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(71) Applicant: **AMP INCORPORATED (a Pennsylvania corporation)**
**P.O. Box 3608 470 Friendship Road**
**Harrisburg Pennsylvania 17105(US)**

(72) Inventor: **Loose, Winfield Warren**
**7625 Lakeside Avenue**
**Linglestown Pennsylvania 17112(US)**

(74) Representative: **Warren, Keith Stanley et al**
**BARON & WARREN 18 South End Kensington**
**London W8 5BU(GB)**

## (54) Insulation displacing barrel terminal.

(57) A two piece terminal includes first and second sections (100,200) where the first section (100) is stationary relative to the second section (200) and the second section (200) is rotatable relative to the first section (100). Each of the sections is comprised of a single thickness of metallic material wrapped into a substantially cylindrical configuration, where the second section (200) is of a larger outer diameter than the first section (100) such that the second section (200) can engagingly overlie the first section (100). The first section (100) is mounted to an insulative housing with a post section upstanding through the center of the first section (100). The post has a through opening which includes at least partially along its length, a frusto-conical section for wire section through the opening. The second section (200) of terminal has two wire receiving openings (212,222 or 232,242), each in communication with a wire-receiving slot (216 or 236) around the circumference of the cylinder, with the two wire receiving openings being on opposed sides of the through opening the post. A cap fits over the second section (200) of terminal and has a shoulder which is engageable with a free end of the second section (200) of terminal for rotation of the second section (200) of terminal relative to the first section (100) of terminal. hen a wire is placed in through the cap and the cap is turned, the second section (20) of terminal is rotated and the wire is terminated in a wire-receiving slot (216 or 236).

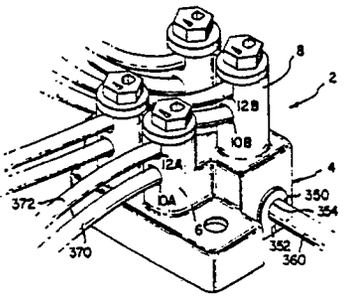


Fig. 1

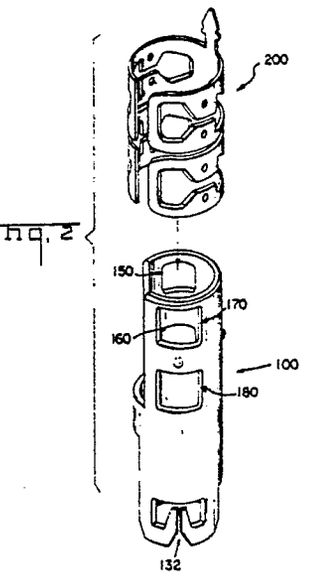


Fig. 2

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# INSULATION DISPLACING BARREL TERMINAL

The invention relates to an insulation displacement connector having a wire receiving opening in the connector for the insertion of the wire therethrough; wherein placing a wire in the wire receiving opening and rotating the terminal relative to a wire, terminates the wire in a wire receiving slot in the terminal.

There are many instances where terminal blocks are set up in high density arrays. Many of these terminal blocks are simply threaded members fixed with insulation material which receive wires either wrapped around the threaded members and secured thereto by an application of a nut, or the wires are terminated by known spade or ring terminals and then secured to the threaded member by a nut. While these have, in some instances, provided effective means for termination, they have not always been convenient for maintenance or repair and they frequently are subjected to environmental degradation with a resulting loss of desired electrical characteristics.

There is a need, predominantly within the telecommunications industry for reusable terminals, and terminals which can accommodate more than one conductor size. The telephone wires coming from the phone company can either be in the form of buried cable or aerial wires. The high density arrays would be mounted in either an enclosure on the aerial mount or on an enclosed pedestal affixed to the ground. As new telephones are installed in a selected locality, the phone wires are then terminated to the respective terminals on the high density array.

The wire sizes within the industry are not always the same gauge and therefore the terminals must be designed to accommodate more than one wire size. A typical size wire running from the high density array to the phone installation is steel wire with a gauge of $18\frac{1}{2}$ AWG, although, other phone installations use copper wire having a gauge of 22-24 AWG. It can be appreciated then, that a terminal having a higher quality means for terminating conductors and having means to accommodate more than one wire size, would be a substantial improvement within the industry. While the preferred embodiment of connector disclosed herein is for telecommunications applications, for example for electrical interconnection of tip and ring voice signals, the invention could be used with other wire sizes and in other applications.

U.S. Patent 4,431,247 shows an insulated terminal and module, however the shell of the terminal only includes one wire opening for insulation displacement.

Other previous designs are shown in U.S. Patents 4,637,675 and 4,705,340 where stationary terminals are located within housings and rotatable caps are placed over the terminals. Rotation of the cap causes the wires within the caps to be rotated into the stationary insulation displacement portions. While the previous versions shown in the '675 and '340 patents are excellent designs, these designs include shortcomings which have been addressed by the instant design.

First, this system is designed for two gauges of wire, where at least one of the wires is $18\frac{1}{2}$ AWG steel. The previous designs, particularly those shown in U.S. Patent 4,705,340; turn the wire into the slot relative to the axial centerline, which causes a bending of the wire. This bend, particularly in the steel wire, causes a stored energy spring effect, which over time, can attempt an anti-rotation of the cap tending to loosen the termination.

Second, as both of the previous terminal designs shown in U.S. Patents 4,705,340 and 4,637,675 are of one piece construction, and which eventually become potted within a housing, the one-piece design leads to difficulty if one of the terminals becomes damaged and the terminals need to be replaced. To replace one of the terminals, the potting material has to be removed around the terminal, re-terminated to one of the telephone company wires, and then re-potted.

The newly designed terminal and connector which we have invented has rectified these earlier shortcomings and is summarily explained below.

The present invention utilizes insulation displacement technology to enable termination of a number of wire sizes in an environmentally protective manner with the termination being reusable and requiring only a common tool.

To overcome the first shortcoming, the effect of the springback of the steel wire, we have designed an electrical connector including an insulation displacement type connector for terminating a conductor of an insulated wire which comprises an insulating housing having at least one terminal receiving cavity defined by a cylindrical wall, and a wire receiving opening through the wall into the interior of the cavity. A cylinder is formed of a conductive material and defines a tubular wall which has at least one wire receiving entry through the wall of the cylinder which is in communication with a slot that partially extends circumferentially around the terminal. A cap is positioned adjacent to the cylinder and is rotatable with respect to the housing and has means for engaging the cylinder for simultaneous rotation of the cylinder with the rotation of the cap. In this manner, when a wire is

placed within the wire receiving entry and the cap is rotated relative to the housing, the cap engages the cylinder and rotates the terminal into the wire, and terminates the conductor of the insulated wire within the slot in the terminal. Thus rather than rotating the wire into the terminal, thereby putting a bend in the wire, the wire is held stationary, and the terminal is rotated into the wire.

Also to address the first shortcoming, another aspect of the inventive connector includes an insulative base member which comprises a floor with a post upstanding from the floor, the post having a through opening for receipt of the insulative wire, at least partially therethrough. A first terminal section is receivable over the post with an interconnection means to a conductive element, with the first said section being stationary relative to the base member. A second terminal section is electrically engageable with the first terminal section and the second terminal section has a wire receiving opening in communication with a conductor terminating slot, the wire receiving opening being aligned with the through opening in the post. The connector further includes means to rotate the second said terminal section relative to the first said terminal section.

In this manner, when an insulated wire is disposed within the wire receiving opening and within the through opening of the post, and the second terminal section is rotated, the conductor receiving slot is moved into electrical connection with the conductor of the insulated wire. The post which upstands from the floor, and the opening, not only provide a bearing surface during the termination of the wire, but also provide a straight opening through the terminal which maintains the wire in the original position. This prevents a bending action which would add a stored energy spring effect causing anti rotation of the cap, and degradation to the electrical connection between the terminal and conductor.

In another aspect of the invention, our instant invention has solved the second shortcoming, that is, where the electrical terminal, when damaged, cannot be easily replaced. In this aspect of the invention, an electrical terminal comprises a first section of terminal of generally cylindrical shape having a first conductor connecting section, and a second section of terminal of generally cylindrical shape profiled for engagement with the first said section, the second section including a wire receiving opening through a wall of the section in communication with a wire receiving slot, such that when a wire is placed through the wire receiving opening and proximate to the wire receiving slot, rotation of the second section of terminal rotates the second section into the insulated conductor and terminates the conductor of said wire within the slot of the terminal.

