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(51) INT CL<sup>7</sup>

B61L 27/00 , G06F 17/60

(52) UK CL (Edition T )

G4A AUXV

(56) Documents Cited

WO 00/35732 A1

FR 002265597 A1

JP 200180515 A

(58) Field of Search

UK CL (Edition S ) G4A AUXV AUXX

INT CL<sup>7</sup> B61L 27/00 , G06F 17/60

ONLINE: EPODOC, JAPIO, WPI

(54) Abstract Title

**Railway maintenance work administration system**

(57) A Railway maintenance work administration system (fig 1), comprises maintenance work terminals 3 connected to a central device 2 through a network 4. Work plans are prepared and/or edited using work terminals 5, connected to the central device 2. Approval or authorisation to commence work is requested by the maintenance workers using the maintenance work terminals 3. Authorisation is received from the central device 2 in the form of two or more identical communications, which are displayed together on adjacent screens 35,36 (fig 6) and checked for differences as an error-check. An alternating or flickering display may also be used to facilitate comparison of the two messages.

FIG. 1

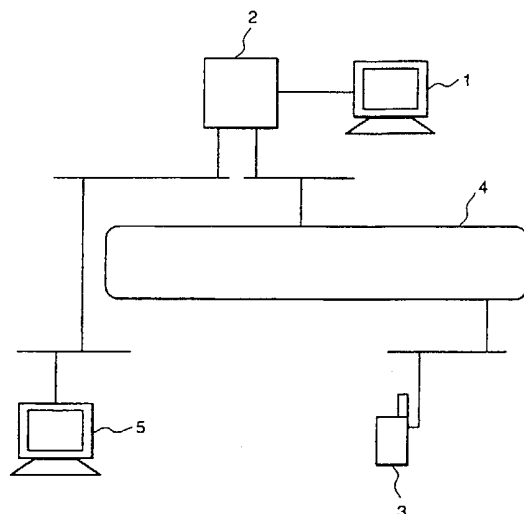
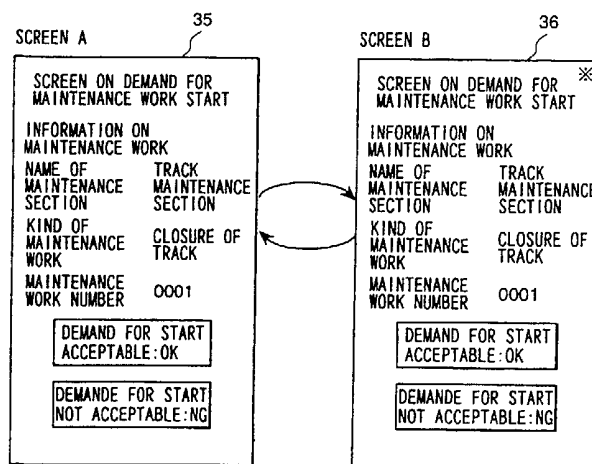
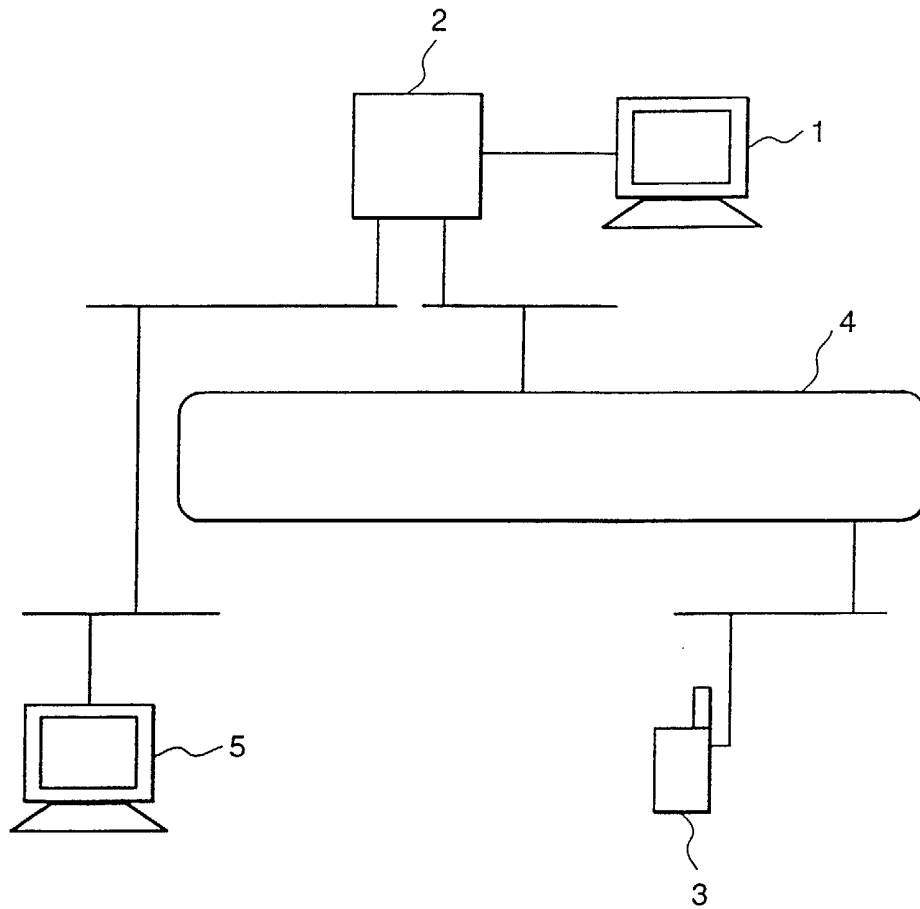


FIG. 6



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*FIG. 1*



## FIG. 2

### DATA CONSTITUTION OF MAINTENANCE WORK PLAN

#### MAINTENANCE WORK NUMNBER

|                             |                           |
|-----------------------------|---------------------------|
| KIND OF MAINTENANCE WORK    | CLOSURE OF TRACK          |
| NAME OF MAINTENANCE SECTION | TRACK MAINTENANCE SECTION |
| MAINTENANCE WORK NUMBER     | 0001                      |
| PURPOSE                     | REPLACEMENT OF TRACK      |

#### INFORMATION ON MAINTENANCE WORKER

|                                             |             |
|---------------------------------------------|-------------|
| MAINTENANCE WORK NUMBER                     | 〇〇          |
| SECTION RESPONSIBLE PERSON BELONGS          | ××××, LTD.  |
| COMMUNICATION ADDRESS TO RESPONSIBLE PERSON | 09012345678 |

#### MAINTENNCE WORK TIME

|                    |            |
|--------------------|------------|
| WORK DATE          | JANUARY 30 |
| WORK PLAN SCHEDULE | 1:10~3:30  |

#### MAINTENANCE WORK SECTION

|                   |                     |
|-------------------|---------------------|
| STATION INTERVAL  | STATION A~STATION B |
| KIND OF LINE      | WAY-UP AND WAY-DOWN |
| (WAY-UP/WAY-DOWN) | 3km,230m~6km,705m   |

