

[54] **MULTIPLE PLUG DEVICE**

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[58] Field of Search 339/31-33,
339/88, 89, 90, 65, 66, 184, 185, 186

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[57]

ABSTRACT

A multiple plug device has contact elements on each of two plug parts arranged to define the corners of a polygon, particularly a square. One plug part has a protective collar around the contact elements, which are mounted in a disk, which may be selectively positioned with respect to the disk to align different contact elements of the two plug parts.

6 Claims, 3 Drawing Figures

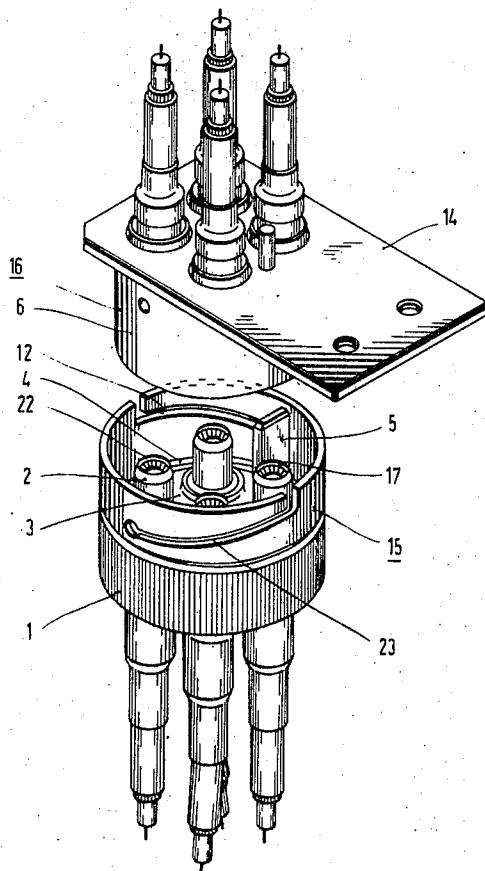


Fig. 1

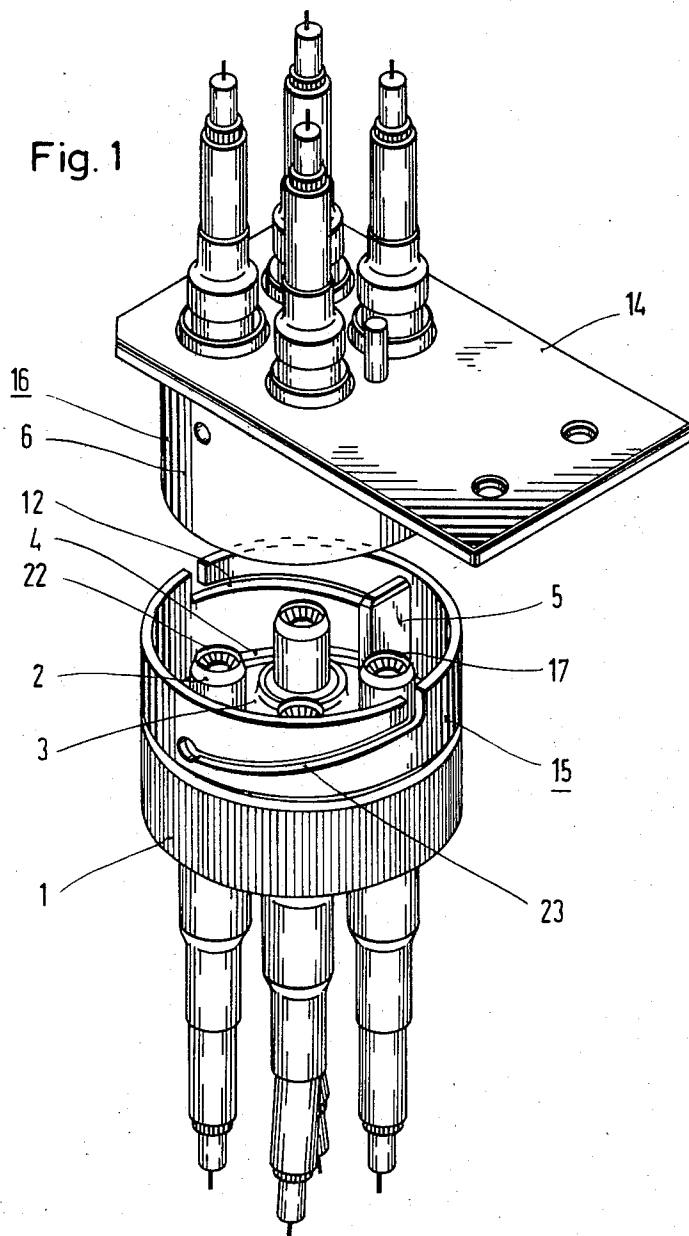


Fig. 2

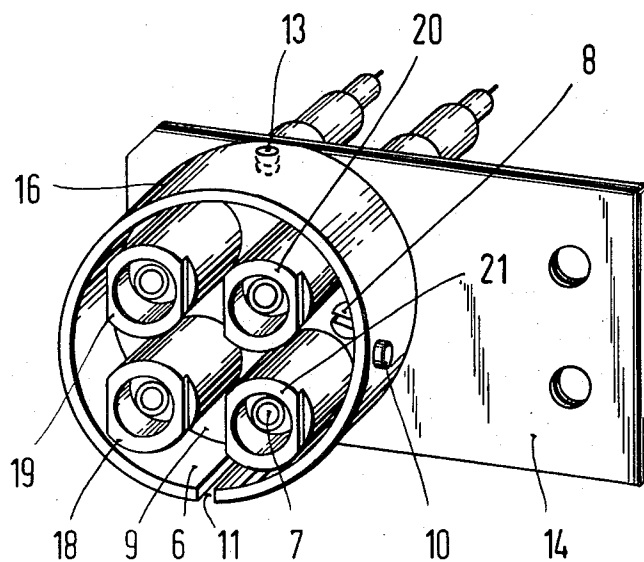
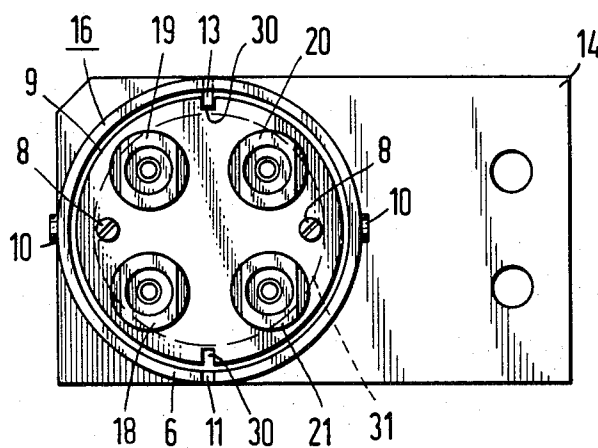


Fig. 3



MULTIPLE PLUG DEVICE

DESCRIPTION OF THE PREFERRED EMBODIMENTS

This invention relates to a plug device and in particular to a multiple plug device having a first plug part comprising first contact elements (such as sockets) and a second plug part comprising second contact elements (for instance plugs), whereby the contact elements of each plug part are fixed in a pattern allowing at least two different associations of the first and second contact elements with respect to each other, specifically, in the end points of a square. Each plug part comprises a protective collar surrounding the first and second contact elements, whereby the protective collars are embodied so that they can be shifted into each other and can be releasably engaged, as well as guiding means cooperating at the plug parts during a plugging process and allowing only one association of the first and second contact elements.

Such plug devices are required, for instance in connection with information transmission techniques, in order to be able to connect coaxial cables in intermediate amplifier positions with the line amplifiers in long-distance transmission systems comprising carrier frequency connections which are extended over coaxial lines. These amplifiers are primarily positioned in unmanned remote-fed amplifier locations. The remote feeding of the amplifiers is thereby effected via the coaxial lines. In order to obtain a symmetrical voltage stress of the cables applied simultaneously for the remote feeding during remote feeding, and also in order to maintain the humming modulation as low as possible, it is desired, for example with two coaxial cables extending between the amplifier locations, to be able to alternately associate the current supply of an amplifier location with the coaxial cable provided for one of the transmission directions and with the coaxial cable provided for the other transmission direction.

It is therefore the object of this invention to provide a multiple-plug device whereby a first association between the contact elements of the two plug part, which is determined by guiding means and which is inexchangeably secured, can be transformed in a simple manner into an equal second or further association which is suited, in particular, for allowing to alternate the current supply of an amplifier location between the transmission direction provided for one of the coaxial cables to that provided for the other coaxial cable in a four-wire coaxial-cable transmission system.

