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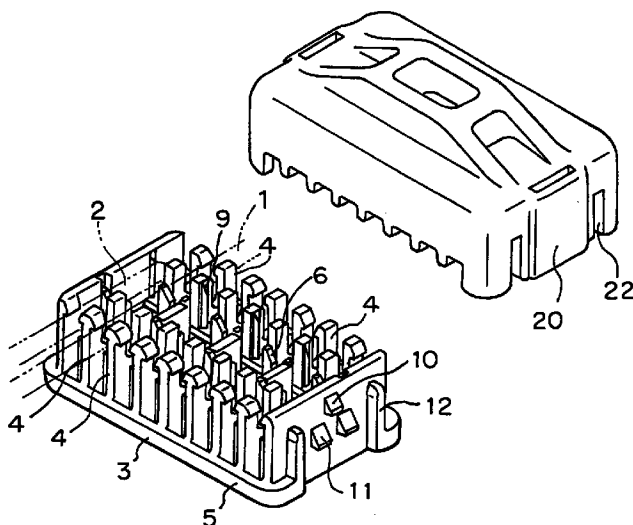
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(54) **Cable branch connector for electrically connecting multicore trunk cables and multicore branch cables with each other**

(57) The cable branch connector for electrically connecting multicore trunk cables and multicore branch cables with each other comprises a case having holding members for holding trunk cables and branch cables, which are to be connected together, in an adjacent and parallel manner, solderless terminals for making the trunk cables and the branch cables conductive with

each other, a cover formed so that it can be mounted to the case, and engaging means for holding the cover in a temporarily engaged state spaced at a predetermined distance from the case and for locking the cover mounted to the case.

FIG.1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention:

The present invention relates to a cable branch connector for electrically connecting multicore trunk cables and multicore branch cables with each other.

Description of the Prior Art:

As a cable branch connector, for example, the one disclosed in Japanese Utility Model Unexamined Publication No. 62468/94 has been known heretofore. Reference will be made below to such a conventional cable branch connector.

Fig.17 is a perspective view of a conventional branch connector being disassembled. In the same figure, the reference numeral 121 denotes a housing, numeral 122 denotes a first cable receiving portion for receiving trunk cables 128 which are for signal transfer or for power supply, and numeral 123 denotes a second cable receiving portion for receiving branch cables 130. The first and second cable receiving portions 122,123 are formed on the back and the surface side, respectively, of the housing 121. Numeral 124 denotes a contact member having electrical conductivity and formed by insert molding in the housing 121 so as to project from each of the cable receiving portions 122,123. Numerals 125 and 126 denote engaging lugs formed plurally at predetermined positions on the side faces of the housing 121. Numerals 129 and 131 denote covers, which are formed with cable receiving portions 132 in corresponding relation to the cable receiving portions 122,123 and also formed with engaging pieces 133. Numerals 134 and 135 denote first and second engaging holes formed in each engaging piece 133.

In assembling, when the covers 129 and 131 are brought into contact with the housing 121 spaced at a predetermined distance, the engaging lugs 125 and 126 of the housing 121 come into engagement with the first engaging holes 134 of the engaging pieces 133, and in a completely engaged state of the covers with the housing, the engaging lugs 125 and 126 are engaged with the engaging holes 135. In this state, the trunk cables 128 and the branch cables 130, which are arranged in up and down relation to each other, are interconnected electrically by means of the contact members 124.

Since the conventional cable branch connector is constructed as above, if the trunk cables 128 and the branch cables 130 are flat cables, it is easy to mount them to the cable receiving portions 122 and 123 formed on the back and the front surface sides, respectively, of the housing 121.

However, in the case of mounting twisted pair cables consisting of discrete trunk or branch cables, it is required to perform their mounting work while checking the cables one by one and while holding them temporar-

ily in the cable receiving portions 122 and 123 formed on the back and the front surface sides of the housing 121. Thus, the working efficiency is poor and the cables are apt to be mounted in wrong positions.

Moreover, since it is difficult to hold the twisted pair cables temporarily at the time of mounting, if there are limitations on the space for working, for example if the working space is intricate or narrow, the working efficiency is further deteriorated, and the cables will come off when the covers are brought into pressure engagement with the housing.

Further, after the said pressure engagement, the cables are held by only the contact members 124 and thus the cable holding force is weak, so that the cables when pulled are apt to come off the connector.

Thus, a cable branch connector which permits mounting of even twisted pair cables firmly has not been provided heretofore.

SUMMARY OF THE INVENTION

The present invention has been accomplished in view of the above-mentioned problems and it is an object of the invention to provide a cable branch connector which can ensure both high connecting work efficiency and high reliability of connection.

In order to achieve the above-mentioned object, according to the first aspect of the present invention there is provided a cable branch connector comprising a case, the case having holding members for holding trunk cables and branch cables, which are to be connected together, in an adjacent and parallel manner; conducting members for making the trunk cables and the branch cables conductive with each other; a cover formed so that it can be mounted to the case; and engaging means for holding the cover in a temporarily engaged state spaced at a predetermined distance from the case and for locking the cover when mounted to the case. With this construction, both high connecting work efficiency and high reliability of connection can be ensured not only in the case where the cables to be connected are flat cables but also where they are twisted pair cables.

According to the second aspect of the present invention, in combination with the cable branch connector of the first aspect, there is provided a cable branch connector wherein the cover has urging projections for urging the trunk and branch cables to the case side when the cover is mounted to the case. With this construction, the trunk and branch cables can be held more firmly and it is possible to obtain a high reliability of connection.

According to the third aspect of the present invention, in combination with the cable branch connector of the first aspect, there is provided a cable branch connector wherein the conducting members each have a pressing blade for pressure contact with the associated trunk cable, a pressing blade for pressure contact with the associated branch cable, and a connecting piece for

connecting the two blades with each other in such a manner that the blades are arranged obliquely relative to each other. With this construction, adjacent trunk and branch cables can be surely conducted with each other in a simple shape. Besides, it is not necessary to determine in what order the cables are to be mounted in accordance with signals. Thus, the working efficiency is improved.