FIG. 3

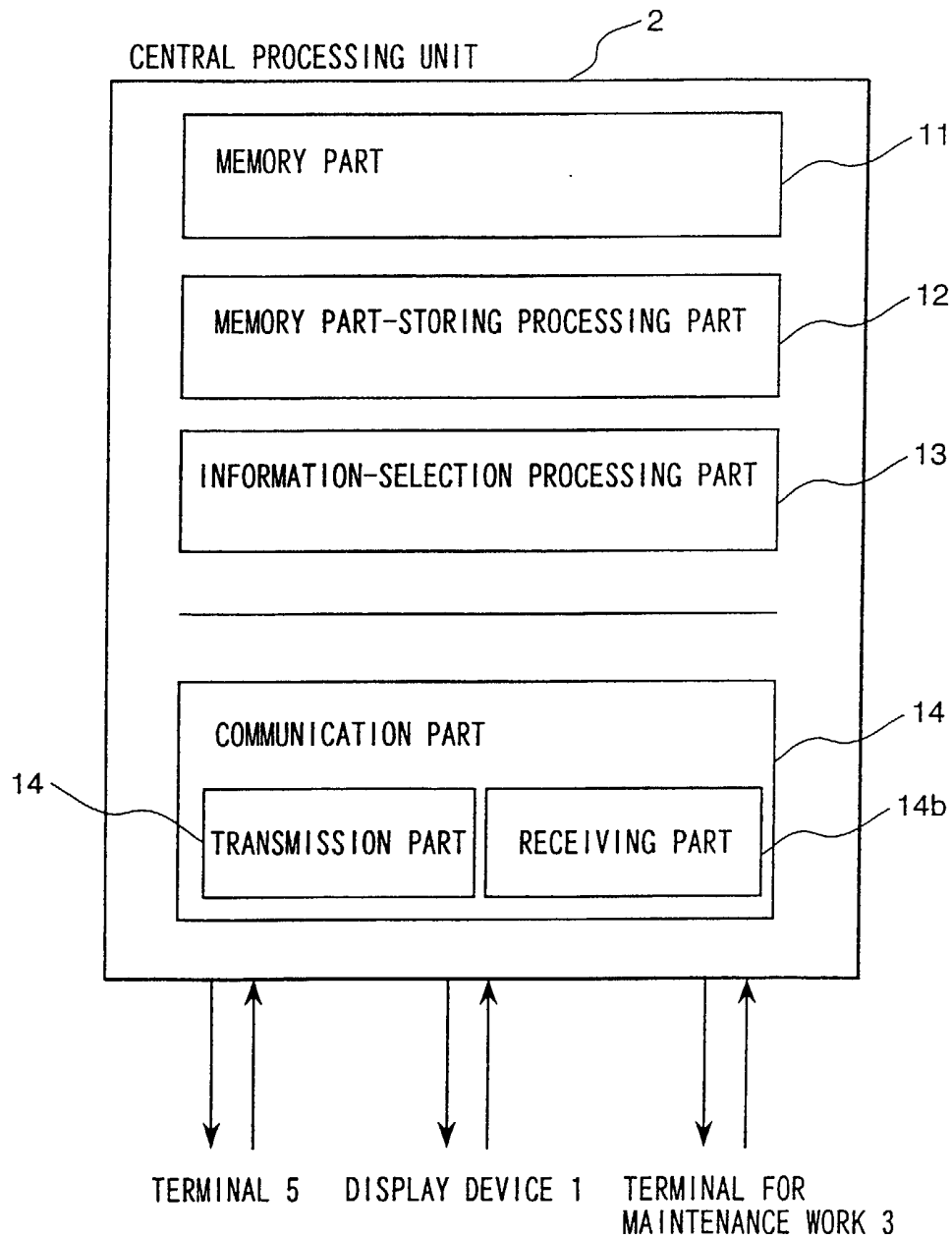
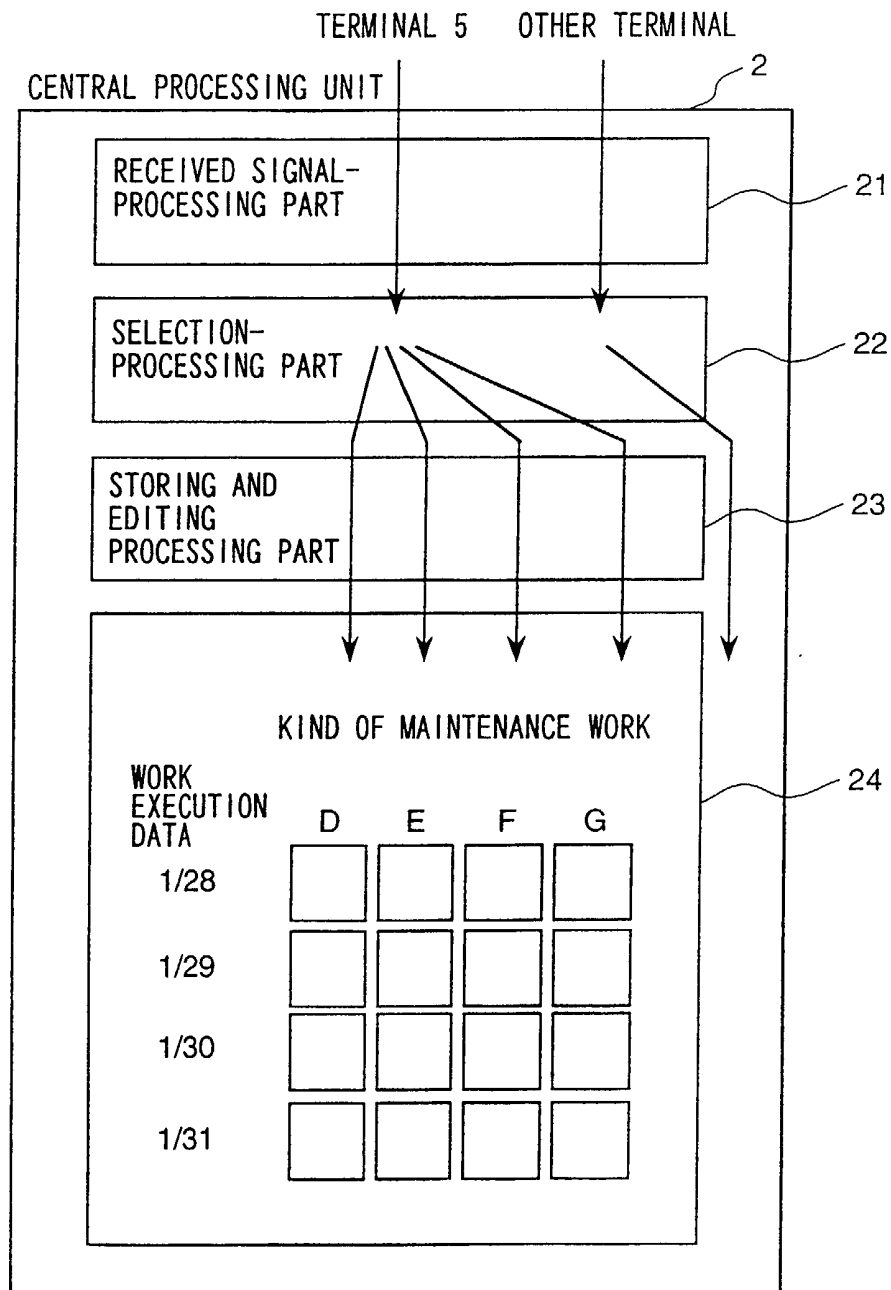


FIG. 4



D: CLOSURE OF TRACK  
 E: MAINTENANCE CAR  
 F: WORK UNDER SIGNAL APPARATUS STOPPED STATE  
 G: WORK UNDER ELECTRICITY STOPPED STATE

