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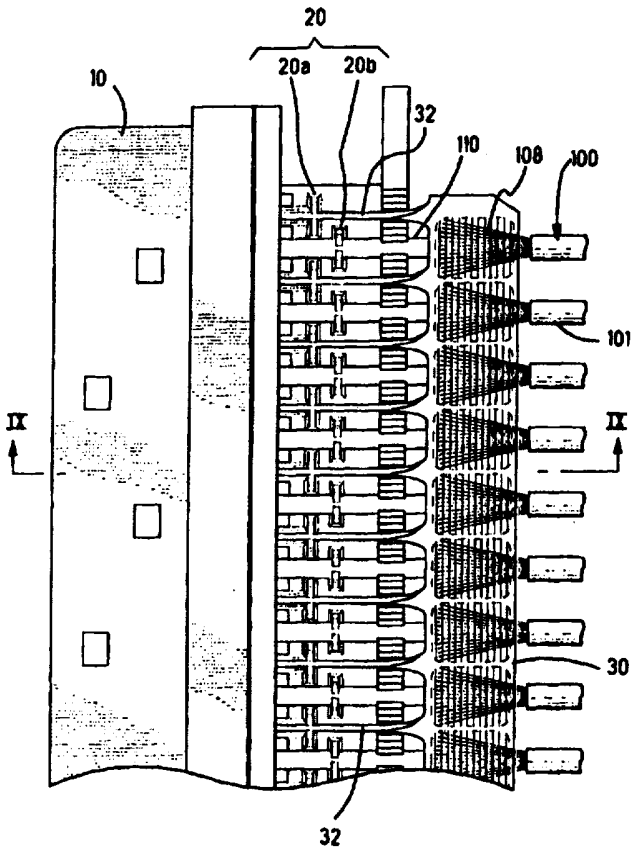
(54) Title: CABLE CONNECTING ARRANGEMENT FOR AN ELECTRICAL CONNECTOR

(57) Abstract

A cable connection arrangement is provided wherein the braids (108) of a plurality of coaxial cables (100) are soldered to a grounding member (30), and the signal conductors are covered by inner insulators (110) and which extend forward beneath the grounding member (30). Ground plates (32) are formed on the grounding member (30) so that these ground plates (32) protrude from one edge of the ground member (30). The ground plates (32) and inner insulators (110) are offset from each other by approximately one-half pitch. The ground plates (32) and the signal conductors are connected at the same time by press fitting into terminals (20a and 20b).



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CABLE CONNECTING ARRANGEMENT FOR AN ELECTRICAL CONNECTOR

The present invention is related to a cable connecting structure for an electrical connector, and specifically concerns a cable connecting structure of an electrical connector which is suitable for the connection of multiple coaxial cables.

Conventionally, the electrical connector 200 shown in Figure 11 has been known as an electrical connector for multiple-conductor cables. A flat cable 220 which has signal wires 202 and ground wires 204, and which is positioned on a retaining frame 222, is connected to this electrical connector 200. The electrical connector 200 has an insulating base 206, and ground plates 208 which are disposed on both surfaces of the base 206. Contact positions 210 which have slots 212 protrude from the rear end of the ground plates 208. The ground wires 204 and signal wires 202 of the flat cable 220 are respectively connected to the slots 212 and to press fit type terminals (not shown in the figures).

Since the cable connected to the electrical connector described above is a flat cable 220, it is easy to cause the end portions of the ground wires 204 and signal wires 202 to extend parallel to each other. However, in the case of individually separated circular electrical cables, it is difficult to arrange the end portions of the cables so that these end portions are parallel to each other, and to maintain the ground wires and the signal wires at a specified spacing. As a result, it is difficult to connect the end portions of the wires to the terminals, In order to avoid such problems, it has been necessary to perform extra work such as soldering or the like when the wires are connected. Furthermore, in the case of

soldering, degradation of the housing due to heat has also been a potential problem.

In light of the above problem points, the object of the present invention is to provide a cable connecting arrangement for an electrical connector which allows easy assembly even in the case of circular separated cables.

The cable connecting arrangement for a cable connector provided by the present invention is characterized by an insulating housing that has a plurality of ground and signal terminals in which the ground wires and signal wires of an electrical cable are connected to corresponding terminals, the terminals are press fit type terminals. A cable sub-assembly is used in which a grounding member with a plurality of protruding ground plates is disposed along one edge of a main body . The ground wires are connected to the ground plates, and the signal wires are shifted approximately one-half pitch from the ground plate, and the ground plates.

The invention will now be described by way of example with reference to the accompanying figures of which:

Figure 1 is a plan view which illustrates of an electrical connector using the cable connecting arrangement for an electrical connector provided by the present invention.

Figure 2 is a front view of the electrical connector shown in Figure 1, as seen from the direction indicated by arrow A.

Figure 3 is a plan view which is similar to Figure 1, having the covers removed.

Figure 4 is a partial enlarged plan view showing the interior of the electrical connector.

Figure 5 is a plan view showing the connection of the grounding member to a carrier strip.

Figure 6 is side view of the grounding member shown in Figure 5, as seen from the direction indicated by arrow B.

