 140. The first insulated conductor 216 can thereby be

electrically connected to the spare IDC 140. Similarly, an end section of the second insulated conductor 218 extends into another traverse wire channel 224 through an opening in the opposite sidewall portion 62. The end section of the second insulated conductor 218 overlies the active IDC 80. The second insulated conductor 218 can thereby be electrically connected to the active IDC 80.

When the part 14 is closed over the part 12 in the above-described manner, the insulated conductors 46, 48, 212, 214, 216, 218 are forced into respective ones of the IDCs 74, 78, 140, 80, 140, 80 by corresponding lengthwise extending projections 98.

The first section 212 and the second section 214 of the active wire are thereby electrically connected by way of the control circuit 200. When the switch 220 is open, the active wire 50 is incomplete and the active contact element 30 of the connector 10 is electrically isolated. As such, the electrical power sockets 20a, 20b are inactive and all electric equipment connected to the power cable 44 after the connector 10 is also inactive. Alternatively, when the switch 220 is closed, the active wire 50 is complete and the active contact element 30 of the connector 10 is electrically charged. As such, the electrical power sockets 20a, 20b are active and all electric equipment connected to the power cable 44 after the connector 10 is also active.

For example, if a number of connectors 10 were fitted in series to the one length of power cable 44 to power a row of fluorescent lights, then the lights could all be turned on or off using a control circuit 200 connected to the first connector 10 in the series.

2. Control the electric devices also electrically connected to the power cable 44.

In the alternative arrangement of the above-described control circuit 5 200 shown in Figure 13, the electrical power sockets 20a, 20b of the connector 10 are always electrically connected to the active power supply and are always live. The control circuit 200 is used to control the operation of a series of electric devices, such as additional connectors, electrically connected to the power cable 44 after the 10 connector 10.

In the arrangement shown, the first section 212 of the cut active wire 50 extends into, and is seated in, a left hand side of the active channel 70. An end portion of the first section 212 of the active wire 50 overlies 15 the active IDC 76. The first section 212 of the active wire 50 can thereby be electrically connected to the active IDC 76. The second section 214 of the active wire 50 extends into, and is seated in, a right hand side of the control wire channel 72. An end portion of the second section 214 of the active wire 50 overlies the spare IDC 140. The earth 20 and neutral wires 48, 46 are respectively arranged in the earth and neutral wire channels 68, 66.

As mentioned, the control circuit 200 includes first and second insulated conductors 216, 218 electrically connected to respective sides of a 25 switch 220. An end section of the first insulated conductor 216 extends into a traverse wire channel 230 through an opening in the opposite side wall portion 62 and overlies the active IDC 76. The first insulated conductor 216 can thereby be electrically connected to the active IDC 76. Similarly, an end section of the second insulated conductor 218

extends into the spare wire channel 222 through an opening in the opposite side wall portion 62 and overlies the spare IDC 140. The second insulated conductor 218 can thereby be electrically connected to the spare IDC 140.

5

When the part 14 is closed over the part 12 in the above-described manner, the insulated conductors 46, 48, 212, 214, 216, 218 are forced into respective ones of the IDCs 74, 78, 76, 140, 76, 140 by corresponding lengthwise extending projections 98.

10

The first section 212 of the active wire 50 is always connected to the active IDC 76 and, as such, the active contact element 30 is always live. The electrical power sockets 20a, 20b are thereby always live.

15 The first section 212 and the second section 214 of the active wire 50 are electrically connected by way of the control circuit 200. The switch 220 is thereby used to open and close the active wire 50. When the switch 220 is open, there is an open circuit between the first and second sections 212, 214 of the active wire 50 and other connectors
20 electrically connected to the power supply cable 44 after from the connector 10 will be inactive. When the switch 220 is closed, there is a closed circuit between the first and second sections 212, 214 of the active cable 50, and the additional connectors, or any other electric device, also electrically connected to the power supply cable 44 will be
25 active.

For example, if a number of new connectors 10 were fitted in series to the one length of power cable 44 to power a row of fluorescent lights, then the control circuit fitted to the first connector 10 in the series could

be used to control the operation of the lights connected to the other connectors in the series. The lights connected to the first connector in the series would always be on.

- 5 **3. Control the electrical power sockets 20a, 20b of the connector 10 without interrupting power supply for electric devices also electrically connected to the cable 44.**

10 In the arrangement of the above-described control circuit 200 shown in Figure 14, the electrical power sockets 20a, 20b of the connector 10 are selectively electrically connected to the active power supply of the cable 44 by the switch 220. Operation of the control circuit 200 does not effect the operation of other electric devices also electrically connected to the power cable 44.

15

In the arrangement shown, the active wire 50 of the cable 44 extends into, and is seated in, the control channel 72 so as to overlie the spare IDC 140. The active wire can thereby be electrically connected to the spare IDC 140. The earth and neutral wires 48, 46 are respectively
20 arranged in the earth and neutral wire channels 68, 66.

An end section of the first insulated conductor 216 of the control circuit 200 extends into the traverse wire channel 230, through an opening in the opposite side wall portion 62, and overlies the active IDC 76. The
25 first insulated conductor 216 of the control circuit 200 can thereby be electrically connected to the active IDC 76. Similarly, an end section of the second insulated conductor 218 extends into the spare traverse wire channel 222 so as to overlie the spare IDC 140. The second insulated

conductor 218 can thereby be electrically connected to the spare IDC 140.

When the part 14 is closed over the part 12 in the above-described manner, the insulated conductors 46, 48, 50, 216, 218 are forced into
5 respective ones of the IDCs 74, 78, 140, 76, 140 by corresponding lengthwise extending projections 98.

In this arrangement, the active wire 50 is unbroken and passes through
10 the connector 10. The control circuit 200 is selectively used to electrically connect the active IDC 76 to the active wire 50. In doing so, the control circuit 200 is able to control the operation of the electrical power sockets 20a, 20b without cutting off electricity in the cable 44.

15

For example, if a number of new connectors 10 were fitted in series to the one length of power cable 44 to power a row of fluorescent lights, then the lights could be turned on or off using individual control circuits 200, without interrupting the power on the main cable 44.

20

The switch 220 of the control circuit 200 is preferably located remotely from the connector 10. Alternatively, the switch 220 is located proximal to the connector 10. For example, the switch 220 is mounted on the planar surface 22 of the part 14.

25

The described arrangement has been advanced merely by way of explanation any many modifications may be made thereto without departing from the spirit and scope of the invention which includes every novel feature and combination of novel features herein disclosed.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion
5 of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that that
10 prior art forms part of the common general knowledge in Australia.