*FIG. 5*

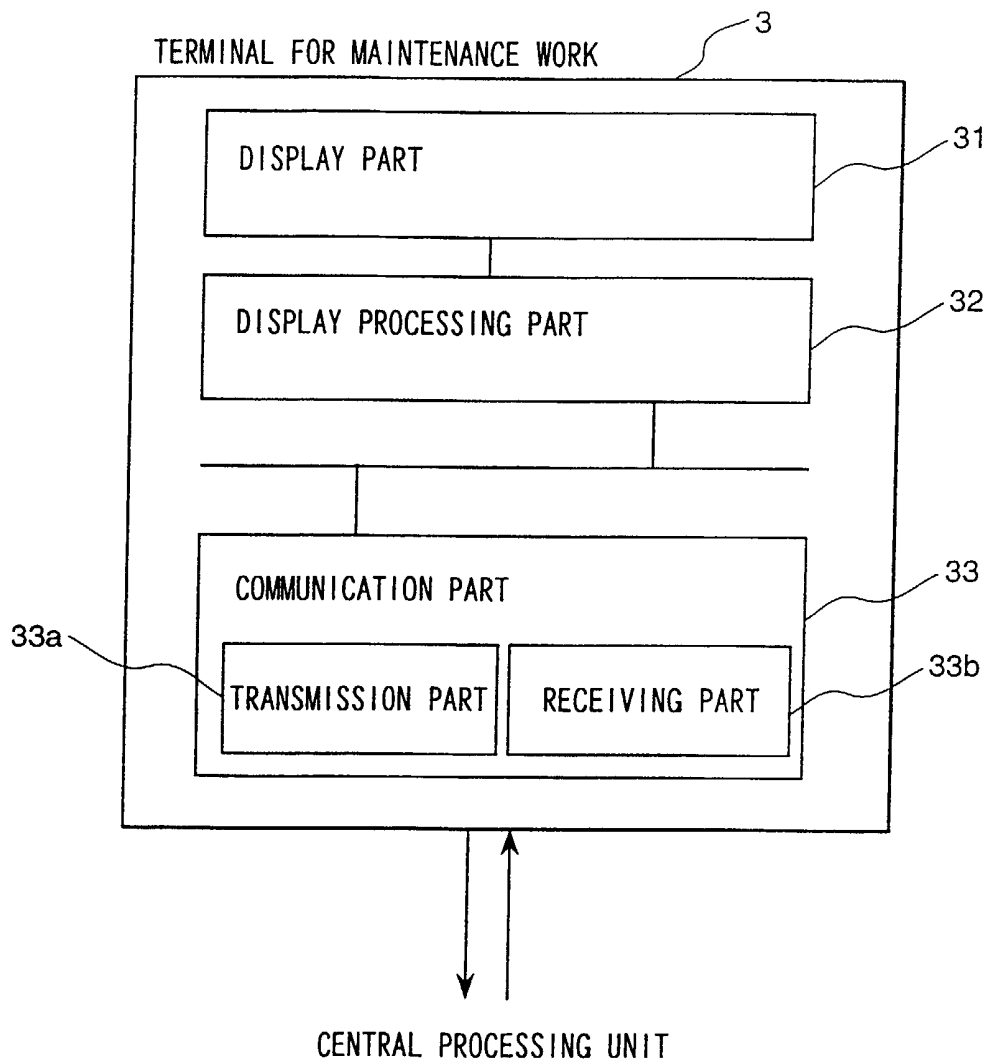


FIG. 6

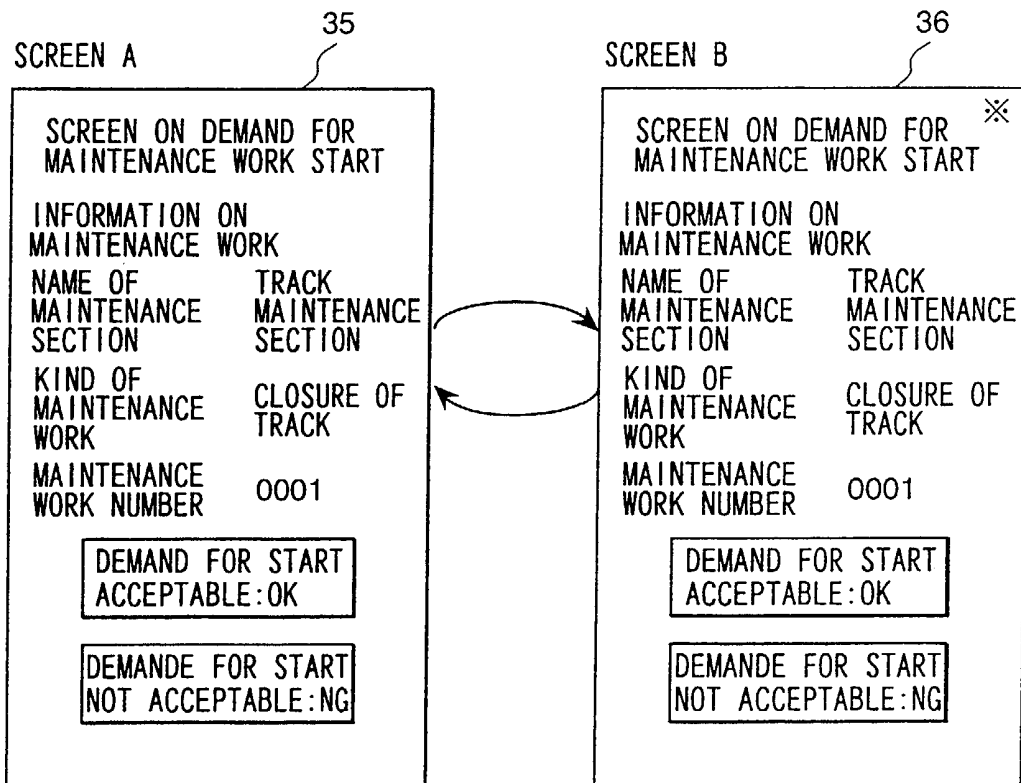


FIG. 7

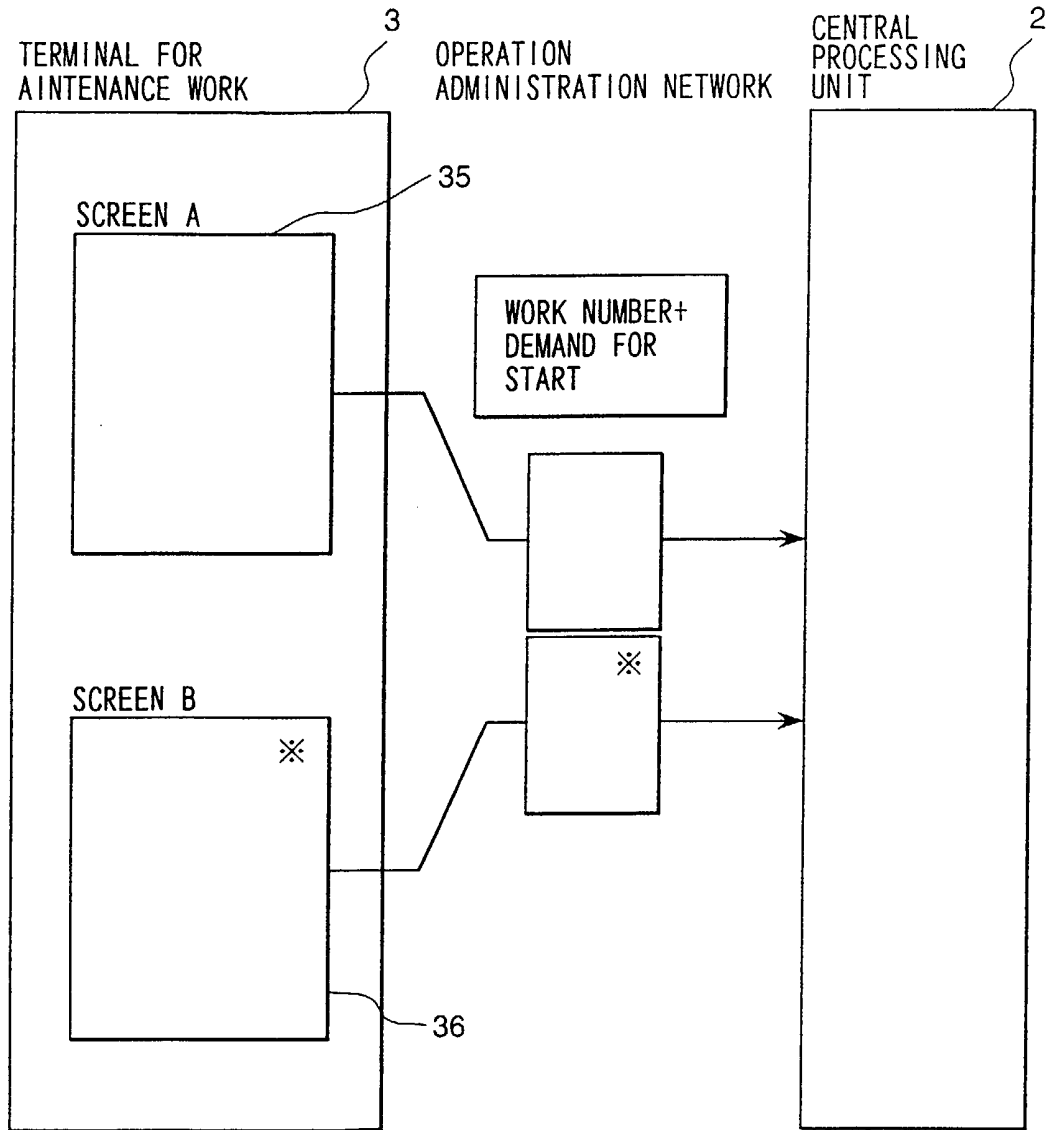


FIG. 8

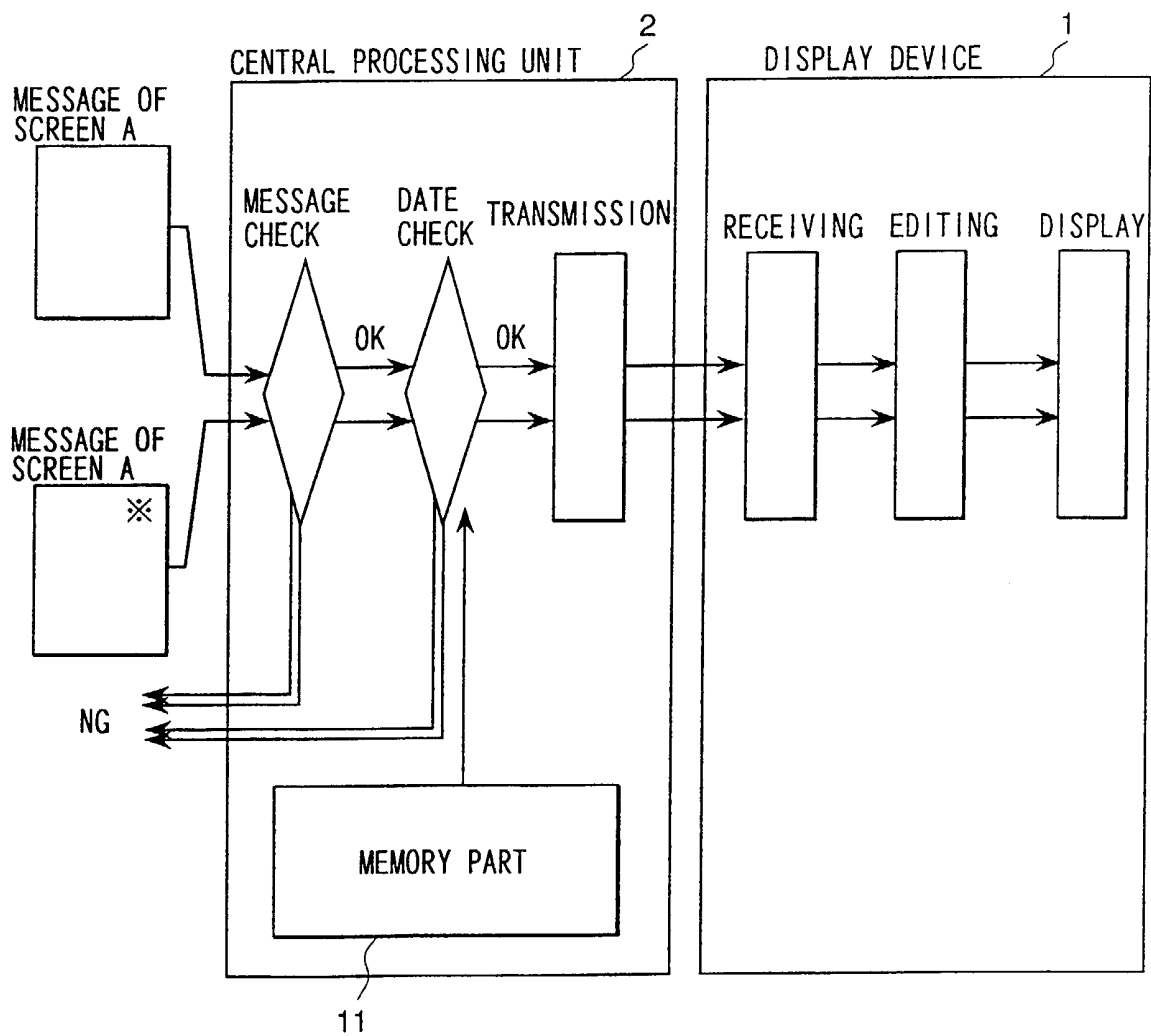


*FIG. 9*

SCREEN DEMANDING FOR APPROVAL  
OF MAINTENANCE WORK

DISPLAY FRONT SURFACE: SCREEN A AND REAR SURFACE:  
SCREEN B: ARE DISPLAYED ALTERNATELY

|                                                |                             |   |
|------------------------------------------------|-----------------------------|---|
| MAINTENANCE WORK NUMBER                        |                             | ※ |
| KIND OF MAINTENANCE WORK                       | CLOSURE OF TRACK            |   |
| NAME OF MAINTENANCE                            | TRACK MAINTENANCE SECTION   |   |
| MAINTENANCE WORK NUMBER                        | 0001                        |   |
| PURPOSE                                        | REPLACEMENT OF TRACK        |   |
| INFORMATION ON MAINTENANCE WORKER              |                             |   |
| RESPONSIBLE PERSON OF<br>MAINTENANCE WORK      | ○○                          |   |
| SECTION RESPONSIBLE<br>PERSON BELONGS          | ××××, LTD.                  |   |
| COMMUNICATION ADDRESS TO<br>RESPONSIBLE PERSON | 09012345678                 |   |
| MAINTENANCE WORK TIME                          |                             |   |
| WORK EXECUTION DATE                            | JANUARY 30                  |   |
| WORK PLAN SCHEDULE                             | 1:10~3:30                   |   |
| MAINTENANCE WORK SECTION                       |                             |   |
| STATION INTERVAL                               | STATION A~STATION B         |   |
| KIND OF LINE<br>(WAY-UP/WAY-DOWN)              | WAY-UP AND WAY-DOWN         |   |
| LOCATION                                       | 3km,230m~6km,705m           |   |
| START<br>ACCEPTABLE: OK                        | START NOT<br>ACCEPTABLE: NG |   |

