

SPECIFICATION

1. TITLE OF THE INVENTION

REMOTE MONITORING SYSTEM FOR CONTAINERS

5 2. FIELD OF THE INVENTION AND RELATED ART STATEMENT

The present invention relates to a remote monitoring system for containers which transmits information such as a control command and an operation data by a serial communication system using power lines and is applicable to
10 a marine freezing container or the like.

Generally, the remote monitoring system for containers comprises a central monitoring device, a key terminal station and a plurality of sub terminal stations. In such a system, if connections among the key station and
15 the sub stations are disconnected due to, for example, the maintenance or the movement of a container, a re-registration process (for example, starting of the central monitoring device, the key station and the sub stations) is made for all of the sub stations.

20 In general, the key station is installed in an office in a container yard or in a monitoring place in an operation room of a ship and the sub stations are installed in the container in combination therewith.

Accordingly, since a distance between the key

terminal station and each of the sub terminal stations is far, the key station and the sub stations can not establish the transmission start condition simultaneously. This is the same even in a temporary disconnection due to the movement
5 of the container or the maintenance.

It takes a very large processing time to implement the registration of the sub terminal stations in the key terminal station in the restoration for the temporary disconnection of the sub terminal stations. On the other
10 hand, since the power line is used as transmission means, it is considered that two or more transmission lines such as A and B lines are formed in the same power line. In such a case, The A and B lines are dedicated to only the respective transmission for the respective sub stations connected to
15 the respective corresponding lines.

Further, in a general communication system, since a network address is settled upon the configuration of the system, it can not be applied to the automatic address registration of the terminals in the communication system of
20 the remote monitoring system for the containers of the present invention.

~~Generally, the registration of many and unspecified terminals on the same network into a center computer is made in accordance with a communication sequence
25 shown in Fig. 11. In Fig. 11, when the center computer~~

The freezing container is basically moved among owners of goods, the container yard and the container ships. Accordingly, in the remote monitoring in the container yard and the container ships, it is always required to monitor containers which are newly connected to the communication network or disconnected therefrom. Further it is difficult to leave the operator of the container to make registration of the container.

The present invention resides in a remote monitoring system for containers including a central monitoring device, a plurality of terminal key stations for communication control, and a plurality of subterminal stations for respective containers, wherein the transmission of signals between the key station and the substation can be carried out by serial communication using a power line, characterized in that each said key station and each substation, constituting a signal transmission line system, are capable of storing a respective registration number peculiar to said substation, more than two of said signal transmission line systems are connected to a common power line so that their respective communications can be carried out by simultaneous utilization of said power line, and each said key station is adapted to stored the registration number of each said substation for a predetermined

period of time if said substation is disconnected from said line and to return the communication state to that before the disconnection of said substation if said substation is reconnected to said line within said period of time.

With such a configuration, the peculiar number of the sub terminal station being in communication is stored in the key terminal station and the information representing that the sub terminal station is in communication is stored in the sub terminal station so that the restoration to the ordinary communication state can be made without the re-registration process in the re-connection of any of the key terminal station and the sub terminal station. At this time, in order to decide whether it is the ordinary initial registration or not, the registration number (serial number) is used and the registration number is stored in the key station and the sub station so that communication between the key station and the sub station can be realized without confusion even though two or more transmission line systems are constituted on the same line.

Further, the key station stores the registration number of the sub station until a predetermined time elapses even if the sub station is disconnected from the transmission line and when the sub station is re-connected to the transmission line within the predetermined time, the communication state is restored to the state before the disconnection so that the

restoration from the temporary disconnection such as the movement of the container and the maintenance and the re-communication can be made automatically.

The following effects are obtained.

(a) The restoration from the temporary disconnection such as the movement of the container and the maintenance and the re-communication can be made automatically and high-speed operation can be achieved.

(b) Even though two or more transmission line systems are constituted on the same line, the normal communication can be made and the constitution of the transmission line is not controlled by the wiring state of the power line system.

In practice, AC 200 V or 400 V line, for example, is used as a data communication line by the power line data carrier technique and mutual communication can be made by means of a master modem device and a slave modem device each including a power line data carrier interface. The central computer system issues a monitoring command of a designated container to the master modem device and the master modem device takes up a monitoring data from a freezer controller in accordance with a communication protocol previously set with the slave modem device on the basis of the command to transmit the data to the computer. The computer processes the data and supplies it to an output device. The computer sequentially receives the monitoring data for other containers and processes the data.

In addition, the container makes connection and disconnection with AC lines in response to movement of cargoes in the container yard or the container ship and the logging on and off processes can be made to the central computer system automatically and efficiently by utilizing the peculiar identification numbers of the containers.