Figure 7 is a plan view of the end portion of the cable sub-assembly.

Figure 8 is a side view of the end portion of the cable sub-assembly.

Figure 9 is a sectional view along line IX-IX of Figure 4.

Figure 10 is a front view which illustrates the relationship between the ground plates and the pressing contact parts.

Figure 11 is a perspective view which illustrates a prior art cable connecting structure for an electrical connector.

The invention will now be described in detail with reference to the attached figures. Figure 1 is a plan view which shows the external appearance of an electrical connector (hereafter referred to simply as a "connector") using the cable connecting arrangement for an electrical connector provided by the present invention. Figure 2 is a front view from the direction indicated by arrow A in Figure 1.

In Figure 1, the electrical connector 1 has insulative covers 4, 4' which are used facing each other in a two-part construction, and screws 6 used for attachment to the mating connector (not shown in the figures), which are located at both ends of the covers 4, 4'. A cable jacket 150 accommodates a plurality of coaxial cables 100 (hereafter referred to simply as "cables") (see Figure 3), and a heat-shrinkable tube 150 which seals the end portion of the cable jacket 150. The covers 4, 4' are fastened together into a unit by means of mutual latch engagement, screws or the like. A metal shell 10 which is engaged with the mating connector protrudes from the front end 8 of the cover 4.

Next, the connector 1 as viewed from the engagement side (that is, as viewed from the direction indicated by arrow A) will be described with reference to Figure 2. The shell 10 has a long, slender, substantially rectangular shape, with insulation displacement contact (IDC) terminals 20 being disposed in two rows inside this shell 10.

Next, the connector 1 will be described in greater detail with reference to Figures 3 and 4. Figure 3 is a plan view which is similar to Figure 1, but which shows the connector 1 with the covers 4, 4' removed. Figure 4 is a partial enlarged plan view of the interior of the connector 1. In Figure 3, a metal braid 156 used as shielding extends from the end portion 154 of the cable jacket 150;
A plurality of independent cables 100 protrude from this end portion 154. The braid 156 surrounds a bundle of cables 100. The outer insulation 101 of the cables 100 also is stripped from the tip portions, so that the inner insulation 110 (Figure 4) of the cables 100 is exposed, and the cables 100 are connected to corresponding IDC terminals 20. The details of this construction will be described later. The front portions of the respective IDC terminals 20 are surrounded by the shell 10 in order to provide electromagnetic shielding. Similarly, the exposed cables 100 protruding from the tip portions of the braid 156 and the rear portions of the IDC terminals 20 are covered by a shield cover 22 which has a two-part structure. This shield cover 22 is fastened to the braid 156 by means of anchoring claws disposed on the rear portion of the shield cover 22, and the front portion 23 of the shield cover 22 is engaged with the periphery of the shell 10.

It is desirable to improve the impact resistance of the connecting structure by sealing with a filler such as ethylene - vinyl acetate or the like inside the

shield cover 22. Furthermore, after the heat-shrinkable tube 152 is moved in the direction indicated by arrow X from the position shown in the figures, this tube is shrunk by heating so that the end portion 154 of the outer covering 150 and the braided wire 156 are sealed.

The area of connection between the cables 100 and the IDC terminals 20 will be described with reference to Figure 4. The outside insulation 101 on the cables 100 is stripped away so that the inner metal braids (ground wires) 108 are exposed. These inner braids 108 are unraveled, twisted to one side and soldered to a grounding member 30. The inner insulation 110 of each cable 100, which contains a signal conductor, is positioned beneath the grounding member 30 so that this inner insulator extends forward. Ground plates 32 which protrude from the grounding member 30 are connected to ground terminals 20a, and the inner insulation 110 is connected to signal terminals 20b. The details of these connections will be described further with reference to Figure 5 and subsequent figures.

Figure 5 is a plan view which shows grounding members 30 and 30' are connected to a carrier strip 34 prior to assembly. The grounding members 30 and 30' and the carrier strip 34 are formed by being punched out of a metal strip as an integral unit. In Figure 5, the grounding members 30 and 30' have a length which is such that the grounding members 30 and 30' are disposed inside respective connectors 1. Since the grounding member 30 and the grounding member 30' are identical, only the grounding member 30 will be described below. Protruding ground plates 32 are formed on one edge 36 of the main body 31 of the grounding member 30 along the of length as integral parts. The ground plates 32 are formed by being punched out in the form of rectangular flat plates

from the main body 31 as integral parts of the main body 31, and then twisted 90 degrees so that the surfaces of the ground plates 32 are perpendicular to the surface of the main body 31. The spacing of these ground plates 32 is the same as the spacing of the ground terminals 20a. The other edge 38 of the main body 31 is connected to the carrier strip 34 in a number of places via connecting parts 40. Notches 42 are formed in the connecting parts 40 in the vicinity of the edge 38 so that the grounding member 30 can easily be removed from the carrier strip 34.

Figure 6 is a side view of the grounding member 30 shown in Figure 5, as seen from the direction indicated by arrow B. The shape of the ground plates 32 can easily be understood from this figure.