**FIG. 10**

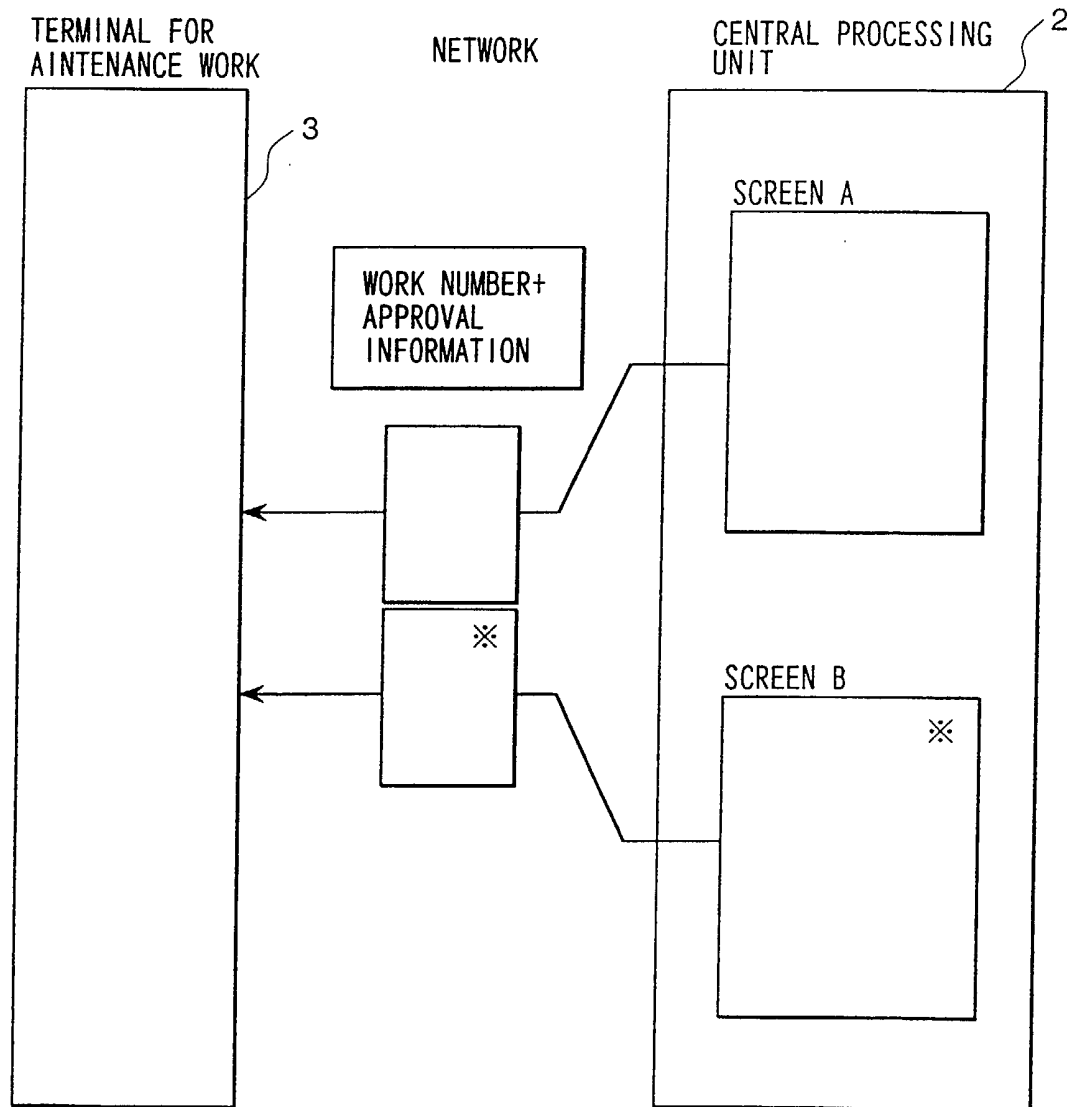


FIG. 11

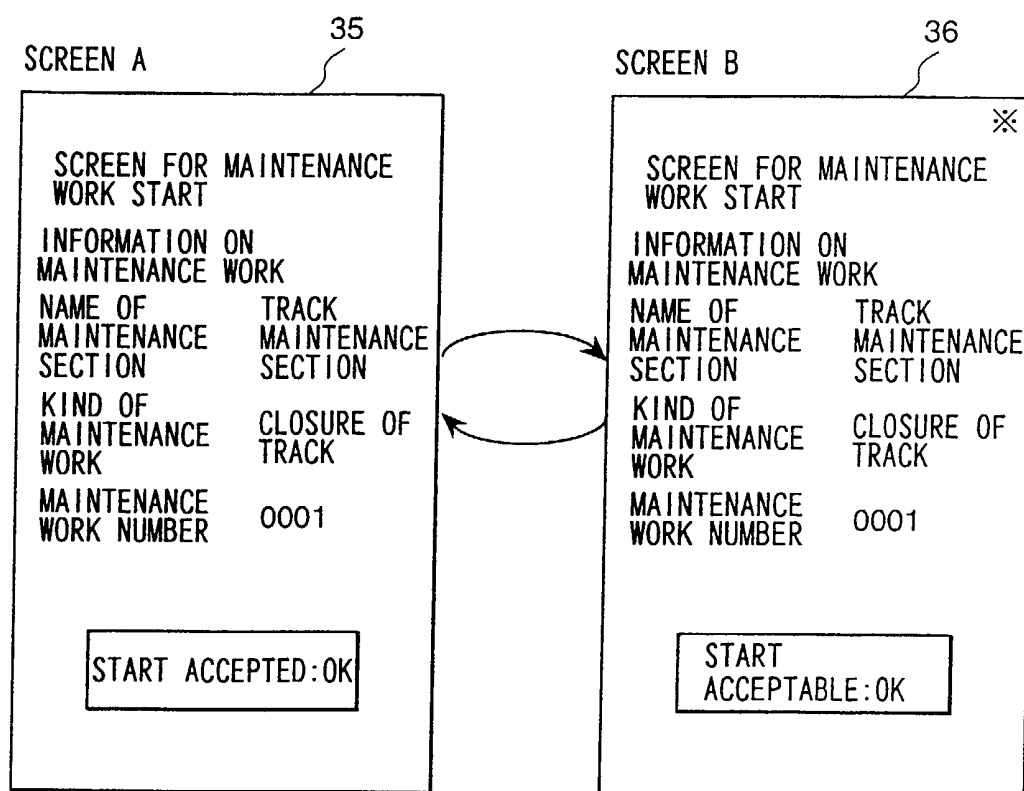
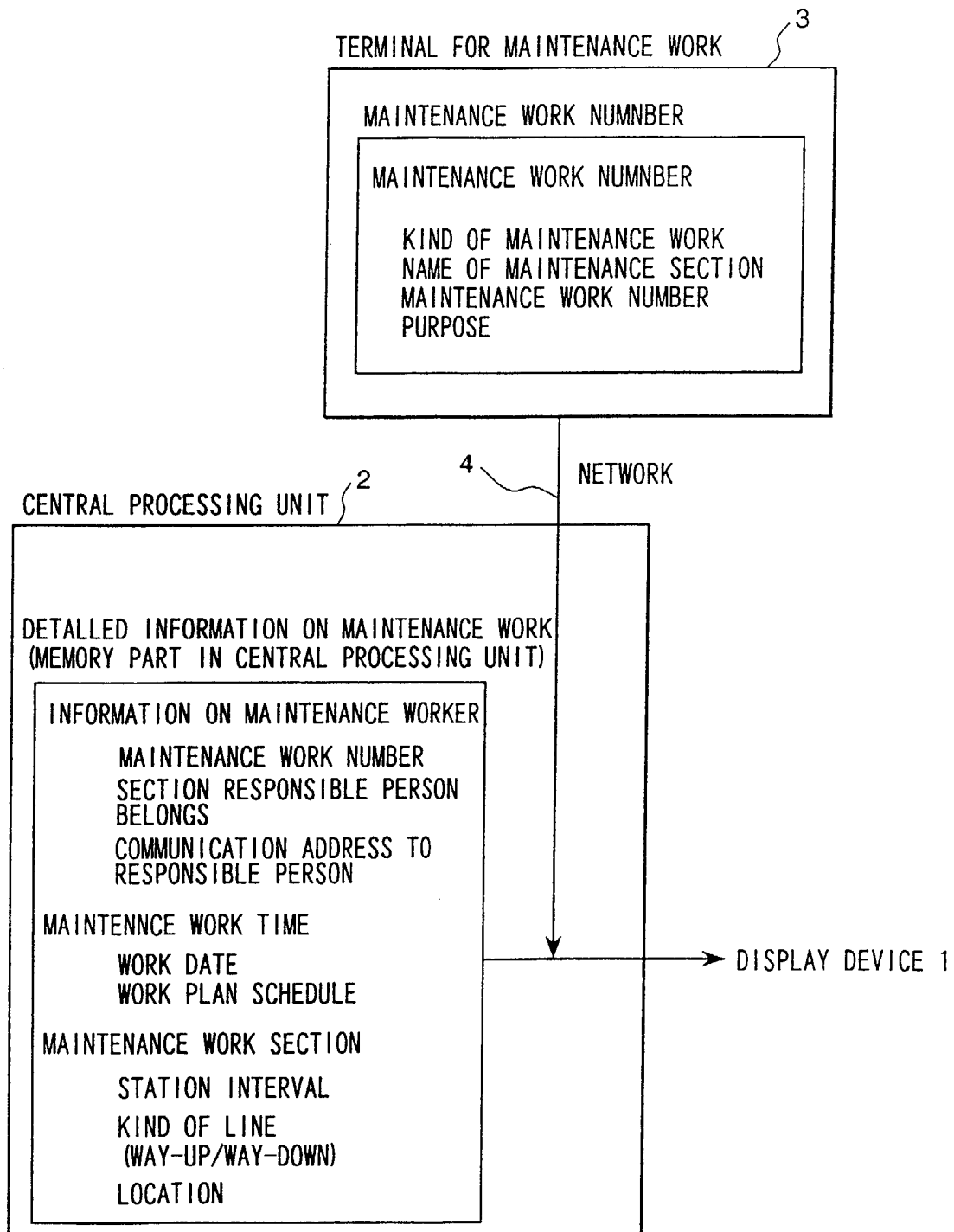


