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(54) Shielded data connector.

(57) An electrical shielded data connector includes an inner terminal support housing (46) carrying a plurality of electrical terminals such as (30) wherein the terminal support housing includes shield members (130) surrounding the terminal support housing (46). The shielded sub-assembly is insertable into an outer housing and is latchably attached therein and a rear support plate (95) and cable support member (110) can be assembled around a cable after the termination of the multi-conductor cable. The cable support member (110) can be positioned in one of two orientations to provide for either a straight through or an angled cable exit. A cross talk shield (200) is positioned in a stuffer cap and is situated between adjacent terminals (30) when in the final position. Another cross talk shield (220) is positioned in a slot intermediate the terminals (30) at the lower side thereof.

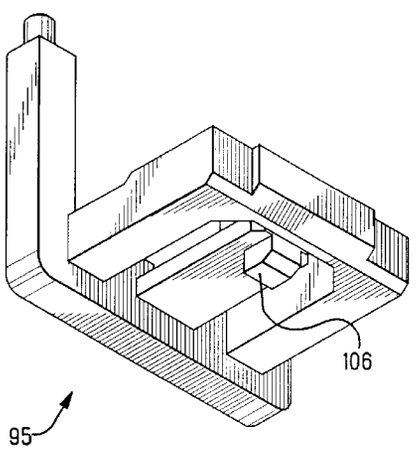

FIG. 7

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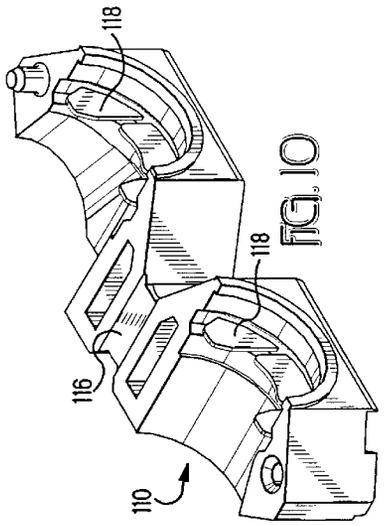
118
118
116
110

FIG. 10

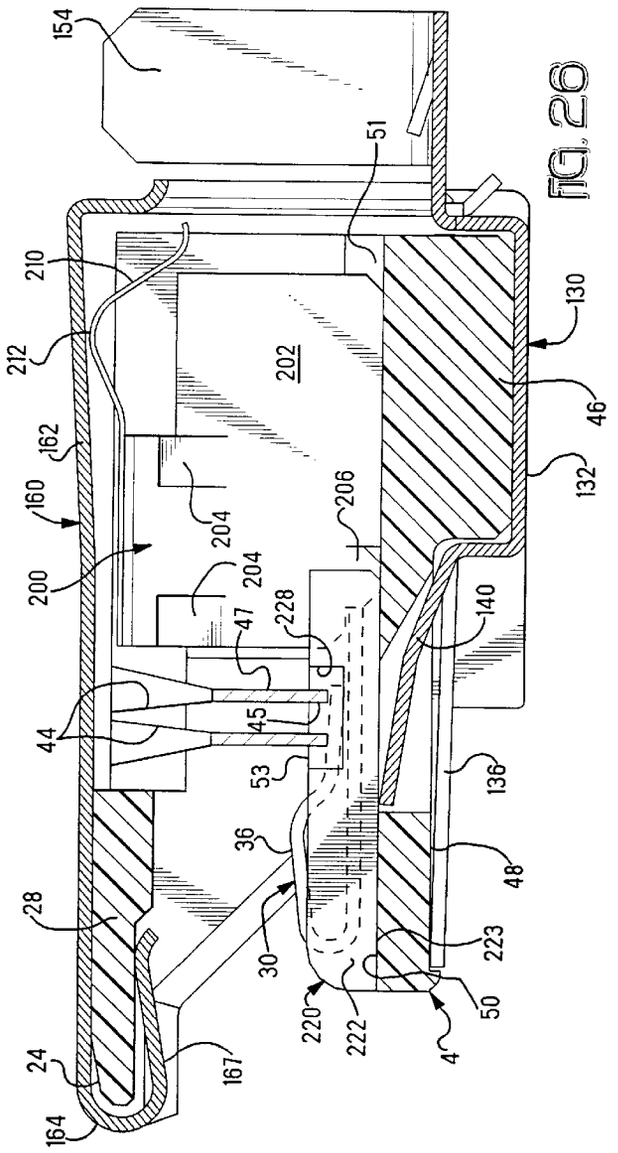
154
51
210
212
202
130
46
162
160
200
204
204
206
132
47
228
140
44
45
53
136
36
48
28
30
223
220
222
50
4
24
167
164

FIG. 2B

The subject invention relates to an improved shielded data connector for use in local area network connections.

U.S. Patent 4,501,459 discloses a local area network connector specifically for use in the data communications industry. These connectors can be employed in a closed loop data communications link in which various equipment such as computer terminals can be interconnected in a system. These connectors are specifically adapted for use in interconnecting numerous micro or mini computers in a micro computer network in an office environment. Connectors of this type have standard interface dimensions and configurations. These connectors must also be shielded to prevent the spurious electrical signals and noise from affecting the signals in the network. These connectors also require a shunting capability since the conductors are part of a network and can be connected in series with other similar connectors. This shunting capability is necessary to prevent disruption of a network when an individual plug is not connected to external equipment.

The structure and components of local area network connectors of this type is represented by the structure of the connectors shown in the before mentioned U.S. Patent 4,501,459. These connectors include a plurality of spring metal terminals having insulation displacement wire barrels for establishing electrical connection with the individual conductors forming the multi-conductor shielded cable. Terminals are positioned on a support housing and upper and lower shields can be positioned in surrounding relationship to the terminals and the support housing. Shield members are permanently attached to upper and lower cover members and the cover members are mated to both encapsulate the conductor and to cover the upper and lower shields to the cable shielding.

The above mentioned conventional shielded electrical connectors provide for shielding around the connector, to prevent adverse interference from exterior to the connector to signals being conducted within the connector. Such connectors have been widely used. Conventional connectors, however, do not address the possibility of signal cross-talk proximate the termination of each conductor, when the twisted pairs are no longer intertwined. Accordingly, while conventional connectors guard against signal interference from outside the connector, they do not include provisions for controlling cross-talk between signal conductors inside the connector.

In the conventional connector systems, four positions are established by four electrical terminals having wire connecting sections interconnected to the mating contact portions. Generally, two twisted pairs of conductors are interconnected to the terminals at the wire connecting sections, by untwisting the pairs for a short distance at their ends. As is well known, the twisting of the pairs eliminates cross talk between the signal pairs due to the inductance balance, thus, untwisting for a short distance eliminates the cross talk compensation provided by the twisting. The untwisting causes no problems at low frequency signals, but could cause interference between the pairs at higher frequencies.

It is an object of the invention then to provide a low cost shielded data connector where the assembly includes adequate EMI/RFI protection, as well as cross talk protection between the adjacent pair of signal contacts.

The objects of the invention have been accomplished by providing an electrical connector having an insulating housing carrying a plurality of electrical terminals where the terminals include a contact portion and a wire termination portion. The wire termination portion comprises a slot within a metal plate for insulation piercing electrical connection with the insulation wire and a stuffer cap for receiving more than one insulated wire where the cap is insertable over the wire termination portion for electrically connecting the wires to the terminal. The connector is characterized in that stuffer cap has a plate like member positioned intermediate at least two of the openings providing shielding between adjacent wires.

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

Figure 1 is an isometric view of the inner terminal support housing showing one of the terminals exploded away from the housing;

Figure 2 is a lower isometric view of the terminal support housing;

Figure 3 is a front plan view of the housing member shown in Figures 1 and 2;

Figure 4 is a lower plan view of the housing shown in Figure 1-3;

Figure 5 is an isometric view showing an outer housing for use with the housing shown in Figure 1-4;

Figure 6 is a cross-sectional view through lines 5-5 of Figure 5;

Figures 7 and 8 are isometric views of the backplate of the present invention;

Figure 9 is a side plan view of the backplate member shown in Figures 7 and 8;

Figures 10 and 11 are isometric views of the cable strain relief member used with the backplate of Figures 7 and 8;

Figure 12 is a side plan view of the strain relief member shown in Figure 11;

Figure 13 is an upper plan view of the lower shield member;

Figure 14 is a side plan view of the lower shield member shown in Figure 13;

Figure 15 is a side plan view of the upper shield member;

Figure 16 is a front plan view of the upper shield

member shown in Figure 15;
Figures 17 and 18 are isometric views of the stuffer cap of the present invention;
Figure 19 is a lower plan view of the stuffer cap shown in Figures 17 and 18;
Figure 20 is a side plan view of the cross talk shield used in conjunction with the stuffer cap shown in Figures 17-19;
Figure 21 is an upper plan view of the cross talk shield shown in Figure 20;
Figure 22 is an end view of the cross talk shield shown in Figure 20;
Figure 23 is a side plan view of the cross talk shield member found in the body member shown in Figures 1-4;
Figure 24 is an upper plan view of the cross talk member shown in Figure 23;
Figure 25 is a front end view of the cross talk shield shown in Figure 23;
Figure 26 is a cross-sectional view showing the cooperation of the cross talk shields with the associated upper and lower shield;
Figure 27 is an assembly view of the back plate and strain relief members;
Figure 28 is a view similar to that shown in Figure 27, but in the assembled condition;
Figure 29 and 30 are isometric views of a locking member;
Figure 31 is a rear isometric view of the fully assembled connector.
Figure 32 is an upper plan view of an alternate lower shield portion;
Figure 33 is a side plan view of the alternate shield shown in Figure 32;
Figure 34 is an end view of the alternate shield shown in Figures 32 and 33;
Figure 35 is an alternate shield usable with the lower shield member shown in Figures 32-34;
Figure 36 is a side plan view of the upper shield member shown in Figure 35;
Figure 37 is an end view of the shield member shown in Figure 36;
Figure 38 is a lower isometric view of the inner housing for use with the shield members of Figures 32-37; and
Figures 39-43 show an alternate embodiment of the top shield member.
Figure 44 depicts an exemplary electrical connector in accordance with the present invention, illustrated from an oblique view.
Figure 45 depicts the connector of Figure 44, illustrated in an exploded perspective view.
Figure 46 illustrates the stuffer cap and central shield member portion of the connector of Figure 45, illustrated from an oblique perspective view.
Figure 47 depicts the stuffer cap of Figure 46 along lines 47-47 of Figure 3, in combination with the central shield member depicted in phantom representation.
Figure 48 depicts the connector of Figure depicts the connector of Figures 44-47, from a front oblique view.

With reference now to Figure 1, the inner insulative housing 4 is shown as comprising a terminal support platform portion 16 having upstanding side walls 18, having recessed sections 19, where the terminal support platform 16 includes a plurality of terminal receiving slots at 20, and where the outer surfaces of the side walls 18 include notched portions 22. A hood portion 24 is shown spanning and interconnecting the two side walls 18 where the lower surface 26 of the hood portion 24 is interrupted by a longitudinally extending rib at 28 (Figures 1 and 2). Terminals 30 are shown as comprising a base portion 32 having a wire barrel portion 34 extending from one end thereof having a slot 35 for receiving a wire in insulation displacement relation, and a contact portion 36 extending from the opposite end of the base portion 32, where the contact portion has a stepped portion extending from the free end thereof. The terminal 30 also includes side tab portions 33 for positioning the terminals as will be described herein.

The terminal 30 is slidably receivable into a respective terminal receiving slot 20 (Figure 3) to a position where the contact portions 36 are adjacent to a front mating edge 40 of the terminal support housing 4, and positioned for mating interconnection with a complementary connector. The terminal support housing 4 further includes two slots 44 in which shunt bars which span the electrical terminals 30 and selectively contact the stepped portions 38 of alternate terminals to provide a closed loop electrical connection as shown in Figure 26 which is more fully disclosed in U.S. Patent 4,501,459. As shown in Figure 3, the terminal support housing 4 further includes a lower insulative block portion 46 positioned on a lower surface 48 of the terminal support housing.

As best shown in Figures 2 and 3, a channel 50 extends rearwardly through the front edge 52 of the housing member extending through the terminal platform portion 53, and is coincidental with channel portion 51 in the rear platform portion 16. Two other platforms 54 and 55 (Figure 3) extend on opposite sides of the central platform 53 and together with side wall portions 56 form the slots 20 having T-shaped openings 58 for receipt of the terminal base portions 32 including their side tabs 33 (Figure 1). As best shown in Figures 2 and 4, a window 60 extends through the lower surface 48 and extends upwardly deep enough to intersect with the slot 50 through the platform 53 as will be described in greater detail herein.

With reference now to Figures 5 and 6, the outer housing portion 70 includes a housing body portion 72 having upper and lower latch plates 74,76 attached thereto by way of an integral molded web allowing the latching plates to pivot about a transverse axis. It

should be noted that the latching plates 74 and 76 include hermaphroditic latching elements 78 and 80 which are conventional for this type of electrical data connector. As shown best in Figure 5, the body portion 72 includes a side wall 82 having openings 83 and 84 extending therethrough which are used for latching structures, as will be described in greater detail herein.

With reference now to Figures 7-9, a rear plate portion 95 includes frame support members 96 and 98 where the frame support member 96 includes a peg 99 and the support member 98 includes a complementary hole 100 for the peg 99. It should be appreciated that these support members 95 are profiled such that another identical support member 95 can be connected above the support member shown in Figure 8 and snapped together by way of the pegs 99 and holes 100. Side plates 102 are located intermediate the support members 96 and 98 and provide a latching arm 104 having an outwardly extending latching lug 106.

With reference now to Figures 10-12, the cable strain relief member at 110 includes halves 112 and 114 integrally molded together by way of a web of material 116 at the lower edge. Each of the strain relief members include flexible inner fingers 118 for compressibly gripping the cable to hold the cable from axial strain. The outer surfaces of the strain relief member includes two slots 120 and 122 which cooperate with the support members 96 and 98 to project the opening 124 in alternate directions.

With respect now to Figures 13 and 14, the lower shield member 130 includes a lower plate portion 132 having upwardly extending side wall portions 134. The lower plate portion 132 has shield tongues 136 extending forwardly from a front wall portion 138. As shown best in Figure 13, a grounding contact member 140 also extends forwardly from the wall portion 138 and is medially positioned between the contact tongues 136. Side wall portions 134 include latch elements 142 stamped out of wall portions 134 and tabs 146. A rear plate 148 extends upwardly from the plate portion 132 and includes tab members 150 on opposite sides thereof, as well as an integral clamp member 152 having crimp arms 154 for crimping to the braid of a shielded cable as will be described in greater detail herein. It should be appreciated that a generally cylindrical crimping ferrule is to be inserted over the crimp arms 154, to ensure a good ground connection.

With reference now to Figures 15 and 16, the upper shield member 160 includes an upper plate portion 162 having a forward hook section 164 where the hook section has a slot 166. The plate portion 162 includes a rear plate portion 168 extending rearwardly therefrom having a cable opening 170.

With reference now to Figures 17-19, a stuffer cap member 180 includes on the lower side thereof a plurality of terminal receiving portions 182 profiled to be slidably received over the barrel terminal 34 (Figure 1) and further includes posts 184 for moving the insulated wires into a terminated condition with the slots 35. The stuffer cap also includes a wire opening at 186 communicating with passageways 188 a-d formed by integral plate members 190a through 190c. A center support wall 192 includes a slot 194 extending through the lower portion of the stuffer cap 180, as well as through the upper portion as shown in Figure 18. As shown in Figure 18, the slot 194 includes an enlarged opening 196, which will be described in greater detail herein.

With reference now to Figures 20-22, a cross talk shield member 200 includes a plate portion 202 having side tabs 204 extending outwardly from one side thereof and a lower tab member 206 extending from the other side thereof, as shown best in Figure 22. A resilient contact member is formed by a folded over plate section 208 where the section 208 includes a resilient cantilever spring 210 extending outwardly thereof including a contact section 212. This shield member 200 is profiled to be received in the slot 194 of the stuffer cap 180, with the resilient contact member 210 extending over the cable opening 186.

With respect now to Figures 23-25, a further cross talk shield 220 is shown generally as an elongate plate 222 having a locking tab 224 at the front end thereof and a locking tab 226 intermediate its length. A notched portion 228 is located over the tab portion 226. This shield member 220 is profiled to be received in the slot 50 of housing 4.

With respect now to Figures 29 and 30, a lock member 250 comprises a frame member 252 having legs 254 extending integrally therefrom. The legs have locking shoulders 256 adjacent to ends thereof, and medially positioned detent members 257. A corner lock 258 together with a plate 260 provide a locking portion, as will be described herein.

With the above elements as described above, the connector is assembled as follows. The terminals 30 are slidably received in their respective slots 58 of housing 4, and moved forwardly until the locking lances are securely locked in place behind locking shoulders. The cross talk shield member 220 is then slidably receivable in the respective slot 50 to its fully rearward position as shown in Figure 26. With the terminals 30 and the cross talk shield 220 in the loaded position, the shorting bars 47 can now be positioned in the appropriate slots 44 and extend downwardly into the lower slot portions 45, as shown in Figures 1 and 26. It should be appreciated that the slot 228 in the cross talk shield 220 allows the transverse passage of the shorting bars 47 therethrough.