Next, Figure 7 shows a plan view of the cable sub-assembly 120 assembled by connecting the cables 100 to the grounding member 30. The respective cables 100 are exposed for substantially the same length from the braid 156, and are connected to the grounding member 30 so that the cables 100 are positioned between the adjacent ground plates 32. As was described with reference to Figure 4, when the braids 108 are connected to the plate-form main body 31, the inner insulators 110 of the cables 100 extend from positions which are substantially intermediate between the adjacent ground plates 32 as viewed in the plan view. Specifically, the ground plates 32 and insulators 110 are alternately disposed at a specified spacing. This spacing is equal to the spacing between the ground terminals 20a and signal terminals 20b. Immediately following the installation of the cables 100, the tips of the insulators 110 are naturally arranged in an arc-form pattern as shown in the figures; however, these tips are cut to form an even distribution prior to being connected to the terminals by pressing contact.

Figure 8 shows a side view of one end portion of the cable sub-assembly 120. The extension of the inner insulators 110 beneath the plate-form main body 31 will be easily understood from this figure. The end portions of the cable sub-assembly 120 have a shape that is almost flat. Since the grounding member 30 and the signal wires are insulated from each other by the inner insulators 110, there is no danger of short-circuiting.

As shown in Figure 9, an opening 48 into which the mating connector is inserted in formed in the front portion 47 of the shell 10. An insulating front housing 50 is held on the rear portion 49 by means of claws (not shown in the figures) on both ends of the shell 10 The method used to hold this front housing 50 in place may also be some other method such as the engagement of projecting and recessed parts or the like. The front housing 50 has a base part 52 which is held in the shell, and a retaining plate 54 which projects forward from the approximately center of this base part 52 as an integral part of the base part 52. Grooves 58 in which contact parts 56 of the terminals 20a and 20b are positioned are formed in both surfaces of the retaining plate 54. The tips 62 of the contact parts 56 of the terminals 20a and 20b are held in the tips of the grooves 58. In the rear portion of the front housing 50, an insulating rear housing 60 is fastened to the front housing 50 by latch engagement (not shown in the figures) at both ends of the rear housing 60. The front housing 50 and rear housing 60 will be referred to collectively as the "insulating housing 70". The terminals 20a and 20b are installed beforehand in the rear housing 60. The positions of the respective pressing contact parts 62a and 62b of the terminals 20a and 20b are shifted in the front to back direction. Accordingly, the terminals 20a and

20b are arranged in a staggered configuration along the length of the rear housing 60.

On the rear portion of the rear housing 60, numerous arms 68 which have wedge-shaped projections 66 on their tips are arranged so that these arms 68 are positioned between adjacent terminals 20a and 20b. The ground plates 32 and inner insulators 110 of the cable sub-assembly 120 are pushed between the corresponding arms 68, and are connected at the same time to the press fit sections 62a and 62b of the corresponding terminals 20a and 20b. As a result, connection can be accomplished very easily without any complicated process such as soldering. Furthermore, there is no damaging effect on the insulating housing 70 due to the heat of soldering.

Figure 10 illustrates the press-fitting of the ground plate 32 in the slots 64a of the press fit section 62a. The thickness of each ground plate 32 is approximately 0.25 mm, and the amount of "give" in engagement is approximately 0.07 mm. When the ground plates 32 are press-fitted in the slots 64a, the slots 64a expand slightly, and the ground plates 32 make contact with the slots 64a so that the ground plates 32 are clamped by both sides of the slots 64a, thus causing the portions of the ground plates 32 contacting the slots 64a to be cold-welded. A relatively soft metal such as pure copper or tough-pitch copper is suitable for use as the material of the ground plates 32. Accordingly, the ground plates 32 are firmly held in the press fit sections 62a. In the present embodiment, the cross-sectional shape of the ground plates 32 is substantially rectangular; however, this shape may also be oval, or a shape in which the lower end is pointed in order to allow smooth press-fitting in the slots.

An embodiment of the present invention was described in detail above. However, the present

invention is not limited to this embodiment. It goes without saying that various modifications and alterations are possible. For example, it would also be possible to solder the braids 108 to the plate-form main body part 31 of the grounding member 30 without unraveling the braids 108. In this case, the inner insulators 110 extend above the main body part 31.

We Claim:

1. An electrical connector having an insulative housing and plurality of signal contacts for receiving a plurality of signal conductors and a corresponding plurality of ground contacts for receiving braids disposed around each signal conductor, the electrical connector characterized by:

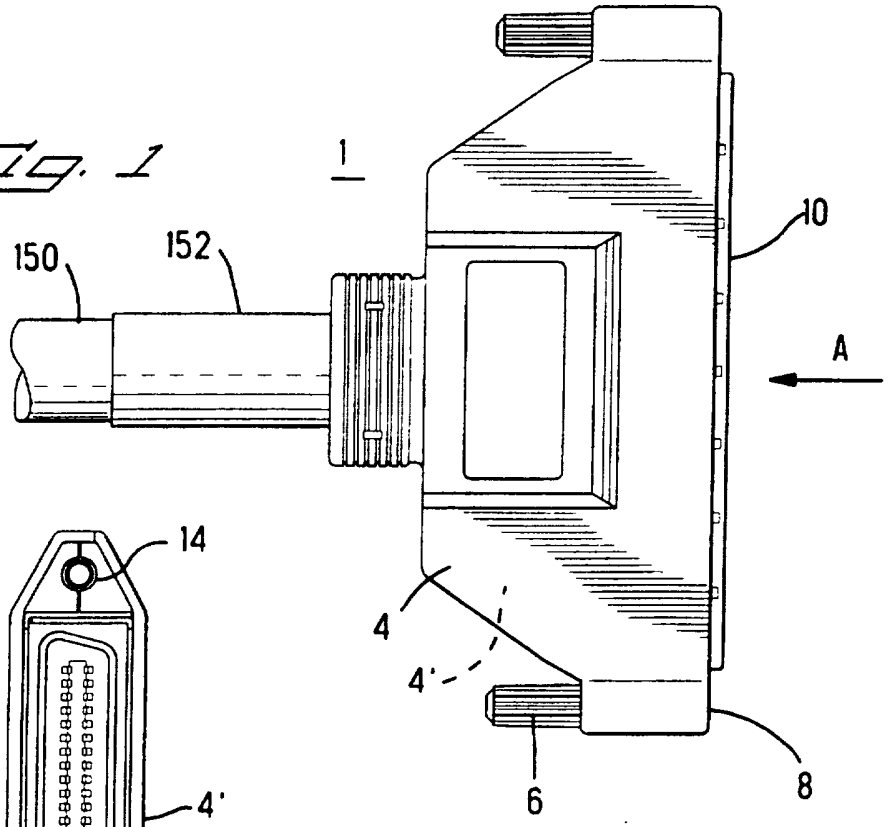
a sub assembly having a grounding member consisting of a plurality of protruding ground plates disposed along one edge of a main body being profiled to electrically engage the braids , the ground plates extending from the main body into engagement with the ground contacts which are each positioned to be next to a signal contact, the signal conductors passing beyond the main body to engage the signal contacts which are each positioned next to a ground plate.

2. The electrical connector as recited in claim 1 wherein the signal contacts are profiled to displace insulation around each signal conductor.

3. The electrical connector as recited in claim 1 wherein each braid is soldered to the main body.

4. The electrical connector as recited in claim 1 wherein each ground plate extends from the main body and is twisted so that it lies perpendicular to a major surface of the main body.