FIG. 12



## MAINTENANCE WORK ADMINISTRATION DEVICE AND METHOD

5           The present invention relates to a maintenance work  
administration device and method for administrating a  
maintenance work, and more particularly to a maintenance work  
administration device and method which can enhance the safety  
and the reliability at the time of executing the maintenance  
10 work.

          When maintenance workers execute a maintenance work, the  
maintenance workers inform a center director of a maintenance  
work plan in advance and the center director performs the  
registration of the maintenance work plan. Further, the  
15 maintenance workers execute a maintenance work after obtaining  
the approval from the center director before executing the  
maintenance work. Conventionally, the communication between  
the maintenance workers and the center director is performed  
using telephones and facsimiles, while a maintenance work  
20 administration system enhances its reliability by hardware  
factors wherein a network and various equipment through which  
performance information and approval information for executing  
the maintenance work plan are constituted as a multiple system.  
Further, at the time of executing the maintenance work,  
25 information including detailed information on the maintenance

work plan is transmitted to the center device.

Further, as a conventional equipment, as described in Japanese Patent Laid-open No. 87756/1982, there has been known a control method of a train operation administration system which ensures a safe maintenance work after the final trains pass by connecting a central device with station control units which perform a route control or the like and by stopping the control of respective station control units in order of the passing of final trains.

In the above-mentioned conventional maintenance work administration system, the reliability of the system is achieved by hardware factors such that a transmission path and various equipment for information at the time of executing the maintenance work and the approval information constitute a multiple system. However, the hardware constitution in a multiple system not only pushes up the cost of the hardware but also the preparation of software which controls the hardware multiple system becomes also necessary simultaneously thus further pushing up the cost. Further, since the demands for the execution of the maintenance work are mainly concentrated after the final train passes the station and all information including the approval information of the maintenance work plan are transmitted to a central device so that a large load is applied to the network and the central device.

Further, in the device described in the Japanese Patent

Laid-open No. 87756/1982, by stopping the control of station control units in order of passing of the final trains, the maintenance work after passing of the final trains can be executed safely. However, the device is applicable only to the  
5 maintenance work after passing of the final train and the application of the device to the diagram check and the approval of the plan of the maintenance work support are not taken into consideration.

Accordingly, it is a first object of the present invention  
10 to provide a maintenance work administration device and method for enhancing the reliability of the execution information and the approval information for executing a maintenance work plan by changing software and thereby enhancing the safety of maintenance workers while suppressing an investment in  
15 hardware.

It is a second object of the present invention to provide a maintenance work administration device and method which transmit minimum necessary information at the time of executing a maintenance work such that a load applied to a network and  
20 a central device can be reduced.

In a maintenance work administration system of the present invention to achieve the above-mentioned object,  
25 maintenance work plans are prepared at terminals, and with

respect to information on the maintenance work plans of a low immediacy, the maintenance work plans are transmitted to a central device through a circuit different from a network of a low transmission speed and the maintenance work plans are held  
5 by the central device. At the time of executing the maintenance work, information on the maintenance work number and the approval demand which constitute maintenance work information from the maintenance work terminals is transmitted by two or more separate sets of messages including the same contents of  
10 the information, detailed maintenance work plan information is added to the maintenance work information at the central device, and a display device asks a director to reply the approval demand while showing the detail of the maintenance work plan. The central device checks the difference of two or more messages  
15 of the information and if the difference exists between or among messages, an error is transmitted to the maintenance work terminal as a return.

At the time of executing or approving the maintenance work, the maintenance work terminal or the central device divides the  
20 screen of the display device so as to display the transmitted two or more messages simultaneously, a portion of the screen is made different from the remaining portion of the screen, and respective portions are alternately displayed in a flickering display. At the time of transmitting the maintenance work  
25 execution demand and the approval information, screen

information which is divided into two or more messages are separately transmitted, and the difference between these transmitted messages is checked by a device which receives these messages and these messages are also checked by a person using  
5 the above-mentioned display method. The device which receives the information divided in two or more does not integrate the information and directly processes them for enhancing the reliability of the processing inside of the device.

10 IN THE DRAWINGS:

Fig. 1 is a constitutional view showing the constitution of a maintenance work administration system according to an embodiment of the present invention.

Fig. 2 is a view showing the constitution of maintenance  
15 work plan data.

Fig. 3 is a constitutional view showing the constitution of a central device.

Fig. 4 is a view explaining functions and processing of the central device.

20 Fig. 5 is a constitutional view showing the constitution of a maintenance work terminal.

Fig. 6 is a view showing an example of screen display of the maintenance work terminal at the time of executing the maintenance work.

25 Fig. 7 is a flow diagram of information transmission from

the start of maintenance work to the completion of registration at a maintenance work terminal.

Fig. 8 is a flow diagram of processing inside of the central device and a display device at the time of demanding  
5 start/completion of the maintenance work of the display device.

Fig. 9 is a view showing an example of a maintenance work approval demand screen of the display device.

Fig. 10 is a flow diagram showing the information transmission of the maintenance work start/completion approval  
10 information from the central device to the maintenance work terminal.