A shielded cable can now be prepared by stripping back the insulation, and separating the individual twisted conductors and placing the twisted pairs in respective openings 188a-188c of stuffer cap 180

with the free end of each wire extending into the associated tubular portion 182. The stuffer cap including the shielding plate member 200 can now be placed in the housing member 4 with the side lugs 197 cooperating with channels 23 in the housing side walls 18. This brings the conductor inside the insulated wire into electrical connection with the slot 35 in the barrel 34. The downward movement of the stuffer cap 180 also brings the shield member 200 into the position shown in Figure 26. The shield member 200 and the shield member 220 are laterally staggered, to prevent end to end abutment. However, to prevent the two shield members from edge stubbing, the cross talk shield 200 has a side foot 206 positioned at the leading edge, which, in the event of possible stubbing, will move the plate 202 sideways behind the shield 220, to the position shown in Figure 26.

The upper and lower shield members 160,130 can now be placed over the housing 4, with the lower portion being placed first over the housing 4 with the plate portion 132 residing against the lower portion 46 and with the contact tongues 136 placed adjacent to the lower surface 48. This positions contact member 140 of the lower shield member 130 in the window 60 in the lower housing portion and into resilient contact with a lower edge 223 of the cross talk shield member 220 as shown in Figure 26. The upper shield member 160 can now be placed over the housing 4 with the front hook portion 164 engaging the front hood member 24 and with the individual contact tongue portions 167 (Figure 16) extending intermediate the center rib 28. The upper shield member 160 is in its fully locked position when the rear plate portion 168 is positioned behind the tab members 155 of the lower shield member 130 (Figure 13), and the upper plate portion 162 is positioned below the tab members 156. When in the full locked position, the side plate portions 169 fit inside the sidewalls 134, into the recesses 19 of housing 4 to cover the shield windows created by the latches. It should be appreciated that the resilient contact member 210 extends above the top surface of the stuffer cap, thus downward movement of the upper shield member 160 into its fully locked position, brings the upper plate portion 162 into ground contact with the contact member 212 on the cross talk shield 200. It should be appreciated from Figure 26 that the contact portions 36 of contacts 30 are substantially shielded against cross talk along their length, and their terminal barrel portions 35 as well as the signal pairs are prevented from cross talk by the cross talk shield member 200.

The assembly can be completed by crimping the arms 154 on the lower shield member to bring the shield arms into a crimp condition with the shielding braid of the shielded cable, which also commons the cross talk shield members 220 and 200 to the shielding braid. The shielded sub-assembly as described above is then insertable into the housing member 70 (Figures 5 and 6) through the rear side thereof until the housing 4 abuts the forward lip 85, whereupon the latches 142 are snapped in place within respective apertures 84. The strain relief member 110 (Figures 27, 28) is then assembled over the shielded cable and together with assembled support members 95 (Figures 7-9) are moved into a fully locked position where latch 106 engages in the window 83 of the housing member 70 to provide a strain relief to the cable as well as retain the shielded sub-assembly inside the housing 4.

The cooperation of the strain relief member 110 with the rear plate members 95, is shown in Figures 27 and 28. The locking member 250 (Figures 29 and 30) can now be assembled into the position shown in Figure 31, where the corner locks 258 overlap the rear edges 75 (Figure 5) to prevent movement of the latching plates 74,76. The legs 254 are slidably received between the latching plates 74 and 76, and when in the locked position, the latch shoulders are snapped against the webs 73 (Figure 5). In this position the latch plates cannot be moved either upwardly or downwardly.

With respect now to Figures 32-34, an alternate lower shielding member 330 is shown having a base plate portion 332 having upwardly extending sidewalls 334 formed at a right angle thereto with shielding tongues 336 extending forwardly from the plate portion 332 by way of an intermediate wall 338. A central tongue 340 extending intermediate tongue portions 336 has a bent up plate portion 320 which forms the analogous shield member as member 220 in Figure 23. The shield member 320 also includes a notch 328 for the transverse positioning of the shunting bars 46 as shown earlier in Figure 26. The shield member 330 further includes tabs 342, 344, 346, 350, 356, and 355 which function as previously described. The lower shield member 330 also includes an integral clamp member 352 having two upstanding crimpable arms 354 as best shown in Figures 33 and 34.

With respect now to Figures 35-37, the upper shield member 360 includes an upper plate portion 362 having a forward hook section 364. A notch 366 spans the front post portion 28 of housing 4 as previously described. The contact portions 367 are thereby positioned against the surface 26 (Figure 2) as previously described with respect to shield member 160. The shield member 360 further includes a rear plate portion 368 having an opening 370 for receiving the shielded cable, and integral shielding arms 371 extending rearwardly from the opening 370. The arms 371 are profiled to be received in a downward movement between the two arms 354 to reside adjacent to the shielded cable to be terminated. The arms 354 are crimped around the arms 371 by use of a locking ring 400 thereby assuring intimate contact between the arms 354, 371 and the shielded cable to be terminated.

The shield members 330, 360 are assembled to the inner housing 404 (Figure 38) in an identical manner as that previously described, except that the shield 330 has an integral shield plate 320, and therefore is placed in a slot 450 of a bottom member 448 of the inner housing 404. This places the integral shield member 320 in the same position as that shown in Figure 26.

As shown in Figures 39-43, an alternate top shield member 460 can be provided having a top plate portion 462 having a front hook section 464 and a rear plate portion 468. The rear plate 468 includes side flaps at 469 extending forwardly therefrom, and an integral shroud 470 surrounding an opening for the shielded cable. Integral ground contacts arms 471 extend from the rear plate portion 468 for crimped engagement with the shielding braid of a shielded cable, as described above.

In this embodiment of the top shield member 460, an integral cross-talk shield 480 is provided by a strap portion 482 extending integrally from a side edge 484 and folded flush with the top plate member 462 as shown best in the side plan view of Figure 39 and the lower plan view of Figure 43. The top shield member 460 shown in Figures 39-43 is usable with any of the lower shield member described herein, and is also usable with the stuffer cap 180 as described with reference to Figures 17-19, the integral cross-talk shield 480 being receivable within the slot 194 of the stuffer cap 180.

Referring now to Figure 44, therein is shown an exemplary electrical connector 500, in accordance with the present invention. Electrical connector 500 is a data connector having many component portions generally as described in U.S. Patent No. 4, 449,778, and in U.S. Patent No. Re. 32,760. The specification of U.S. Patent Nos. 4,449,778 and Re. 32,760 are hereby incorporated herein by reference for all purposes. Electrical connector 500 is of hermaphroditic construction and is thereby designed to mate with an identical, relatively inverted, connector.

Referring now also to Figure 45, connector 500 includes an upper cover 512 and a lower cover 514. Upper cover 512 and lower cover 514 are configured to cooperatively engage one another. When engaged, in the manner depicted in Fig. 44, upper and lower covers 512, 514 form a housing assembly. Both covers 512, 514 will preferably be formed of an insulating material, such as an insulating plastic. Connector 500 also includes an upper cable clamping ground shield 516 and a lower cable clamping ground shield 518, each of which will lie substantially within the assembled housing of connector 500. Connector 500 further includes a terminal housing 520 and a stuffer cap 522. Shown associated with stuffer cap 522 is central shield 524 and a cable 526. Cable 526 is of a type particularly suitable for use with electrical connector 500. Cable 526 includes two pairs of conductors 528, 530, the conductors of each pair being twisted together within the cable in a manner well-known to the art. The two twisted pairs 528, 530 are within a shielding braid 532, within a jacket 534 of cable 526. Cable 526 also includes a bushing 536, to facilitate clamping of the cable and shield within connector 500.

Terminal housing 520 is preferably molded of a plastics material and includes a terminal platform 540 extending between forward, mating, and rear, wire connecting, faces of the housing. Terminal platform 540 includes a plurality of parallel channels 542 which extend forwardly across terminal platform 540 and define undercut terminal supporting ribs 544. Sidewalls 546 and 548 extend upwardly from opposite sides of terminal supporting platform 540 and are joined proximate the front end of housing by a transverse hoods 550. Sidewalls 546 and 548 each include internal, generally vertical, locating ribs, 552 and 554, respectively, and further include external generally vertically extending sidewall portions 556 and 558, respectively. Extending at the rear sides of terminal housing 520 are removable aperture plug segments 614, 616. Aperture plug segments 614, 616 are adapted to occupy side recesses 615a, 615b, and 617a (617b not depicted) in upper cover 512 and lower cover 514.

A plurality of terminals, 560, are retained on terminal platform 540 of terminal housing 520. These terminals 560 will each include a body portion 654 coupled to a reversely bent contact portion 562 which will extend proximate the forward mating end of terminal platform 540 (as depicted in Fig. 48). Each terminal 560 also includes a wire receiving barrel portion 565 constructed generally in accordance with U.S. Patent No. 3,860,318, the disclosure of which is hereby incorporated herein by reference for all purposes.

Upper and lower shields 516 and 518, respectively, are each preferably formed of a single piece of sheet metal. Upper shield 516 includes a body portion 570 and downwardly extending side flanges 572 and 574. Upper shields 516 also includes a forward bifurcated contact portion, 580, having a pair of contact tabs 582 with upturned contact surfaces 584 at their forward ends. Side flanges 572 and 574 each include a semicircular cable receiving recess 576. Cable receiving recesses 576 facilitate the connection of a cable from the side of the connector, as depicted in Fig. 44. This is accomplished in a known manner, through the removal of the appropriate aperture plug segment 614, 616 to facilitate coupling of cable 526 to covers 512, 514.

As is also apparent from the drawings, connector 500 may also accommodate a cable extending axially from the connector, in the general relationship depicted in Fig. 45. Where axial cable entry is not utilized, a rear cover 619, having an approximately sized detention insert 621 will be placed in recesses 623a, 623b in upper and lower covers 512, 514. To accom-

modate such an axial connection, a braid contacting tab 578 extends from a rearward portion of shield body 570.

Lower shield 518 includes a body member 590 having generally upwardly extending side flanges 592 and 594, and generally upwardly extending rear flanges 596, 598. Cable receiving apertures 600 and 602 are defined on each side; between side flange 594 and rear flange 598 on one side, and between side flange 592 and rear flange 596 on the other side. Additionally, a rear cable receiving aperture 604 is defined between rear flanges 596 and 598. It will be noted that each side flange 592 and 594, and each rear flange 596 and 598 include inwardly extending flanges to facilitate mechanical and electrical contact with cable braid 532.

Lower shield flanges 592, 594, 596, and 598 each include side detent flanges 606, 608, 610, and 612, respectively, adapted to engage receiving apertures 586, in flanges 572 and 574 of upper shield 516. This mechanism assures both mechanical and electrical connection between the two shields when connector 500 is assembled.

Stuffer cap 522 is preferably molded of a generally non-conductive, stiffy flexible plastic material, and includes a plurality of internal partition walls which define wire receiving passageways which extend between gripping flanges 620. Included within stuffer cap 522 are a plurality of barrel receiving portions, having wire engaging projections of the type generally described in U.S. Patent No. 4,186,984, the disclosure of which is incorporated herein by reference for all purposes. Stuffer cap 522 cooperates with electrical contact barrel portions 565 to form a terminal assembly which mechanically and electrically terminates the conductors.

Referring now also to Figs. 46 and 47, therein it can be seen that stuffer cap 522 includes a generally centrally placed slot 622. Slot 622 is placed between central barrel receiving portions of stuffer cap 522, generally proximate the areas 624 and 626. These barrel receiving portions are, however, electrically isolated, through the body of stuffer cap 522, from slot 622. When connector 500 is assembled, central shield 524 will be placed in cooperative engagement with stuffer cap 522 through slot 622. Central shield 524 is a conductive member, preferably formed of sheet metal. Central shield 524 includes a front portion 628, which is separated from a central portion 630, having a greater vertical dimension, by a notch 632. Notch 632 is configured to fit over a rear web 634 extending across slot 622 in stuffer cap 522. Front portion 628 of central shield 524 is configured to extend proximate the entire vertical dimension of stuffer cap 522, when notch 632 engages web 634. Extending above a generally central portion of central shield 524 are a plurality of generally resilient tabs 636. Central shield 524, including tabs 636, is configured such that when connector 500 is assembled, tabs 636 will make mechanical and electrical contact with the lower side of upper shield 516, and the lower surface of central portion 630 will extend proximate the rear surface of terminal platform 540 and proximate lower shield 518.

In the depicted exemplary preferred embodiment of central shield 524, shield 524 includes a rear "rudder" portion 638, which extends from central portion 630, but which is flexibly arranged through upper and lower separation notches 640 and 642. The flexible attachment of rudder portion 638 to central portion 630 facilitates the bending, and resulting variable placement, of rudder portion 638 in any desired orientation relative to the termination of cable 526 in connector 500. This facilitates maintaining central shield 524 between pairs of signal carrying conductors 528, 530 regardless of the location at which cable 526 terminates in connector 500 (i.e., on a side, as depicted in Fig. 44, or axially, as generally depicted in Fig. 45.)

As depicted in Fig. 45, twisted pair conductors 528 and 530 extend beyond braided sheath 532 to facilitate their termination. Central shield 524 extends between the pairs of conductors to provide a ground potential shield therebetween to minimize cross-talk between the conductors. The engagement of tabs 636 with upper shield 516, serves to continue the ground potential shield of braided sheath 532 not only through the connector enclosure as formed by upper shield 516 and lower shield 518, but also to essentially surround each conductor pair within a ground potential enclosure through the interaction of central shield 524 with upper shield 516. The extension of front portion 128 of central shield 524 through stuffer cap 522 continues this enclosure of each conductor pair through the complete termination of the pair at the barrel portion 565 of each terminal.

Referring now to Fig. 48, therein is depicted a front view of terminal housing 520, lower shield 518 and lower body member 514. Electrical contact terminal end contact portions 562 each include a forwardly extending base portion 654 which is reversely bent proximate a forward extent 656 to form a resilient contact tongue 658. As can be seen from this view, terminal housing 520 includes a central slot 650 extending between the base portions 654 of terminal end contact portions 562. Slot 650 serves to establish an air gap between the terminals associated with each conductive pair, and to thereby reduce dielectric coupling between terminals. This reduction in dielectric coupling serves to further reduce signal cross-talk between the contact portions. Slot 650 may be extended rearwardly virtually any desired distance which is consistent with the strength of the material utilized for terminal housing 520 and the strength requirements for the connector. Preferably, slot 650 will extend rearwardly as close as possible to the forward

most extension of central shield 524.

Claims

1. A shielded electrical connector for data transmission, having an insulating housing (4, 404, 520) carrying at least two signal contacts (30, 560), where said contacts (30, 560) include forward contact sections (36, 658) and rear wire connecting sections (34, 565), the connector further comprising outer shielding means (130, 160; 330, 360; 460; 516, 518) in at least a partially surrounding relation with said housing (4, 404, 520), said connector being characterized in that cross talk shield means (200, 220, 320, 480, 524) is disposed between said at least two electrical contacts (30, 560), and electrically connected to said shielding means (130, 160; 330, 360; 460; 516, 518).

2. The electrical connector of claim 1, characterized in that said housing (4, 404, 520) includes an axially extending slot (50, 450, 622) positioned between said at least two terminals (30, 560) which receives said cross talk shield means (200, 220, 320, 480, 524).

3. The electrical connector of claims 1 or 2, characterized in that a slot (450) extends through a lower surface (448) of said housing (404), and said cross talk shield means (320) is positioned in said slot, intermediate said terminals.

4. The electrical connector of any of claims 1-3, characterized in that said cross talk shield means (320) is integral with said outer shielding means (330).

5. The electrical connector of any of claims 1-4, characterized in that said outer shielding means is comprised of upper (160, 360, 460, 516) and lower (130, 330, 518) sections.

6. The electrical connector of claim 5, characterized in that said lower section (130, 330) includes shielding wing portions (136, 336) extending forwardly from a base section (132, 332), with a tongue section (140, 340) extending forwardly from the base section (132, 332) intermediate to said wing portions (136, 336).

7. The electrical connector of any of claims 1-5, characterized in that said cross talk shield means (220) is a discrete member positioned in said slot (50), and said tongue section (140) forms a contact arm for contact with said cross talk shield means (220), through an opening (60).

8. The electrical connector of any of claims 2-5, characterized in that said cross talk shield means (320) is integral with said tongue section, 340) said cross talk shield means (320) being folded upright along a longitudinal axis for positioning in said slot (450).

9. The electrical connector of any of claims 1-8 characterized in that said wire connecting sections are insulation displacing contacts, and said connector further comprises a stuffer cap (180, 522) having an intermediate slot (194, 622) for receipt of said cross talk shield means (200, 480, 524).

10. The electrical connector of claim 9, characterized in that said cross talk shield means (200) is a discrete member, including an upper contact portion (212) which cooperates with an inner surface of said upper shield member (160) for grounding contact therewith.

11. The electrical connector of claim 9, characterized in that said cross talk shield means (480) is integrally formed with said upper shield member (460).

12. The electrical connector of claim 1, characterized in that said cross talk shield means (200, 220) is comprised of upper and lower cross talk shield sections, said upper cross talk shield section (200) being electrically connected to an upper section (160) of said shielding means, and said lower cross talk shield section (220) being electrically connected to a lower section (130) of said shielding means.