	<u>Parts</u>	
	10	Connector
	12	Part
5	14	Part
	16	Wire channel plate
	20a, 20b	Electrical power socket
	22	Planar surface
	24, 26, 28	Apertures
10	30	Active contact element
	32	Neutral contact element
	34	Earth contact element
	36a, 36b	End portions
	38a, 38b	End portions
15	40a, 40b	End portions
	42	Cable channel
	44	Cable
	46	Neutral wire
	48	Earth wire
20	50	Active wire
	52	Outer cover of cable
	54	First wall
	56	Second wall
	58	Third wall
25	60	Side wall portion
	62	Opposite side wall portion
	66	Neutral wire channel
	68	Earth wire channel
	70	Active wire channel
30	72	Control wire channel

- 74, 76, 78, 80 Insulation displacement contacts
- 82a, 82b Upstanding contact portion
- 84 Upwardly open space
- 86 Elongate planar roof portion
- 5 88 Rim portion
- 90 Hinge 90
- 92 Lugs
- 94 Hinge pin
- 96 Part-tubular elongate portion
- 10 98 Lengthwise extending projections
- 98a, 98b, 98c Lengthwise projection
- 100 End portions of the outer covering of the cable
- 102 Resilient clips
- 108a, 108b Restraining flanges
- 15 110a, 110b Lugs
- 120 Second cable
- 122 Transverse active wire channel
- 124 Transverse earth wire channel
- 126 Transverse neutral wire channel
- 20 128 Transverse active insulated wire
- 130 Transverse earth insulated wire
- 132 Transverse neutral insulated wire
- 140 Insulation displacement contact
- 198 Slot
- 25 200 Control circuit
- 212 First section of active wire
- 214 Second section of active wire
- 216 First insulated conductor of control circuit
- 218 Second insulated conductor of control circuit

- 220 Switch
 - 222 Spare transverse channel
 - 224 Another transverse wire channel
 - 230 Another transverse wire channel
- 5

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

- 1. An electrical connector, comprising:
 - (a) a first connector part defining:
 - 5 (i) control, active, and ground lengthwise extending wire channels for receiving lateral sections of insulated conductors of a first cable extending through the connector; and
 - (ii) control and active transverse wire channels
 - 10 respectively intersecting with the control and active lengthwise extending wire channels;
 - (b) a second connector part coupled to the first connector part so as to move between open and closed positions;
 - (c) a plurality of insulation displacement contacts (IDCs)
 - 15 including:
 - (i) a control IDC positioned at an intersection of the control lengthwise extending wire channel and the control transverse wire channel;
 - (ii) an active IDC positioned at an intersection of the
 - 20 active lengthwise extending wire channel and the active transverse wire channel;
 - (iii) a ground IDC positioned in the ground lengthwise extending wire channel,
- wherein the insulated conductors are coupled to respective IDCs
- 25 when the first connector part and the second connector part are moved to the closed position;
 - (d) an electrical power socket defined on the first connector part, the electrical power socket being configured to receive an electrical plug, the electrical power socket including electrically

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conductive contact elements that are respectively electrically connected to the active IDC and the ground IDC; and

(e) a control circuit for remotely controlling operation of the power socket without affecting operation of additional electric devices electrically connected to the first power cable downstream of the electric connector, including:

(i) a first insulated conductor including an end section seated in the active transverse wire channel and electrically coupled to the active IDC;

(ii) a second insulated conductor including an end section seated in the control transverse wire channel and electrically coupled to the control IDC; and

(iii) a switch located remotely from a main body portion of the connector, the switch being electrically coupled between the first and second insulated conductors for selectively electrically connecting the active IDC to the control IDC so as to electrically connect the active IDC to an active insulated conductor of the first power cable extending through the connector via the control channel.

2. An electrical connector, comprising:

(a) a first connector part defining:

(i) control, active and ground lengthwise extending wire channels for receiving lateral sections of insulated conductors of a first cable extending through the connector; and

(ii) control and active transverse wire channels respectively intersecting with the control and active lengthwise extending wire channels;

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(b) a second connector part coupled to the first connector part so as to move between open and closed positions;

(c) a plurality of insulation displacement contacts (IDCs) including:

5 (i) a control IDC positioned at an intersection of the control lengthwise extending wire channel and the control transverse wire channel;

(ii) an active IDC positioned at an intersection of the active lengthwise extending wire channel and the active transverse wire channel; and

10 (iii) a ground IDC positioned in the ground lengthwise extending wire channel,

wherein the insulated conductors are coupled to respective IDCs when the first connector part and the second connector part are moved to the closed position;

15 (d) an electrical power socket defined on the first connector part, the electrical power socket being configured to receive an electrical plug, the electrical power socket including electrically conductive contact elements that are respectively electrically connected to the active IDC and the ground IDC; and

20 (e) a control circuit for remotely controlling operation of one or more electric devices separately electrically connected to the first power cable downstream of the connector without affecting operation of the electrical power socket including:

25 (i) a first insulated conductor including an end section seated in the active transverse wire channel and electrically coupled to the active IDC;

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(ii) a second insulated conductor including an end section seated in the control transverse wire channel and electrically coupled to the control IDC; and

5 (iii) a switch located remotely from a main body portion of the connector, the switch being electrically coupled between the first and second insulated conductors for selectively electrically connecting the active IDC to the control IDC so that a first section of an active insulated conductor extending into the connector through the active lengthwise wire channel to the active IDC can be selectively electrically
10 connected to a second section of the active insulated conductor extending from the connector via the control IDC through the control lengthwise extending wire channel.

15 3. An electrical connector substantially as hereinbefore described, with reference to the accompanying drawings.