According to the fourth aspect of the present invention, in combination with the cable branch connector of the first aspect, there is provided a cable branch connector wherein branch cable end insertion holes for insertion therein of end portions of the branch cables are formed in the case. With this construction, end portions of the branch cables can be held easily and the assembling work efficiency is improved.

According to the fifth aspect of the present invention, in combination with the cable branch connector of the fourth aspect, there is provided a cable branch connector wherein branch cable holding ribs for pressing and holding end portions of the branch cables are formed on the case. With this construction, the branch cables inserted into the branch cable end insertion holes are held more firmly and difficult to be disengaged from those holes. Thus, the connecting work efficiency and the reliability of connection are further improved.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the present invention will be understood more fully from the following detailed description taken in connection with the accompanying drawings, in which:

Fig.1 is a perspective view of a cable branch connector according to an embodiment of the present invention, showing in what state the connector is assembled;

Fig.2 is a perspective view showing a solderless terminal used in the cable branch connector;

Fig.3 is a perspective view of a case of the cable branch connector, showing a state before mounting of the solderless terminals;

Fig.4 is a perspective view of the case after mounting of the solderless terminals;

Fig.5 is a plan view showing the interior of the case;

Fig.6 is a plan view showing the interior of a cover of the cable branch connector;

Fig.7 is a front view in vertical section showing a state before mounting of the cover to the case;

Fig.8 is a side view in vertical section of the cable branch connector in the state shown in Fig.7;

Fig.9 is a plan view of the cable branch connector, showing a temporarily mounted state of trunk and branch cables to the case;

Fig.10 is a diagram showing an end portion of a branch cable as inserted into a branch cable end insertion hole;

Fig.11 is a diagram showing in what manner the

cover is pressed against the case, using a commercially available tool;

Fig.12 is a front view in vertical section showing a temporarily mounted state of the cover to the case;

Fig.13 is a perspective view showing the cover as pressed against the case;

Fig.14 is a front view in vertical section of Fig.13;

Fig.15 is a side view in vertical section showing a pressed state of a trunk cable;

Fig.16 is a side view in vertical section showing a pressed state of a branch cable; and

Fig.17 is a perspective view of a conventional cable branch connector being disassembled.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention will be described in detail hereinafter by way of a preferred embodiment thereof with reference to the accompanying drawings.

In Figs.1 to 6, the reference numeral 1 denotes a trunk cable which is a twisted pair cable for signal transfer or for power supply, and the numeral 2 denotes a branch cable for branching from the trunk cable. Although the following description is based on the assumption that the trunk cable 1 and the branch cable 2 are twisted pair cables, it goes without saying that they may be flat cables.

Numeral 3 denotes a case having cable holding posts (holding members) 4 for holding the trunk cables 1 and the branch cables 2 to be connected together in such a manner that both cables are arranged in an adjacent and parallel manner. The case 3 has an outer surface formed in a shape such that when a cover 20 is pressed against the case 3 using a pressing tool available commercially, the area of abutment of the case outer surface with the pressing tool is as large as possible and that the pressing force is applied uniformly to the case outer surface.

Numeral 4a denotes a trunk cable holding projection for temporarily holding each trunk cable 1 in a sandwiched state between adjacent cable holding posts 4. Numeral 4b denotes a branch cable holding projection for temporarily holding each branch cable 2 in a sandwiched state between adjacent cable holding posts 4. Numeral 5 denotes a cable bending rib which clamps the cables when the case 3 and the cover 20 to be described later are pressed against each other. As shown in Figs.15 and 16, the cables are held by both cable receiving ends 3a formed at upper edges of the case 3 and cable pressing ends 20a formed at lower edges of the cover 20.

Numeral 6 denotes a solderless terminal (conducting member) formed of, say, a copper alloy for conduction between the trunk cables 1 and the branch cables 2 to be connected together. The pressing terminal 6 is provided with two pressing blades 6a each having a U-shaped groove for press-fitting therein of the associated trunk cable 1 or branch cable 2, and a connecting piece

6b for interconnecting the pressing blades 6a in such a manner that the blades are arranged obliquely relative to each other. Thus, there is no distinction between the blades for both trunk cable 1 and branch cable 2. Therefore, it is optional in which direction the pressing blades are to face when each cable is press-fitted into the U-shaped grooves.

The pressing blades 6a are formed so that they can break the coating of the associated trunk cable 1 or branch cable 2 to provide conduction between both cables.

The pressing blades 6a are each provided at the lower portion thereof with projections 6c for preventing dislodgment of each solderless terminal 6 after press-fitted into a solderless terminal press-fitting portion 7 which is recessed in the case 3.

Numeral 8 denotes a branch cable end insertion hole formed in the case 3 for insertion therein of an end portion of each branch cable 2 to hold the same cable.

Numeral 9 denotes a branch cable supporting rib formed in a pair on each cable holding post 4 to press and hold an end portion of the associated branch cable 2. The branch cable holding ribs 9 each have a generally triangular shape in horizontal section and are formed so that the spacing between the paired ribs 9 is narrower at the bottom. That is, the lower the position where each branch cable 2 is press-fitted between adjacent cable holding posts 4, the stronger the pressing force exerted on the branch cable from the branch cable holding ribs 9.

An internal structure of the case 3 composed of the above components is in the shape of 180-deg. rotation symmetry, as shown in Fig.5, so that the case 3 and the cover 20 can be easily pressed against each other without the need for the worker to consider the direction of the case.

Numeral 10 denotes a temporary retaining portion (engaging means) projecting from each of the right and left outer side faces of the case 3 to hold the cover in a temporarily engaged state spacedly a predetermined distance from the case when the cover is mounted to the case.