When provided with such a design, the top portion of the terminal is removable relative to the lower portion of the terminal. In this manner, if the upper portion of the terminal is damaged, the upper portion of the terminal is simply removed and thrown away. The lower portion of the terminal runs a low risk of damage as it is not moveable and it is terminated to a lower wire prior to potting. In other words, the lower terminal, if it is going to be damaged would more than likely get damaged during the termination of the lower wire; and in that event the replacement of the lower portion of the terminal is easily handled, because the lower portion is not yet potted in place.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a perspective view showing a high density array of terminals and caps;

Figure 2 is a perspective view of the subject two piece terminal exploded apart;

Figure 3 is a front plan view showing the two piece terminal of Figure 2;

Figure 4A is a cross sectional view through the upper insulation displacement slot showing the cap and upper terminal in the fully open position;

Figure 4B is a view similar to that of Figure 4A showing the cap through a first detent;

Figure 4C is a view similar to that of Figures 4A and 4B showing the cap and upper terminal in the fully terminated condition;

Figure 5 is an isometric view of the cap portion;

Figure 6 is an isometric view, partially cut away, through the housing;

Figure 7 is a stamped blank of the lower portion of the terminal prior to being rolled into a barrel terminal;

Figure 8 is a stamped blank of the upper portion of the terminal prior to being rolled into a barrel terminal;

Figure 9 is a top view of a section of the housing;

Figure 10 is a bottom plan view showing the underside of the connector with the individual wires of the multi-conductor cable in a terminated condition; and

Figure 11 is a cross sectional view through lines 11-11 of Figure 10.

With reference first to Figure 1, an electrical connector 2 is shown which includes an insulative housing member such as 4 including a plurality of silo members, such as 6 and 8, disposed in two opposed rows. The electrical connector is for electrical connection to individual conductors such as 362 within a multi-conductor cable 360 (Figure 11).

Either one or two other insulated conductors such as 370 and 372 can be interconnected within each silo member 6 or 8, to one another, or to a discreet one of the individual conductors 362 of the multi-conductor cable 360 upon insertion through the openings 10a and 12a as shown in Figure 1.

With reference now to Figure 6, the housing member will be described in greater detail, and it should be noted that Figure 6 shows the internal structure of silo 8 in particular, however it should be noted that the internal structure of silo 6 is identical to that of silo 8. Both silos 6 and 8 include an internal diameter such as 14 which extends circumferentially around the internal surface of the silo where it ends with stop surfaces 18 and 20. A longitudinally extending channel 16 extends along the length of the silo and includes opposed parallel surfaces 16a and an end surface 16b. Along a portion of the internal circumferential surface, proximate to stop surface 20 is a first detent member 22 which defines a recessed section 24 adjacent to the stop surface 20 and further defines a shallow surface 30. A second detent member 32 is located beyond the first detent member 22 and defines a second shallow surface 34. Surface 34 is gradually increasing in thickness from a position just beyond the detent 32, and increases in thickness upon radial movement from the detent member 32 to the opening 12. Each of the surfaces 30 and 34 extend only partially along the length of the silo thereby defining a floor such as 36 partially along the length thereof. Inner-circumferential surface 14 extends from the floor 36 downwardly to a second floor such as 40. Beneath the floor 40 is a circumferential surface 44 having a lead in such as 42.

A generally solid post member 50 is integral with the entirety of the housing 4 and integrally molded therewith via a web section shown in phantom as 48 in Figure 6. The outer diameter of the post is shown as 52 and forms a terminal receiving area in conjunction with the inner surface 44. Two wire selector through openings 56 and 64 are included in the post and are radially and longitudinally aligned with the openings 12 and 10 in the silo of the housing respectively. The upper opening 56 includes first spaced-apart walls 54 which are in transition with a lead-in section 58 thereby leading into a slot such as 60. It should be noted that the openings 12 and 56 are in radial alignment with the center of the channel 16. The lower wire selector opening 64 includes first spaced apart walls 66 in transition with a second lead-in surface 68 which then transitions into a smaller opening 70. Similarly, the openings 10 and 64 are all in radial alignment with the center of the channel 16, relative to the center of the post 50.

Referring now to Figure 7, a lower terminal section 100 is shown as generally including an upper edge 102, a lower edge 104, side edges 106, 108 and 110 on one side thereof and side edges 116, 114 and 112 on the opposite side thereof. Wire receiving slots such as 126 and 132 are included extending upwardly from the lower edge 104 and include wire terminating edges 128 and 134, respectively. At the lower section thereof is an opening such as 120 which is defined by two parallel and opposed side edges 122; the opening 120 providing a mechanical relief area between the two wire receiving slots 126 and 132. To further prevent overstressing the lower wire receiving slots 126 and 132, recessed areas 130 and 136 are included surrounding the wire terminating edges 128 and 134, respectively.

At the upper portion of the terminal 100, two small wire openings 150 and 160 are included at the left margin, while two large wire openings 170 and 180 are included at the right hand margin. The upper section of the terminal 100 further includes three contact members 190, which when viewed from Figure 7 would project through the bottom side of the paper rather than through the viewing side. As shown in Figure 3, the lower section of terminal 100 when formed has side edges 114 and 108 in a substantially abutting relation such that side edges 110 and 112 and side edges 106 and 116 respectively are in a spaced apart relation with each other. It should also be noted from Figure 3 that the pairs of large and small wire openings 170 and 150, and 180 and 160 are opposed from each other, in radial alignment through the center of the terminal.

As shown in Figure 8, an upper section of terminal 200 is shown as including side edges 202 and 204, while a plurality of wire receiving openings and wire receiving slots are shown in communication with one another. For example, a large IDC section 210 includes a large wire receiving opening 212 in communication with a large wire terminating section 216. Further IDC sections 220, 230 and 240 are included having similar openings in communication with similar slots. Behind each of the wire receiving slots such as 216, a relief area such as 217 is included to insure that when the conductor of the wire is moved into the terminating condition, the section adjacent to the end of the wire terminating slot 216 is not overstressed. As formed in Figure 3 the side edges 202 and 204 are brought towards each other until the shape of the terminal 200 is substantially cylindrical, although a small gap exists between their ends as explained more fully herein. It should be noted that the large wire openings 212 and 232 are opposed and in radial alignment with small wire openings 222 and 242, respectively.

Referring now to Figure 5, an insulative cap 300 is shown including a circular structural portion

302 with a driver nut portion 304 integrally molded above the circular portion 302. A partially cylindrical portion 306 is integrally formed with the cylindrical portion 302 and extends downwardly therefrom having stop edges 308 and 310. A rotation bar 313 is also included on the inner surface 315 of the cap and has a forward bearing surface such as 312. Two through openings 320 and 326 in the cap extend inwardly between an outer diameter 314 and an inner diameter 315.

To assemble the connector with the lower section of terminal as formed in Figure 3, the lower section 100 is inserted over the post 50 such that the opening created between side edges 110 and 112 (Figures 2 and 7) of the lower terminal fit over the lug 48 as shown in Figure 6. This prevents the rotation of the lower portion 100 of the terminal during the rotation of the upper terminal portion 200. The lower section of terminal 100 is placed adjacent to the outer diameter 52 of the post 50 and adjacent to the inner diameter 44 of the silo, as shown in Figure 9, with the wire terminating sections 126 and 132 extending beyond the surface 82 of the housing 80, as shown in Figure 9. This also places side edges 110 and 112 adjacent to the side edges of the lug 48 to ensure that the lower section 100 remains rotationally stationary relative to the housing 4. When the lower section 100 is inserted between the silo and post, the upper edge 102 of the terminal section 100 is flush with the upper edge 9 of the silo (Figure 6) such that large openings 170 and 180 of the lower section 100 are aligned with openings 12 and 56, and with openings 10 and 64 in the silo and inner post 50, respectively.

