

[0016] FIG. 4 shows as a flow diagram a method according to an embodiment of the invention for indicating correct installation of a plug-in unit of a telecommunications device.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0017] FIG. 1*a* shows a telecommunications device with a frame 101 and plug-in units installed therein, some of which are designated by numbers 102, 103, 104, and 105. Each plug-in unit is installed in the frame by pushing the plug-in unit in a plug-in unit slot in the frame in the negative z direction of the coordinate system 150. The frame may have, for example, wirings such that plug-in units installed in said frame form a full mesh network or such that plug-in units installed in said frame are connected to a central element of the telecommunications device which may comprise one or more plug-in units installed in said frame or which may be a functional component integrally built in said frame. Said wirings are typically located on the backplane of the frame.

[0018] FIG. 1*b* shows a plug-in unit 102 of the telecommunications device depicted in FIG. 1*a* and a detail of the frame 101. In the plug-in unit 102 there are electric connectors 112, 113, 114, and 115 the contact parts of which make galvanic contacts with the contact parts of electric connectors 116, 117, 118, and 119 in the backplane of the frame when the plug-in unit 102 is inserted in its place along the direction of the arrow 120, i.e. the negative z direction of the coordinate system 150. FIG. 1*c* shows a situation where the plug-in unit 102 has been installed in the frame 101. The plug-in unit 102 has an arrangement according to an embodiment of the invention for indicating correct installation of a plug-in unit. Said arrangement comprises a distance indicator 106 located at the edge 109 of the plug-in unit and adapted to produce an indication for correct installation of the plug-in unit in response to a situation where the distance of the distance indicator from a wall 107 of the frame 101 is smaller than a predetermined threshold value. The distance indicator 106 is an electromechanical limit switch adapted to produce said indication in response to a situation where a first part 110 of said limit switch has contacted the wall 107 of the frame and said first part has traveled a predetermined distance in relation to a second part 111 of said limit switch, which second part is fixed relative to the plug-in unit 102. The distance indicator 106 is thus capable of producing said indication without a need for a galvanically conducted electric current between the distance indicator 106 and frame 101. Information represented by said indication can be output for example by using an indicator light or some other arrangement perceptible to the installer. It is also possible to feed the information represented by said indication into a network management system, for instance. When using the above-described arrangement according to an embodiment of the invention there is no need for electrical circuit arrangements in the frame 101 for indicating correct installation of plug-in units. The above-described arrangement according to an embodiment of the invention can thus also be used in conjunction with telecommunications devices in which there are no such electrical circuit arrangements in the frame.

[0019] FIG. 2 shows a plug-in unit 202 according to an embodiment of the invention and a detail of a frame 201 of a telecommunications device. The plug-in unit may include processor equipment to handle data communications. Said processor equipment may be adapted to support the functionality of at least one of the following, for example: IP (Internet

Protocol) router, ATM (Asynchronous Transfer Mode) switch, Ethernet switch, and MPLS (Multi Protocol Label Switching) switch. The plug-in unit may also be a power supply unit, for example, in which case it might not include processor equipment to handle data communications. The plug-in unit includes distance indicators 206 and 208 which are electromechanical switches located at a distance from each other at opposite ends of the edge 209 of the plug-in unit as shown in FIG. 2. Each distance indicator is adapted to produce an indication for correct installation of the plug-in unit in response to a situation where the distance of the distance indicator from a wall 207 of the frame 201 of said telecommunications device is smaller than a predetermined threshold value. The plug-in unit has an electric circuit adapted to indicate correct installation of said plug-in unit if and only if both distance indicators 206 and 208 indicate correct installation of the plug-in unit. It is also possible to have more than two distance indicators in the plug-in unit.

[0020] FIG. 3 shows a plug-in unit 302 according to an embodiment of the invention and a detail of a frame 301 of a telecommunications device. The plug-in unit includes distance indicators 306 and 308 which are capacitive distance sensors located at a distance from each other at opposite ends of the edge 309 of the plug-in unit. Each distance indicator is adapted to produce an indication for correct installation of the plug-in unit in response to a situation where the distance of the distance indicator from a wall 307 of the frame 301 of said telecommunications device is smaller than a predetermined threshold value. The plug-in unit has an electric circuit adapted to indicate correct installation of said plug-in unit if and only if both distance indicators 306 and 308 indicate correct installation of the plug-in unit.

[0021] The distance indicator in the plug-in unit may also be a magnetic distance sensor, distance sensor based on a beam of light or some other distance sensor suitable for the purpose. A distance sensor based on a beam of light, for instance, need not be located at the edge of the plug-in unit as in the embodiment examples depicted in FIGS. 1*b*, 1*c*, 2, and 3.

[0022] FIG. 4 shows as a flow diagram a method according to an embodiment of the invention for indicating correct installation of a plug-in unit of a telecommunications device. The method includes step 402 to produce an indication, using at least one distance indicator located in said plug-in unit, for correct installation of said plug-in unit if the distance of said distance indicator from a wall of the frame of said telecommunications device is smaller than a predetermined threshold value, condition step 401. The distance indicator used in the method is capable of producing said indication without a need for a galvanically conducted electric current between the distance indicator and frame of the telecommunications device.

[0023] In a method according to an embodiment of the invention the indication is produced by an electromechanical limit switch in response to a situation where the plug-in unit has been pushed towards said wall of the frame of the telecommunications device, a first part of said limit switch has contacted the wall, and said first part has traveled a predetermined distance in relation to a second part of said limit switch, which second part is fixed relative to the plug-in unit.

[0024] In a method according to an embodiment of the invention the indication is produced using a capacitive distance sensor.