Numeral 11 denotes a retaining portion (engaging means) projecting from each of right and left outer side faces of the case 3 below and spacedly from the temporary retaining portion 10. This spaced distance between the temporary retaining portion 10 and the retaining portion 11 permits the creation of the above temporarily engaged state.

Numeral 12 denotes a guide portion which, in mounting the cover 20 to the case 3, comes into engagement with a slit portion 22 to be described later of the cover 20 to position the cover and the case with respect to each other.

The cover 20 is formed so that it can be mounted to the case 3. It has an outer surface formed in such a shape that, when the cover is pressed against the case using a pressing tool available commercially, the area of abutment of the outer surface with the pressing tool is

as large as possible and that a uniform pressing force is applied to the outer surface.

The peripheral edge portion of the cover 20 is cut out in a predetermined shape so that the trunk cables 1 and branch cables 2 can pass therethrough when the cover and the case are pressed against each other.

As shown in Fig.6, moreover, the cover 20 has an internal structure of a shape which is 180-deg. rotation symmetry. This shape of an internal structure permits the cover 20 to be brought into pressure engagement with the case 3 without the need for the worker to consider the direction of the cover.

Numeral 21 denotes an urging projection for urging the trunk and branch cables 1,2 to the case 3 side when the cover is mounted to the case.

Numeral 22 denotes a slit portion for engagement with the associated guide portion 12 of the case 3.

Numeral 24 denotes an engaging projection (engaging means) capable of engagement with the temporary retaining portion 10 and retaining portions 11.

In assembling, as shown in Figs.7 and 8, the trunk cables 1 and the branch cables 2 to be connected together are arranged at predetermined positions in an adjacent parallel manner. The operation for such an adjacent arrangement can be done easily because the cables have respective predetermined colors on their coatings.

Next, as shown in Fig.9, the trunk cables 1 are brought into engagement with the solderless terminals 6 and are each sandwiched in between adjacent cable holding posts 4 by means of the trunk cable holding projections 4a, whereby the trunk cables are held temporarily.

The branch cables 2 are held by inserting their end portions 2a into the branch cable end insertion holes 8 (Fig. 10) and also by means of the branch cable holding ribs 9. Further, for temporary fixing, the branch cables 2 are each sandwiched in between adjacent cable holding posts 4 by means of the branch cable holding projections 4b.

In this way the trunk cables 1 and the branch cables 2 are easily mounted temporarily to the case 3.

Next, as shown in Fig.12, for temporary engagement of the cover 20 with the case 3, the engaging projections 24 of the cover 20 are brought into engagement with the temporary retaining portions 10 of the case 3. At this time, the slit portions 22 and the guide portions 12 come into engagement with each other, so that the case 3 and the cover 20 can be positioned with respect to each other easily and quickly.

Then, as shown in Fig.11, the case 3 and the cover 20 are clamped by a pressing tool 23 available commercially and pressed together until engagement of the engaging projections 24 with the retaining portions 11 as in Fig. 14.

As a result, the trunk and branch cables 1,2 are urged to the case 3 side by the urging projections 21 of the cover 20. At this time, the trunk and branch cables 1,2 are broken their coatings by the pressing blades 6a

and come into conduction with each other, so that the branch connection is completed.

Moreover, when urged to the case 3 side as above, the trunk and branch cables 1,2 are bent by the bending ribs 5 and pulled outward, resulting in that the proportion of the cable portions whose coatings are broken by the pressing blades 6a increases to a further extent and hence the connection becomes more reliable.

Further, the trunk and branch cables 1,2 after the pressure engagement of the cover with the case are bent and clamped firmly by both cover 20 and bending ribs 5, as shown in Figs.15 and 16, so even if the cables are pulled outward, this tension is difficult to be applied to the solderless terminals 6, which terminals therefore can be prevented from being damaged. Thus, the connection reliability is enhanced.

According to this embodiment, as described above, not only in the case where the cables to be connected are flat cables but also where they are twisted pair cables, it is possible to easily effect temporary mounting of the cables and the case-cover pressing work. Consequently, it is possible to improve the connecting work efficiency and enhance the reliability of the connection.

In particular, since the connector components required in the case-cover pressing work are only the case 3 with solder less terminals 6 pre-mounted thereon and the cover 20, not only the cable connecting work is easy, but also the components cost can be reduced.

Besides, since the branch cable end insertion holes 8 are formed in the case 3, the worker can recognize at a glance in which position the end portion 2a of each branch cable 2 should be located. That is, the temporary mounting work for the cables can be done quickly.

Moreover, since the internal structure of the case 3 and that of the cover 20 are each in the shape of 180-deg. rotation symmetry, the cover 20 can be mounted to the case 3 easily without the need for the worker to consider the direction of the cover and the case. Thus, the working efficiency is high.

Further, since the case 3 and the cover 20 can be held in a temporarily engaged state, the worker can perform the case-cover pressing work easily while having in one hand the case 3 which is in a state of temporary engagement with the cover and while having a pressing tool in the other hand.

Although the above description of this embodiment is based on the assumption that the cable branch connector is used for branching cables, it is possible to apply the cable branch connector to other purposes such as, for example, extension of cables and coupling of device blocks.

While a preferred embodiment of the invention has been described, such description is for illustrative purpose only, and it is to be understood that changes and modifications may be made without departing from the spirit and scope of the following claims.

Claims

1. A cable branch connector comprising:

a case having holding members for holding trunk cables and branch cables, which are to be connected together, in an adjacent and parallel manner;
conducting members provided on said case for making said trunk cables and said branch cables conductive with each other;
a cover formed so that it can be mounted to said case; and
engaging means for holding said cover in a temporarily engaged state spaced at a predetermined distance from said case in the course of mounting the cover to the case and for locking the cover when mounted to the case.