13. The electrical connector of claim 12, characterized in that said housing (4, 404) includes an axially extending slot (50, 450) positioned between at least two terminals (30) which receives said lower section of said cross talk shield means (220, 320).

14. The electrical connector of claim 13, characterized in that said cross talk shield means (320) is integral with said lower shield section (330).

15. The electrical connector of any of claims 12-14, characterized in that said connector further comprises a wire stuffer cap (180, 522) profiled for bringing wires to be terminated into connection with the wire connecting sections (34, 565), and said cap (180, 522) includes an axially extending slot (194, 622) intermediate said terminals for receiving said upper cross talk shield section therein.

16. The electrical connector of claim 15, character-

ized in that said upper cross talk shield section (200) includes an upper contact member (212) for electrical contact with said upper shield section (160).

17. The electrical connector of any of claims 12-16, characterized in that said upper cross talk shield section (480) is integral with the upper shield section (460).

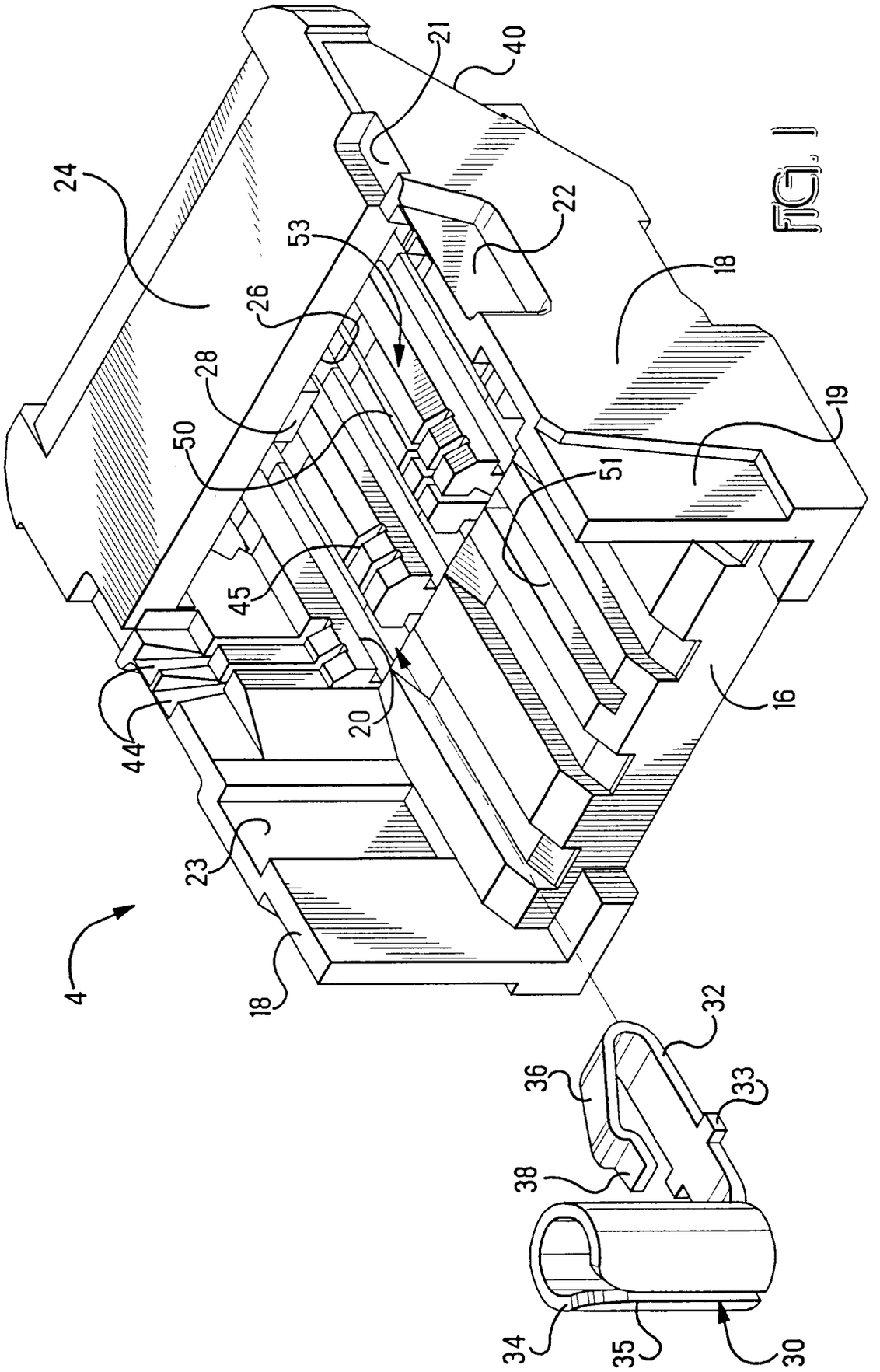

FIG. 1

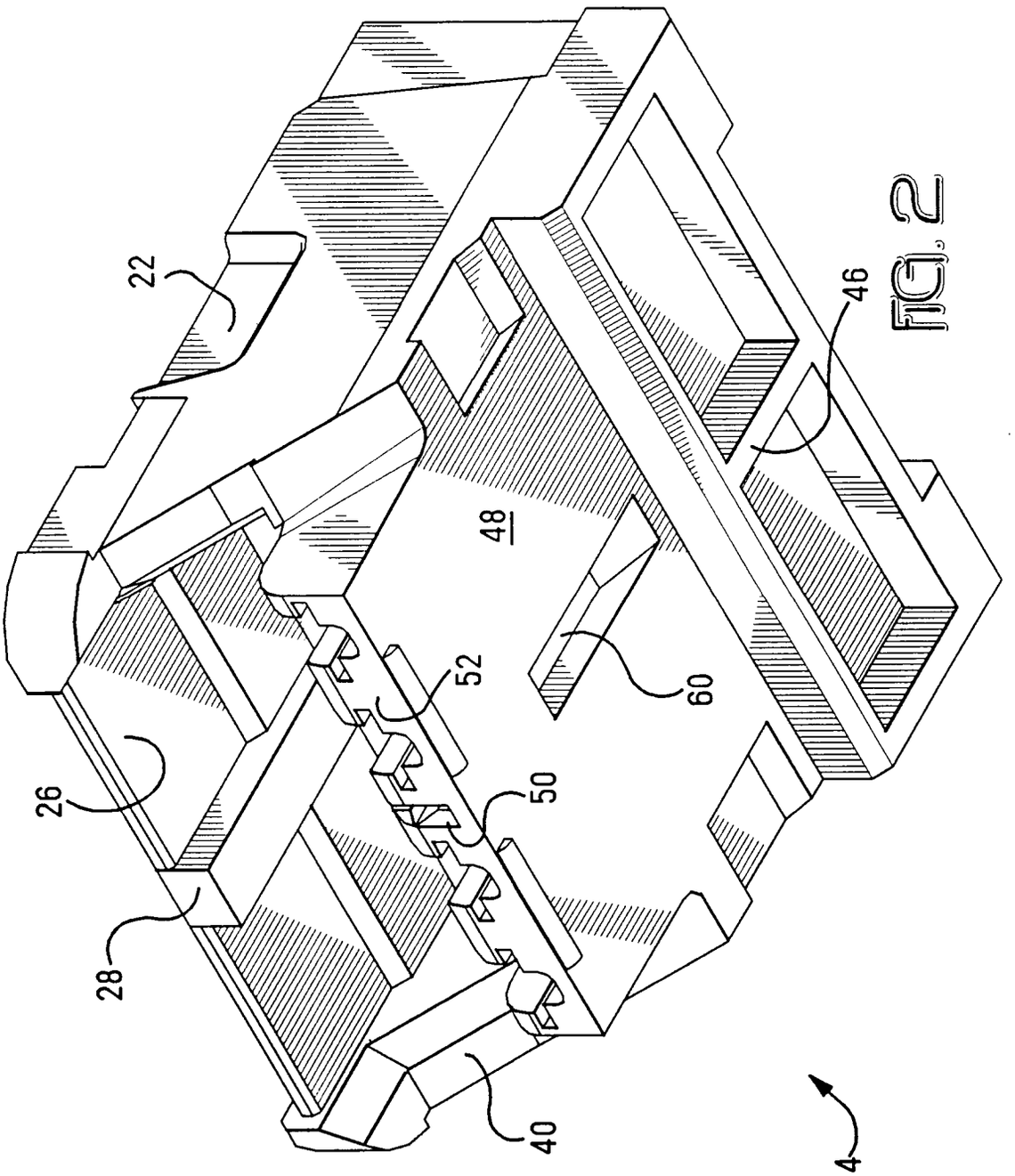

FIG. 2

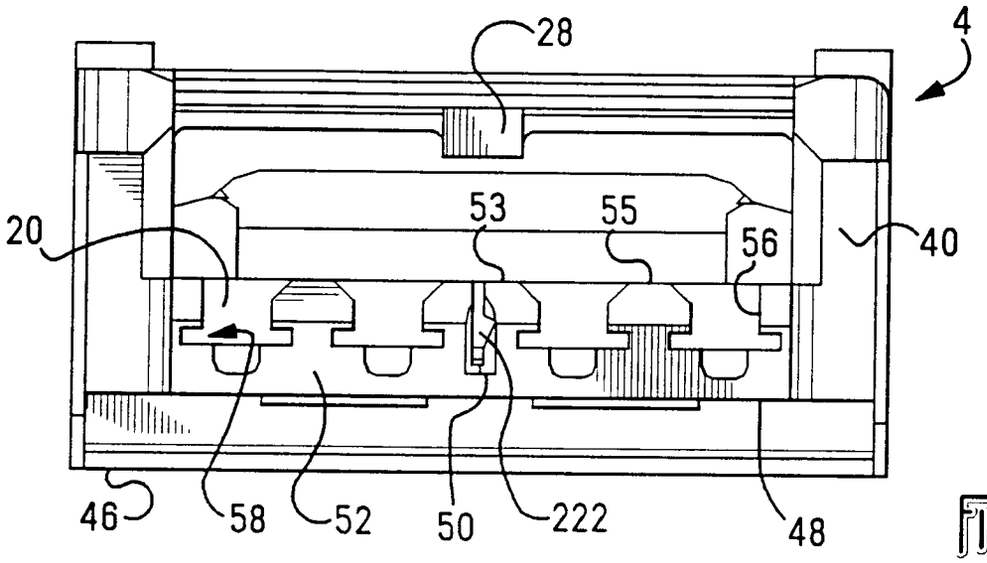

FIG. 3

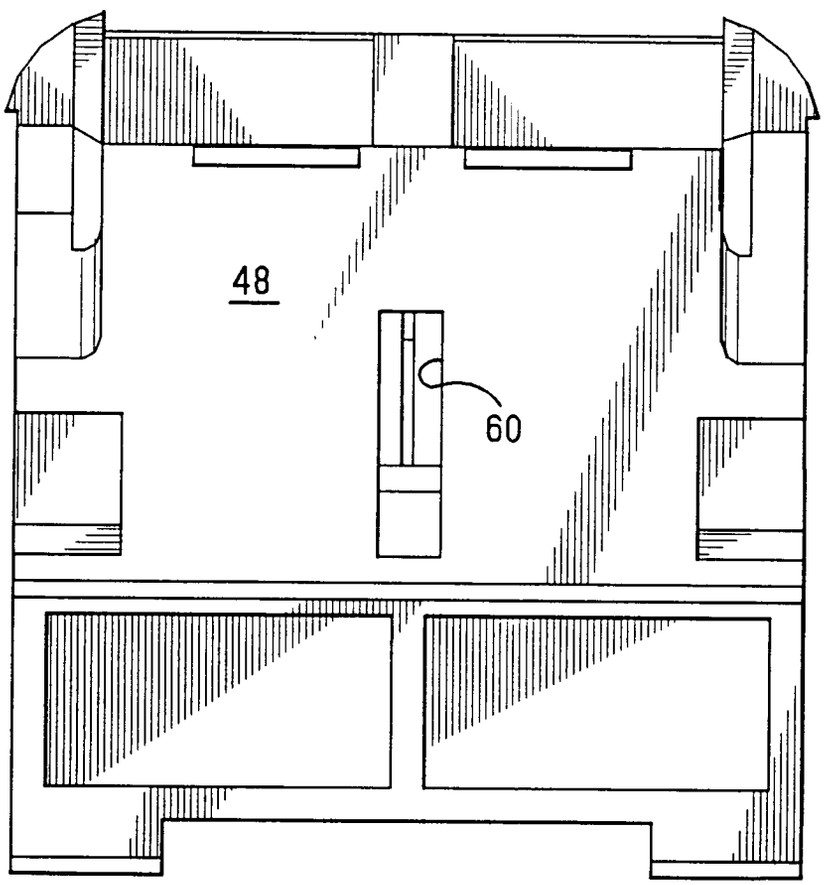

FIG. 4

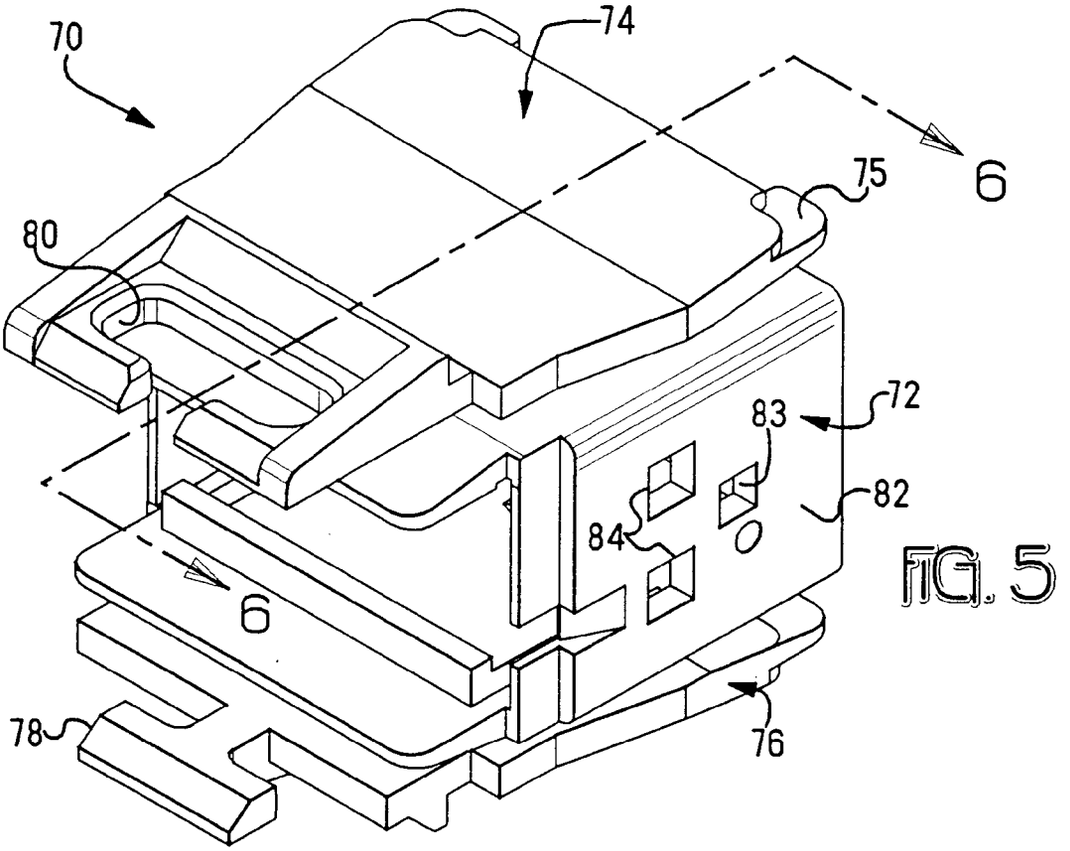

FIG. 5

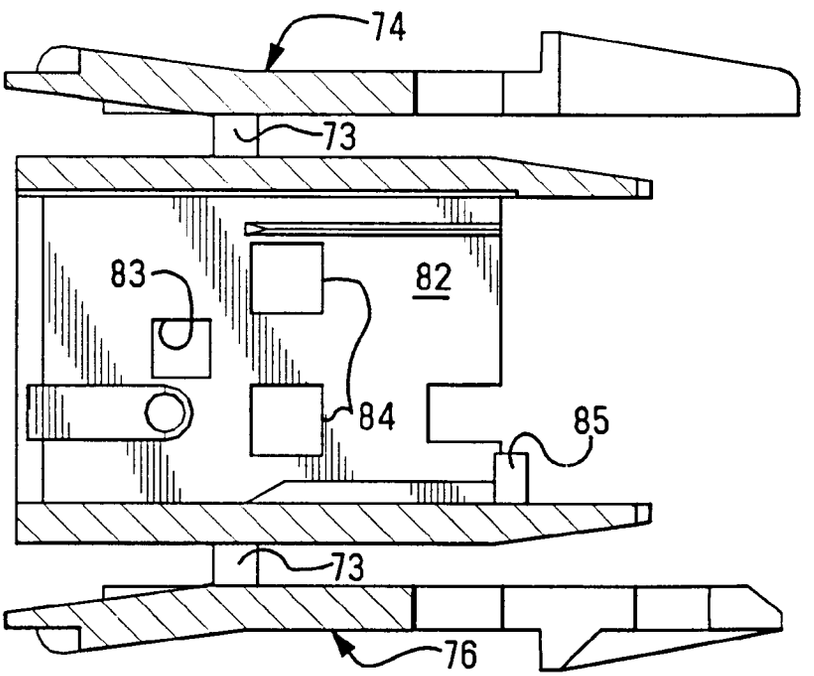

FIG. 6

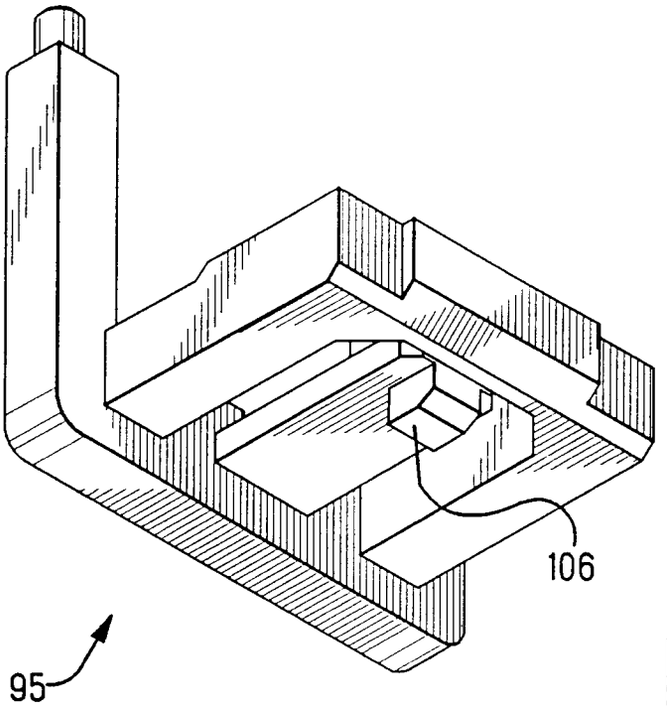

FIG. 7

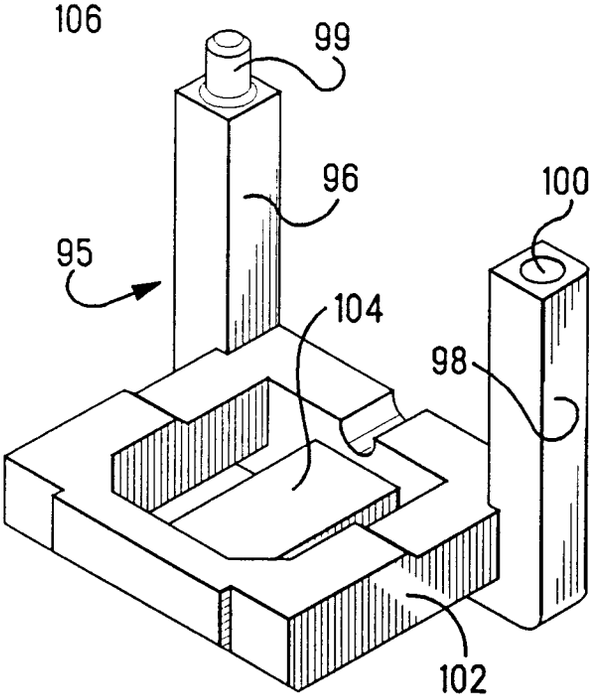

FIG. 8

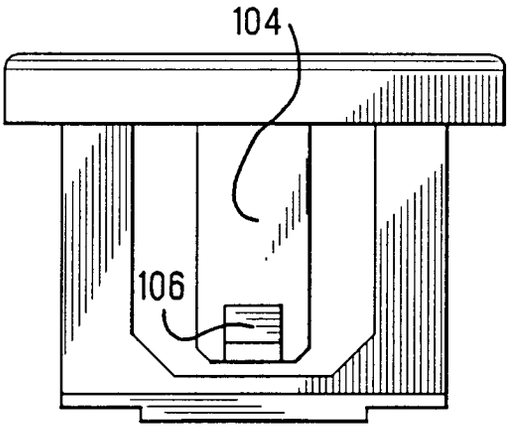

FIG. 9

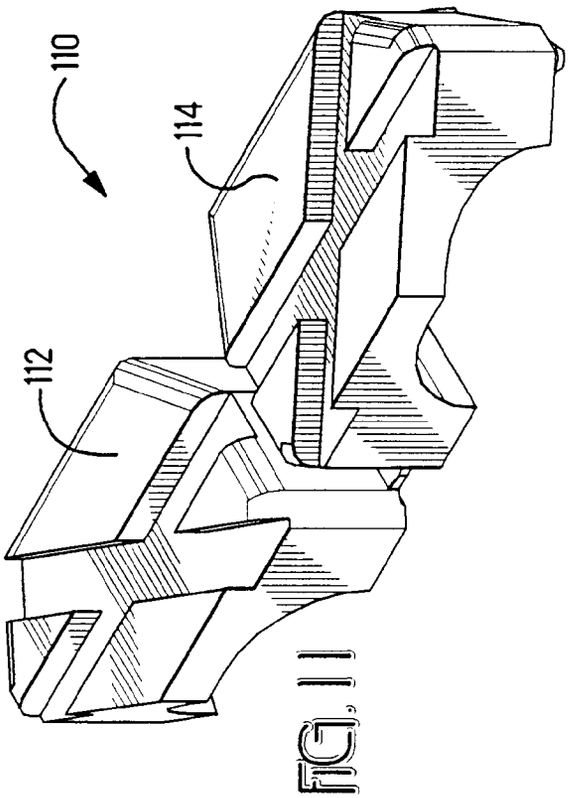

FIG. 11

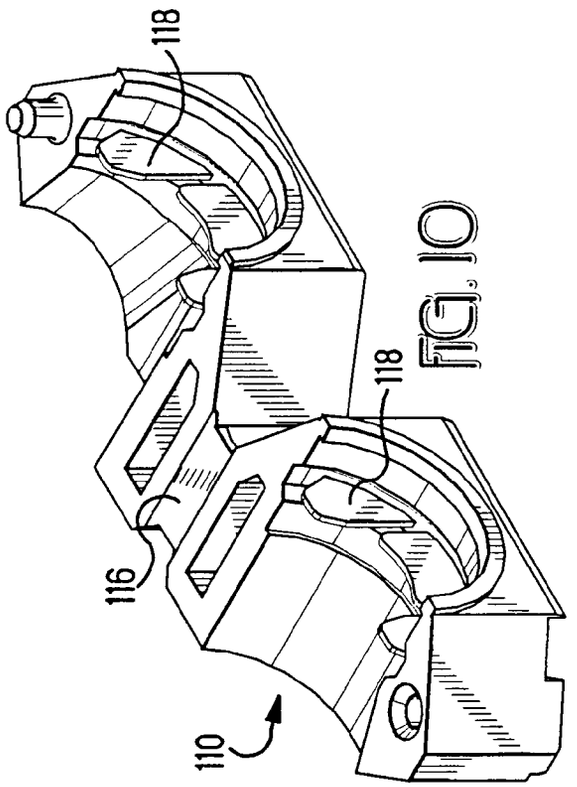

FIG. 10

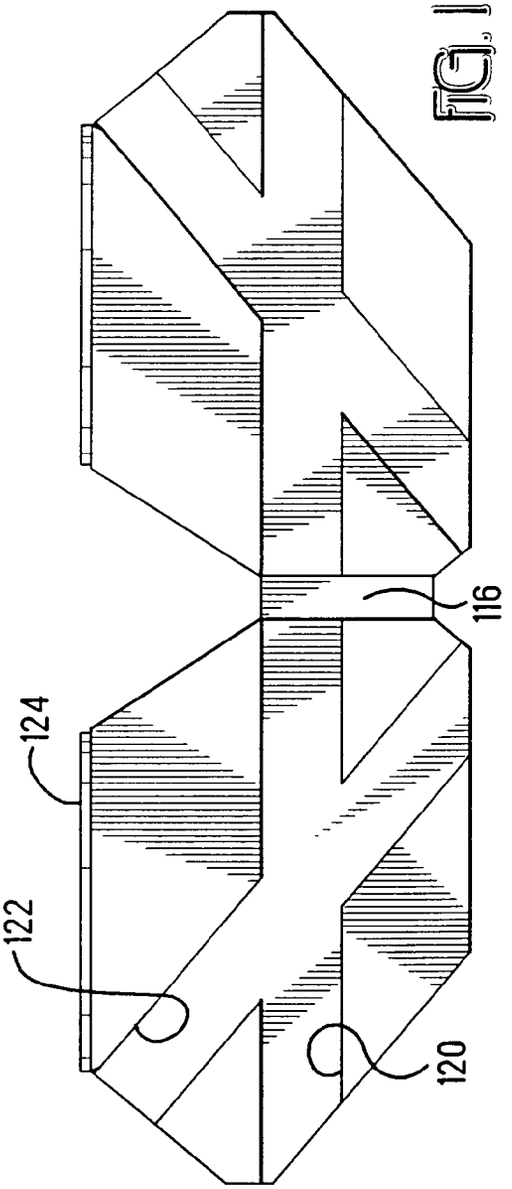

FIG. 12

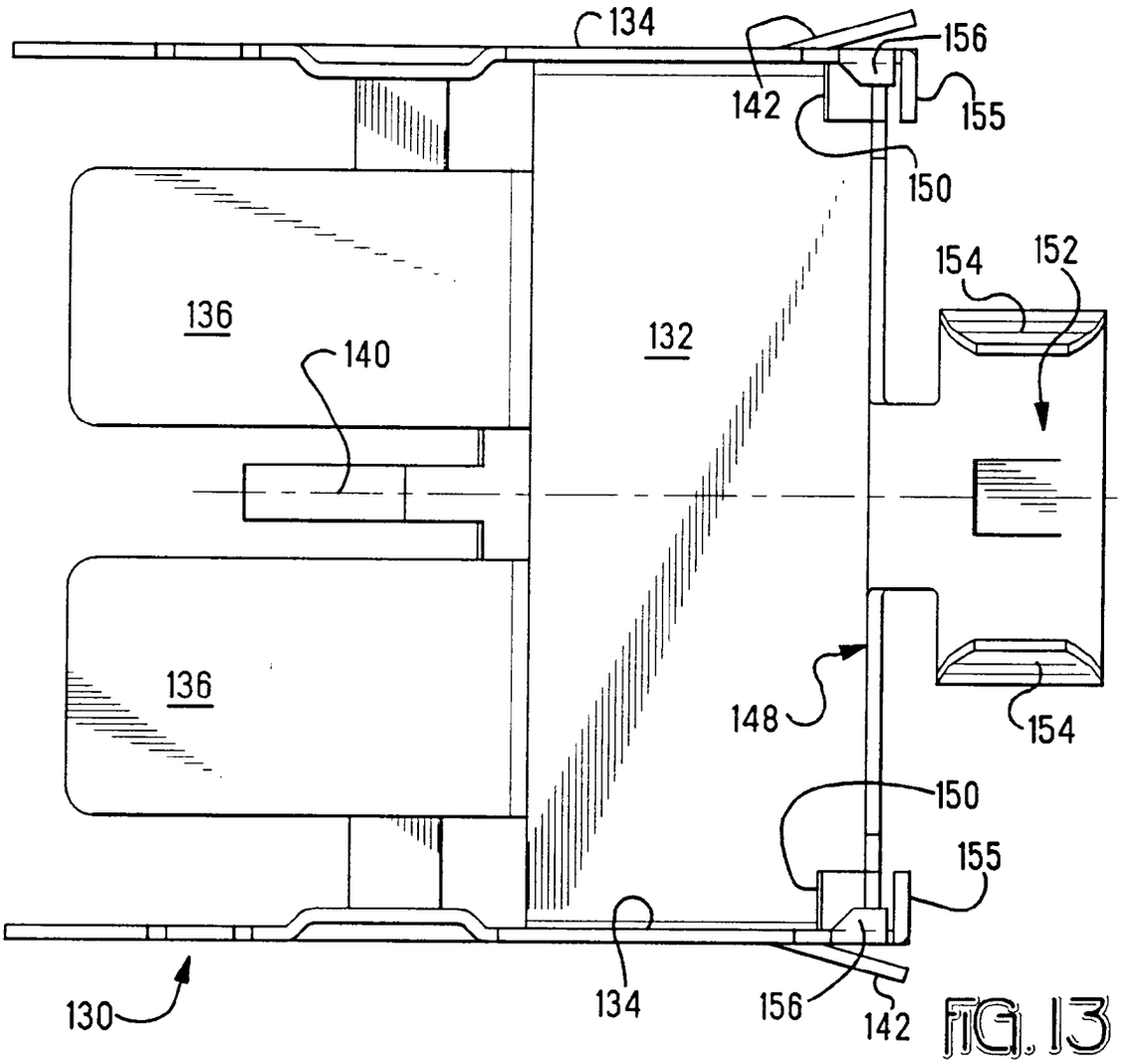
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FIG. 13

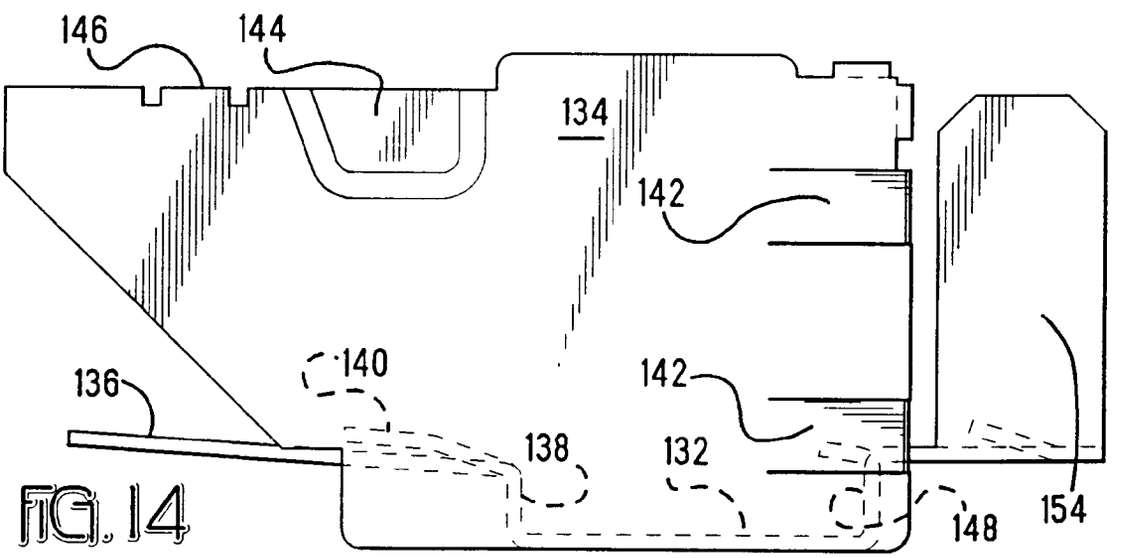
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FIG. 14