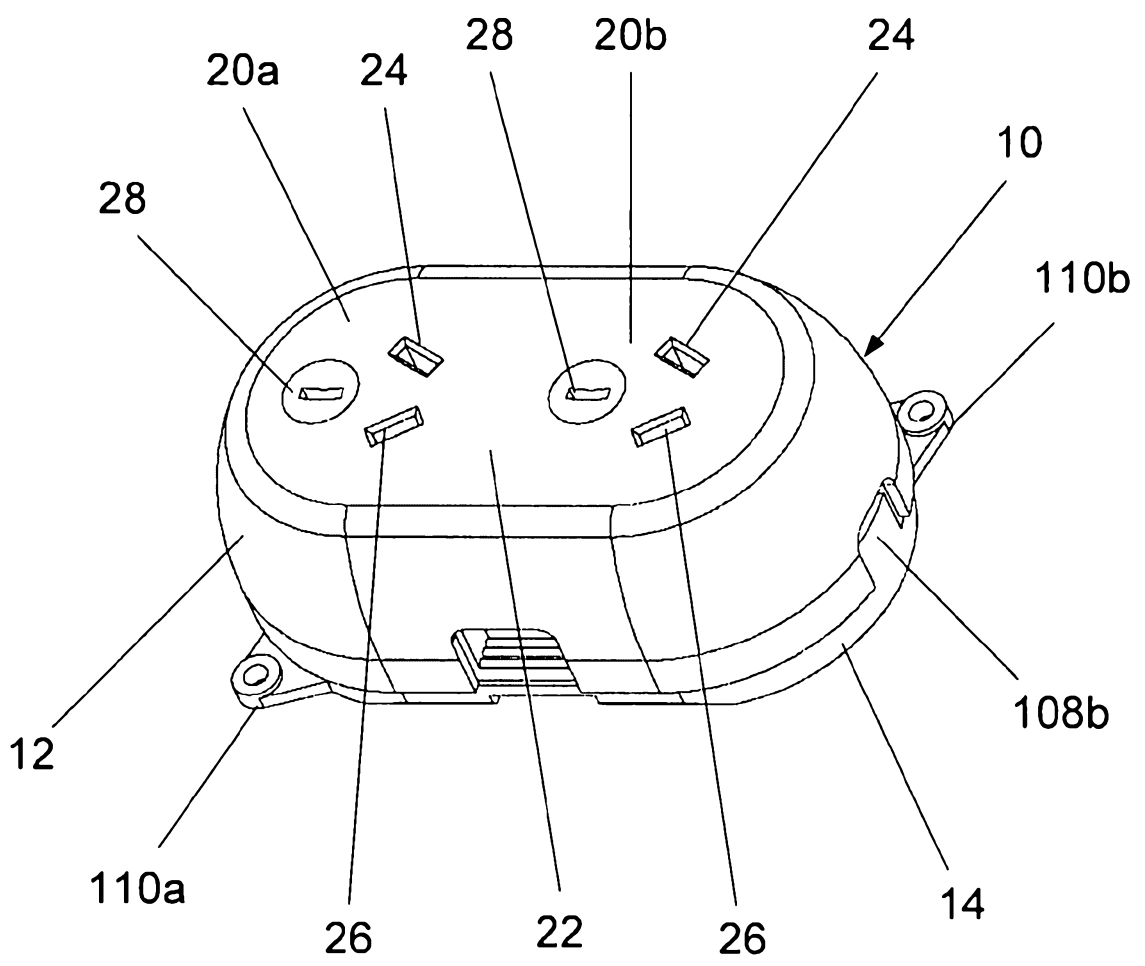


Figure 1

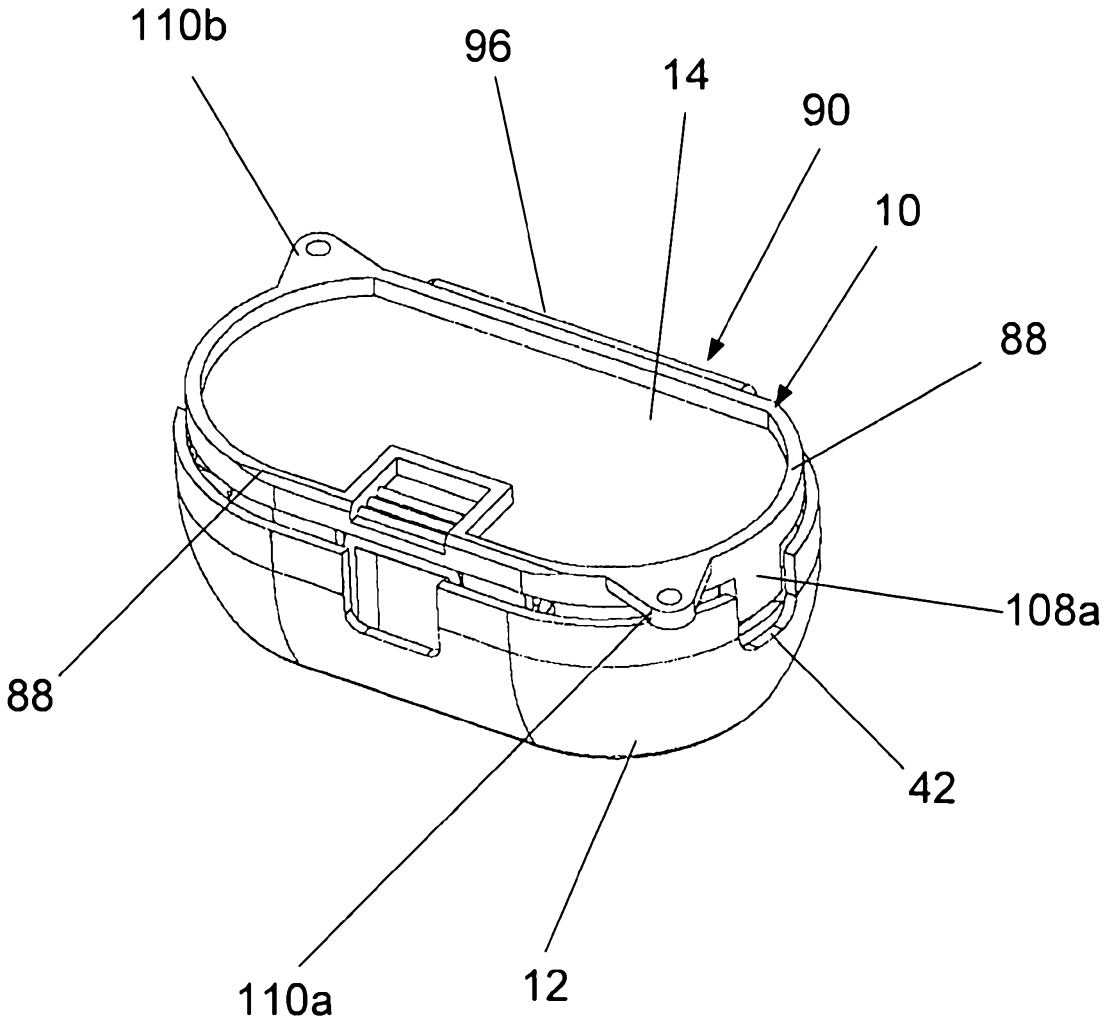


Figure 2

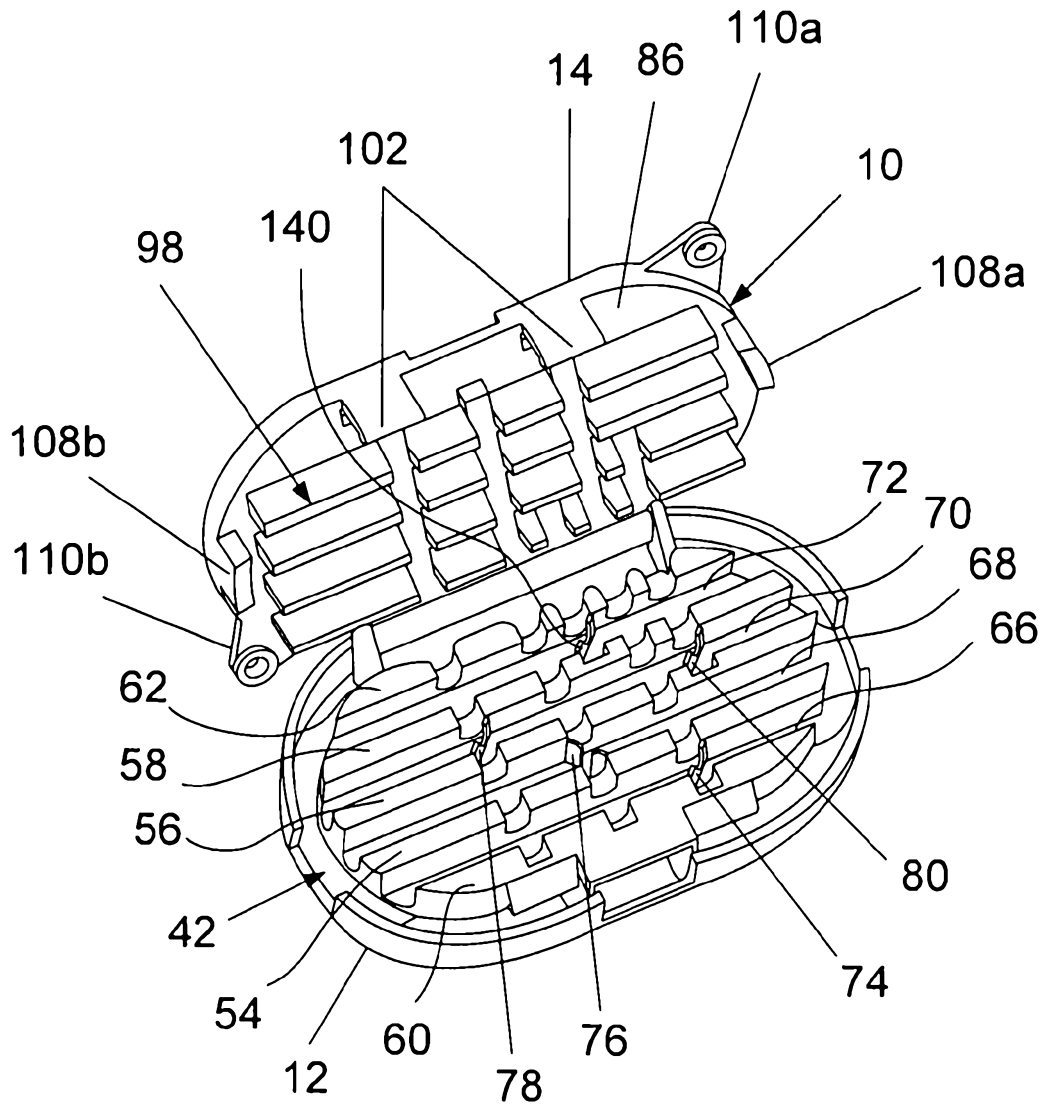