Fig. 1



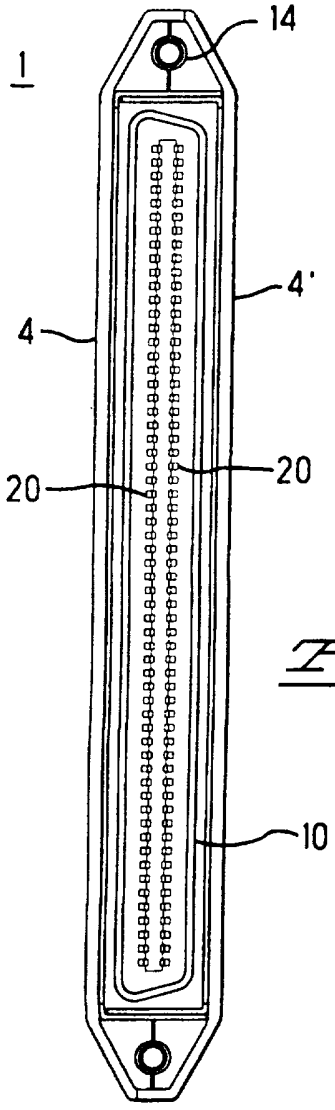


Fig. 2

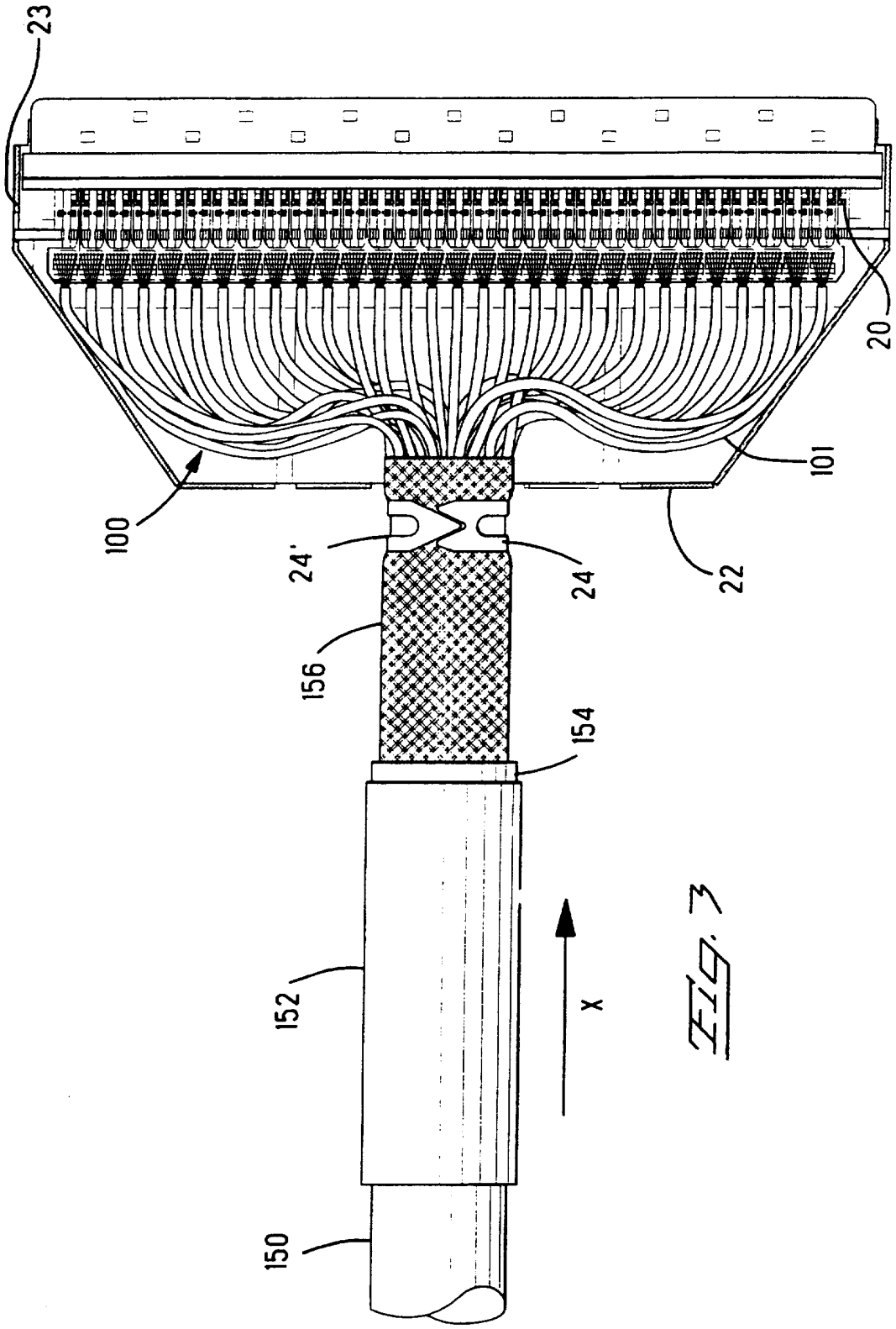


Fig. 3

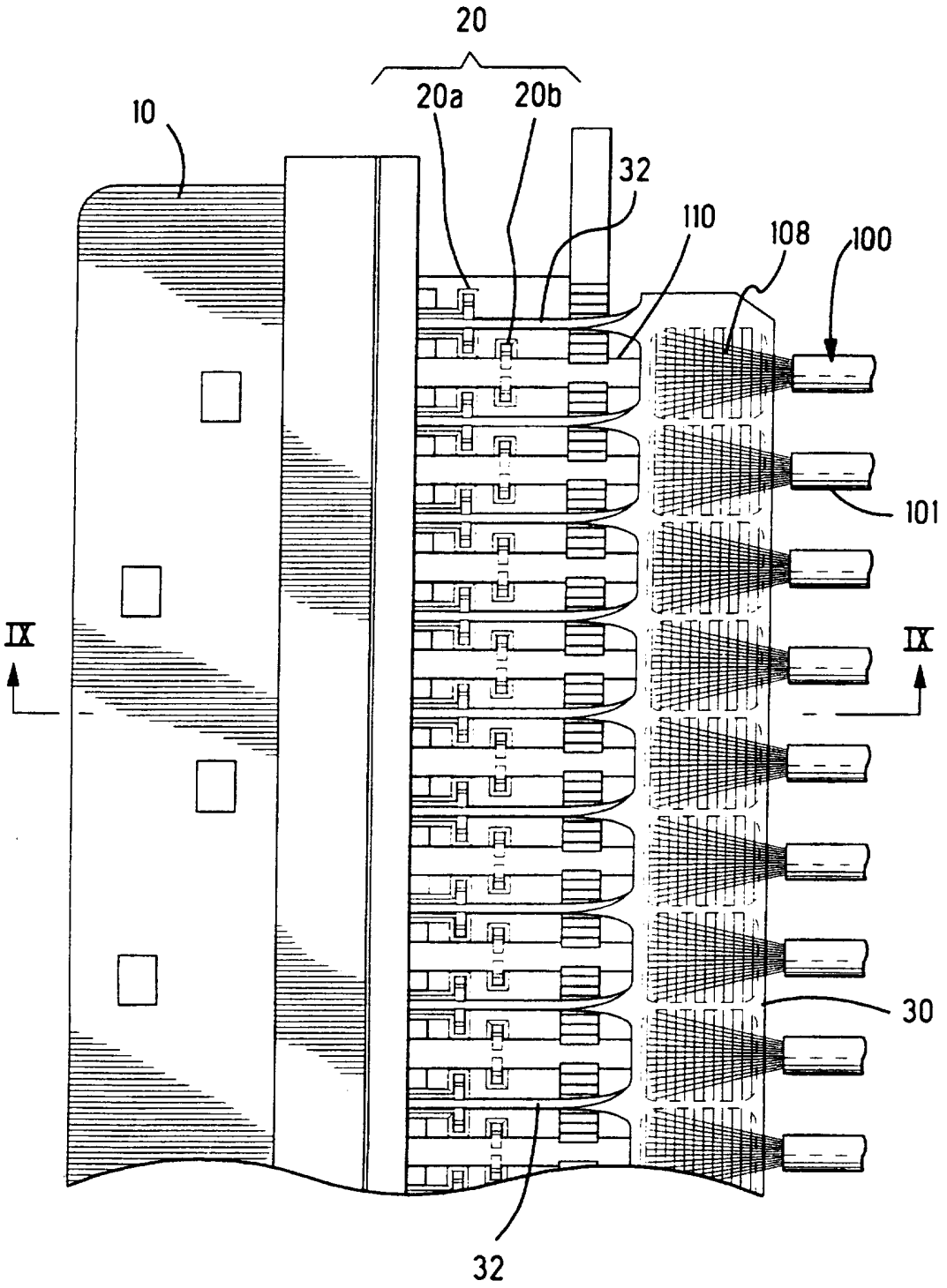


Fig. 4

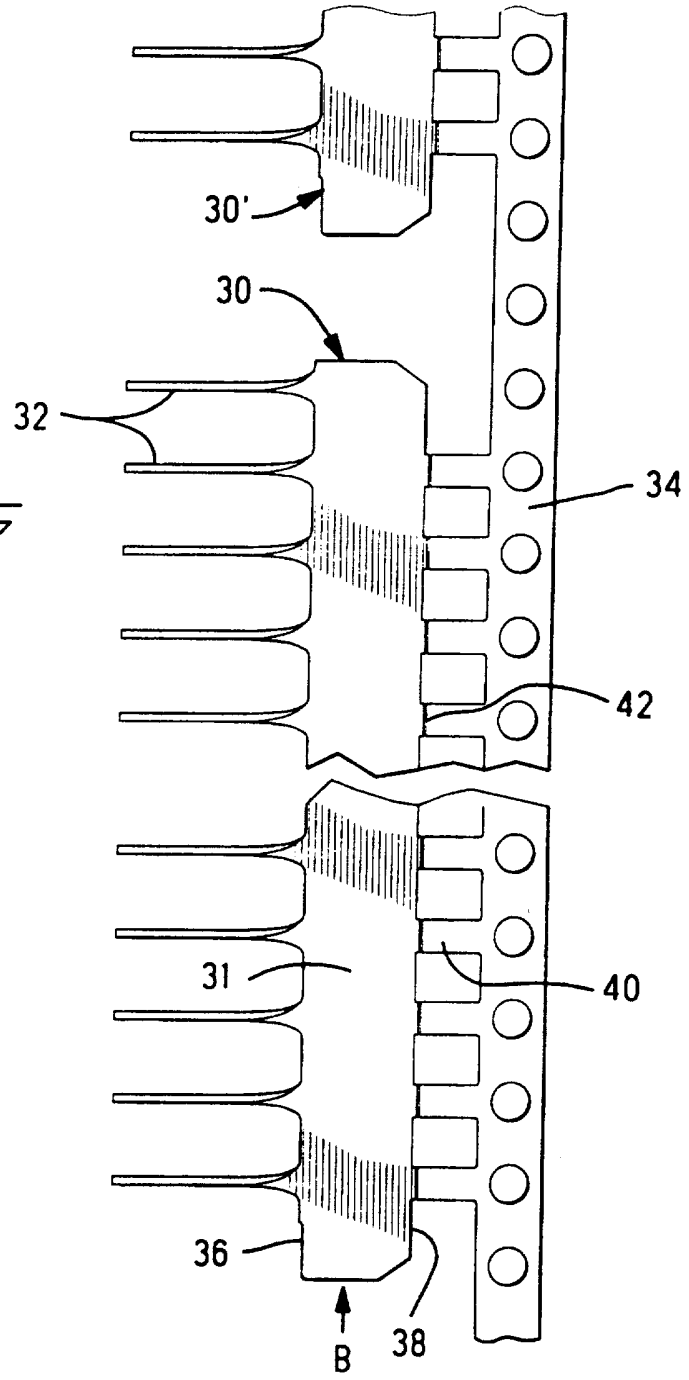


Fig. 5

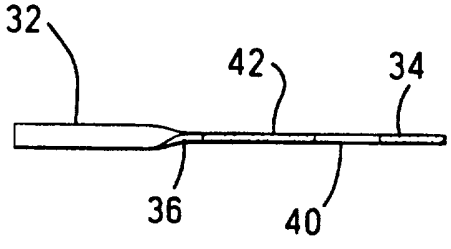


Fig. 6

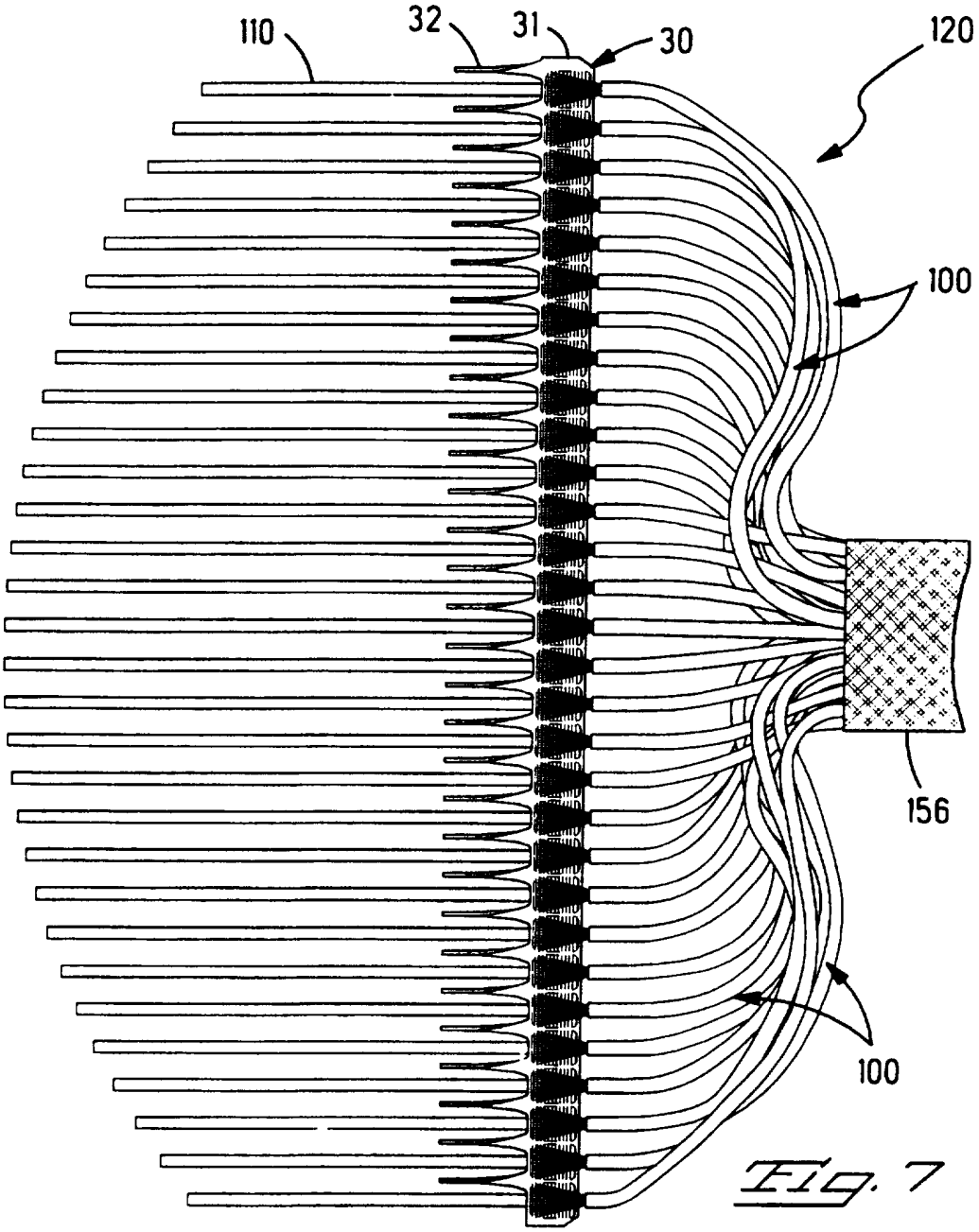


Fig. 7