Fig. 11 is a view showing a screen display of the maintenance work terminal at the time of approval of the maintenance work.

15 Fig. 12 is a view showing the correspondence of memory between the maintenance work terminal and the central device.

One embodiment of a maintenance work administration  
20 system of the present invention is explained in conjunction with attached drawings. The maintenance work administration system of this embodiment has a constitution shown in Fig. 1. A central device 2 which is connected to an operation administration network 4 holds and administrates train diagram information and  
25 plans and performances of a maintenance work support. A display

device 1 is connected to the central device 2 and displays the diagram information and the plans and performances of the maintenance work support held by the central device 2. The display device also displays an approval screen of the maintenance work support. Terminals 5 installed at operation stations and sections are connected to the central device 2, while maintenance work terminals 3 are connected to the central device 2 through an operation administration network 4. Here, the terminals 5 are connected to the central device 2 by a circuit different from a circuit which connects the maintenance work terminals 3 to the central device 2.

Using the terminals 5, the maintenance work plans can be prepared, changed and cancelled. The maintenance work plan data which are prepared by using the terminals 5 or the maintenance work plan data which are changed or cancelled by using the terminals 5 are transmitted to the central device 2 and stored inside of the central device 2. The maintenance work terminals 3 are used by on-site facilities at stations or tracks and the start/completion of the maintenance work is inputted at the maintenance work terminals 3. The central device 2 receives the start/completion data of the maintenance work from the maintenance work terminals 3 through the operation administration network 4 and displays the data on the display device 1. A director can perform an approval manipulation of the maintenance work by the display device 1. When the director

makes an approval by manipulating the display device 1, a start/completion permission of the maintenance work is transmitted to the maintenance work terminals 3.

5 The manner of executing the maintenance work plan according to the operation administration system of this embodiment is explained hereinafter taking the closure of track as a kind of maintenance work as an example.

Maintenance workers prepare the maintenance work plan by manipulating the terminal 5. The prepared maintenance work  
10 plan is transmitted to the central device 2 through the circuit different from the circuit for the operation administration network 4 and is received by a receiving part 14b in the inside of the central device 2 and is stored in a memory part 11 (see Fig. 3). In this manner, since the prepared maintenance work  
15 plan is transmitted through the different or separate circuit, information on the maintenance work plan of a low immediacy can be transmitted to the central device 2 through the different circuit of a low transmission speed. As shown in Fig. 2, the maintenance work plan information to be transmitted to the  
20 central device 2 is mainly constituted by the maintenance work number, information on maintenance worker, the maintenance work time and the maintenance work section. The maintenance work number relates to information on the maintenance work including the kind of maintenance work, the name of maintenance section,  
25 the maintenance work number and the purpose. The maintenance

worker information relates to information on the maintenance worker including the name of a responsible person, the section which the responsible person belongs to and the communication to the maintenance workers. The maintenance work time is information on the execution date and the maintenance work time at the scheduled time of the maintenance work plan. The maintenance work section is constituted by information on the maintenance work section including the station interval, the kind of line (way-up/way-down) and the location.

As shown in Fig. 3, the central device 2 includes a communication part 14 which is comprised of a transmission part 14a and the receiving part 14b which transmits and receives a data, an information selection processing part 13 connected to the communication part 14, a memory part storing processing part 12 connected to the information selection processing part 13 and a memory part 11 connected to the memory part storing processing part 12.

The central device 2 receives the maintenance work plans, the maintenance work performances and the approval information which are information transmitted from the display device 1, the maintenance work terminals 3 and the terminals 5 through the receiving part 14b. Among the received information, the maintenance work plan information is stored in the memory part 11 in the inside of the central device 2 in accordance with a flow shown in Fig. 4.

That is, the maintenance work plan which is prepared by the terminal 5 and is received by the communication part 14 of the central device 2 is processed by a received signal processing part 21. Then, in a selection processing part 22, the maintenance work plan, the maintenance work performance and the approval information are recognized and selected. Further, in a storing and editing processing part 23, the maintenance work plan is classified in accordance with the work execution date and the kind of maintenance work and is stored in a memory part 24.

As shown in Fig. 5, the maintenance work terminal 3 includes a display part 31, a display processing part 32 connected to the display part 31 and a communication part 33 connected to the display processing part 32. The communication part 33 includes a transmission part 33a and a receiving part 33b. As shown in Fig. 6, the display part 31 is provided with two screens consisting of a screen A and a screen B. The screen A and the screen B are alternately displayed every one second or at a longer time interval and different portions between the screen A and the screen B are displayed by flickering.

The same content is displayed on the screen A and screen B of the maintenance work terminal 3. On the screen demanding for maintenance work start shown in Fig. 6, the name of maintenance section, the kind of maintenance work and the maintenance work number are displayed as the maintenance work

information. The maintenance work terminal 3 is provided with an inputting part and a selection part for the maintenance work information consisting of the name of maintenance section, the kind of maintenance work and the maintenance work number. By  
5 manipulating the inputting part or the selection part, the worker can execute the start/completion of the corresponding maintenance work. Here, when there exists the difference with respect to the maintenance work information such as the name of maintenance section, the kind of maintenance work, the  
10 maintenance work number or the like, the maintenance work terminal 3 performs the flickering display and hence, it can be readily understood that the terminal is not functioning normally. Further, by making the display B partially different from the display A with the use of a mark such as \* shown at  
15 a right upper corner of Fig. 6, it becomes possible to detect whether the maintenance work terminal 3 is operating or not. Further, on the screen A and the screen B, "demand for start acceptable" or "demand for start not acceptable" is displayed so that the worker can understand whether the result of the  
20 decision by the director is affirmative or negative.

At the time of start/completion of the maintenance work plan, as shown in Fig. 7, assuming the screen A and the screen B as separate messages, the maintenance work information is transmitted from the maintenance work terminal 3 to the central  
25 device 2 for demanding for the approval. In this manner, by

transmitting the screen A and the screen B as separate messages,  
even when data on one of the screen A and the screen B is rewritten  
on the operation administration network 4 due to noises or the  
like, the rewritten part of the message can be detected at the  
5 central device 2 side. Further, since the whole of the detailed  
data on the maintenance work is not transmitted, that is, since  
only three maintenance work information consisting of the name  
of maintenance section, the kind of maintenance work and the  
maintenance work number are transmitted, a load that the  
10 operation administration network 4 receives can be reduced.

The flow and the processing of the information inside of  
the central device 2 and inside of the display device 1 are  
executed as shown in Fig. 8. The information on the  
start/completion of the maintenance work transmitted from the  
15 maintenance work terminal 3 is received by the central device  
2 as the message of the screen A and the message of the screen  
B which are separate from each other. A message check is  
performed whether the difference is present in a portion of the  
maintenance work information between the received message of  
20 the screen A and the received message of the screen B or not.  
If the difference exists, it is judged that an error is generated  
at any one of the operation administration network 4, the  
central device 2 and a communication portion of the maintenance  
work terminal 3 and then the central device 2 returns a reply  
25 that the demand for start/completion of the maintenance work

is an error to the maintenance work terminal 3.

A date check is performed with respect to the information on the start/completion of the maintenance work which has cleared the message check. In this date check, the work plan  
5 scheduled time of the maintenance work time of the maintenance work plan stored in the memory part 11 and the present time are compared so as to check whether the present time is within  $\pm$  2 hours from the work plan scheduled time or not. As a result of the date check, when it is judged that the present time is  
10 not within  $\pm$  2 hours from the work plan scheduled time, the central device 2 returns the result of the date check as a date check error to the maintenance work terminal 3.