To further complete the assembly, the upper section of terminal 200 is inserted into the cap with the gap between side edges 202 and 204 of the terminal 200 slidably received between the rotation bar 313 (Figure 5) such that surface 202 abuts the bearing surface 313. In this manner, the outer diameter 252 (Figure 8) of the terminal 200 will be adjacent to the inner diameter 315 of the cap. It should also be noted that with the cap and terminal assembled as just described, the openings 320 and 326 in the cap are adjacent to and in alignment with, the large wire receiving openings 212 and 232 in the upper terminal section 200, respectively.

The cap 300 and the upper terminal portion 200 are then insertable within the individual silos between the inner surface 14 of the silos and between the outer surface 140 of the lower terminal portion. The cap 300 is placed in the silo such that the radial void between the edges 308 and 310 (Figure 5) of the cap are between the stop surfaces 18 and 20 within the interior of the silos, and more particularly with the edge 310 of the cap in an abutting relation with the stop surface 20 such that the detent member 330 on the exterior surface of the cap is between the detent member 22 and the stop surface 20. A cross-sectional view of this position is shown in Figure 4A. When the cap 300, and the upper 200 and lower 100 sections of terminal are in this first position, the left hand portion of the upper wire receiving opening 320 in the cap 300 is in alignment with the large wire opening 212 in the outer portion of the terminal. At the same time, the left hand portion of the upper wire receiving opening 320 is in alignment with the large wire receiving opening 170 in the lower terminal 100, and with the small wire receiving opening 150 in the terminal portion 100, and with small wire opening 222 in the terminal portion 200. Similarly, the left hand portion of the lower wire receiving opening 326 in the cap is in alignment with the openings 232, 180, 160 and 242. When the cap 302 and upper terminal portion 200 are placed within the silo such that the lower edge 316 of the section 302 is in an abutting relation with the top surface 9 of the silo, the slots 206 and 208 of the upper terminal portion are overlying the contact members 190 on the lower section of the terminal 100.

As shown in Figure 10, the connector 2 is then prepared for field use by inserting a plug 350 having a slit 352 through the center, communicating with an aperture 354. With the plug 350 wrapped around a multi-conductor cable, such as cable 360 in Figures 11 or 12, the plug 350 can be inserted within the U-shaped slot 84. Each of the discreet insulated wires are then terminated to the lower insulation displacement sections 126, 132 in a conventional manner. With the housing 4 in a configuration such that the caps 300 and terminals 100, 200 are facing downwardly, the upstanding side walls 80 of the housing 4 and the end walls form a cavity with the upstanding sidewalls of the housing higher than the protruding portions of the lower sections of terminals. To environmentally protect the lower terminations, an epoxy resin 370 is poured into the cavity to completely cover the insulation displacement portions 126, 132 and the individual discreet wires 362, as shown in Figure 12. The plug 350 retains the epoxy 370 in the cavity until the epoxy has cured and also acts as a strain relief member protecting the wire terminations from tensile force on the cable. The array is then ready for field pedestal installation, or for mounting within an enclosed aerial mounting box. The individual wires of the multi-conductor cable are then connected to corresponding wires of the phone company, either the buried cable or aerial drop wires.

With the connector in the configuration shown in Figure 4A, a further discreet wire can be terminated within the connector by inserting a discreet

wire such as 370 or 372 through either of the through openings 10 or 12 in the silo. If the wire is a large gauge wire, the wire will project into the connector into the interior of the post 50 as far as surfaces 58 to prevent the wire from passing through the post into the small wire terminating section. Rather, if the discreet wire to be terminated has a small gauge, the wire freely passes through the section 60 in the post, through the small wire openings 224, 244 and 150, 160 in both the upper and lower terminal sections, 100, 200, respectively and into the channel 116 as shown in phantom in Figure 4C.

To terminate the wire into one of the respective slots 216-246, the cap 300 is rotated in the clockwise direction as viewed in Figures 4A through 4C, and as the cap is first rotated, the detent 330 on the outer surface of the cap passes the detent 22 within the interior of the silo to the position shown in Figure 4B. Continued rotation of the cap continues the rotation of the upper terminal portion 200 until the cap is rotated to the position shown in Figure 4C where the detent 330 is locked behind the complementary detent section 32 on the silo. With the cap rotated to the position shown in Figure 4C, the upper section 200 of the terminal is rotated into the insulated wire such that the conductor inside the insulated wire is placed centrally within one of the wire receiving edges 216, 226, 236 or 246, depending on the gauge of wire, and depending upon which wire receiving opening, 10 or 12, the insulated wire was inserted through. It should be appreciated that the wire receiving edges 216 through 246 have gaps between them, slightly smaller than the diameter of the conductor to be terminated such that movement of the wire into the slot causes the leading edges 214 through 244 to sever through the insulation of the insulated conductor and place the bared conductor between the edges 216 through 246 in a contacting relation.

It should be appreciated that the post acts as a selector for the particular gauge of wire to be inserted within the terminal and it acts as a bearing surface for the anti-rotation of the wire during the termination of the wire. Further bearing surfaces are provided by the leading edges of the openings 170, 180, 150 and 160 in the lower terminal portion 100, and against the leading edges of the openings 12 and 10, and of the channel 16. It should also be noted from the progression of Figures 4A through 4C that the wire remains in a straight condition during the termination thereof. Finally, the two piece terminal allows one terminal portion 100 to be fixed, while allowing the second terminal portion 200 to rotate relative to the first portion 100, yet maintain electrical continuity between the two by virtue of the raised projections 190 on the terminal portions 100 being in contact with the slots 206 and 208 in the upper terminal portion 200. The upper 200 and lower 100 terminal portions are kept in electrical engagement by the close proximity of the respective concentric surfaces of the post 50, the inner terminal portion 100, the outer terminal portion 200, the inner and outer surfaces of the cylindrical portion 306 of the cap 300 and the inner surface 14 of the silo 6 or 8; as shown in the Figures 4A-4C.

Other embodiments of the invention are foreseeable without departing from the scope of the claims herein. For example, the two opposed slots 216, 226; and 236, 246 on opposite sides of the outer 200 terminal could be sized for terminating the same sized wire; thus instead of alternately terminating two wire sizes, the wire always protrudes through to the channel 16 and the wire is terminated within two slots, thereby providing for a redundant interconnection.

## Claims

1. An electrical terminal for the electrical interconnection to an insulated conductor (370,372), the terminal characterized in that:
a first section (100) of terminal of generally cylindrical shape having a first conductor connecting section; and
a second section (200) of terminal of generally cylindrical shape profiled for engagement with the first said section (100), the second section (200) including a wire receiving opening (212,232) through a wall of the section in communication with a wire receiving slot (216,236),
whereby, when a wire (370,372) is placed through the wire receiving opening (212,232) and proximate to the wire receiving slot (216,236), rotation of second section (200) of terminal rotates the second section (200) into the insulated conductor (370,372) and terminates the conductor of said wire within the slot (216,236) of the terminal.

2. The terminal of claim 1 further characterized in that the first and second sections (100,200) are engaged through raised detents (190) on one of the sections (100) against the other of said sections (200).

3. The terminal of claim 2 further characterized in that the other of said sections (200) includes a guide means (206,208) for receiving the detents (190) in a contacting relation, such that the rotation of the second said section (200) relative to the first said section (100) allows the detents (190) to travel within the guide means (206,208).

4. The terminal of claim 1 further characterized in that the first and second terminal sections (100,200) are engaged by means of outward projecting raised detents (190) on the first said section

(100) in contact with edges of a peripheral slot (206,208) in the second said section (200), the rotation of the second said section (200) relative to the first said section (100) causing the second said section (200) to engaging rotate relative to the first said section (100).

5. An electrical connector (2) of the insulation displacement type for the electrical termination of an insulated wire (370,372), the connector (2) comprising an insulative base member (4) comprising a floor with a post (50) upstanding from the floor, the post (50) having a through opening (56,64) for receipt of the insulative wire (370,372), at least partially therethrough, the electrical connector being characterized in that:
a first terminal section (100) is receivable over the post (50) with an interconnection means (132) to a conductive element (360), the first said section (100) being stationary relative to the base member (4);
a second terminal section (200) is electrically engageable with the first terminal section (100), the second terminal section (200) having a wire receiving opening (212,232) in communication with a conductor terminating slot (216,236), the wire receiving opening (212,232) being aligned with the through opening (56,64) in the post (50); and
means (300) are provided to rotate the second said terminal section (200) relative to the first said terminal section (100); whereby
when an insulated wire (370,372) is disposed within the wire receiving opening (212,232) and within the through opening (56,64) of the post (50), and the second terminal section (200) is rotated, the conductor receiving slot (216,232) is forced into electrical connection with the conductor of the insulated wire (370,372).