The foregoing object is achieved by provision of a multiple plug device of the initially mentioned kind which is embodied, according to this invention, in such a way that the guiding means of the first plug part comprising the first contact element is rigidly connected with the first plug part, and the protective collar is embodied rotatably around the axis of the part extending in the plugging direction, and that the guiding means of the second plug part which comprises the second contact elements, is associated with the protective collar. The protective collar can be selectively fixed with its plug in one of the rest positions which are evenly distributed over the circumference, whose number is determined by the number of different association possibilities of the first and second contact elements, or at least an integer fraction thereof.

In a further development of the invention, it is provided that a plug part comprise at least one flat or disk-shaped member as contact element mounting, and that the guiding means, which is rigidly connected with its plug part, consists of a projection directed radially with the lateral surfaces, attached with a front side within the protective collar at the contact-element mounting and extending in the plugging direction. The protective collar, which can be fixed with its plug part in the rest positions, is provided with a slot for receiving the front of the projection section and extending in the plugging direction, and comprises a smaller diameter as compared with the other protective collar. The protective collar, which has been provided with the slot is provided with an edge 31 directed inwardly and extending parallel to the contact-element mounting. The protective collar comprises a locking means engaging into corresponding opposite outlines of the contact-element mounting, and that the contact-element mounting is composed of an inner disk and outer plate which clamp the edge of the protective collar therebetween. The disk and plate of this contact-element mounting are connected, with the help of screws. The protective collars are designed as hollow cylinders, and the contact-element mounting of the plug part comprises the rotary protected collar is designed as a disk which is rotatably attached in the associated protective collar with the help of a ring which can be directed into an inner groove of the protective collar. The protective collar, which can be fixed at its plug part, comprises two diametrically arranged pins extending outwardly from its outer circumference, and two guiding grooves are cast into the rotary protective collar, which cooperate with the pins in the manner of a bayonet-type fitting.

The advantage of this multi-plug connection are, among other things: that in an even simultaneous connecting or separation of the plug-in sockets is possible when four elements embodied as coaxial plugs or sockets are employed, which avoids a multiple contacting and voltage peaks caused by it in the cables, during the connection or separation of the plug connection, in a long-distance feed circuit which is extended via the plug connection; and the voltage peaks would stress protective devices provided for deflecting overvoltages, and would thus be short lived.

Other objects, features and advantages of the invention will be best understood from the following detailed description of an embodiment thereof, taken in conjunction with the accompanying drawing, on which:

FIG. 1 is a pictorial representation of a multiple plug connection provided with the coaxial contact elements whereby the plug parts are illustrated separately;

FIG. 2 illustrates that part of the plug of the multiple-plug device whereby the protective collar is designed for locking-in discrete positions of the plug part; and

FIG. 3 is an end view of the plug part of FIG. 2.

The figures show in detail that the contact elements of the multiple-plug devices, embodied as coaxial sockets 2 and plugs 7, respectively, are fixed in the end points of a square at contact-element mountings 3 or 9, 14, which are respectively associated with a plug part 15 and 16. Therefore, the sockets of the plug parts may, for instance, be connected with the coaxial plugs of the plug part 16, in four different associations, whereby, for example, the socket 17 is contacted alternately with one of the coaxial plugs 18, 19, 20 or 21. It is desired with the illustrated multiple-plug connec-

tion, for example to be able to selectively connect the socket 17 with the coaxial plug 21 or the coaxial plug 19, operationally safe and interchangeably. For this reason, the contact-element mounting 3 which is provided for fixing the sockets, is embodied as a disk rotatably arranged within a cylindrical protective collar 1. The mounting of this disk is thereby effected in an advantageous manner by a shoulder of the protective collar 1 and a resilient ring 4 which is inserted as a retaining spring into an inner groove of the protective collar. The coaxial plug of the plug part 16 is fixed in a contact-element mounting which is composed of a disk 9 which is inserted into the cylindrical protective collar 6, which is associated with this plug part, whereby the coaxial plugs are attached thereto. The mounting also comprises a plate 14, whereby the disk 9 is connected with the plate 14 by means of screws 8. The protective collar 6 is provided with an edge engaging between the disk 9 and the plate 14. Furthermore, it comprises a stud 13 engaging on the inside into recesses 30 of the plate 9. The recesses 30 at the plate 9 are arranged at the circumference of the plate, opposite each other. The protective collar 6 can thus be connected with the contact-element mounting of the plug part 16 in a first position between the disk 9 and the plate 14, by means of tightening the screws 8, and in a second position, different from the first, by means of a rotation around 180°. The protective collar 6 is provided with a slot 11 extending in the plugging direction, and has a smaller diameter as compared with the diameter of the protective collar 1, so that, when the two plug parts are assembled, a projection 5, which is attached with one of its frontal sides at the disk 3 within the protective collar 1, can protrude into the slot 11. Furthermore, two pins 10 are diametrically arranged at the outside of the protective collar 6, and the protective collar 1 is provided with two guidance grooves 12, which are adapted to receive the pins 10 in such a way that, when the two plug parts are connected, the pins 10 intrude into the respective guidance grooves and a locking of the two plug parts of the multiple-plug connection in the manner of the bayonet connection can be effected by means of twisting the protective collar 1.