The information on start/completion demand that has passed the date check are, as shown in Fig. 12, merged or  
15 integrated with the detailed information on the maintenance work plan read from the memory part 11 of the central device 2 and are transmitted to the display device 1. The display device 1 receives the start/completion demand and executes the editing processing for submitting the approval demand to the  
20 director and displays such an approval demand. In this manner, according to this embodiment, since the maintenance work number and the approval demand are transmitted from the maintenance work terminal 3, the detail of the maintenance work plan is added at the central device 2 and the approval demand is submitted  
25 to the director together with the detail of the maintenance work

plan at the display device 1, the load that the operation administration network 4 receives can be reduced and the detailed information can be also confirmed.

Fig. 9 shows a screen demanding for an approval of maintenance work of the display device 1. In this screen demanding for an approval of maintenance work, the detailed information such as the information on maintenance workers, the maintenance work time, the maintenance work section and the like are added to the maintenance work information and they are displayed together with a start acceptable button and a start unacceptable button. Upon confirming the detailed information on the maintenance work plan, when the director judges that there exists no problem with respect to the start/completion of the maintenance work, the director pushes the start acceptable button. On the other hand, when the director judges that there exists a problem with respect to the start/completion of the maintenance work, the director pushes the start unacceptable button. Due to such manipulations, approval information or non-approval information is transmitted to the maintenance work terminal 3.

Fig. 10 shows a method for transmitting the approval information from the central device 2 to the maintenance work terminal 3.

When the approval information or the non-approval information is transmitted from the display device 1, for

example, the maintenance work number and the approval information are extracted from the detailed maintenance work plan information in the central device 2 and the extracted information is transmitted from the central device 2 to the  
5 maintenance work terminal 3 through the operation administration network 4. In this operation, the screen A and the screen B are transmitted separately. In this manner, the central device 2 transmits the same screen in a form that the screen is divided into two or more messages and the maintenance  
10 work terminal 3 processes the messages without integrating them, makes portions of the screens different from each other, displays these screens alternately and performs a flickering display. Further, at the time of demanding the execution of the maintenance work and transmitting the approval information,  
15 the screens divided into two or more are transmitted separately and the device which receives such messages checks the difference of the transmitted messages.

The maintenance work terminal 3, after receiving the approval information which is either information that the  
20 maintenance work is approved or information that the maintenance work is not yet approved as separate messages of the screen A and the screen B, as shown in Fig. 12, displays these messages alternately on the screen of the maintenance work terminal 3. Accordingly, the maintenance workers can detect  
25 whether an information error is generated on the operation

administration network 4 or not. Further, the confirmation of the presence or the non-presence of a failure of the maintenance work terminal 3 is performed as follows. That is, as shown in Fig. 12, a portion of the screen A and a corresponding portion of the screen B are made different from each other and these portions are displayed by flickering so that the maintenance workers can visually confirm the presence or the non-presence of the failure.

According to this embodiment, in performing the registration of the maintenance work plan, the maintenance work plan can be registered to the central device without ill-affecting the network which requires an immediacy. Further, at the time of executing the maintenance work, the maintenance work can be executed by merely transmitting only the maintenance work number on the network, the load to the network can be reduced. Further, by dividing the display screen in two or more, by displaying divided screens alternately, or separately performing the processing or transmission/receiving, it becomes possible to check whether the device and the network are operating normally or not so that the reliability of system can be enhanced without depending on the hardware constitution whereby the safety of the maintenance work can be ensured.

As has been described heretofore, according to the present invention, by merely preparing software, the reliability of the execution information and the approval

information to execute the maintenance work plan and the safety of the maintenance worker can be enhanced and the investment in hardware can be suppressed. Further, at the time of executing the maintenance work, by transmitting the information  
5 on the maintenance work number, the load applied to the network and the central device can be minimized.

## CLAIMS:

1. A maintenance work administration device characterized in that said device includes maintenance work terminals which  
5 are connected to a central device through a network, said maintenance work terminal includes an inputting part and selection part for maintenance work information and an approval demand, and said maintenance work terminal prepares a plurality of screens and displays said maintenance work information and  
10 said approval demand inputted by a manipulation of said inputting part or said selection part on said screens.

2. A maintenance work administration device characterized in that said device includes maintenance work terminals which  
15 are connected to a central device through a network, and said maintenance work terminal transmits maintenance work information inputted from an inputting part or a selection part to said central device by separately transmitting two or more messages having the same content.

20

3. A maintenance work administration device characterized in that said device includes maintenance work terminals which are connected to a central device through a network, and said maintenance work terminal prepares a plurality of screens and  
25 displays maintenance work information and approval information

which are constituted by two or more messages transmitted from said central device.

4. A maintenance work administration device characterized in that said device includes maintenance work terminals which are connected to a central device through a network, said central device and said network include terminals which are connected through a different circuit and a display device connected to said central device, and said central device receives and integrates a maintenance work plan prepared by said terminal and maintenance work information prepared by said maintenance work terminal and displays said integrated maintenance work plan and said maintenance work information on said display device.

15

5. A maintenance work administration device characterized in that said device includes maintenance work terminals which are connected to a central device through a network and a display device connected to said central device, said central device transmits maintenance work information extracted from approval information and a maintenance work plan inputted from said display device to said maintenance work terminal by transmitting two or more messages of the same content, and said maintenance work terminal prepares a plurality of screens and displays said two or more received messages on said screens.

25

6. A maintenance work administration device according to claim 1, wherein a plurality of said prepared screens are alternately displayed and said maintenance work information is the maintenance work number.

5

7. A maintenance work administration method characterized in that maintenance work information inputted from an inputting part or a selection part of a maintenance work terminal is transmitted to a central device by transmitting two or more  
10 messages of the same content separately, and said central device checks said two or more received messages and, if there exists a difference between or among said messages, returns a reply that there exists an error in said messages to said maintenance work terminal.

15

8. A maintenance work administration method characterized in that a maintenance work plan prepared by a terminal is transmitted to a central device through a circuit different from a circuit of a network, maintenance work information and an  
20 approval demand prepared by a maintenance work terminal are transmitted as two or more messages having the same content to said central device through said network, said maintenance work plan and said maintenance work information are integrated by said central device and are displayed on a display device,  
25 maintenance work information extracted from approval

information and maintenance work plan inputted from said display device are transmitted as two or more messages of the same content to said maintenance work terminal, and said maintenance work terminal prepares a plurality of screens and  
5 display said two or more received messages on a plurality of said screens.

9. A maintenance work administration device substantially as herein described with reference to and as illustrated in the  
10 accompanying drawings.

10. A maintenance work administration method substantially as any one described herein with reference to the accompanying drawings.



**Application No:** GB 0103764.7  
**Claims searched:** 1-10

**Examiner:** Phil Osman  
**Date of search:** 20 December 2001

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): G4A (AUXV), (AUXX)

Int Cl (Ed.7): G06F, B61L

Other: Online: EPODOC, Internet, JAPIO, WPI

### Documents considered to be relevant:

| Category | Identity of document and relevant passage       | Relevant to claims |
|----------|-------------------------------------------------|--------------------|
| A        | WO 00/35,732 (NATIONAL RAILROAD PASSENGER CORP) |                    |
| A        | FR 2,265,597 (SIEMENS) Page 6 lines 21-38       |                    |
| A        | JP 2001080515 (HITACHI) Abstract                |                    |

|   |                                                                                                           |   |                                                                                                                  |
|---|-----------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------|
| X | Document indicating lack of novelty or inventive step                                                     | A | Document indicating technological background and/or state of the art.                                            |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. | P | Document published on or after the declared priority date but before the filing date of this invention.          |
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