Figure 3

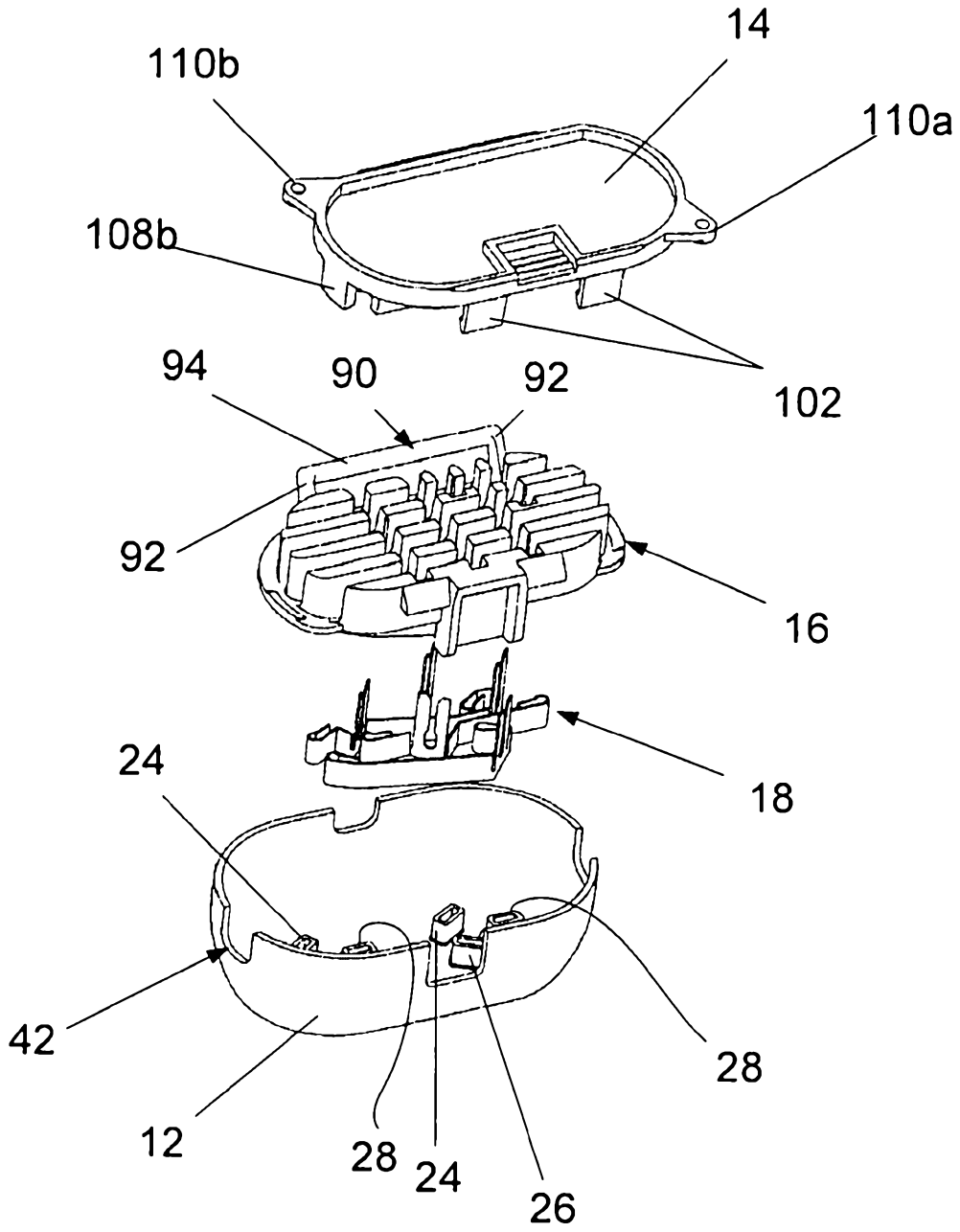


Figure 4

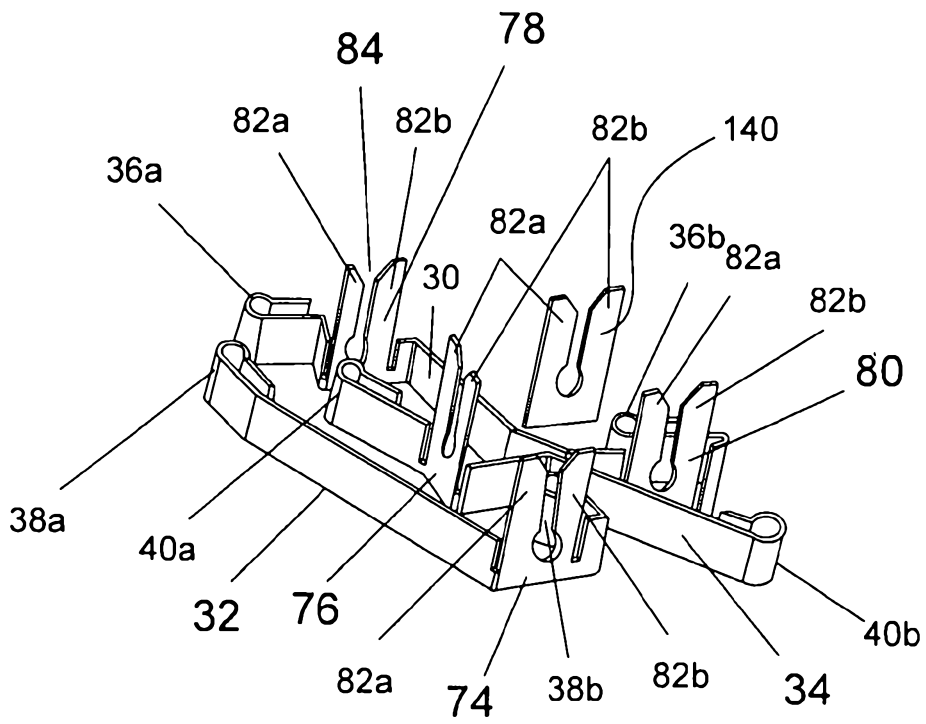


Figure 5