6. The connector (2) of claim 5 further characterized in that the second said terminal section (200) is receivable over the first said terminal section (100).

7. The connector (2) of claim 6 further characterized in that the rotation means (300) comprises a cap (300) of an insulative material which is operatively connected to the second said terminal section (200), such that rotation of the cap (300) rotates the second terminal section (200).

8. The connector (2) of claim 7 further characterized in that the first and second terminal section (100,200) are generally cylindrical in configuration.

9. The connector (2) of claim 8 further characterized in that the second terminal section (200) comprises a stamped and formed terminal where the free ends of the terminal are slightly spaced apart from one another.

10. The connector (2) of claim 9 further characterized in that the cap (300) includes a shoulder (312) extending longitudinally along an interior wall of the cap (300) for abutment with one of the free ends of the second terminal section (200), such that rotation of the cap (300) causes the shoulder (312) to drive the free end of the second terminal section.

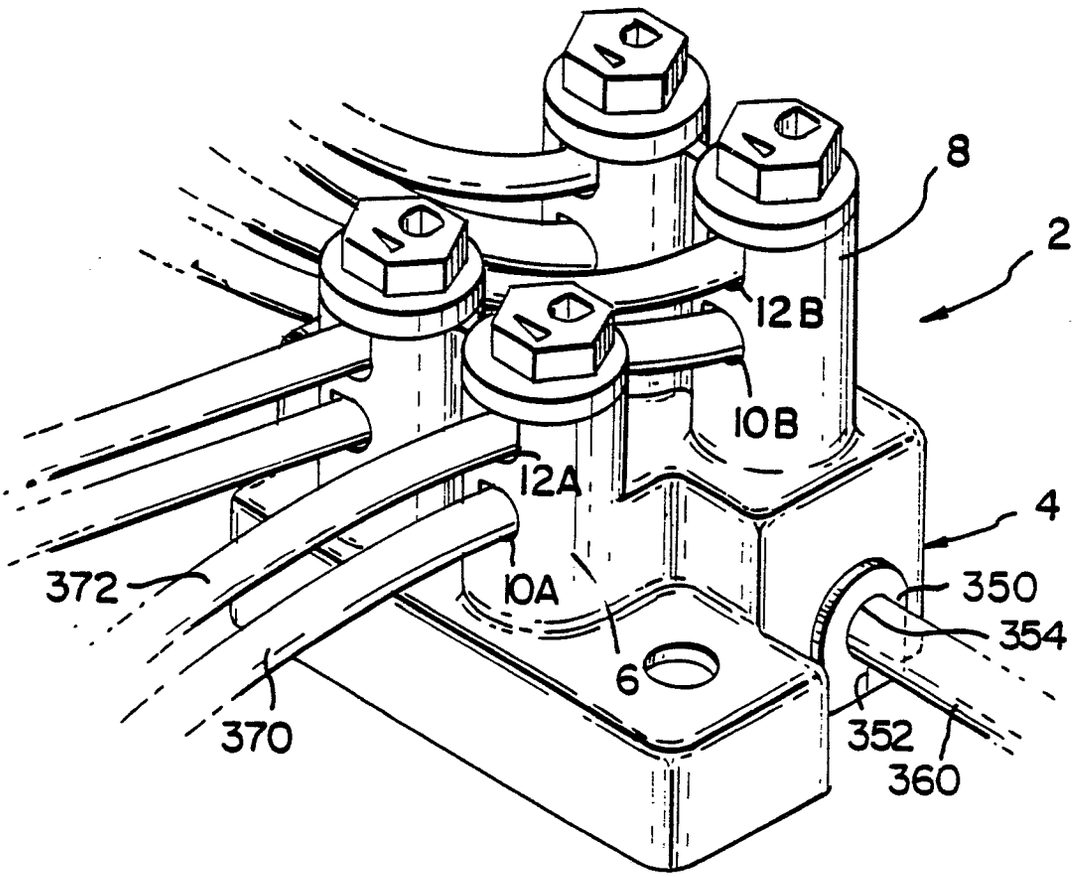
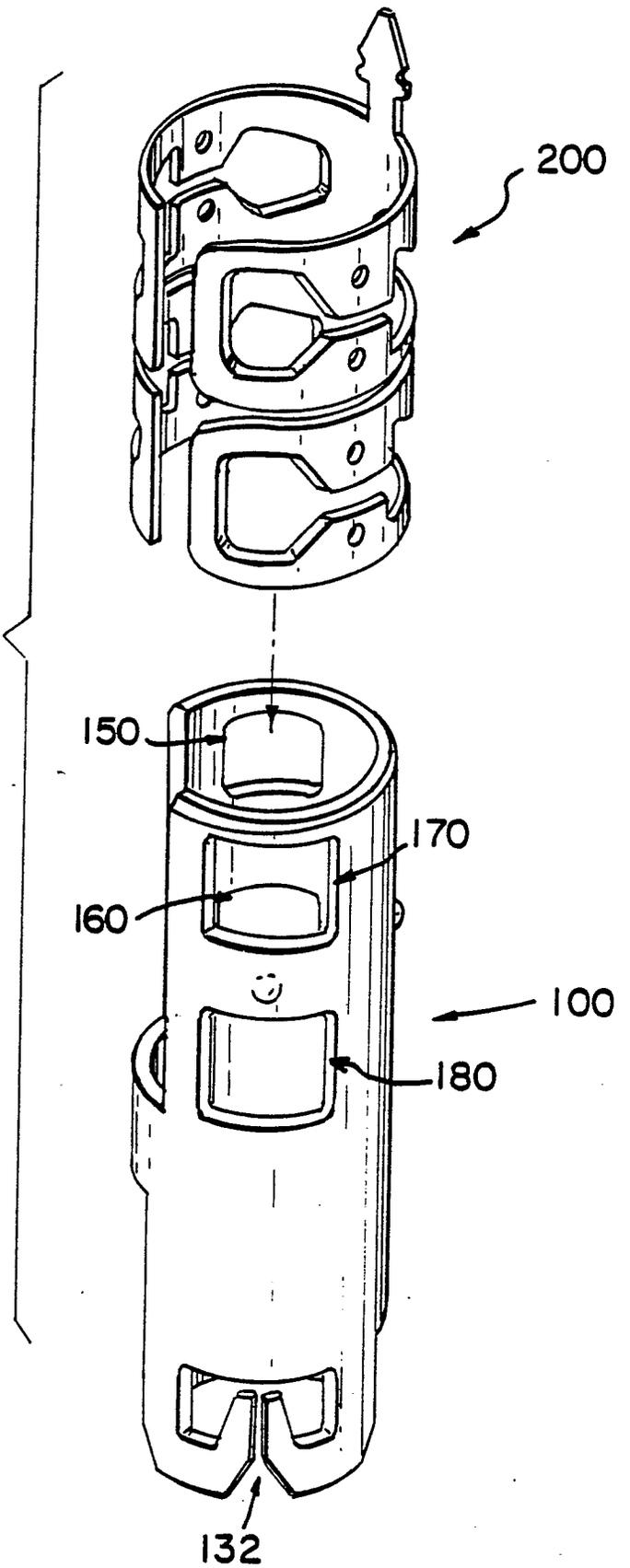
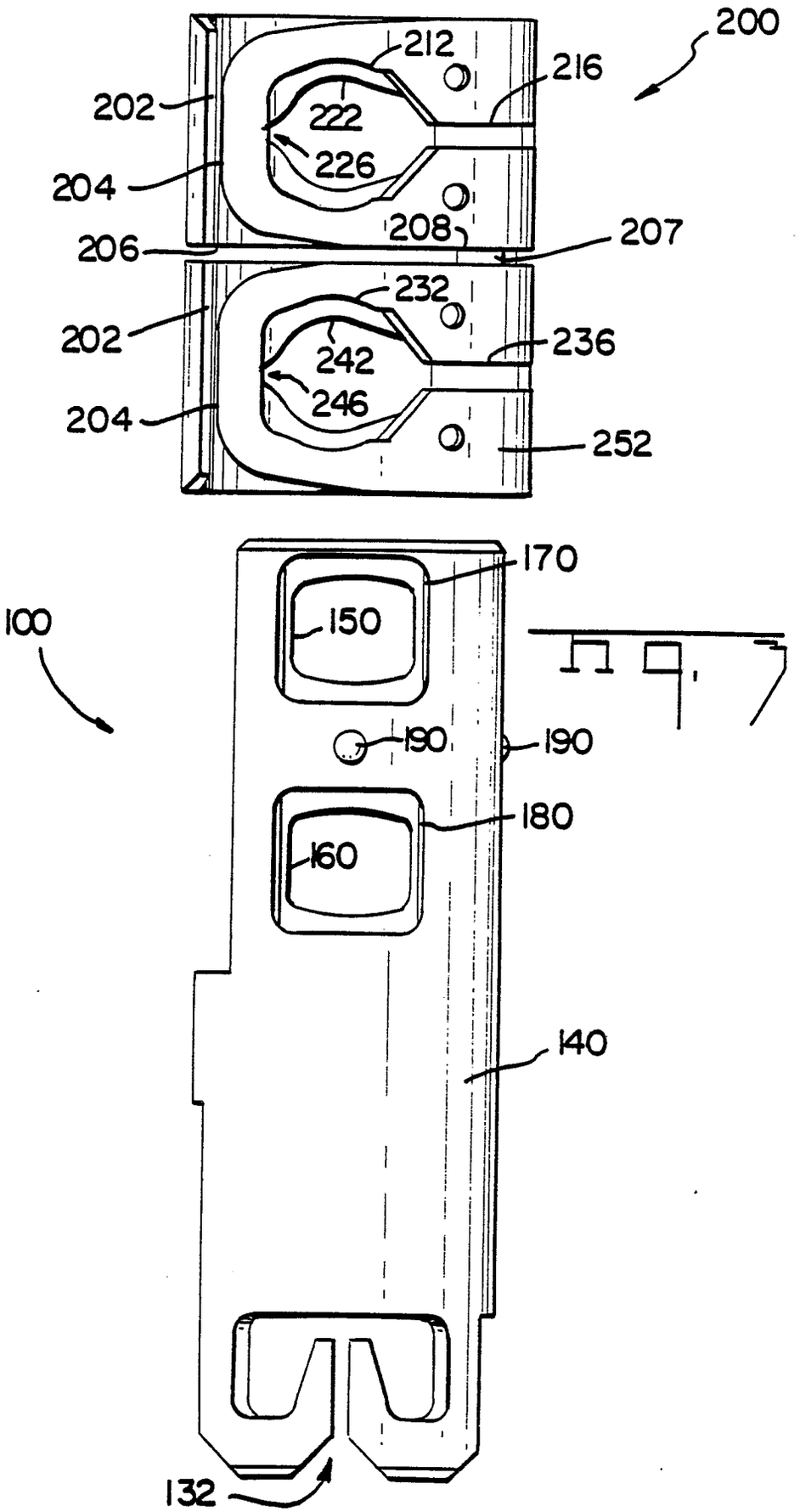