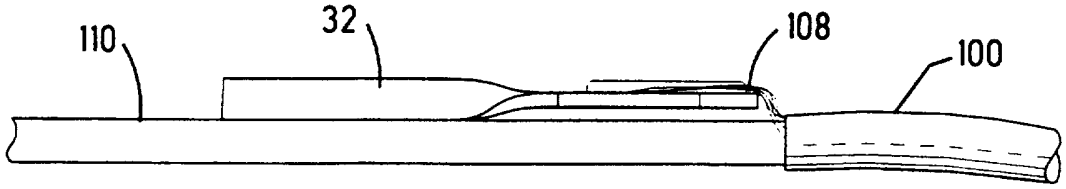


Fig. 8

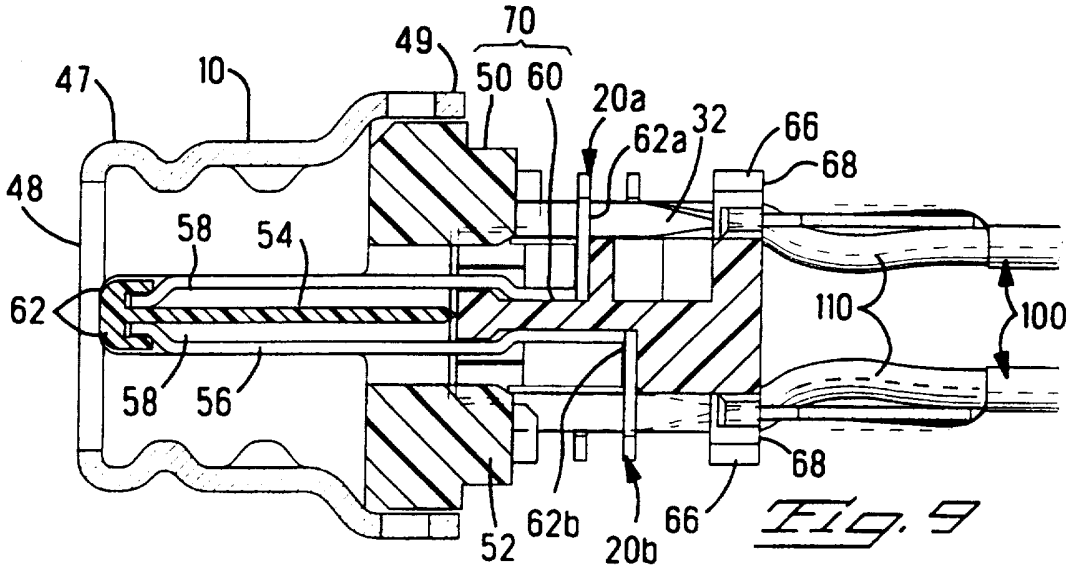


Fig. 9

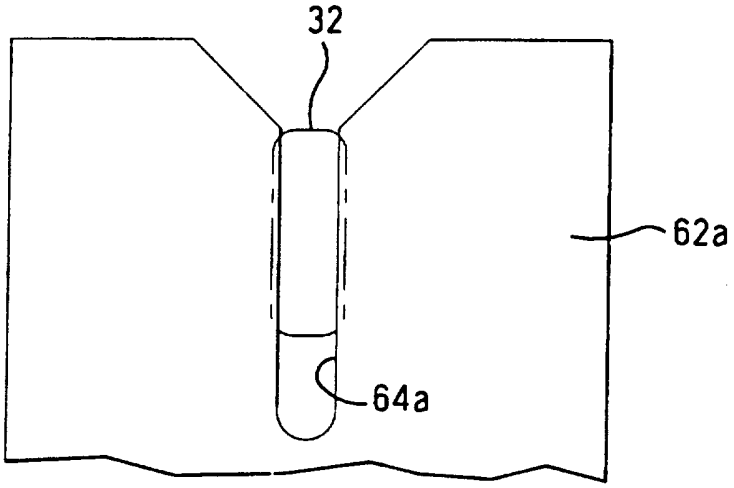


Fig. 10

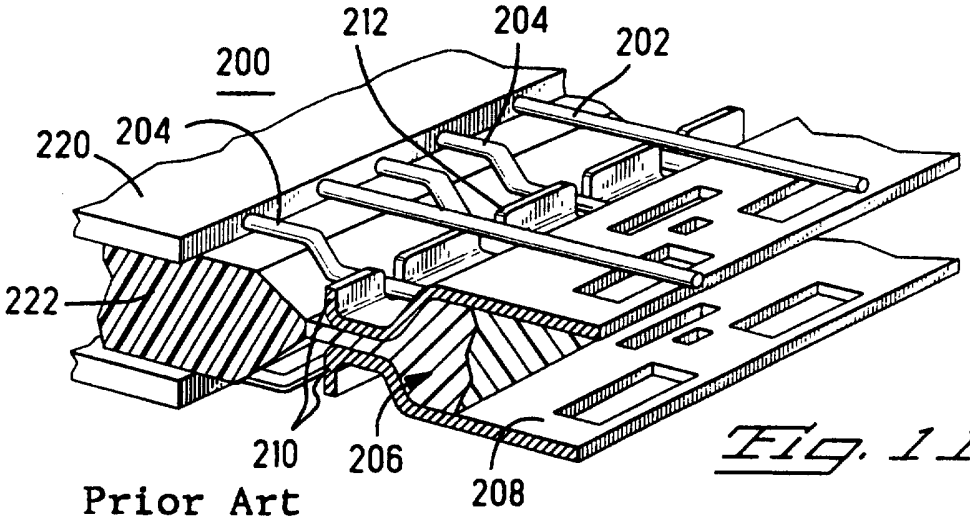


Fig. 11

Prior Art

INTERNATIONAL SEARCH REPORT

Inter nal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H01R13/658

According to International Patent Classification (IPC) or to both national classification and IPC

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 261 328 A (3M) 12 May 1993 see page 1, paragraph 1-2 see page 3, paragraph 2-3; figures 1,2,4	1,3
Y	US 4 781 620 A (J.N.TENGLER ET AL) 1 November 1988 see column 3, line 25 - line 52 see column 5, line 3 - line 59; figures 1,3-6	1,3
A	US 4 976 628 A (J.L.FEDDER) 11 December 1990 see column 2, line 33 - line 48; figures 1,4-5C	1,3
A	EP 0 590 796 A (WHITAKER) 6 April 1994 see column 5, line 36 - line 49; figure 20	1,2

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