2. A cable branch connector according to claim 1, wherein said cover has urging projections for urging said trunk cables and said branch cables to said case side when the cover is mounted to the case.

3. A cable branch connector according to claim 1, wherein said conducting members each have a pressing blade for pressure contact with the associated trunk cable, a pressing blade for pressure contact with the associated branch cable, and a connecting piece for connecting said two pressing blades with each other in such a manner that the blades are arranged obliquely relative to each other.

4. A cable branch connector according to claim 1, wherein branch cable end insertion holes for insertion therein of end portions of said branch cables are formed in said case.

5. A cable branch connector according to claim 4, wherein branch cable holding ribs for pressing and holding end portions of said branch cables are formed on said case.

FIG.1

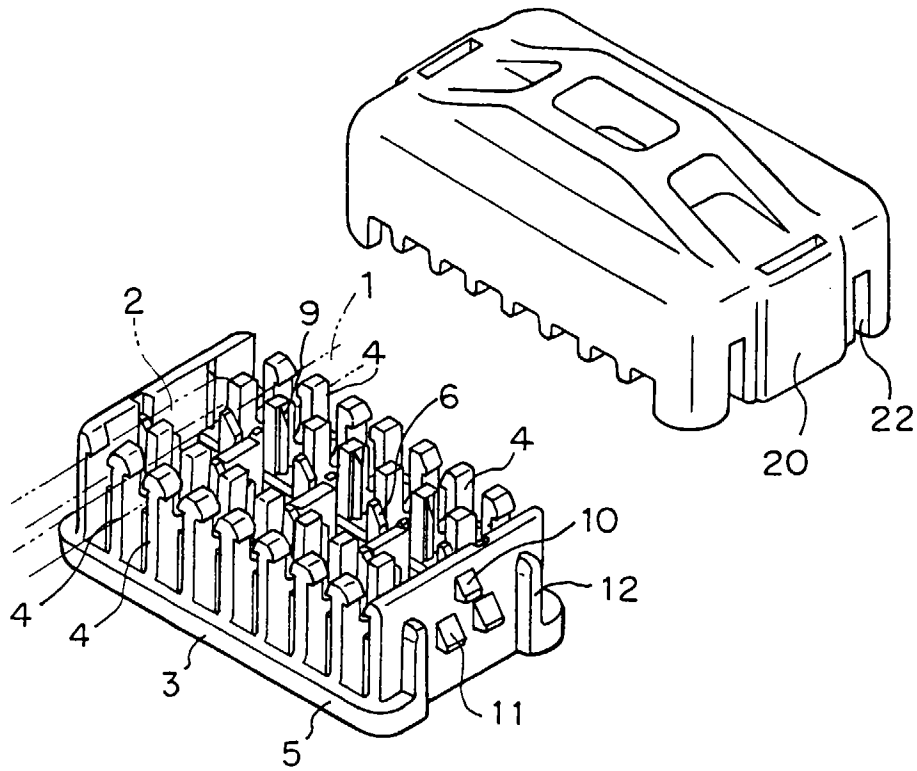


FIG.2

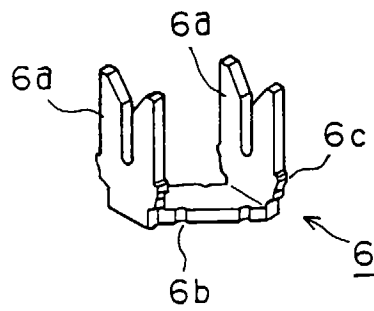


FIG.3

