

## DESCRIPTION

### **Title of Invention: SHIP WHEELHOUSE STRUCTURE**

#### **Technical Field**

[0001] The present invention relates to a ship wheelhouse structure applied to various ships, such as LNG carriers.

#### **Background Art**

[0002] Conventionally, one or a plurality of consoles are installed in the wheelhouse of a ship. One of the known consoles is configured such that various operating tools and display monitors are mounted on the surface of a large cabinet that accommodates, for example, processing units, power supply units, and communication equipment. Various nautical instruments, communication equipment, a power source, etc., are connected to the console via cables. The wiring of these cables is passed below the wheelhouse.

[0003] Examples of known wiring structures for various types of equipment installed in a wheelhouse include a double-floor wiring structure and an underfloor wiring structure. In the double-floor wiring structure, a floorboard is installed above the deck of the wheelhouse, and cables are laid between the deck and the floorboard, i.e., the cables are laid above the deck but below the floorboard. In the underfloor wiring structure, a wiring/piping space is made between the deck of the wheelhouse and the ceiling board of a lower-floor cabin below the wheelhouse, i.e., the wiring/piping space is made above the ceiling board but below the deck, and cables are laid in the wiring/piping space. Patent Literatures 1 and 2 disclose these types of wheelhouse wiring structures.

[0004] In the wheelhouse wiring structure of Patent Literature 1, there is a pit at the back side of the deck below main equipment of the wheelhouse, and the pit is open toward the inside of the wheelhouse. The pit is used as a wiring path. A cable hanger is fixed inside the pit, and cables connected to the aforementioned main equipment are laid by utilizing the cable hanger. The pit is surrounded by a material that meets the SOLAS A60 class division fire safety requirements, and the pit's opening facing the inside of the wheelhouse is covered by a pit cover.

[0005] In the wheelhouse wiring structure of Patent Literature 2, a floor-forming member of the wheelhouse is provided with a recessed groove that protrudes downward, and the recessed groove forms a wiring path. The recessed groove is closed up by a detachable floorboard member.

#### **Citation List**

**Patent Literature**

[0006] PTL 1: Japanese Laid-Open Patent Application Publication No. 2003-267290

PTL 2: Japanese Laid-Open Patent Application Publication No. 2008-211859

**Summary of Invention****Technical Problem**

[0007] In recent years, there has been remarkable advancement in electrical and electronic equipment for ships' communications, navigation, radio, etc. Such advancement in technology has realized labor savings for an operator in the wheelhouse. However, processing by the electrical and electronic equipment has become complex, and there has been a tendency for the console to become larger in size due to increase in the number of components of the console. In addition, normally, a plurality of pieces of equipment, such as a console and other equipment, are arranged in the wheelhouse.

[0008] However, in a case where a plurality of large-sized consoles and other equipment are arranged in the limited space of the wheelhouse, the working space for the operator may be limited, or the operator may feel cramped in the wheelhouse.

[0009] The present invention has been made in view of the above-described problems. An object of the present invention is to provide a ship wheelhouse structure that makes it possible to simplify the operation space in the wheelhouse and improve the ease of operation in the wheelhouse.

**Solution to Problem**

[0010] A ship wheelhouse structure according to one aspect of the present invention includes: a division floorboard provided above a deck of a wheelhouse, the deck being made of steel plates and thermally insulated, the division floorboard dividing the wheelhouse into an upper room and a lower room; a processing unit installed in the lower room; a console installed in the upper room and mounted with at least one of an input device and an output device of the processing unit; and at least one wiring hole formed in the division floorboard, the wiring hole being a hole through which a cable connecting between the processing unit and the input device and a cable connecting between the processing unit and the output device are passed.

[0011] According to the above-described ship wheelhouse structure, the input device and the output device are installed in the upper room, and the processing unit connected to the input device and the output device is installed in the lower room. That is, the processing unit, which is accommodated in the cabinet of a console in the conventional art, is installed in the lower

room. For this reason, the input device and the output device, which are installed in the upper room where an operator is normally present, are reduced in size compared to a conventional cabinet-type console. That is, equipment installed in the operation space (i.e., the upper room) of the wheelhouse can be simplified without reducing the number of pieces of equipment in the wheelhouse. This makes it possible to expand the operation space for the operator in the wheelhouse and improve the ease of operation in the wheelhouse. Also, the deck space of the wheelhouse can be reduced while securing the same amount of operation space for the operator as in the conventional art.

[0012] In the above ship wheelhouse structure, the cable connecting between the processing unit and the input device and the cable connecting between the processing unit and the output device are passed through the wiring hole of the division floorboard. The wiring hole does not require conventional fire proofing. This makes it possible to reduce labor hours and costs for cable wiring work.

[0013] In the above ship wheelhouse structure, a height of the lower room may be greater than or equal to 900 mm but less than 2000 mm. It should be noted that the height of the lower room herein refers to the vertical distance from the upper surface of the deck of the wheelhouse to the lower surface of the division floorboard.

[0014] Accordingly, a sufficient room height of the lower room is secured, which allows the operator or worker to perform inspection work or other engineering work in the lower room.

[0015] In the above ship wheelhouse structure, the division floorboard may be provided with a transparent portion for allowing an inside of the lower room to be visually checked from the upper room.