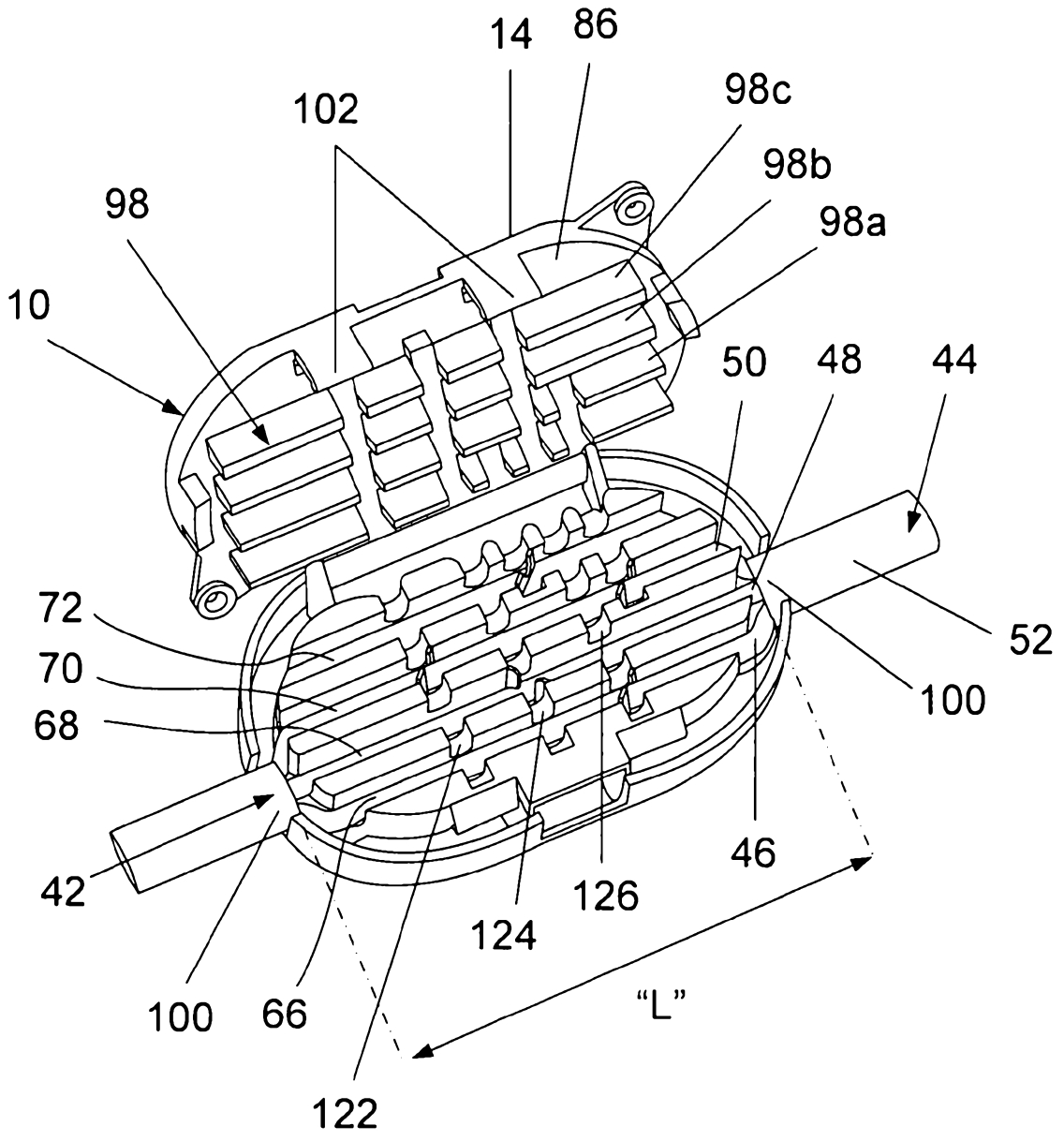


Figure 6

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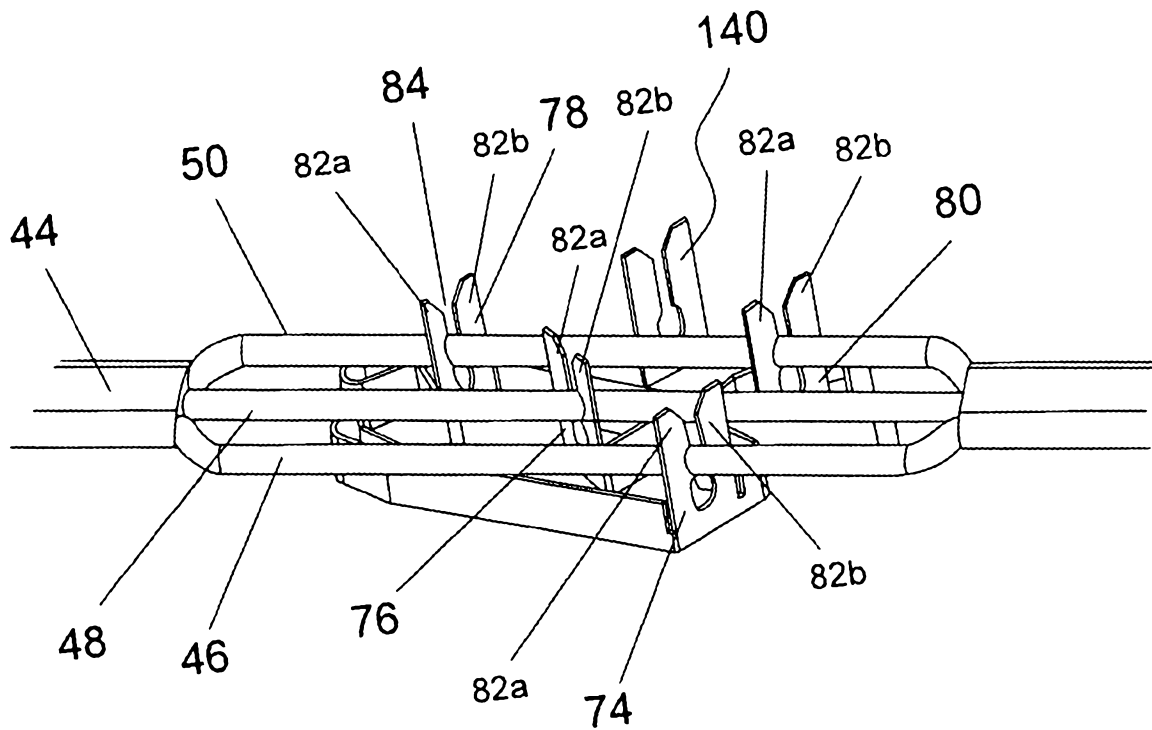


