Exhibit B

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Falk

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(54) **PLUG-IN CONNECTOR SYSTEM FOR PROTECTED ESTABLISHMENT OF A NETWORK CONNECTION**

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H04L 29/06 (2006.01)

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CPC ***H04L 63/10*** (2013.01); *H04L 63/0853* (2013.01)
USPC **709/227**; 709/229

(58) **Field of Classification Search**
CPC H04L 63/10; H04L 63/0853
USPC 709/227–229; 726/3–10, 16–21, 34; 713/160–163, 168–174, 184–186, 192, 713/194
See application file for complete search history.

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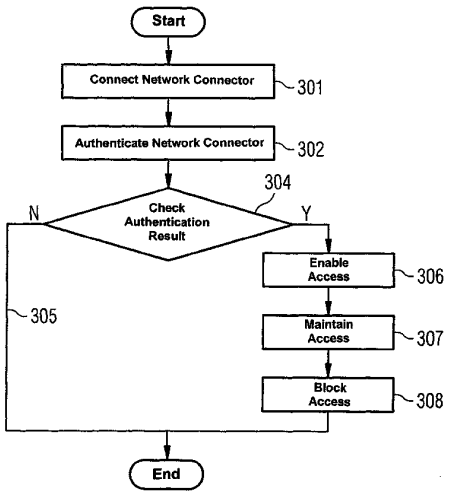
(57) **ABSTRACT**

A plug-in connector system for a data communication interface comprising a network connector and a network socket is equipped with an integrated authentication function that is independent of network communication. The authentication is undertaken independently of the data transmission or the data communication. The enabling is undertaken by a physical connection between the contacts of the network socket, where the network connector associated therewith is established after successful authentication.