Unskillful computer operation by the container operator is removed and the operation for the remote monitoring in the connection and disconnection of the freezing container is also removed so that mistakes by the operator can be excluded and the logging on and off processes to the remote monitoring system of the freezing container can be made exactly.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing a configuration of a first embodiment of the present invention;

Fig. 2 is a block diagram showing a case where two transmission lines are mixed on the same signal transmission line;

Fig. 3 is a timing chart showing the communication process in Fig. 1;

Fig. 1 is a block diagram showing a configuration of a first embodiment of the present invention. In Fig. 1, numeral 1 denotes a central monitoring device, 2 a computer system, 3 a key station A, 4 a key station B, 5 a sub station No. 1, 6 a container No. 1, 7 a sub station No. 2, 8 a container No. 2, 9 a power line

system A, 10 a power line system B, 11 a sub station No. 3, 12 a container No. 3, 13 a sub station No. 4, 14 a container No. 4.

Fig. 2 shows a case where a plurality of transmission lines are mixed on the same line and Fig. 3 is a timing chart of the embodiment shown in Fig. 1. In Fig. 2,

numeral 15 denotes a sub station No. 1A, 16 a container No. 1A, 17 a sub station No. 3A, 18 a container No. 3A, and 19 a common power line system.

5 In Figs. 1 to 3, registration and deletion of a registration number are made by the central monitoring device 1 and storage (data backup) of the registration number is made by the key stations 3 and 4 and the sub stations 5, 7, 11 and 13.

10 When the sub stations 5, 7, 11 and 13 are first connected, since the presence of a new connection is checked for each monitoring cycle from the central monitoring device 1, the connection between the key stations 3 and 4 and the sub stations can be achieved. At this time, the key stations 3 and 4 and the sub stations 5, 7, 11 and 13 store the same
15 registration number. More particularly, when the registration number is determined as, for example, 001 between the key station 3 and the sub station 5, the key station 3 stores the sub station of 001 and the sub station 5 stores 001 as its own registration number.

20 Thereafter, this registration number is used to perform transmission.

At this time, if the No. 1 sub station 5 is disconnected due to any reason, the key station A3 does not cancel the registration number of the No. 1 sub station 5
25 until a predetermined time T_1 has elapsed. Thus, when there

is reconnection within the time T_1 , the connection state is returned to the communication state before the disconnection immediately.

Further, as shown in Fig. 2, in the common power line system 19 in which a plurality of lines (in this example, two lines) are connected to the same line, No. 3A sub station 17 is registered to any one of the key station A3 or B4.

In Fig. 1, when No. 4 sub station 13 is moved from the line 10 of the power line system B to the line 9 of the power line system A, that is, when the connection of No. 4 sub station 13 having a plug inserted into a plug socket of the B line 10 must be changed from the B line to the A line due to movement of the installation place in the yard of No. 4 container 14 or modification of the system or the like by unbalanced consumption power in a ship, calling of the registration number for backup in No. 4 sub station 13 is not made and when this no-calling state is continued for a time T_2 , the registration for the power line system B10 is canceled and the registration for the power line system A9 is newly made.

In this manner, No. 4 sub station 13 is automatically moved from the line 10 of the power line system B to the line 9 of the power line system A.

Attention is drawn to our co-pending Application No. 93.12569.8 divided from the present application, which describes and claims a remote monitoring system for containers which transmits operation information for ~~freezing~~ containers on a communication network including a central monitoring device having a computer and a communication modem device and a communication modem included in the ~~freezing~~ container, characterised in that registration and cancel of the registration to the central monitoring device corresponding to connection and disconnection of the ~~freezing~~ containers are made by using peculiar numbers (terminal address) of the ~~freezing~~ containers for avoidance of collision in request of the registration of a plurality of containers, and when communication for ordinary monitoring is impossible and this state is continued for a predetermined time, the registration is cancelled.

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CLAIMS:

1. A remote monitoring system for containers including a central monitoring device, a plurality of terminal key stations for communication control, and a plurality of subterminal stations for respective containers, wherein the transmission of signals between the key station and the substation can be carried out by serial communication using a power line, characterized in that each said key station and each substation, constituting a signal transmission line system, are capable of storing a respective registration number peculiar to said substation, more than two of said signal transmission line systems are connected to a common power line so that their respective communications can be carried out by simultaneous utilization of said power line, and each said key station is adapted to stored the registration number of each said substation for a predetermined period of time if said substation is disconnected from said line and to return the communication state to that before the disconnection of said substation if said substation is reconnected to said line within said period of time.

2. A system as claimed in claim 1, comprising a plurality of said terminal key stations each associated with a respective power line and a respective plurality of subterminal stations.



12.

3. A system as claimed in claim 1 comprising a plurality of said terminal key stations each associated with respective subterminal station and each connected to a single common power line.

4. A remote monitoring system for containers, substantially as herein described with reference to figures 1 and 3, or figure 2 of the accompanying drawings.