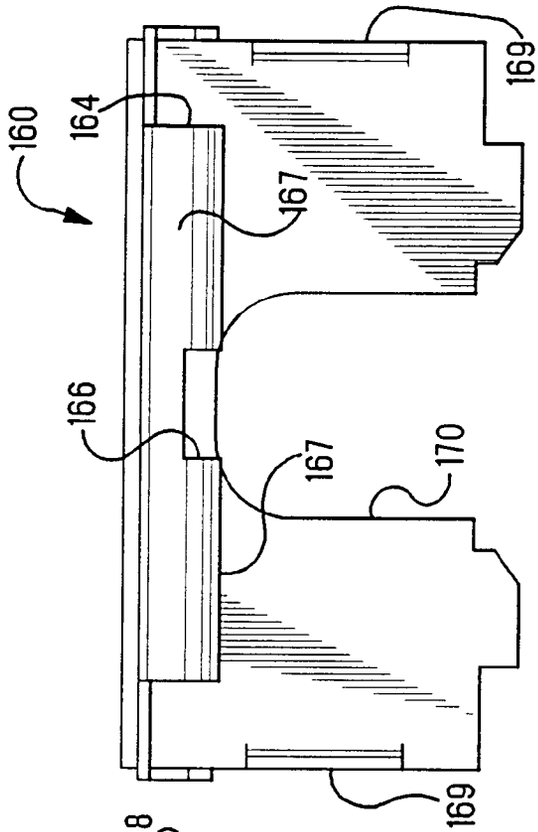

FIG. 16

FIG. 15

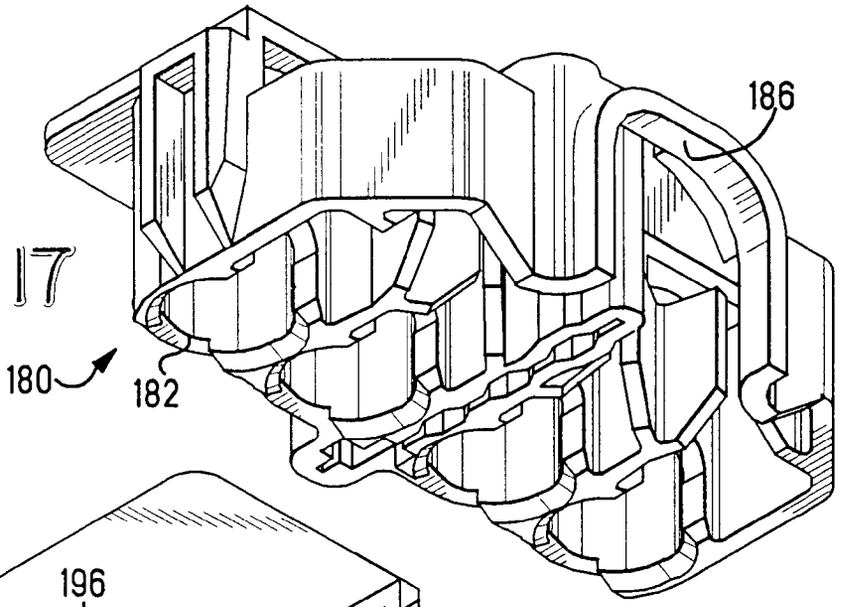

FIG. 17

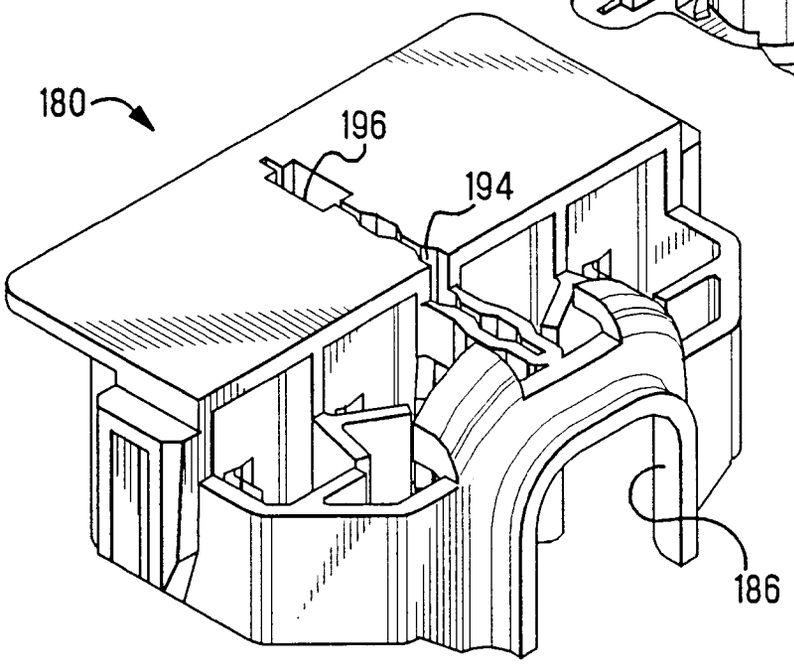

FIG. 18

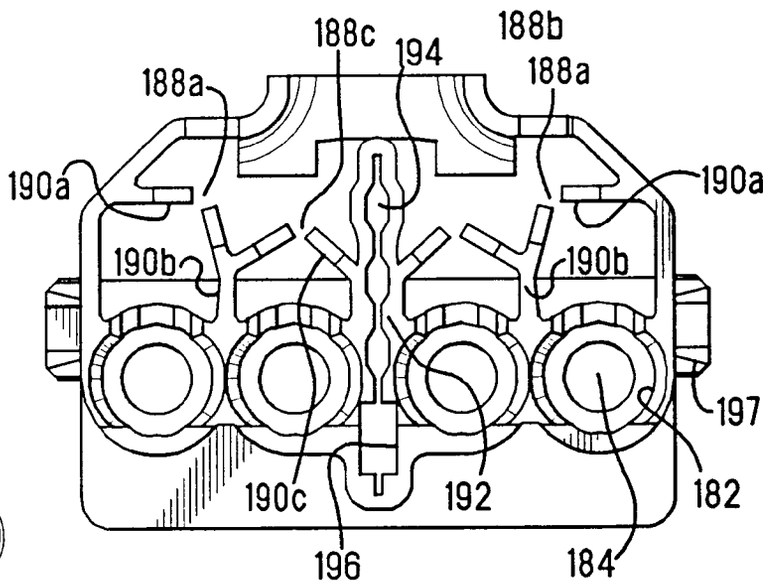

FIG. 19

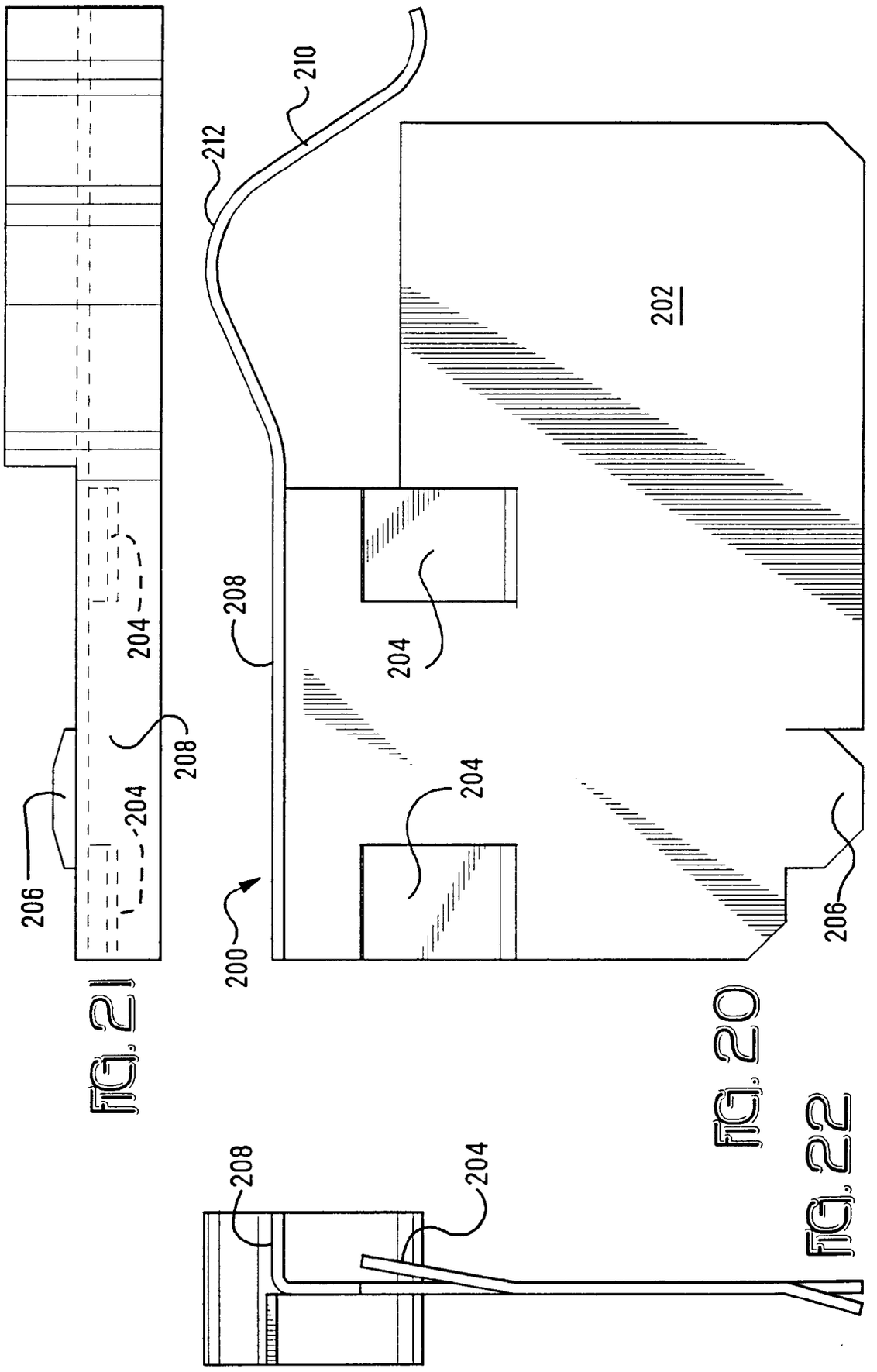
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FIG. 21
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FIG. 22

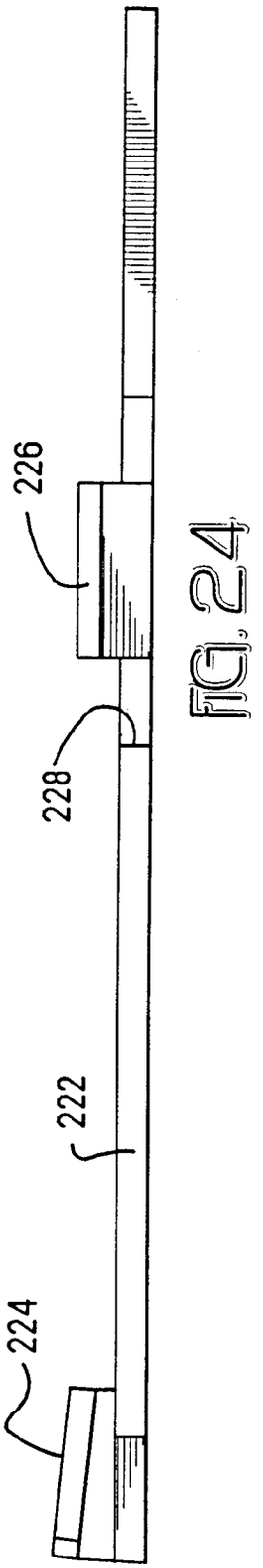

FIG. 24

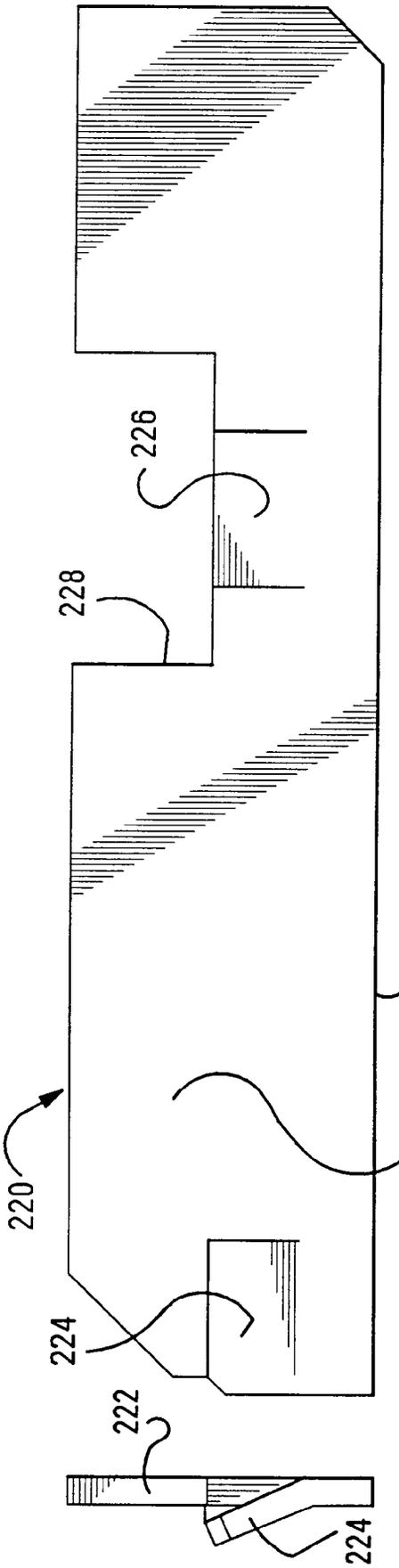

FIG. 23

FIG. 25

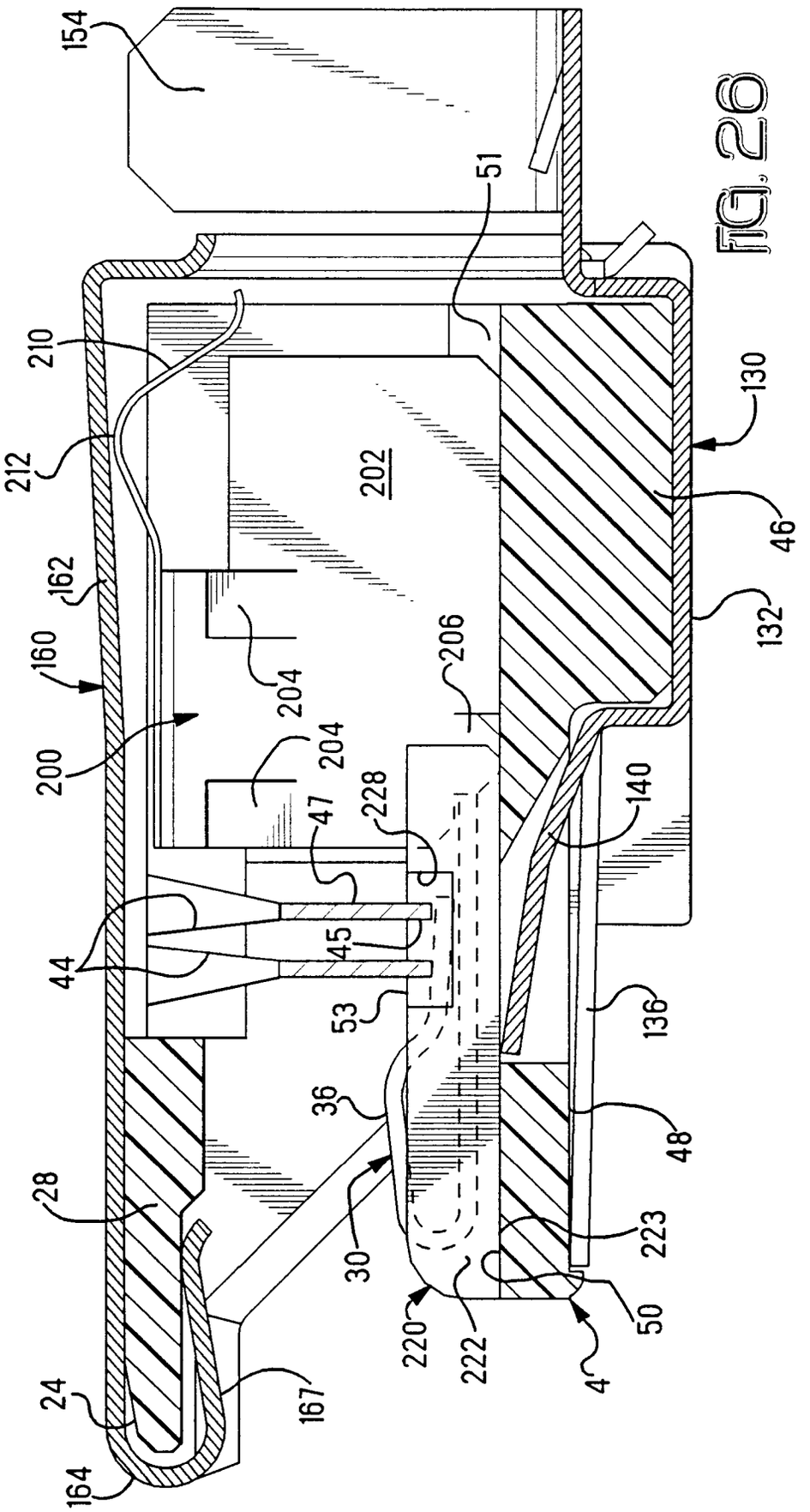
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FIG. 26