7 Claims, 2 Drawing Sheets



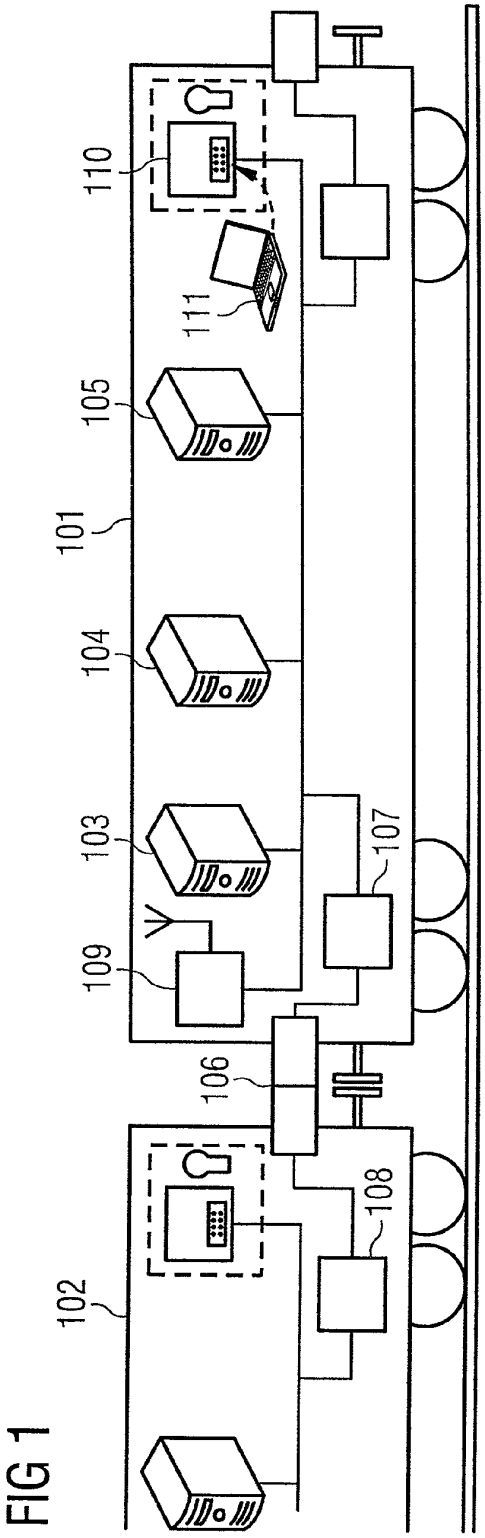


FIG 1

FIG 2

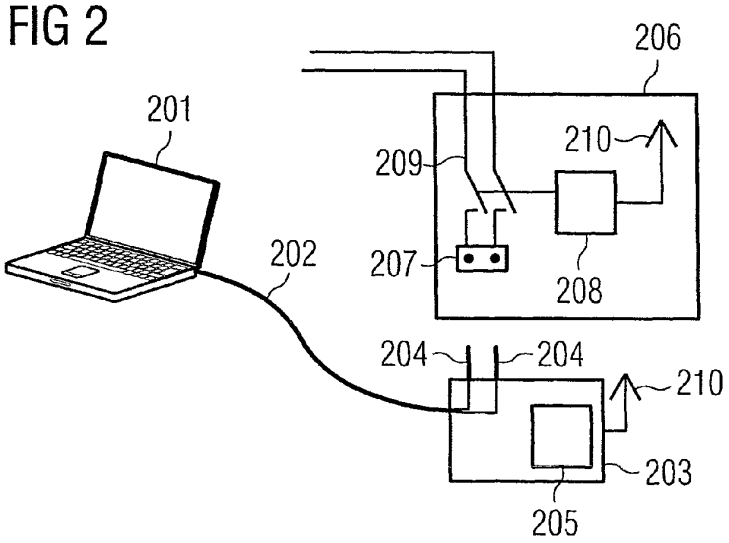
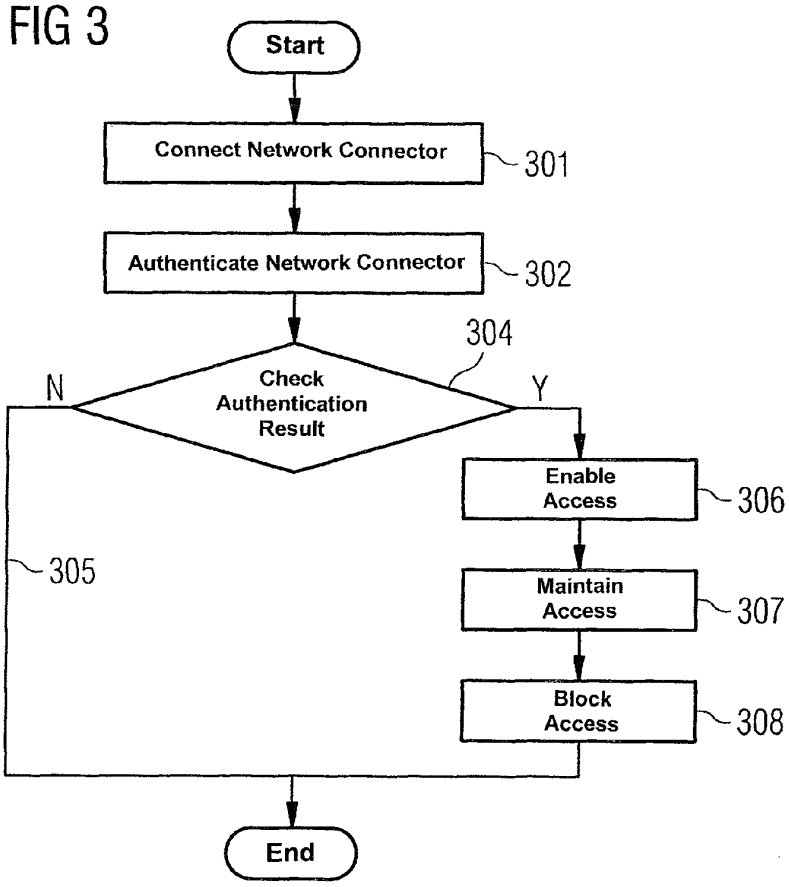


FIG 3



PLUG-IN CONNECTOR SYSTEM FOR PROTECTED ESTABLISHMENT OF A NETWORK CONNECTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a plug-in connector system, and a network plug and a network socket for protected establishment of a network connection, which is especially suitable for granting previously defined maintenance companies or maintenance technicians access to a system that is to be maintained.