Fig. 1

Fig. 2

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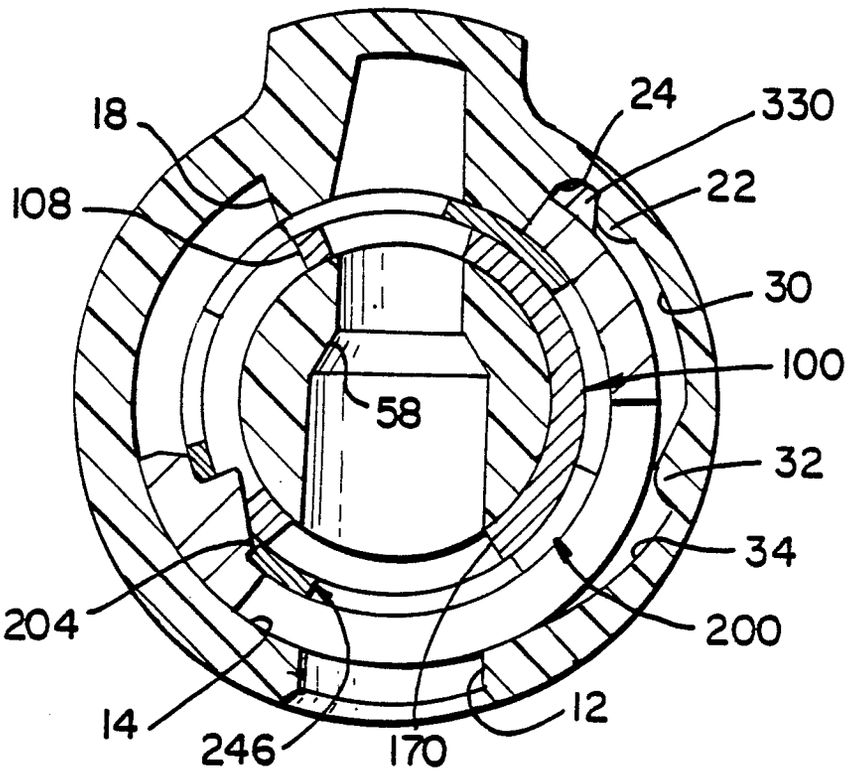