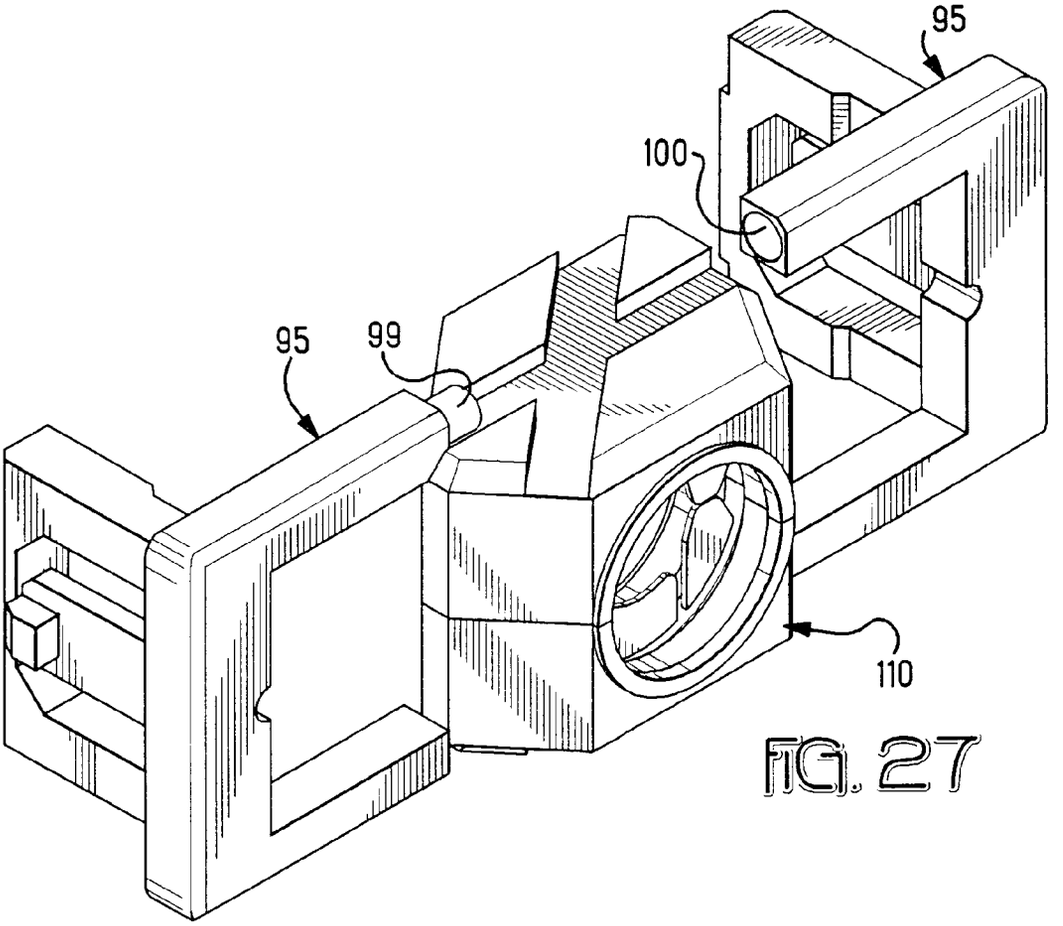

FIG. 27

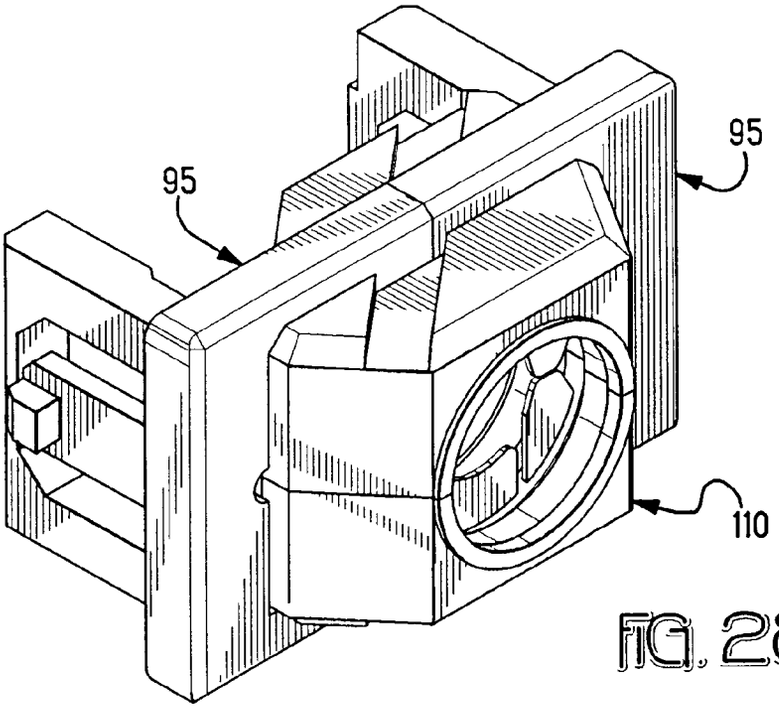

FIG. 28

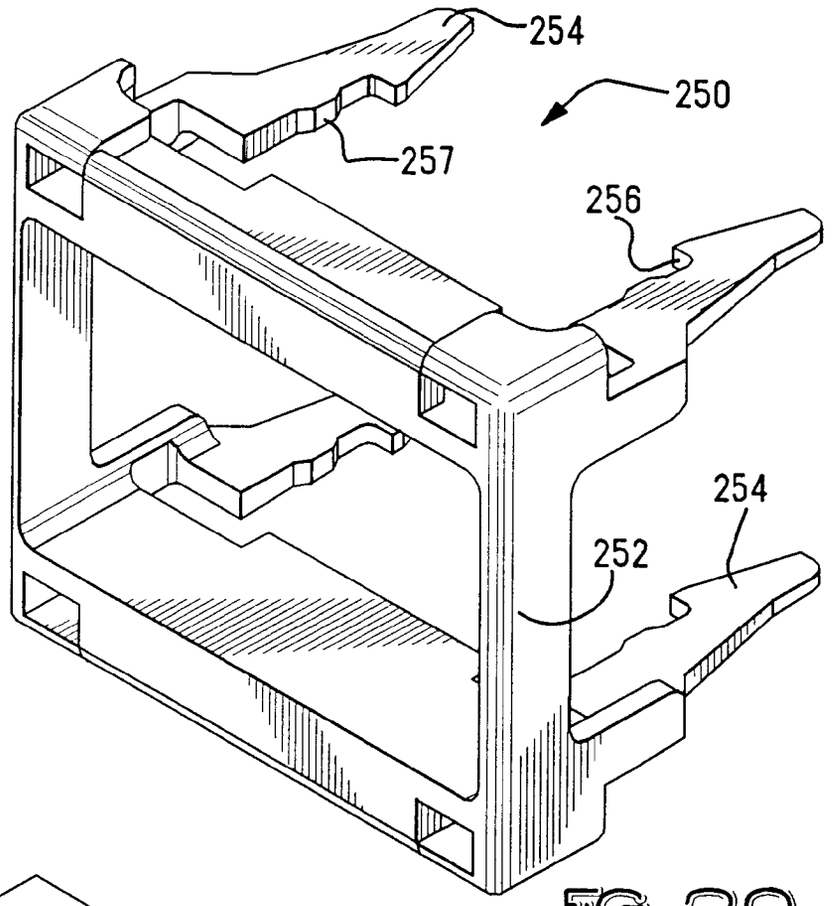

FIG. 29

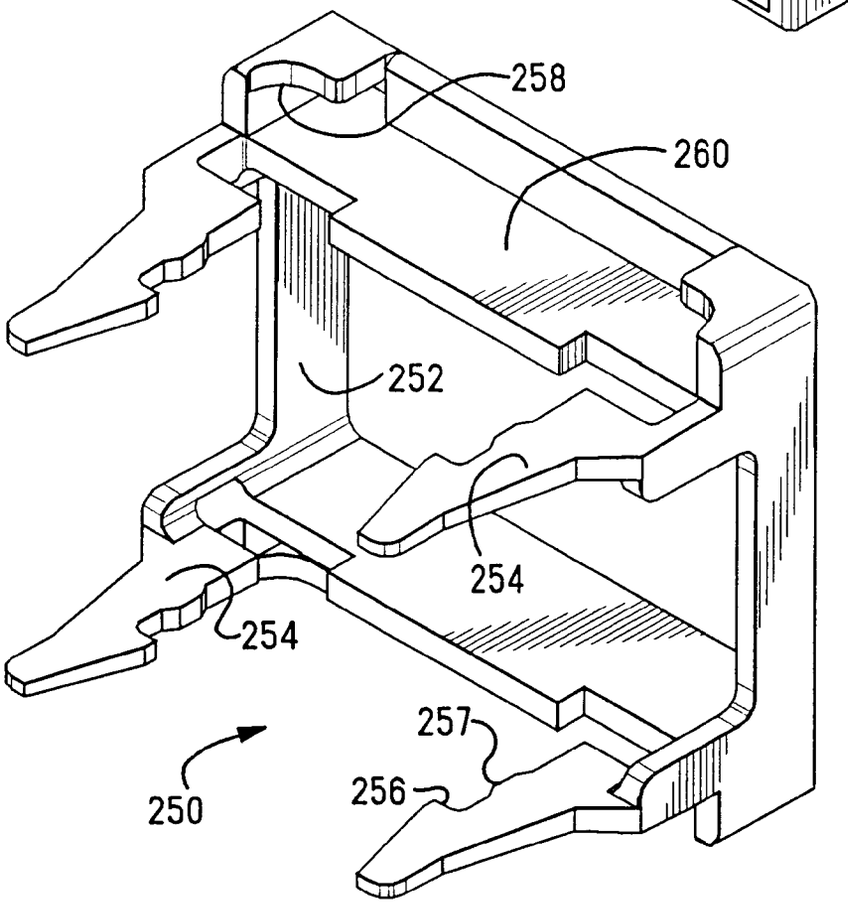

FIG. 30

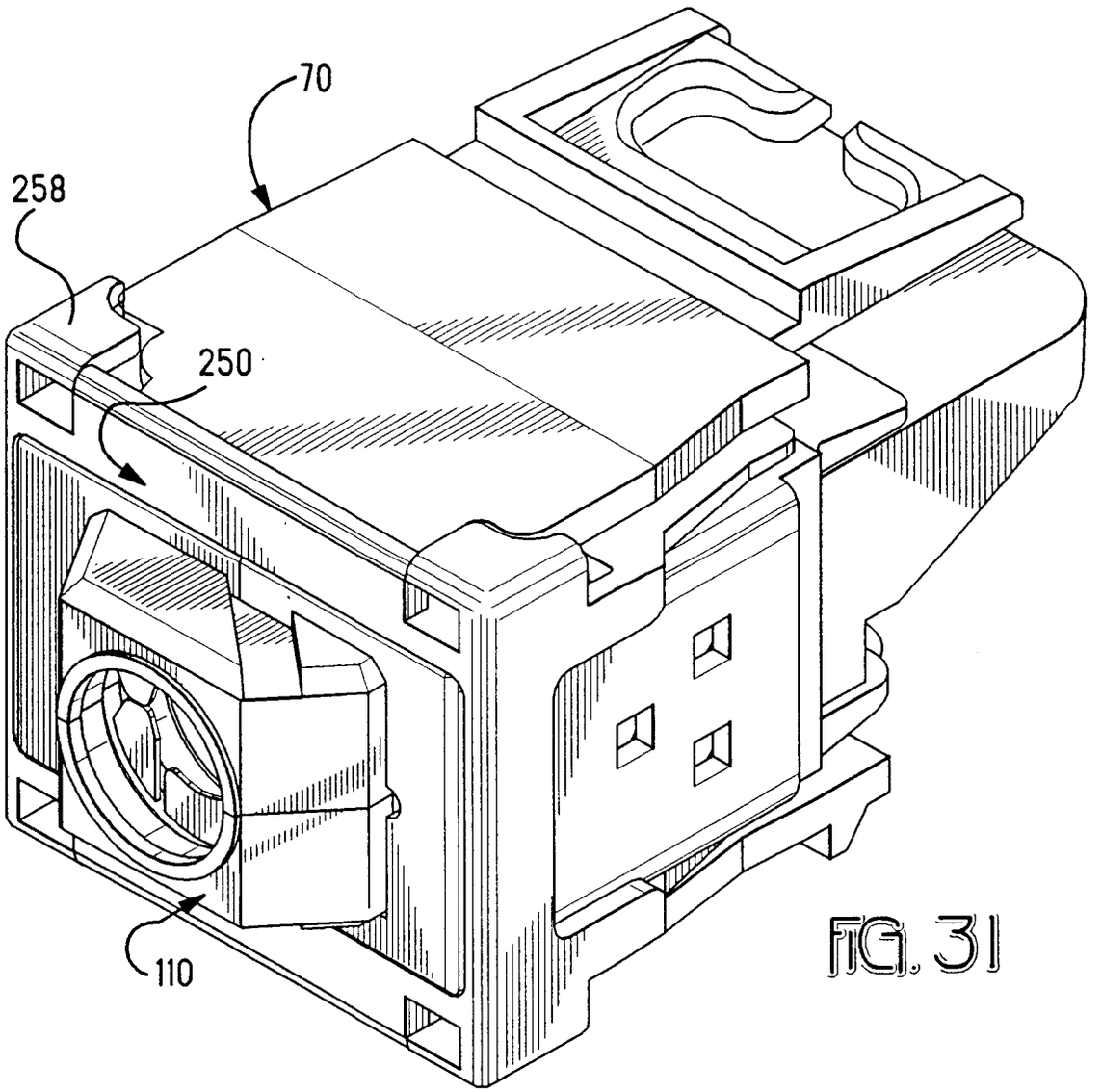

FIG. 31

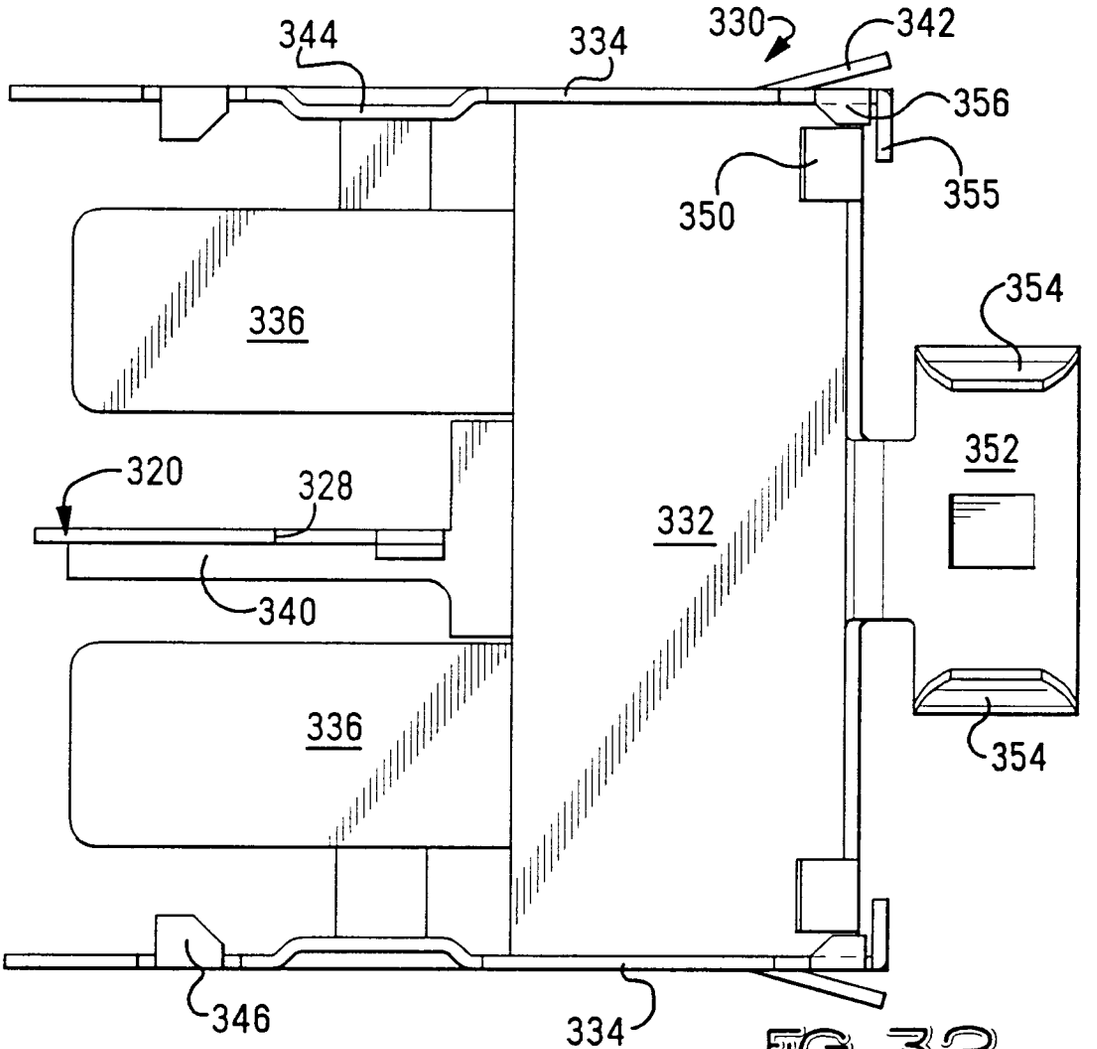
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FIG. 32

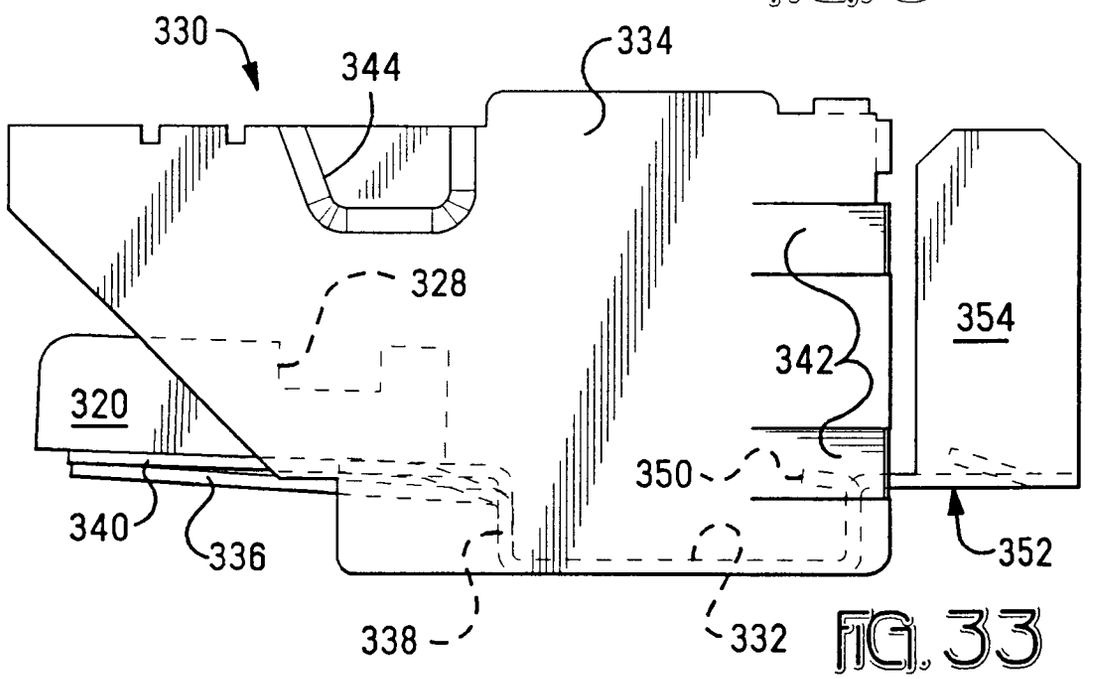
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FIG. 33