Figure 7

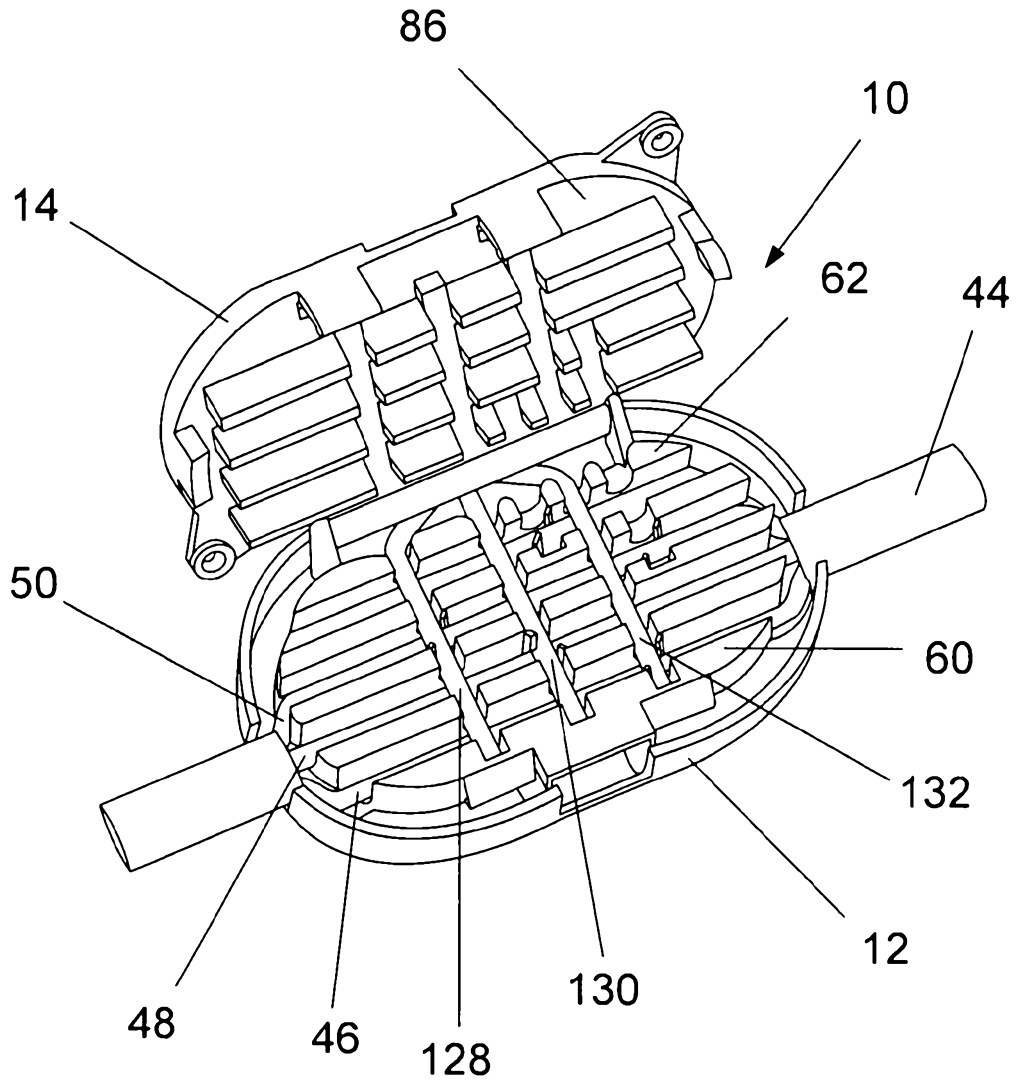


Figure 8

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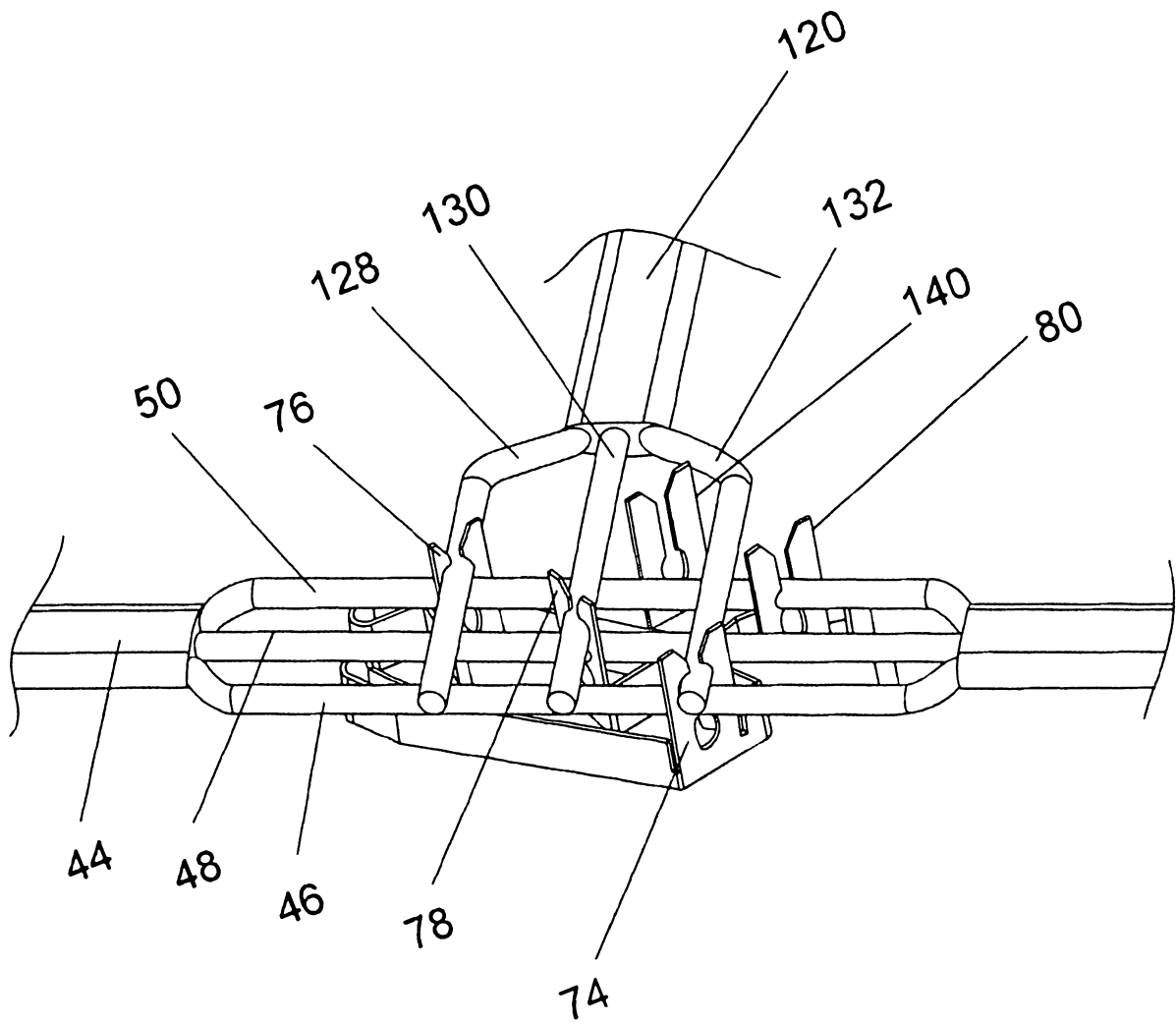


Figure 9

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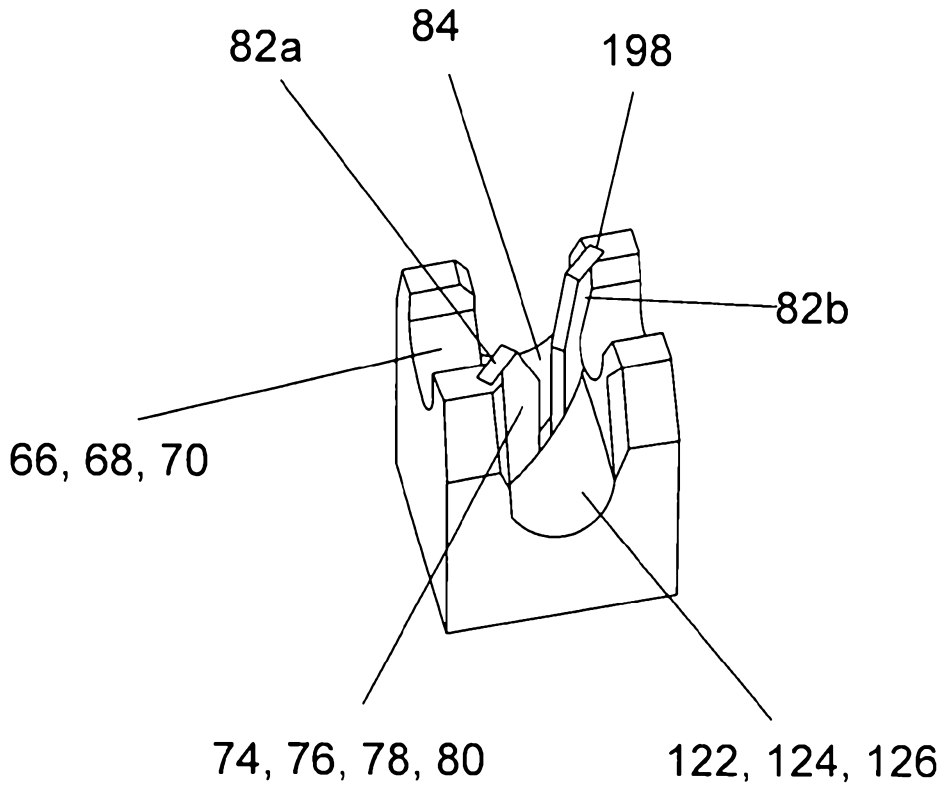