Fig. 4A

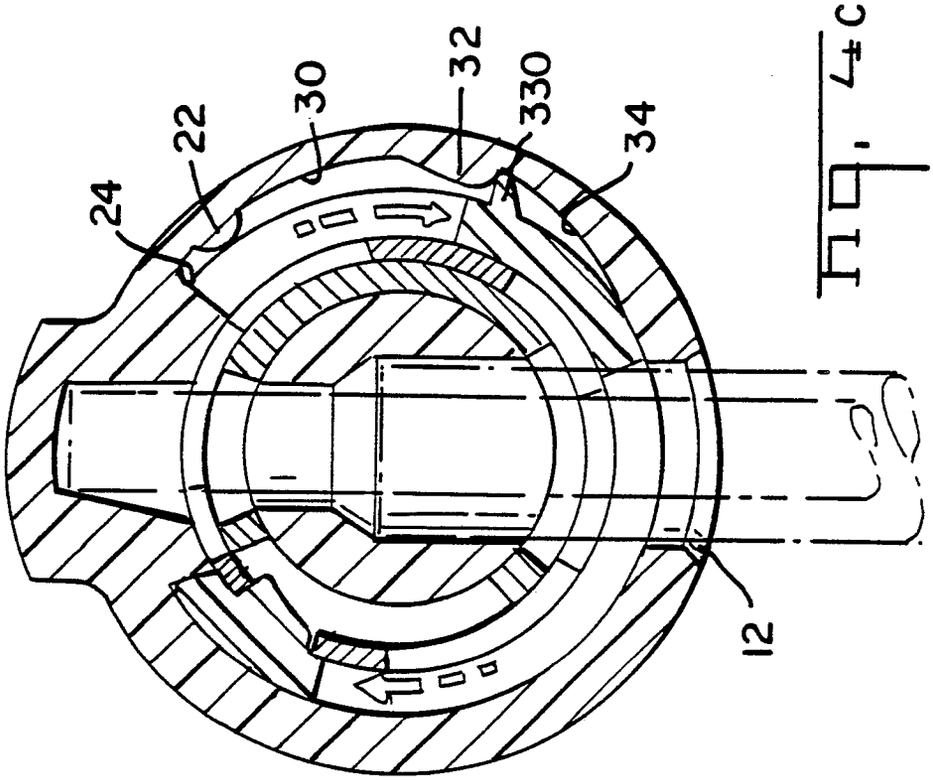


Fig. 4C

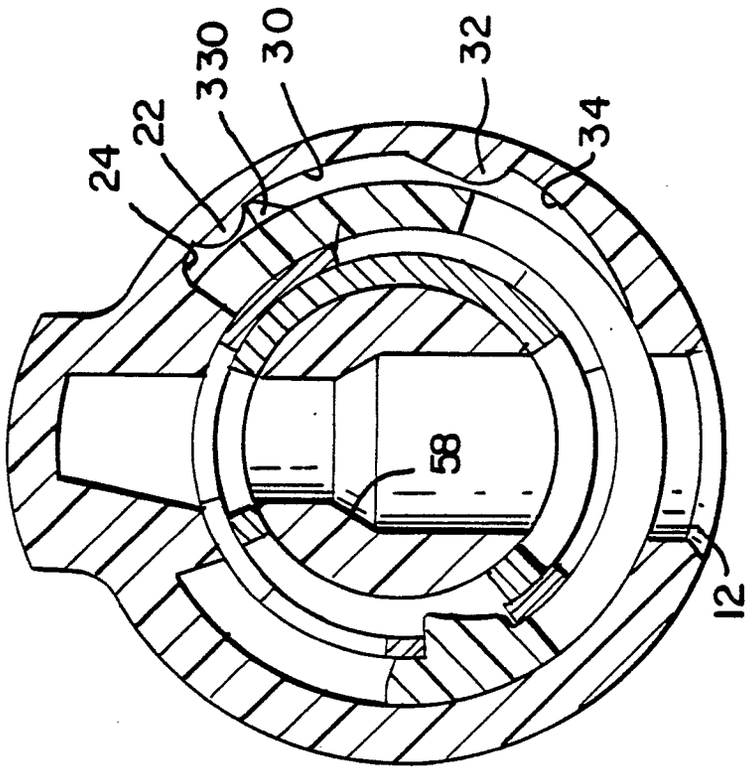


Fig. 4B

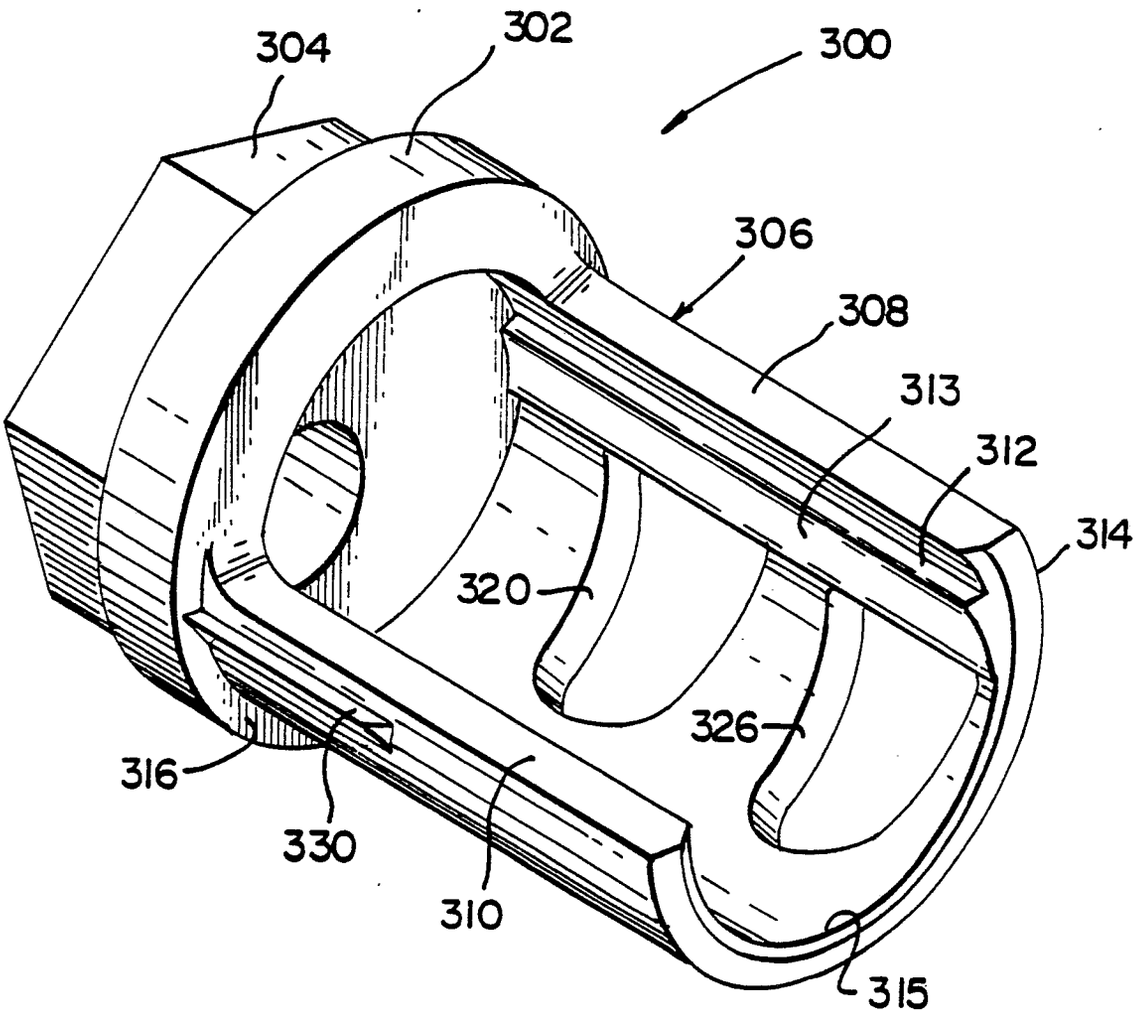


Fig. 5

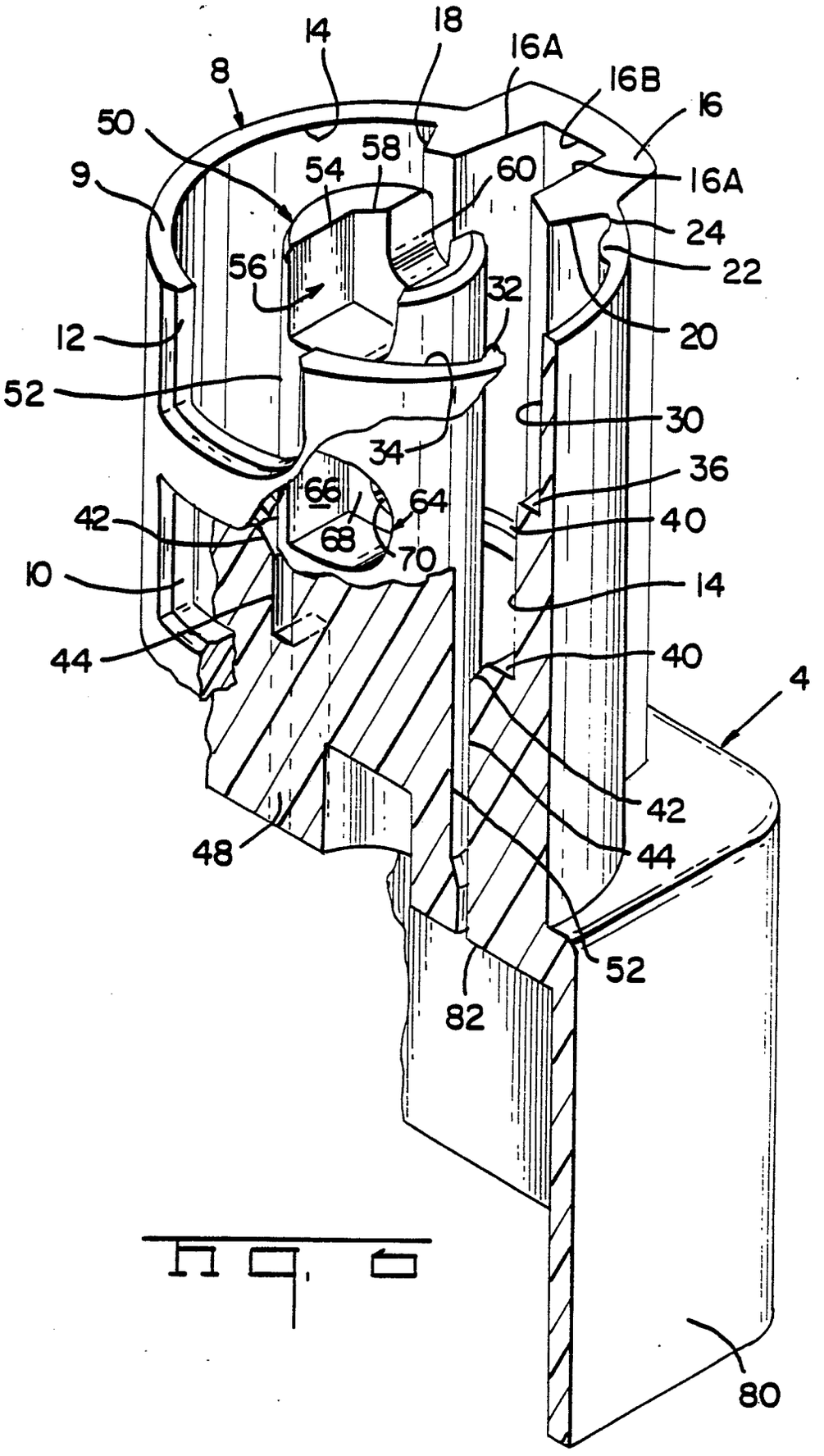