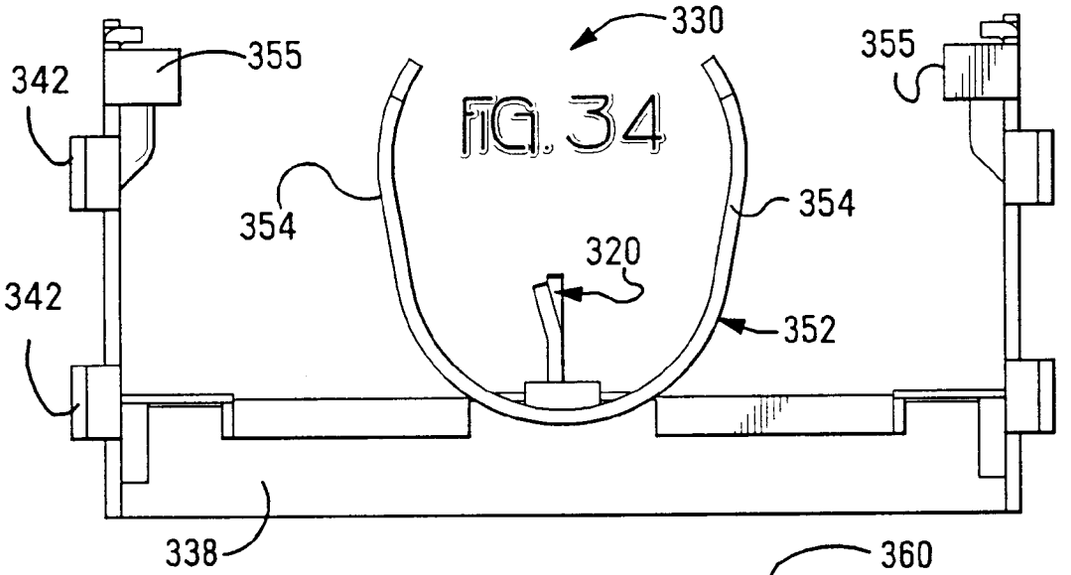


FIG. 34

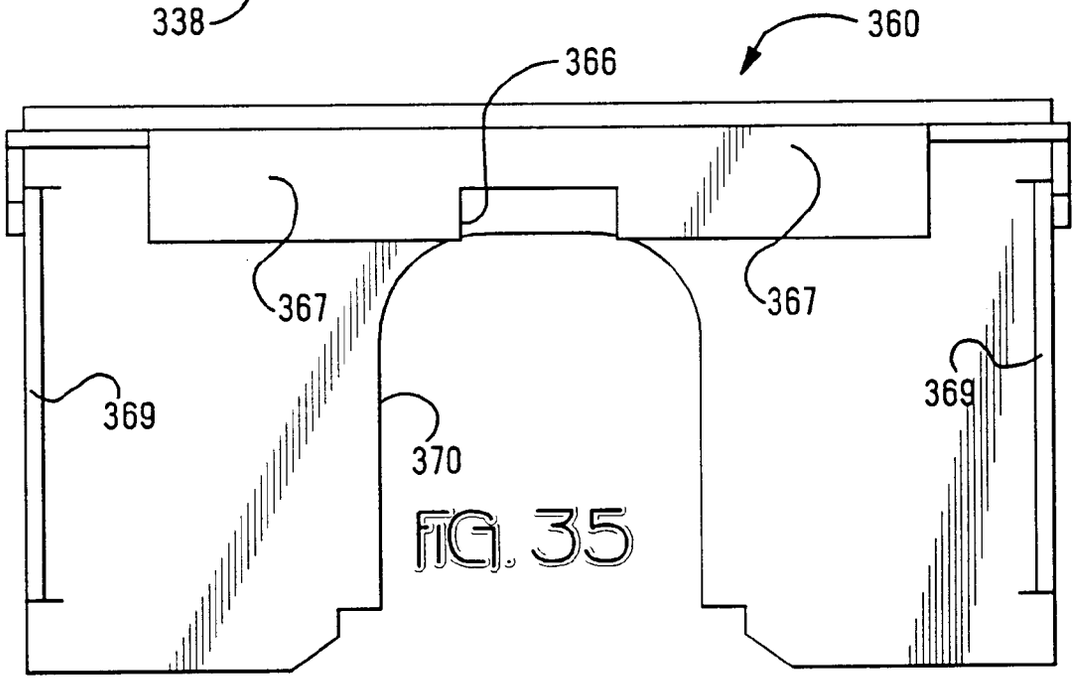


FIG. 35

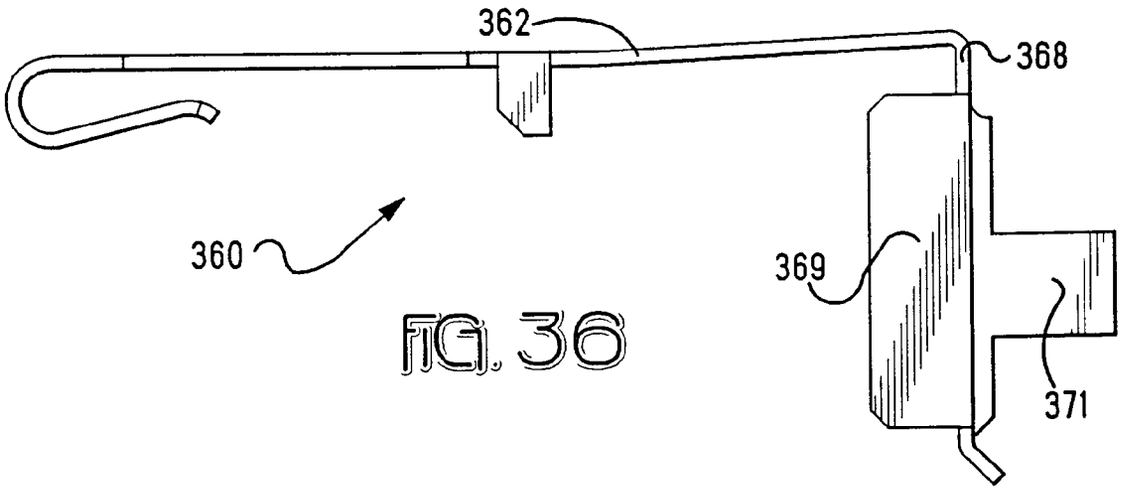


FIG. 36

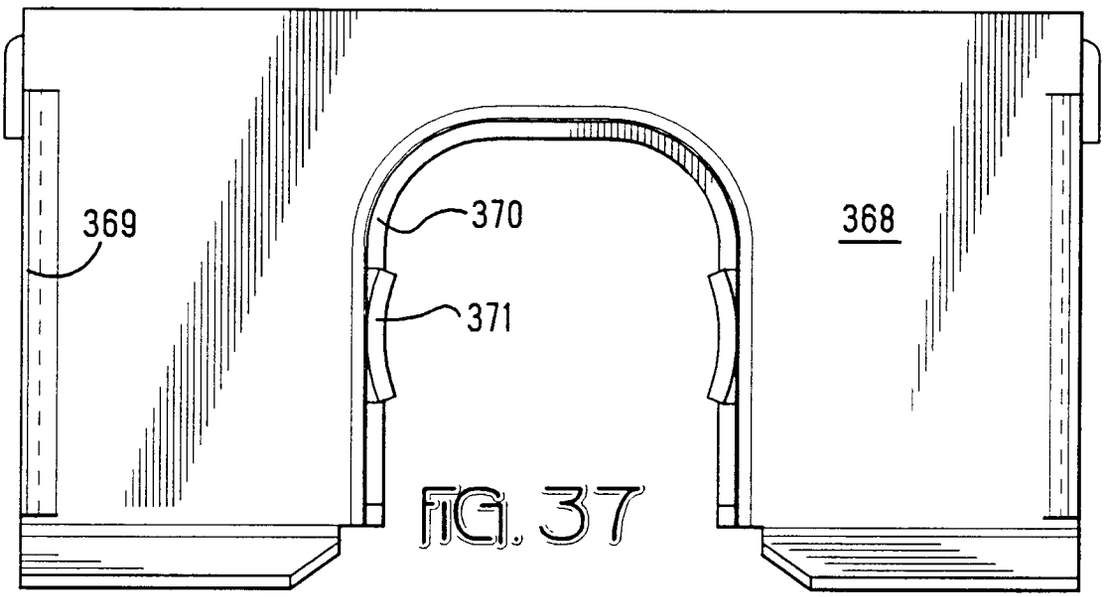


FIG. 37

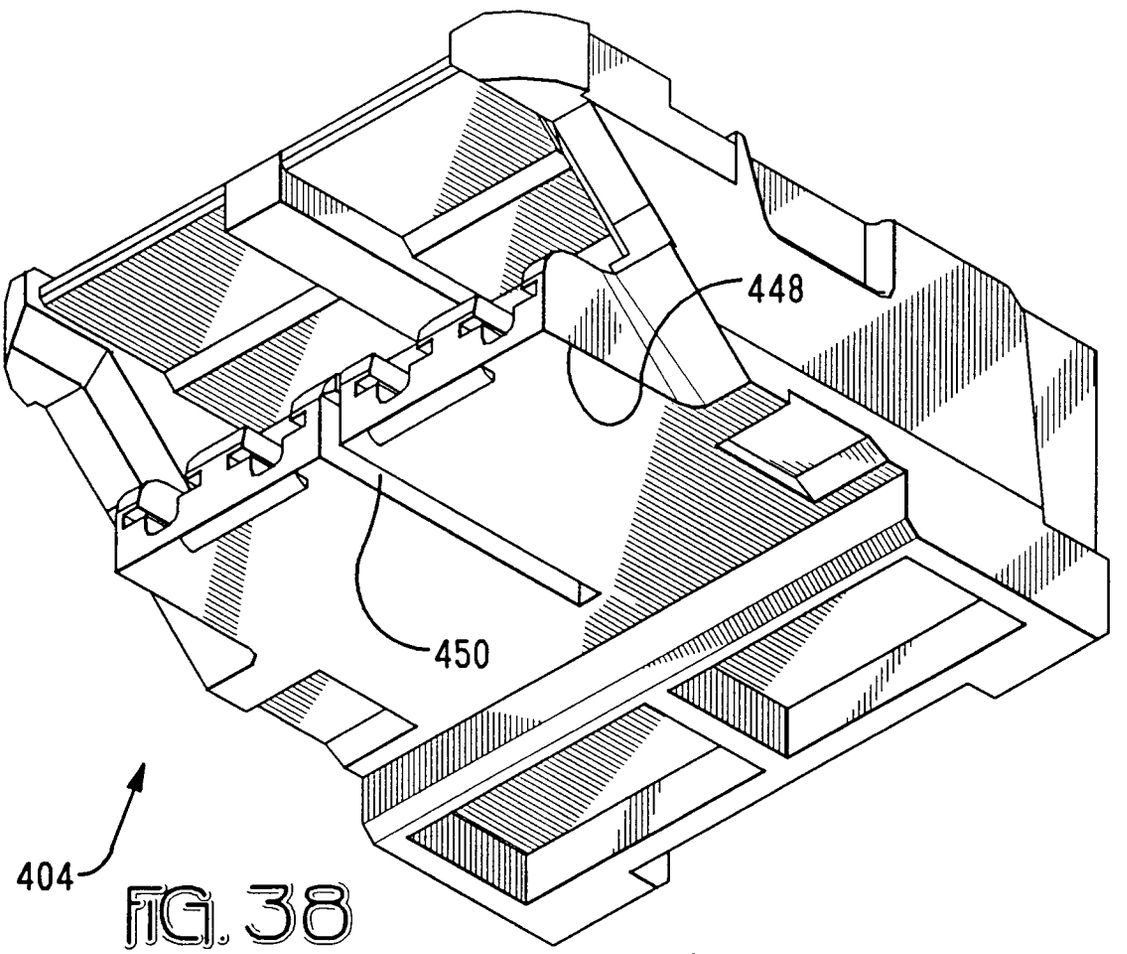


FIG. 38

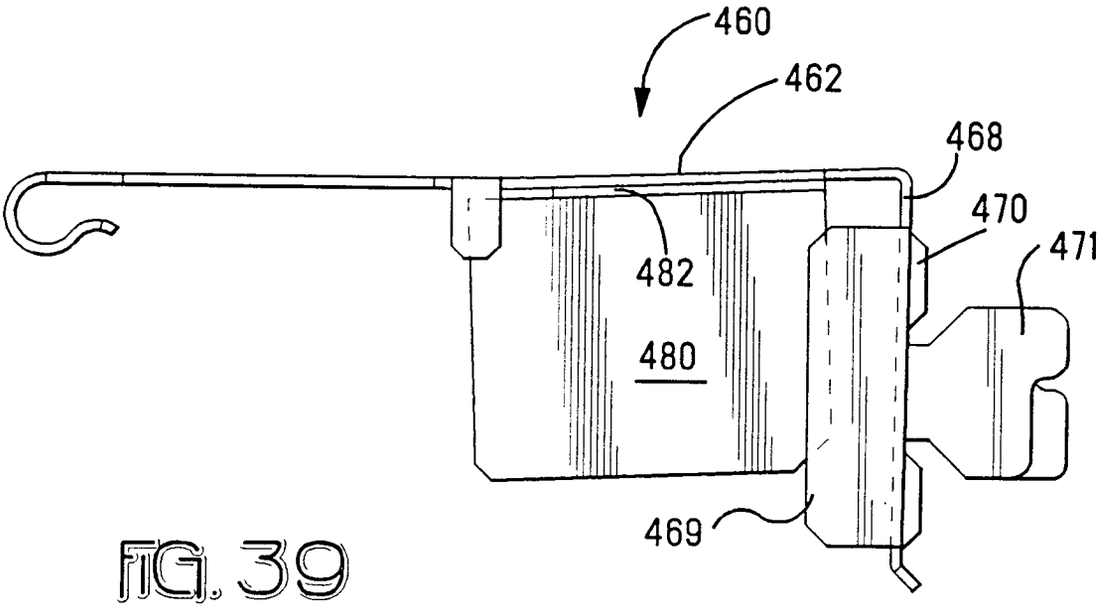


FIG. 39

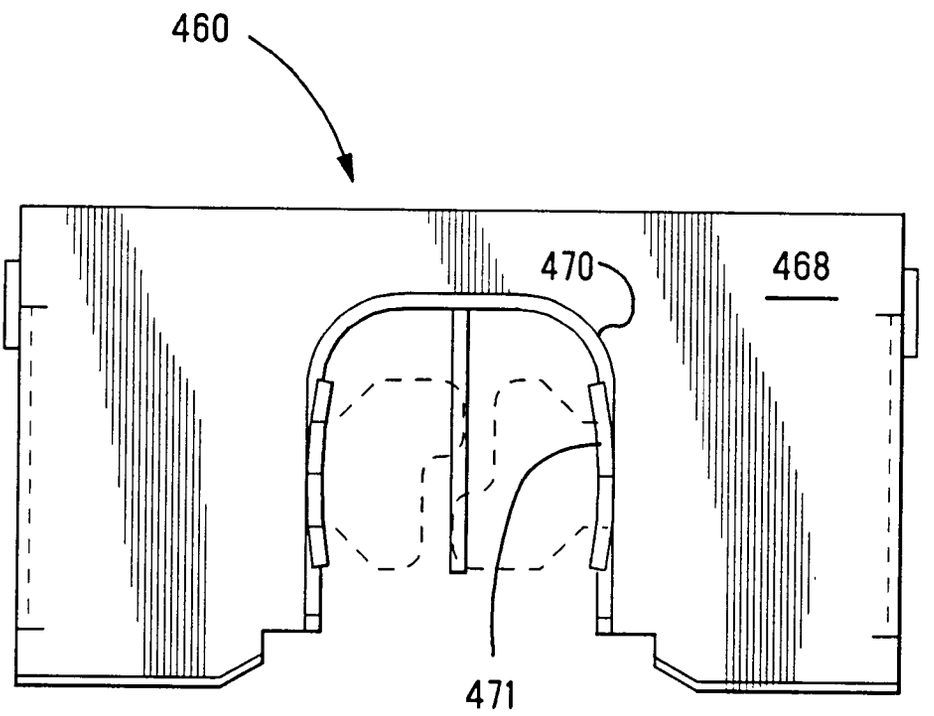


FIG. 40

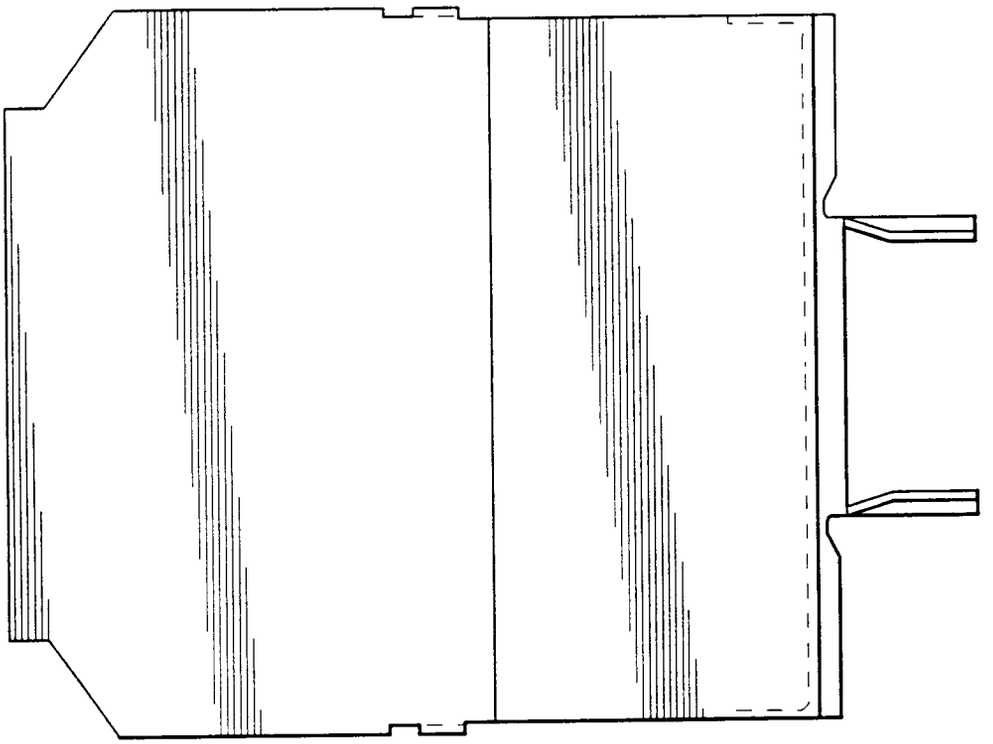


FIG. 41