The length of the projection 5 is dimensioned in such a way that, when the two plug parts are assembled, the projection 5 must first of all be inserted into the slot 11, before the coaxial sockets can be brought into contact with the coaxial plugs. Before this contacting, the protective collars 1, 6 must have already been plugged into each other. In this manner, a clear and accurate association of the coaxial sockets with respect to the coaxial plugs is guaranteed. By means of rotating the protective collar 1, the ends of the guidance grooves 12, can be applied to receive the pins 10 and the pins can be inserted to the guidance grooves. By means of twisting the protective collar 1, the pins 10 will then reach the section 23 of the respective guidance groove 12, extending at an inclination to the plugging direction, and thereby pull the protective collar 6 into the protective collar 1 and thus the coaxial plugs 18, 19, 20 and 21 into the coaxial circuit.

If the association of the coaxial circuits with respect to the coaxial plugs is suppose to be changed in such a way that the coaxial sockets 17 and 22 exchange their association with the coaxial plugs 21 and 19, merely the screws 8 need to be loosened somewhat; the protective collar 6 can then be shifted out of the recess 30 of the

disk 9 with its stud 13, rotated at 180° and the stud 13 can be received by another recess of the disk 9. A subsequent tightening of the screws 8 will fix the protective collar 6 again at the contact-element mounting 14. In an advantageous manner, the guiding means of the contact device consisting of the protrusion 5 and the slot 11 can be utilized for producing a further electrical connection between the plug part 15 and the plug part 16 if the disk 3 and the protrusion 5 are embodied as metallic parts and a contact spring is attached at the protrusion 5, which resiliently clamps between an edge of the slot 11 and the protrusion 5.

Although I have described my invention by reference to a specific illustrative embodiment thereof, many changes and modifications of my invention may become apparent to those skilled in the art without departing from the spirit and scope of my invention. I therefore intend to include within the patent warranted hereon all such changes and modifications as may reasonably and properly be included within the scope of my contribution to the art.

I claim:

1. A multiple connector comprising a first plug part and a second plug part each comprising a respective plurality of contact elements which cooperably engage the other plurality of contact elements when said plug parts are mated, each of said pluralities of contact elements fixed in a pattern defining the corners of a polygon which permits at least two different engagement associations of the pluralities of contact elements, first and second protective collars included in the respective plug parts surrounding the contact elements thereof and dimensioned for telescopic movement of said second protective collar into said first protective collar upon mating of the plug parts, first and second cooperable guide means for the respective plug parts for aligning and guiding said parts, said first guide means rigidly connected with said first plug part, second guide means included in said second collar, said first protective collar being rotatably mounted on said first plug part about an axis of said first plug part extending in the direction of plugging, and means for selectively securing said second protective collar to said second plug part at a number of circumferentially distributed positions, the number of positions determined as at least an integer fraction of the number of possible associations of said pluralities of said contact elements.

2. A connector according to claim 1, wherein said first protective collar is a hollow cylinder and includes an inwardly directed end flange and a circumferential groove about the inner surface thereof, a disk mounting the respective contact elements is disposed between said flange and said groove and a retaining ring is disposed in said groove to hold said disk.

3. A connector according to claim 2, wherein said first guide means includes a projection extending from said disk both axially and radially.

4. A connector according to claim 3, wherein said second protective collar includes means defining a slot for receiving said projection.

5. A connector according to claim 4, wherein said second protective collar includes a second disk mounting the respective contact elements, means defining an inwardly directed edge for receiving said second disk in abutment therewith said second disk including recesses in and distributed about the outer edge thereof, and means for releasably locking the position of said second protective collar with respect to said second disk including at least one stud extending from said second collar into a recess of said second disk.

6. A connector according to claim 5, comprising screws for releasably securing said second collar and said second disk.

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