Figure 10

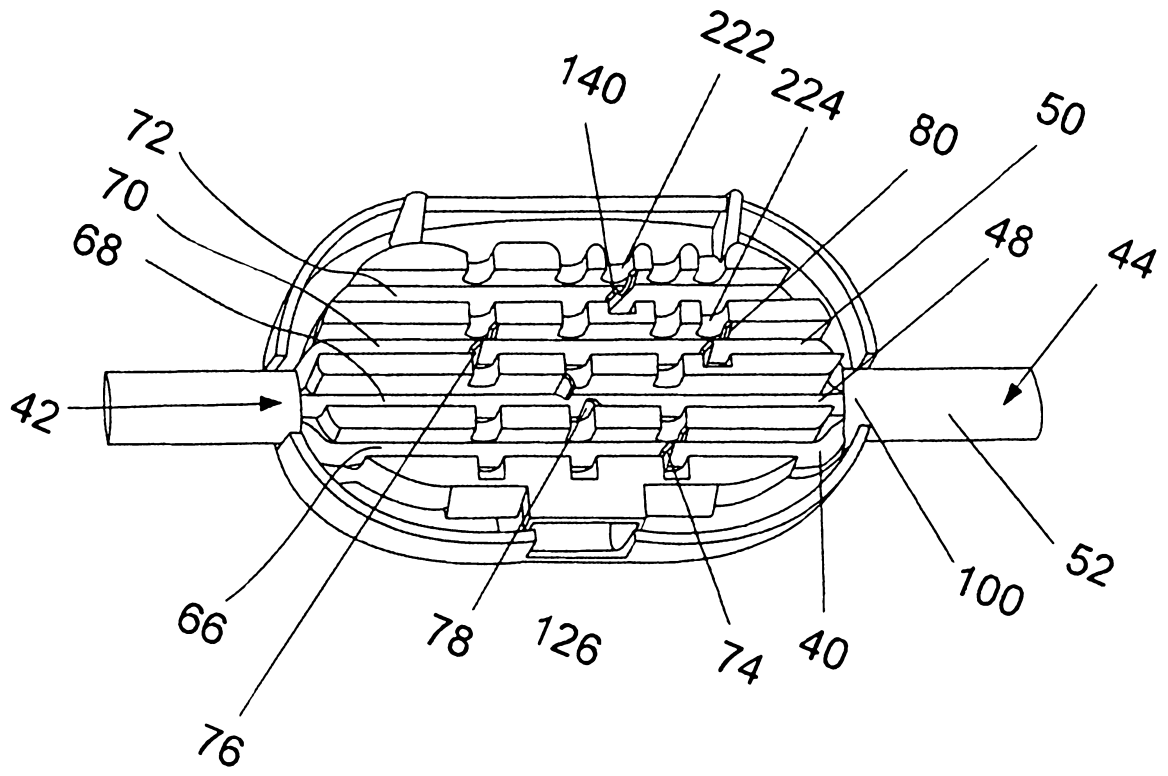


Figure 11

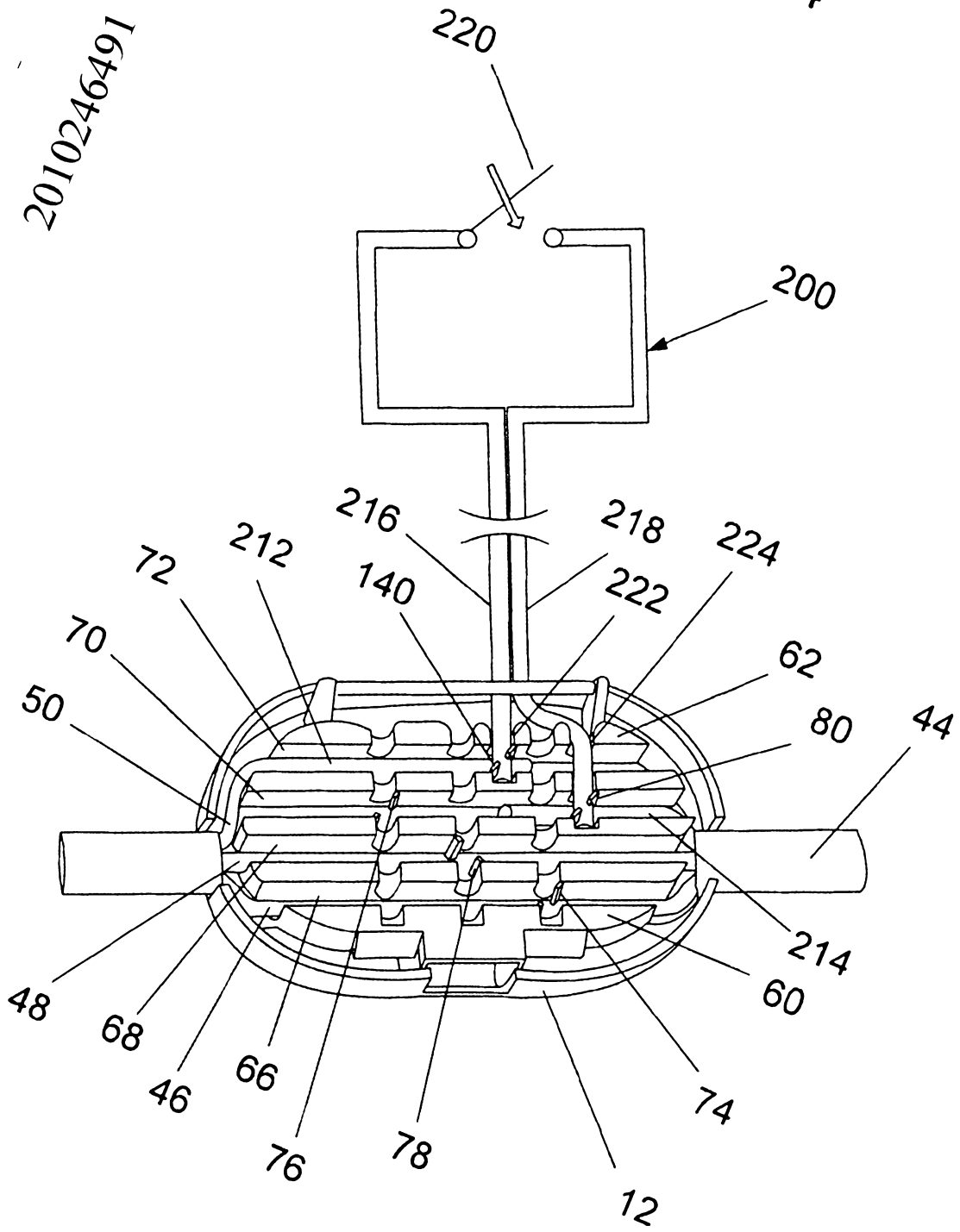