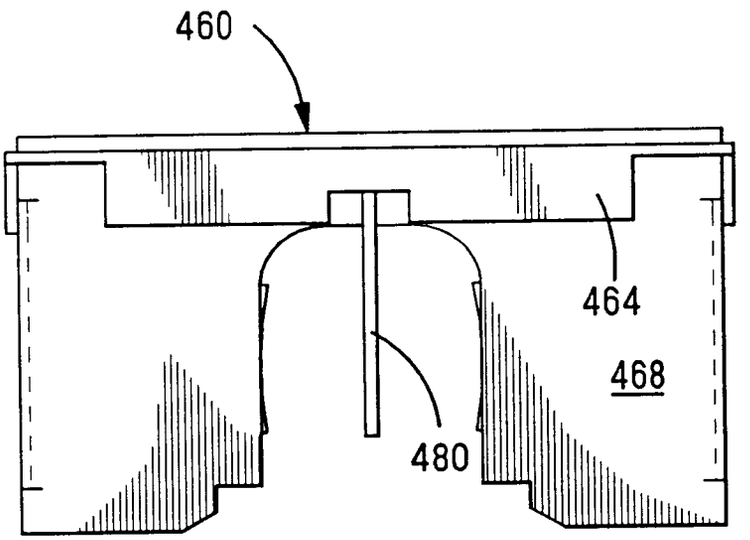


FIG. 42

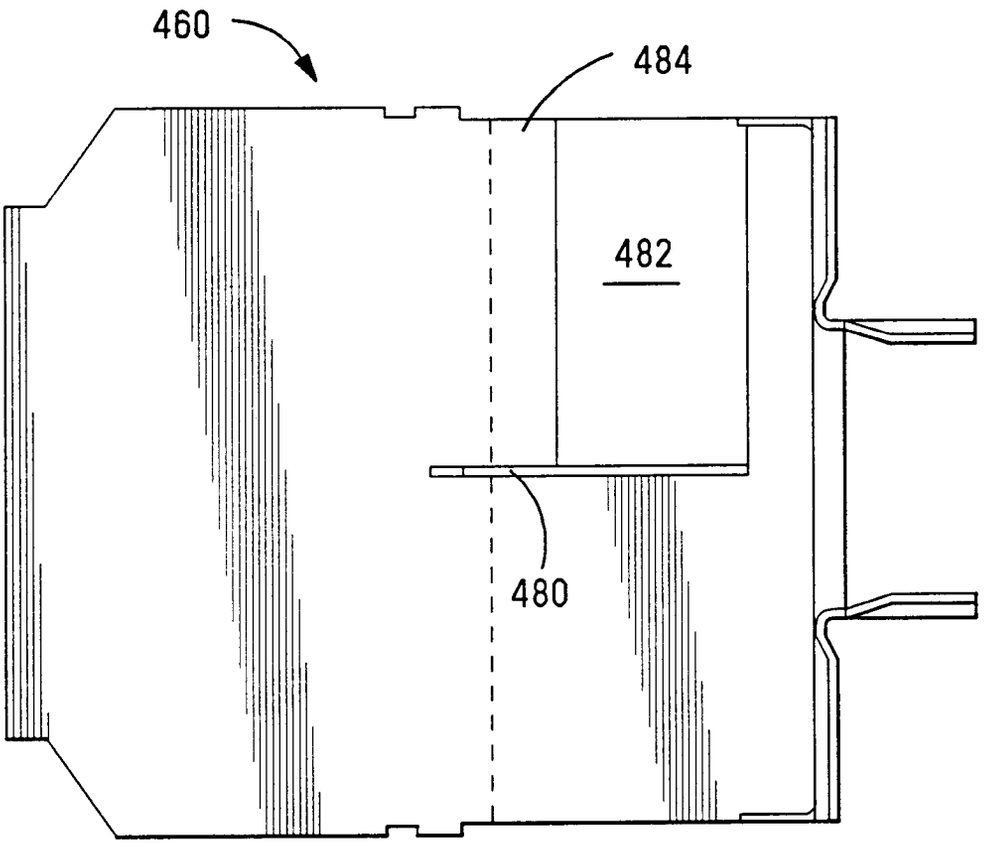
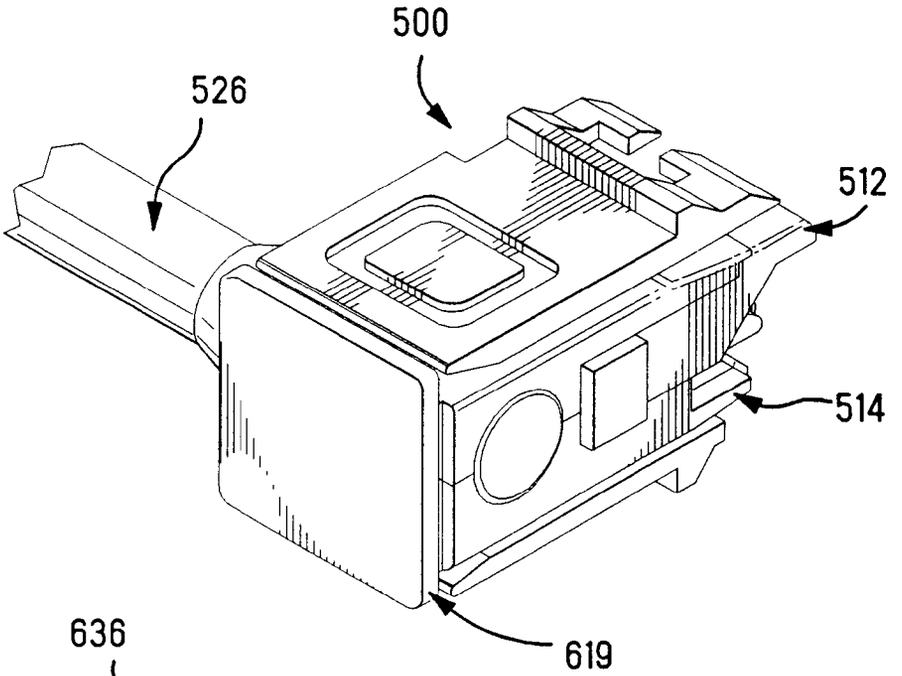


FIG. 43

FIG. 44



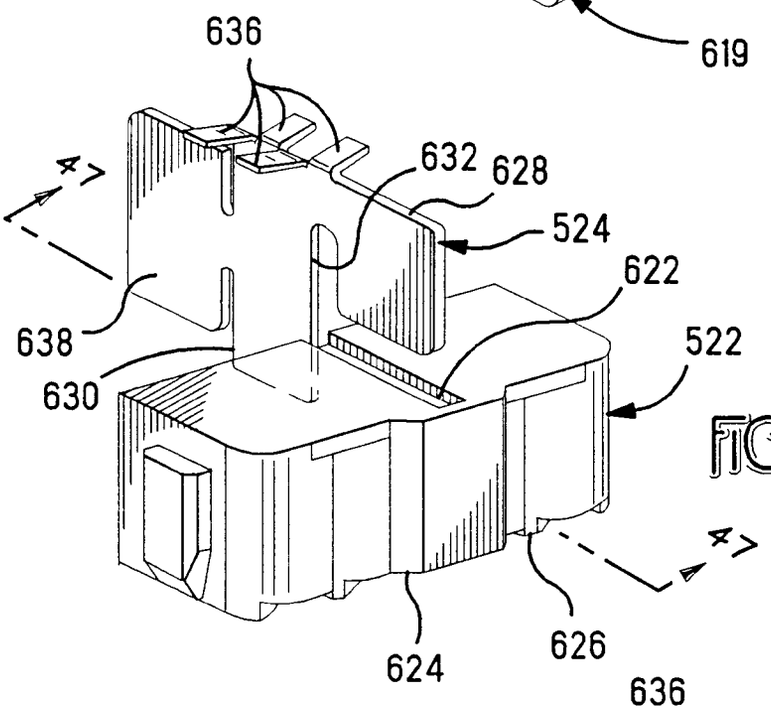


FIG. 46

FIG. 47

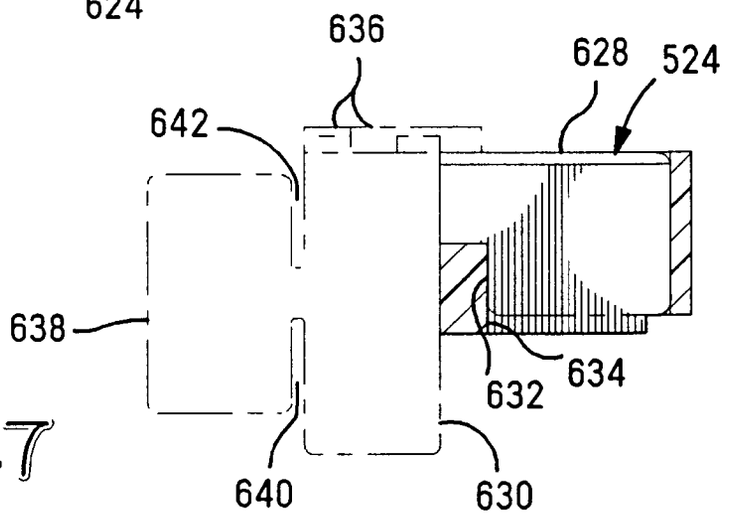
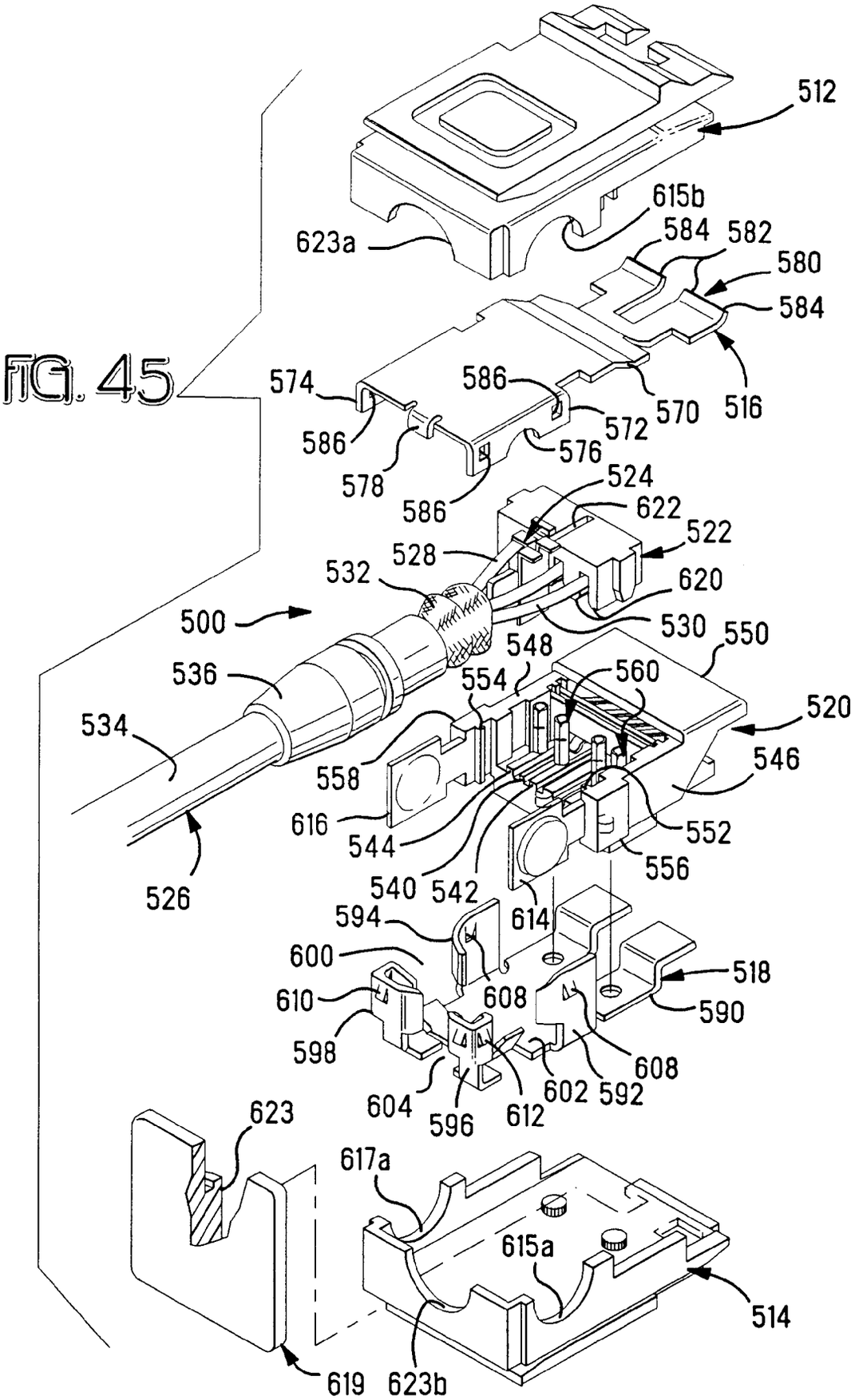


FIG. 45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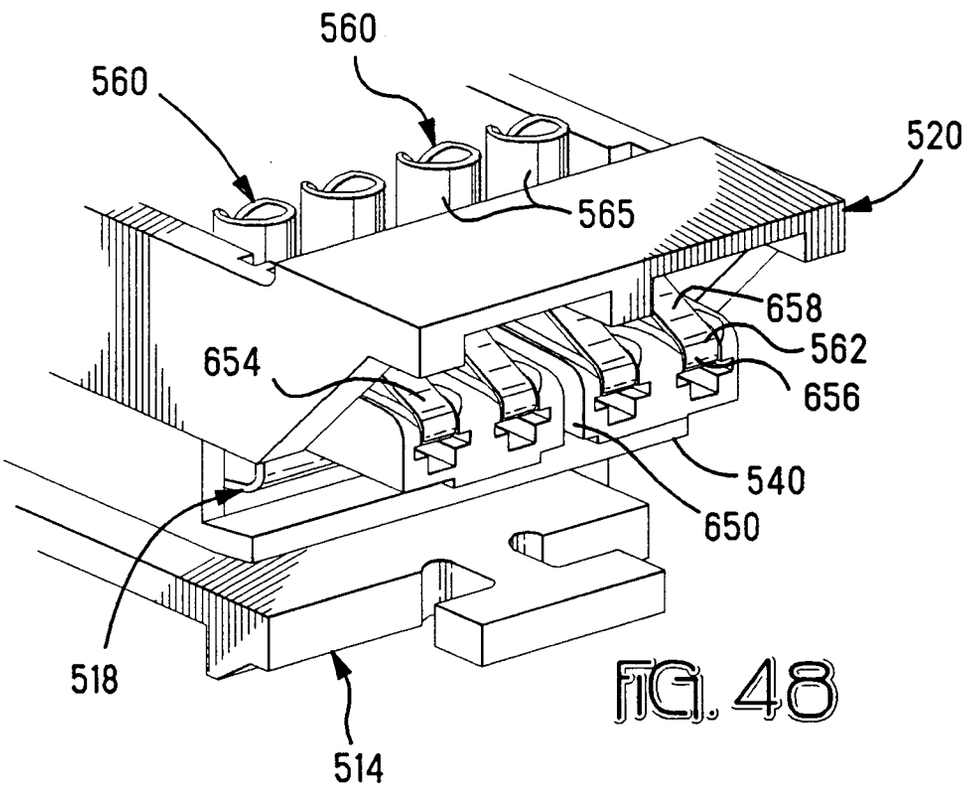

FIG. 48