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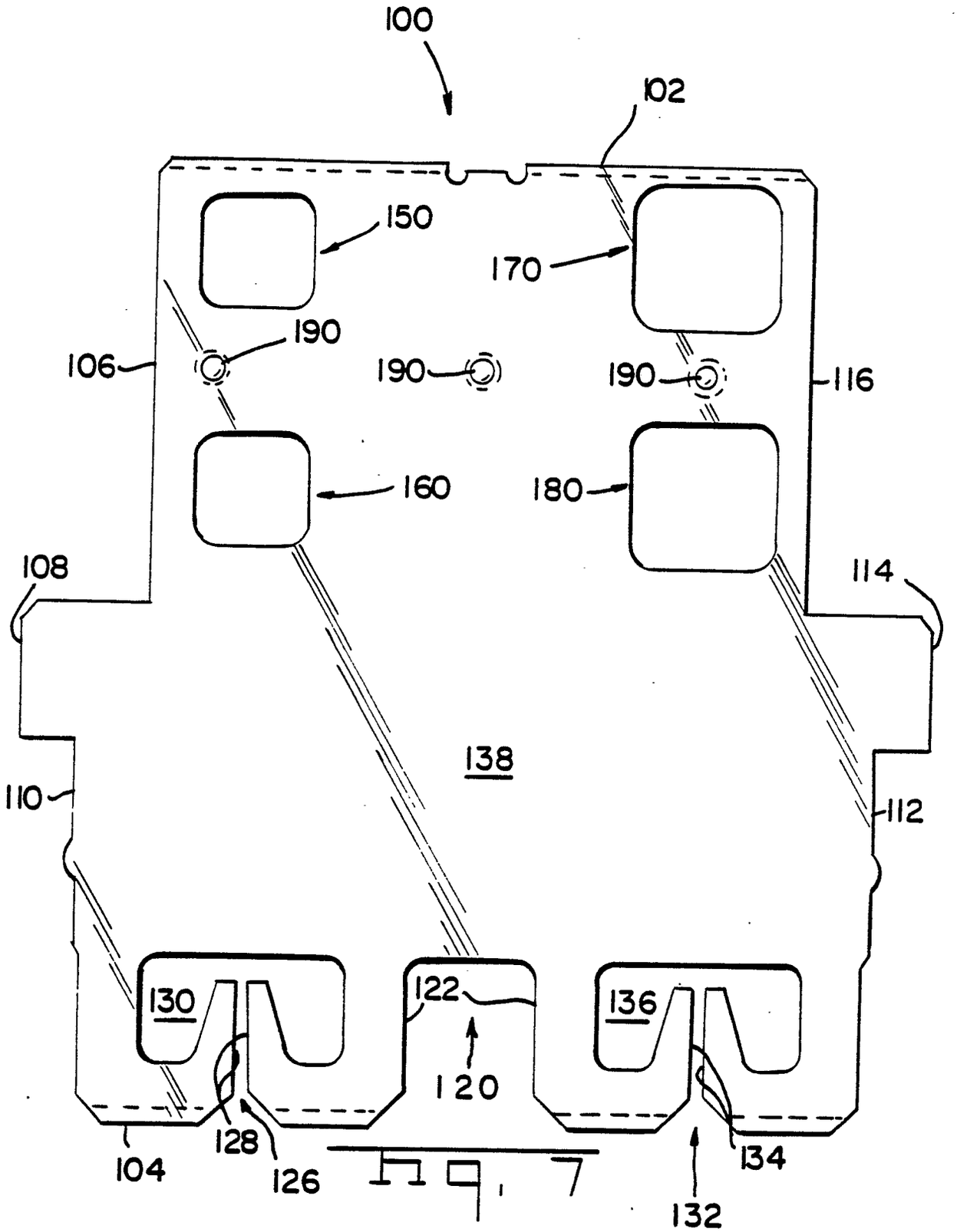
Fig. 1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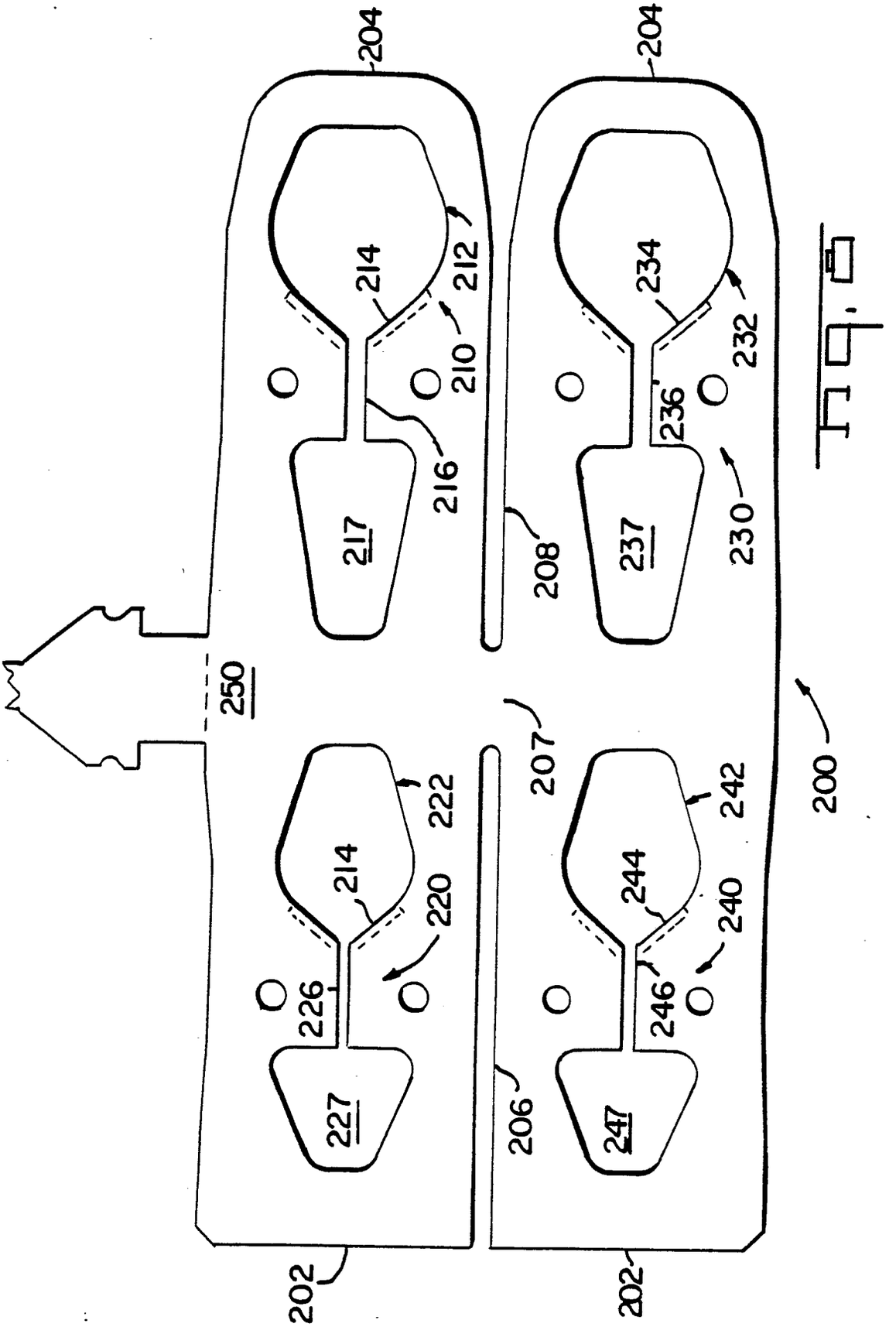
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Fig. 6