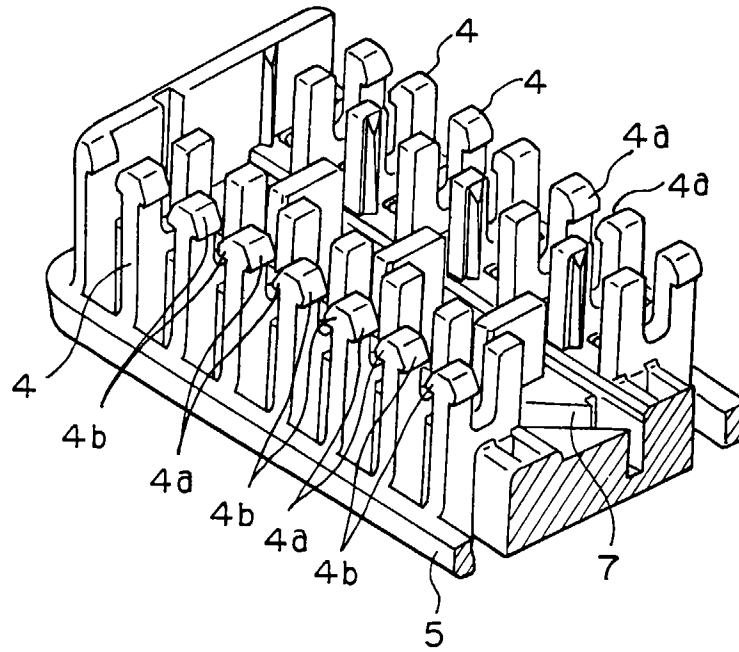


FIG.4

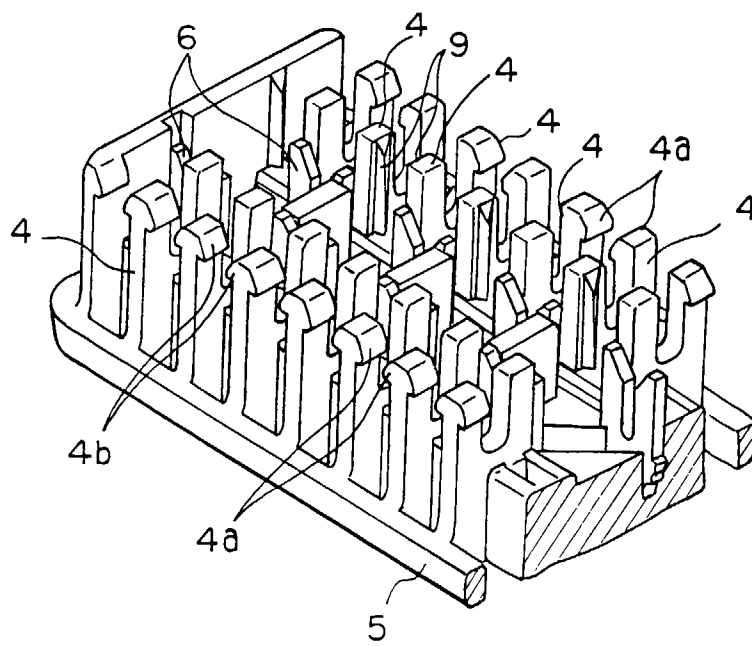


FIG.5

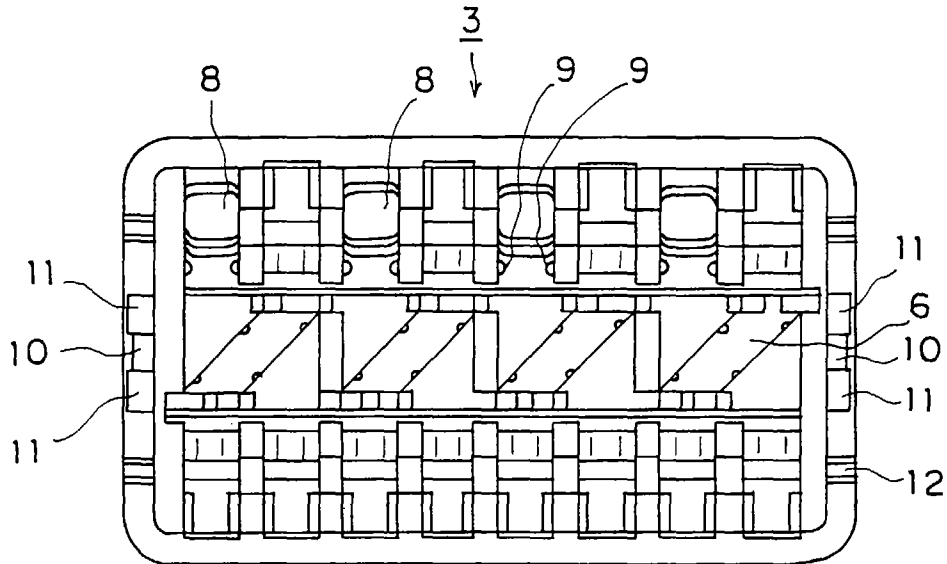


FIG.6

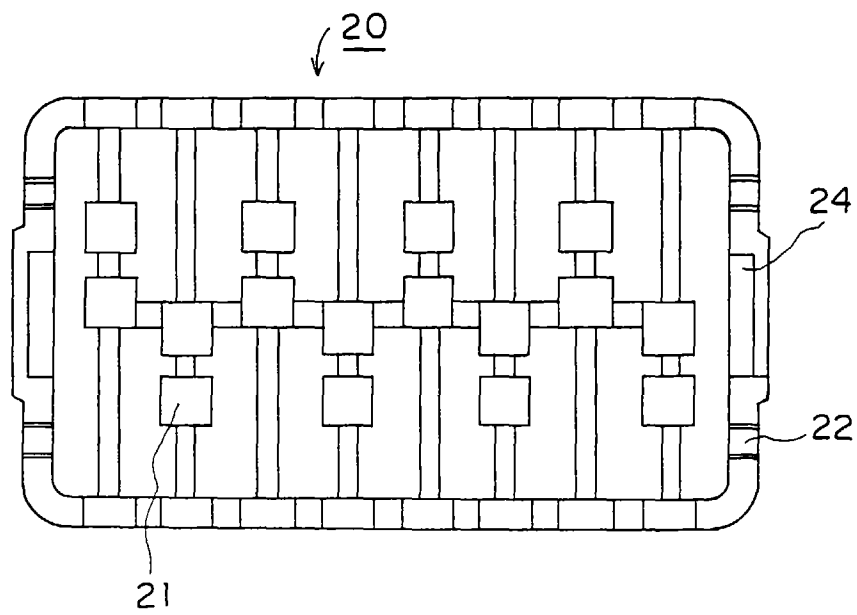


FIG. 7

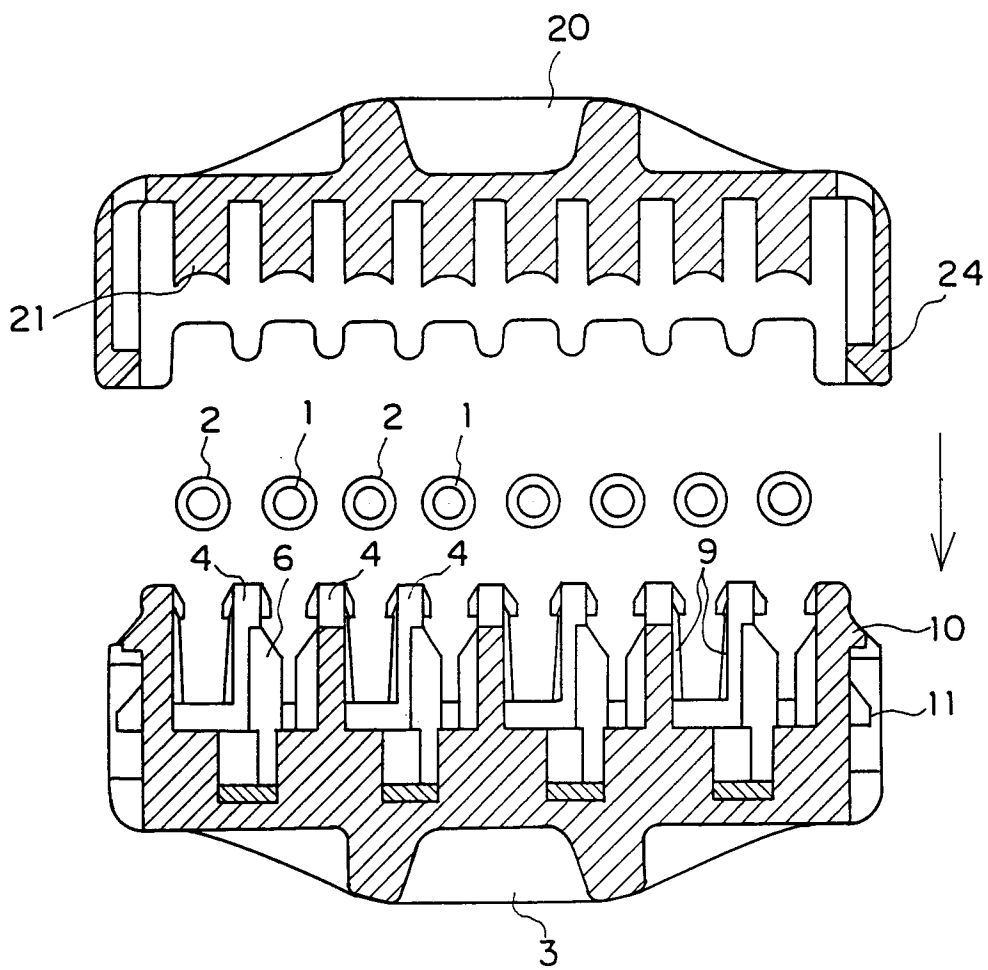


FIG.8

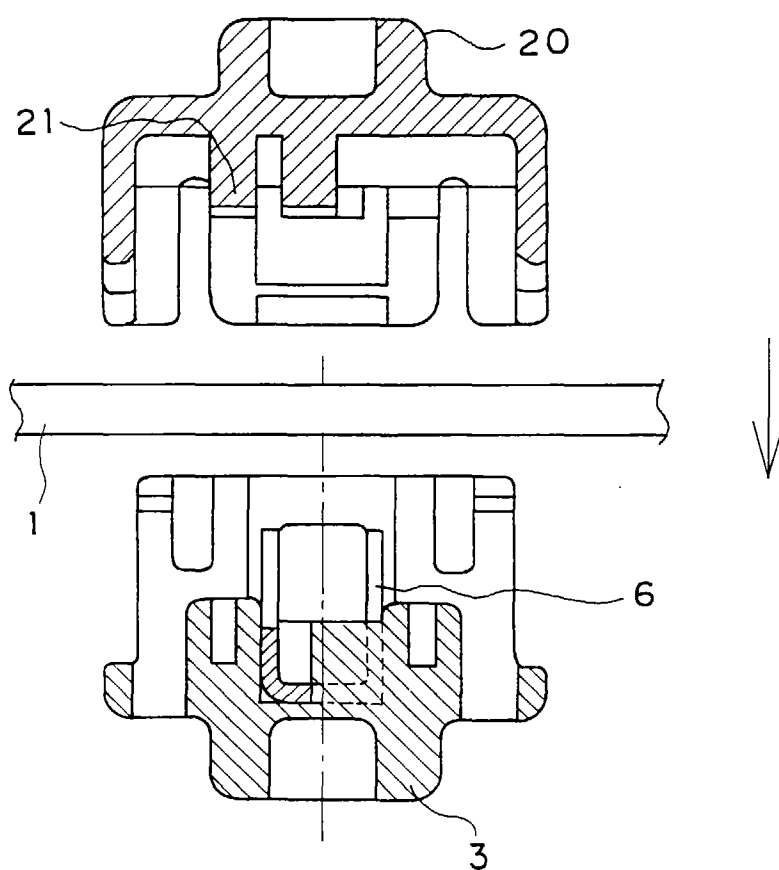


FIG.9

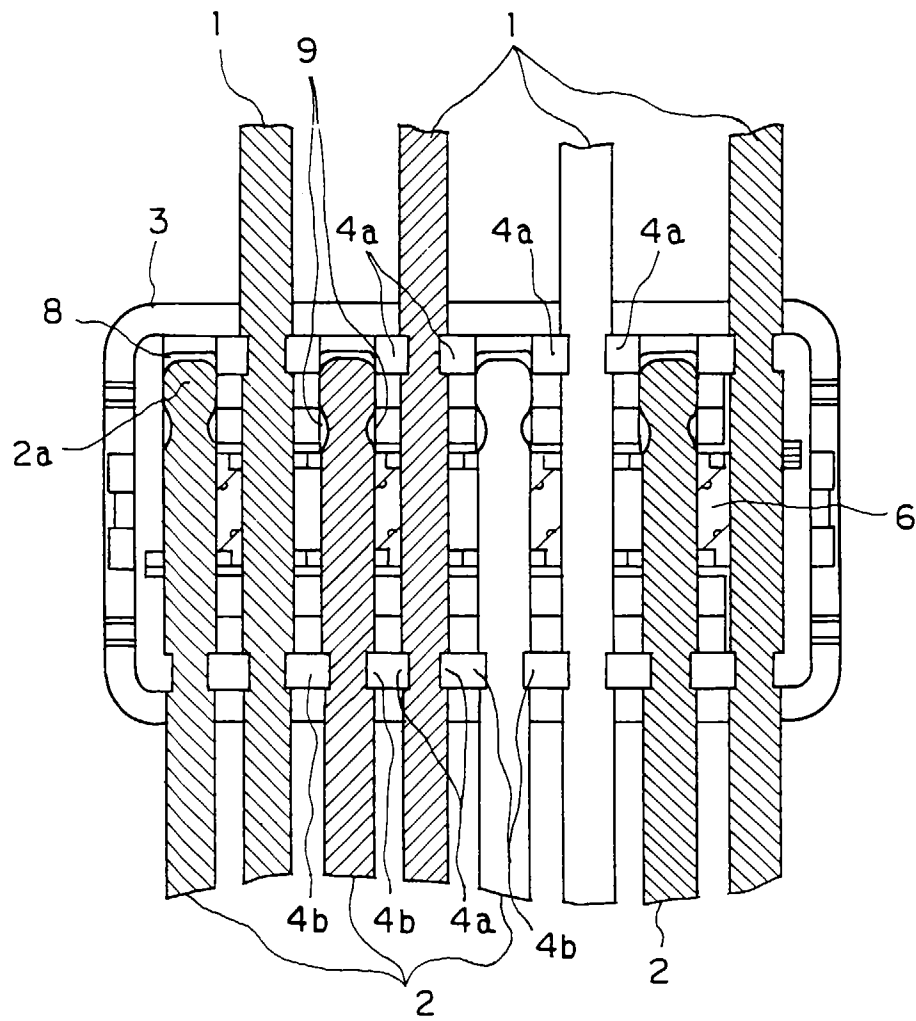


FIG.10