2. Description of the Related Art

Technical devices require maintenance at regular intervals or in the event of malfunctions. To guarantee operational security, the maintenance should only be undertaken by authorized personnel. Consequently, it is necessary to allow only appropriately authorized personnel access to the maintenance functionality of the machine or system. For example, an owner of a machine can make it possible that only maintenance personnel who have completed the appropriate training have access to the machine to be maintained. Thus, on the one hand, the safety of the maintenance technician and, on the other hand, the correct operation of the machine to be maintained can be guaranteed.

In such cases, mobile maintenance devices, such as notebooks or PDAs (Personal Digital Assistants), are normally used, which obtain maintenance access by a locally accessible interface to a specific industrial device, such as a train, an interlocking system, an automation controller or a medical device. The connection to the locally accessible interface is made by wire or wirelessly. Diagnostic functions can be called up through the maintenance access, error memories read out, configuration settings of the industrial system modified or software updates uploaded.

To grant access rights, an authentication check is usually performed in which a claimed identity is verified and thus the authorization for accessing the respective maintenance interface is checked. If the authentication check is successful, the access rights previously allocated to the respective user are granted.

Most known authentication methods are based on the entity to be authorized having to prove, in relation to a checking entity, that it is in possession of a secret and/or of an object. The best known authentication method is the transmission of a password in which the authenticating entity transmits a secret password directly to a checking entity. The checking entity or the authentication checking unit respectively then check the correctness of the transmitted password.

For administration of maintenance accesses in large systems, however, such a method involves a significant administrative overhead. In particular, when temporary maintenance technicians or freelancers are used, the respective maintenance passwords should be changed again once maintenance on the system to be maintained has been completed so that future maintenance access is no longer possible for said persons.

A further known option for secure administration of maintenance accesses is to provide the respective network sockets for maintenance access in an area to which access is physically protected. For example, the network socket can be secured with a lockable maintenance flap or can be located in a lockable room. Such a method is, however, associated with uncertainties because a physical access protection can be overcome with little effort in most cases. In addition, this type of solution also demands significant administrative outlay, for example, for distributing and collecting the mechanical keys.

SUMMARY OF THE INVENTION

It is therefore in the object of the present invention to provide a system for administering and implementing access rights to maintenance functionalities that is operable securely and with little effort.

This and other objects and advantages are achieved in accordance with the invention by a plug-in connector system, a network plug and a network socket, wherein the inventive plug-in connector system for protected establishment of a network connection comprises a network plug featuring an authentication unit and a network socket featuring an authentication checking unit and an enabling unit. The authentication unit, the authentication checking unit and the enabling unit include devices for performing the following steps:

A checking command is transferred by the authentication checking unit to the authentication unit. Based the checking command, a checking response is determined by the authentication unit and transferred to the authentication checking unit. The checking response is checked by the authentication checking unit. In the event of a successful check of the checking response, a physical connection is enabled between the network plug and network socket for protected establishment of the network connection by the enabling device.

In the preferred embodiment, a plug-in connection for a data communication interface is equipped with an integrated authentication function independent of network communication. The data communication connection typically involves an RJ45 or M12 plug-in connection. Consequently, the network connector fulfils the function of a key, without a mechanical key being needed, however. The authentication is undertaken independently of data transmission or data communication, so that neither a maintenance device nor a device to be maintained has to support this functionality. The enabling is undertaken by a physical connection being established between the contacts of the network socket and the network plug connected to it.

In an embodiment of the present plug-in connector, after the establishment of a network connection for a network connector by a physically access-protected network socket, identification information of the network connector is stored. Based on the identification information, the network connector is checked at a predeterminable number of further network sockets. In other words, an inventive maintenance cable with authentication function is connected to a physically access-protected maintenance access. In this case, identification information of the network connector is captured and stored by the system to be maintained. Thereafter, further maintenance accesses of the same system will typically be used with this network connector for a certain predeterminable period of time, in which case only the identification information is checked. As a result, a physical access protection only present at some maintenance interfaces can be used to indirectly secure maintenance access by openly accessible maintenance interfaces.

In accordance with an embodiment of the present connector system, the network connector is allowed to set up a network connection for a predeterminable period of time and/or for a predeterminable scope of access rights. Accordingly, the authentication information of a network connector includes information about the maintenance accesses or the period of time for which the respective network connector is authorized and thus able to be used. This allows definition of the systems to which maintenance access is possible with a

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