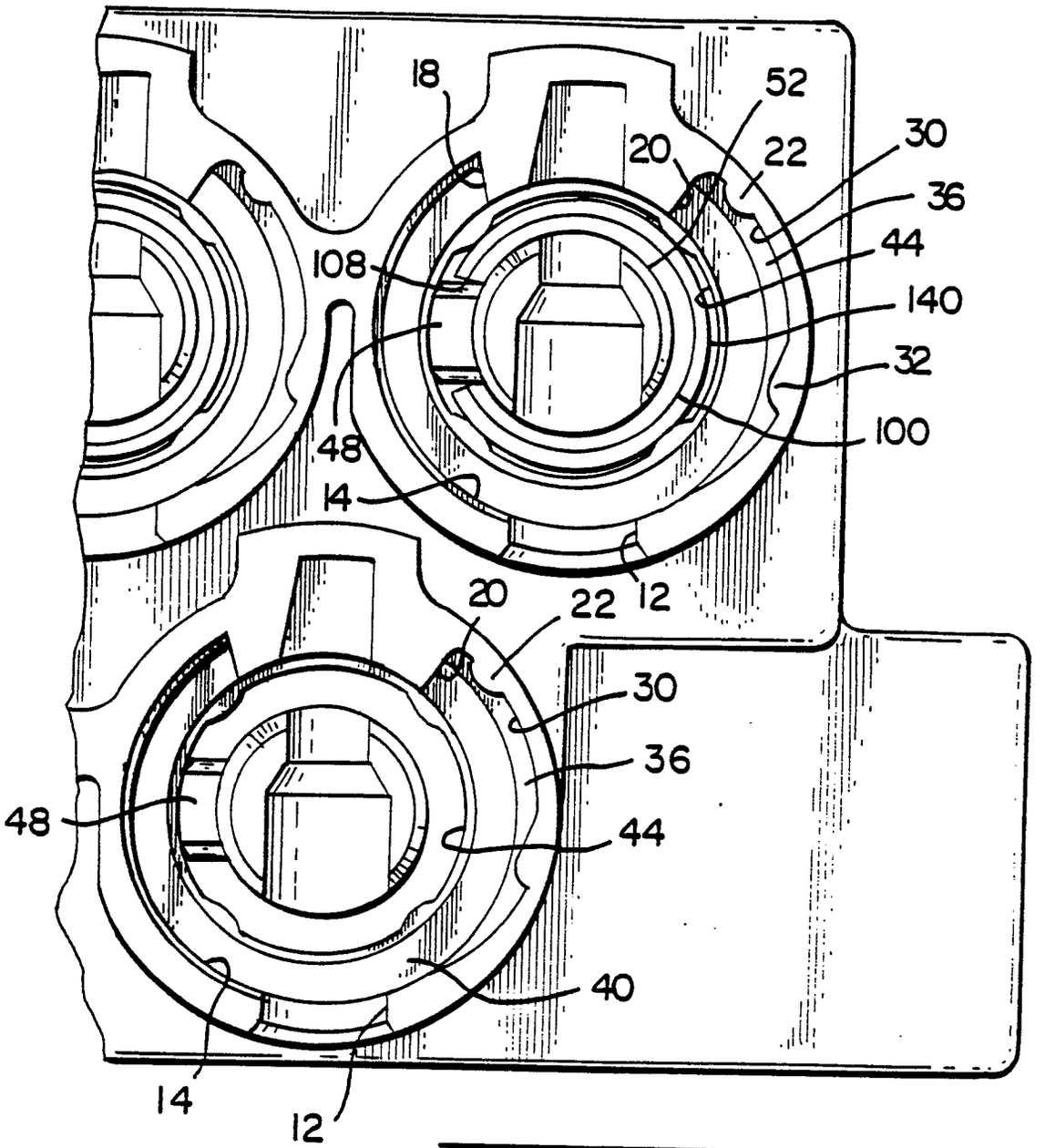



Fig. 9

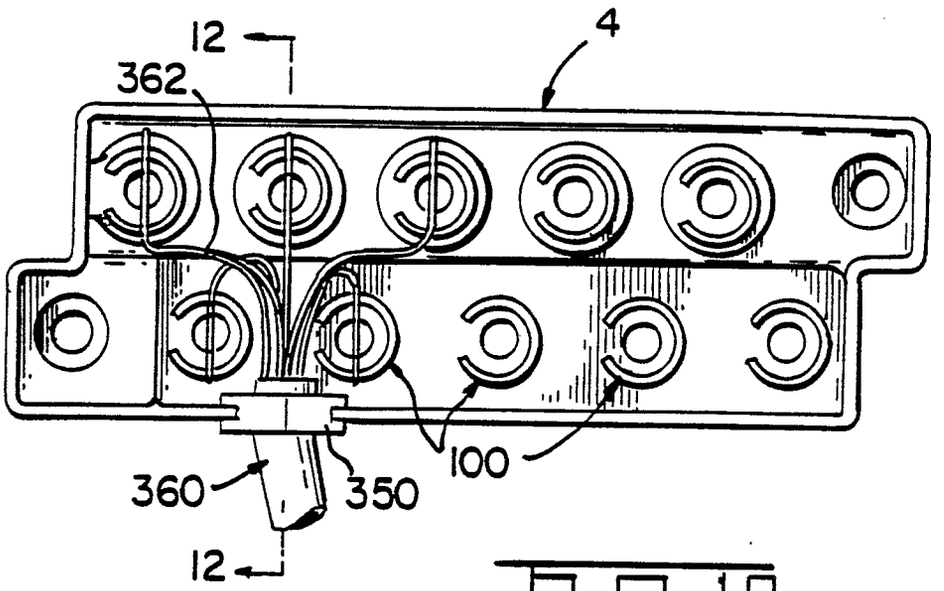
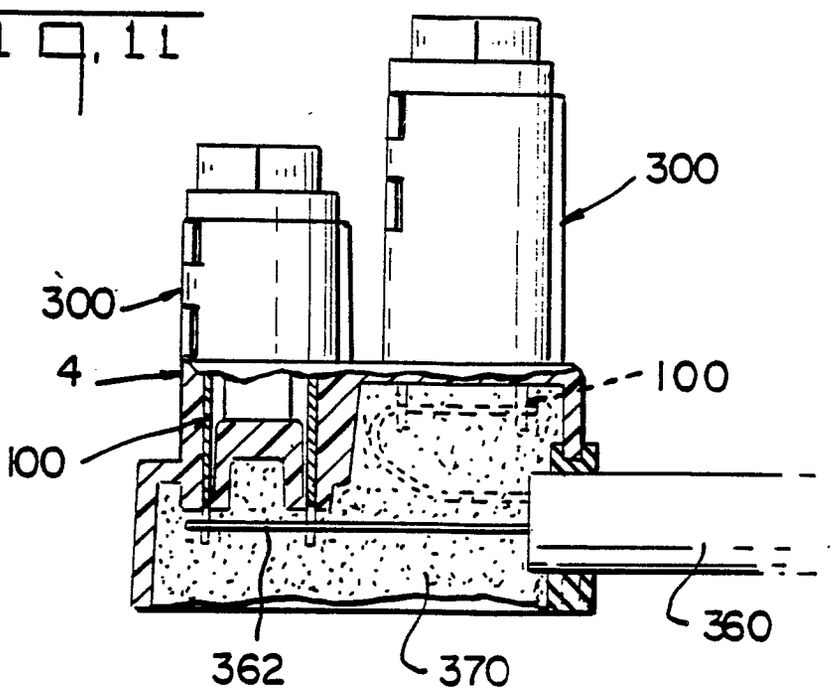



Fig. 10

Fig. 11



European Patent Office

# EUROPEAN SEARCH REPORT

Application Number

EP 89 30 5747

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.4) |
|---|---|---|---|
| A | DE-B-1640633 (KRONE KG.)<br>* column 2, line 55 - column 3, line 25; figure 1 * | 1, 5 | H01R4/24 |
| A | EP-A-0193512 (ADC TELECOMMUNICATIONS INC.)<br>* page 7, line 26 - page 8, line 37; figures 3, 5, 6, 12, 13 * | 1 | |

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

H01R

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 18 SEPTEMBER 1989 | HORAK A.L. |

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