Figure 12

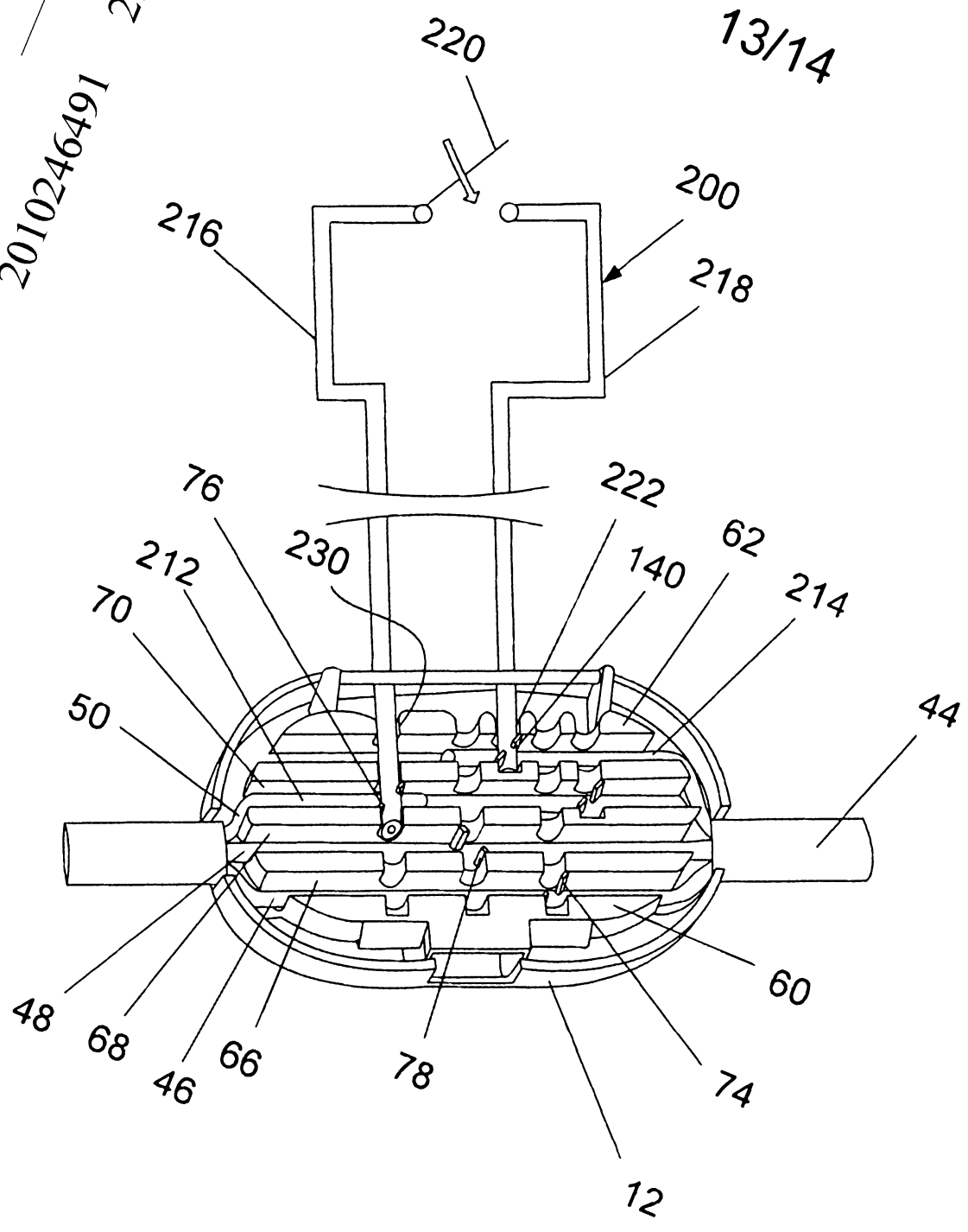


Figure 13

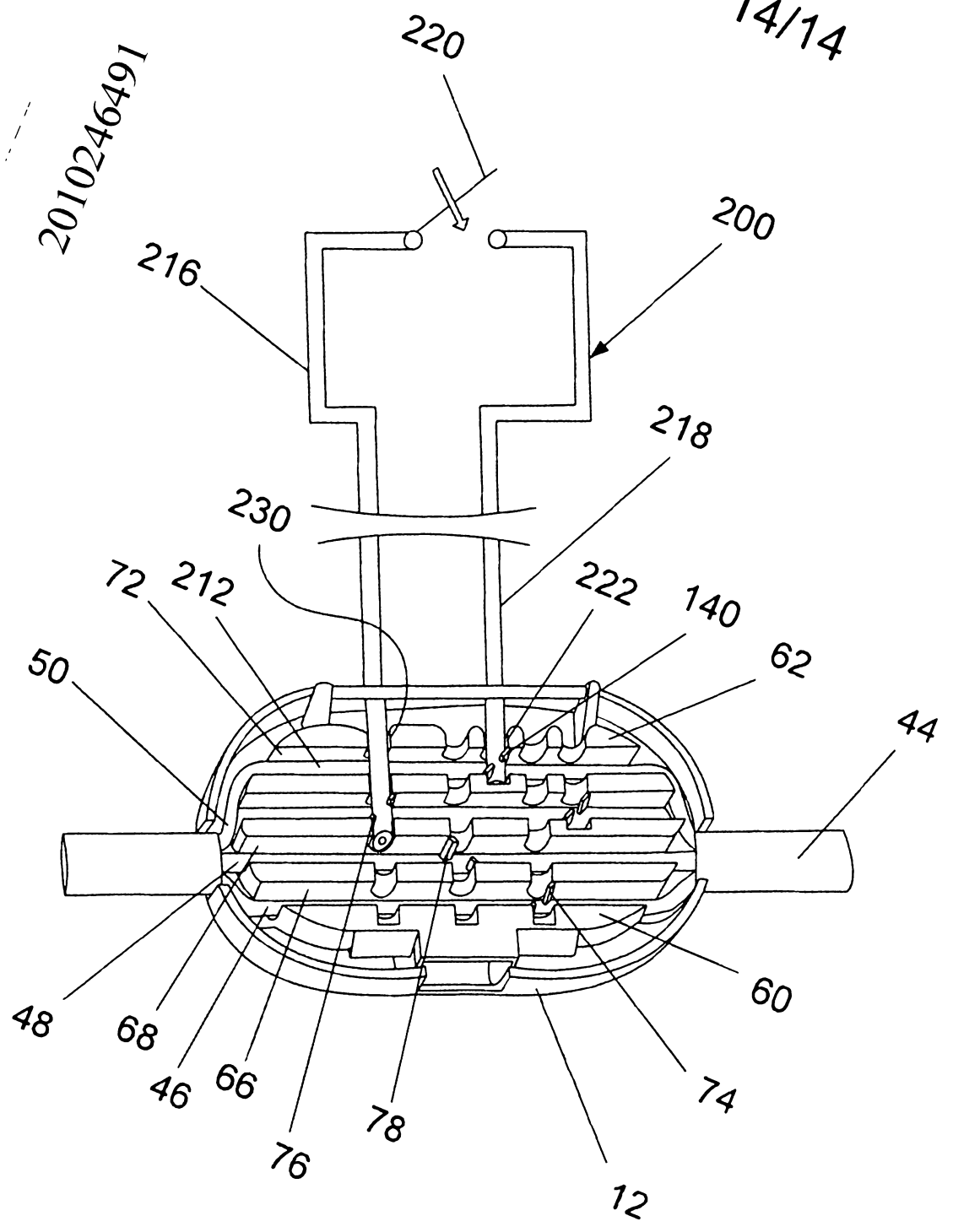


Figure 14