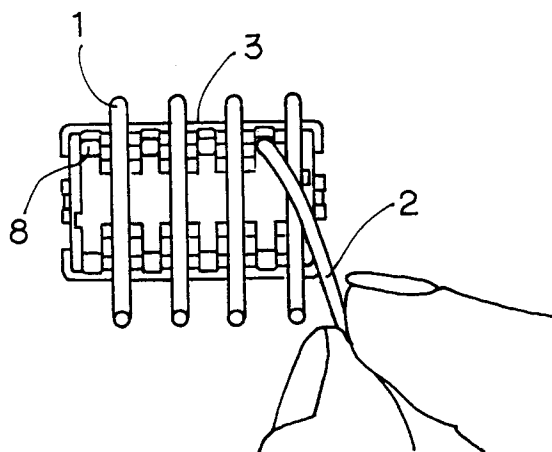


FIG.11

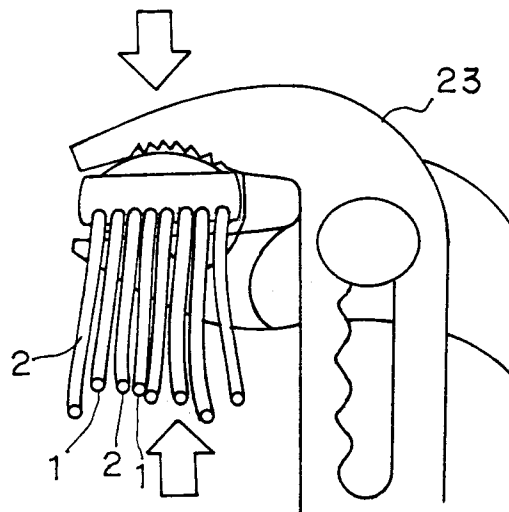


FIG.12

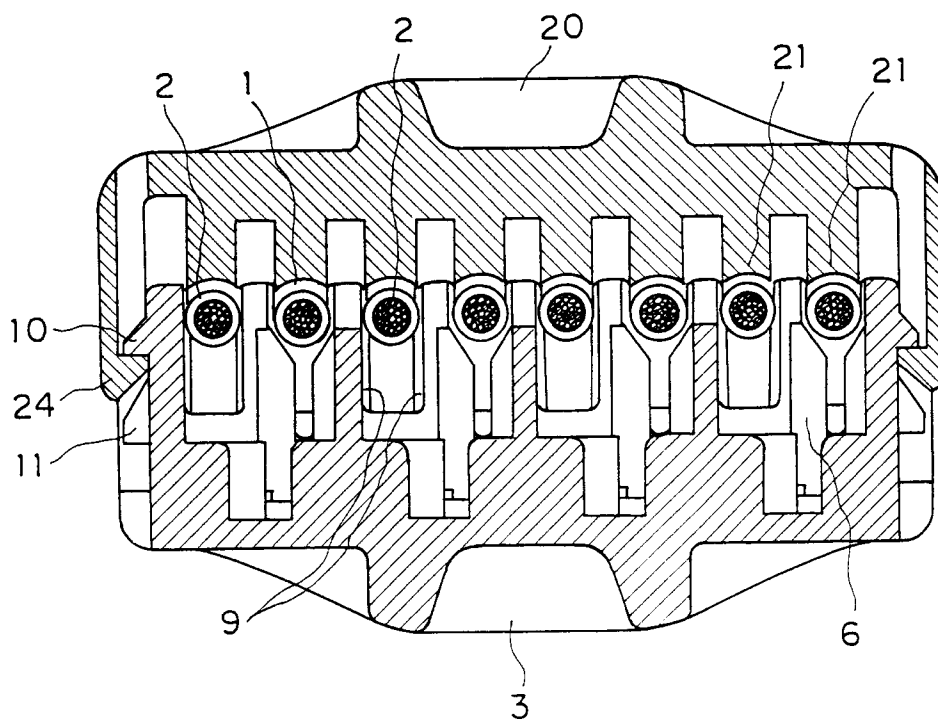


FIG.13

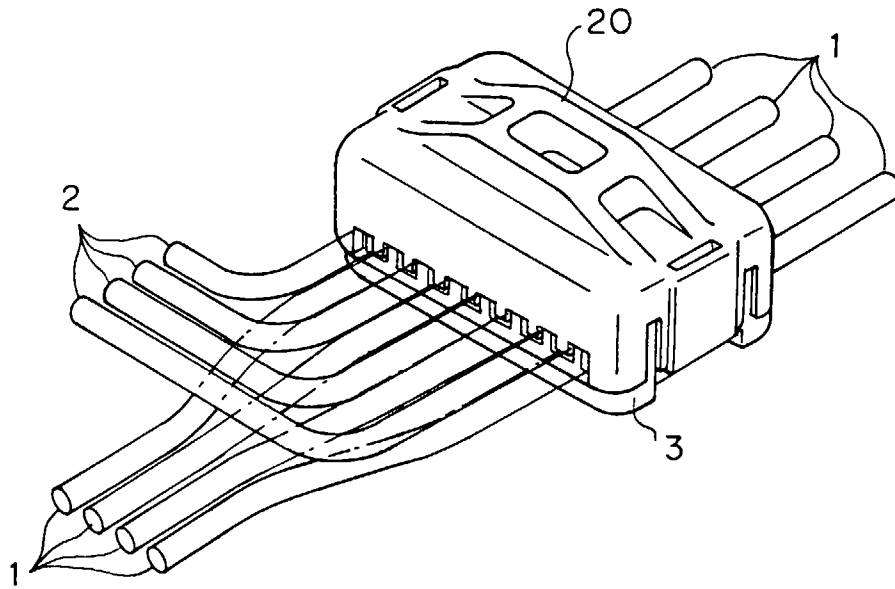


FIG.14

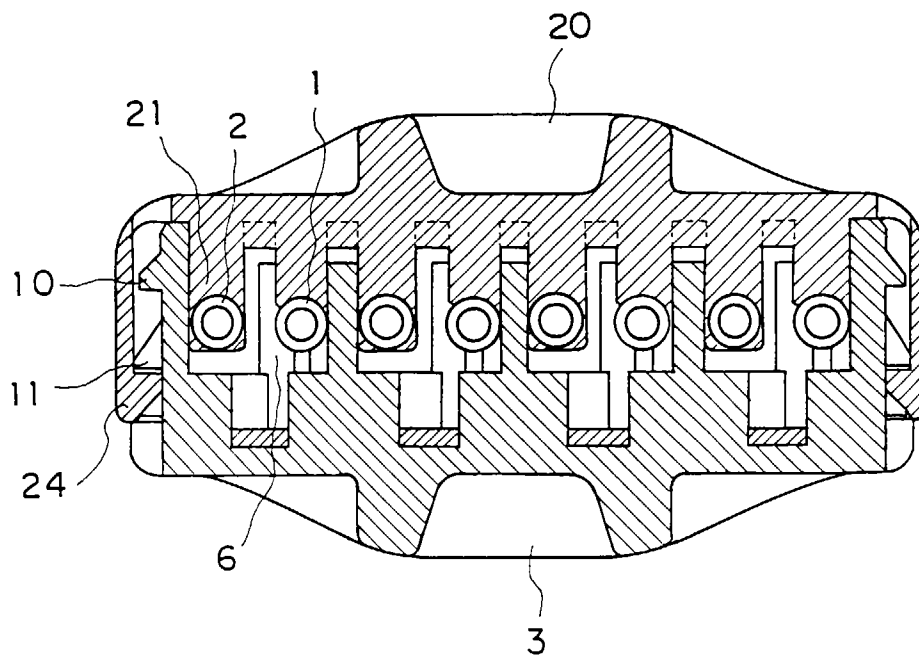


FIG.15

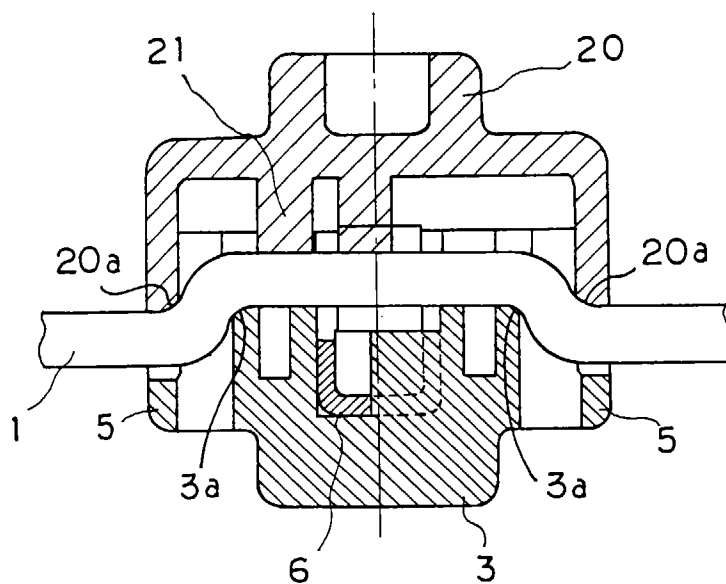


FIG.16

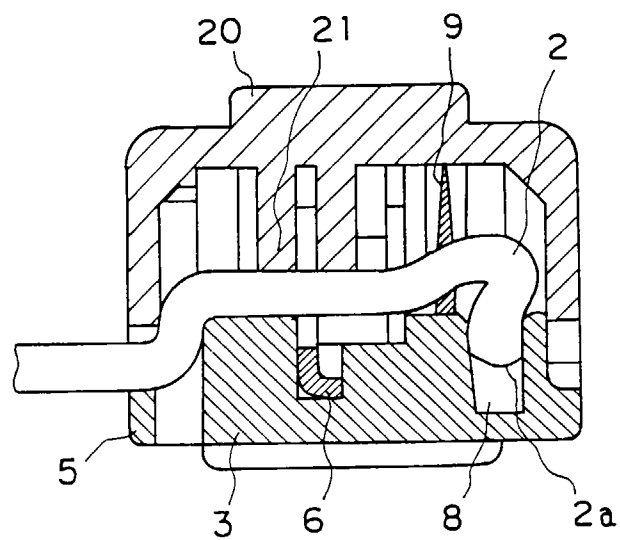


FIG.17
(PRIOR ART)