[0016] Accordingly, the operator or worker can visually check, from the upper room, the state of the processing unit installed in the lower room through the transparent portion without moving into the lower room.

[0017] In the above ship wheelhouse structure, the division floorboard may be provided with an inspection opening for allowing the lower room to be visually checked from the upper room.

[0018] Accordingly, the operator or worker can visually check, from the upper room, the state of the processing unit installed in the lower room through the inspection opening without moving into the lower room.

[0019] In the above ship wheelhouse structure, the division floorboard may be provided with an access hatch for allowing a person to access the lower room from the upper room.

[0020] Accordingly, the operator or worker can move between the upper room and the

lower room through the access hatch.

[0021] The above ship wheelhouse structure may include an air conditioner configured to perform air conditioning of the upper room and the lower room separately.

[0022] Accordingly, the temperature and humidity of the lower room, in which the heat-generating processing unit is installed, and the temperature and humidity of the upper room, which is the operation space for the operator, can be adjusted in accordance with the intended purposes of the upper and lower rooms.

[0023] The above ship wheelhouse structure may include fire alarms provided in the upper and lower rooms, respectively.

[0024] Accordingly, when a fire occurs in the upper room and/or the lower room, the occurrence of the fire is notified promptly.

[0025] The above ship wheelhouse structure may include an automatic dry chemical fire extinguisher provided in the lower room.

[0026] Accordingly, when a fire occurs in the lower room, initial firefighting is promptly done by the automatic dry chemical fire extinguisher.

[0027] The above ship wheelhouse structure may include a plurality of pillar members provided on the deck of the wheelhouse in a standing manner, the pillar members supporting the division floorboard. The processing unit may be mounted on the pillar members.

[0028] Thus, since the pillar members for supporting the division floorboard also have the function of supporting the processing unit, support members that are intended only for supporting the processing unit can be eliminated. This makes it possible to secure the working space for the operator or worker while securing the wiring space and installation space for the equipment, such as the processing unit, in the lower room.

### **Advantageous Effects of Invention**

[0029] The present invention provides a ship wheelhouse structure that makes it possible to simplify the operation space in the wheelhouse and improve the ease of operation in the wheelhouse.

### **Brief Description of Drawings**

[0030] Fig. 1 is a schematic sectional view of a wheelhouse of a ship and the vicinity thereof, showing a ship wheelhouse structure according to one embodiment of the present invention.

FIG. 2 shows a support structure of a division floorboard.

FIG. 3 is a schematic sectional view of a wheelhouse of a ship and the vicinity thereof, showing one variation of the ship wheelhouse structure of FIG. 1.

### **Description of Embodiments**

[0031] Next, one embodiment of the present invention is described with reference to the drawings. FIG. 1 is a schematic sectional view of a wheelhouse 2 of a ship 1 and the vicinity thereof, showing a wheelhouse structure of the ship 1 according to one embodiment of the present invention. FIG. 1 shows the wheelhouse 2 arranged in the ship 1 and a cabin 9 arranged immediately below the wheelhouse 2. The cabin 9 may be a cargo hold or a machinery room.

[0032] The wheelhouse 2, which is a space surrounded by, for example, windows, bulkheads, and upper and lower decks, is formed in the ship 1. A deck 20 of the wheelhouse 2 is constructed by laying steel plates, and is thermally insulated by a non-combustible material or a non-combustible sealing material. For example, the non-combustible material may be at least one of the following types of materials: glass fiber; ceramic fiber; and rock wool. The deck 20 of the wheelhouse 2 has a fire protection structure that meets the SOLAS fire safety requirements (A60 class division) specified for bulkheads and decks between a control station and its adjacent areas.

[0033] Although not illustrated, for example, the ceiling of the wheelhouse 2 and bulkheads that divide between the wheelhouse 2 and its surrounding cabins are also made of steel plates, and are thermally insulated in a predetermined manner. That is, the wheelhouse 2 has a fire protection structure that meets the SOLAS fire safety requirements (A60 class division) specified for bulkheads and decks between a control station and its adjacent areas. It should be noted that A60 class divisions are divisions structured by bulkheads or decks that comply with the following criteria: (1) being made of steel or other equivalent material; (2) being suitably stiffened; (3) being thermally insulated by a non-combustible material; and (4) being so constructed as to be capable of preventing the passage of smoke and flame up to the end of a 60-minute standard fire test.

[0034] Above the deck 20 of the wheelhouse 2, a division floorboard 3 is laid such that a predetermined distance in the vertical direction is formed between the deck 20 and the division floorboard 3. The division floorboard 3 divides the wheelhouse 2 into an upper room 21 and a lower room 22, i.e., divides the wheelhouse 2 into two upper and lower spaces. The upper surface of the deck 20 of the wheelhouse 2 and the upper surface of the division floorboard 3 are parallel to each other. The vertical distance from the upper surface of the deck 20 of the wheelhouse 2 to the lower surface of the division floorboard 3, i.e., a height H of the lower room

22, is greater than or equal to 900 mm but less than 2000 mm. When the height H of the lower room 22 is greater than or equal to 900 mm, a sufficient room height of the lower room 22 is secured, which allows an operator or worker to perform inspection work or other engineering work in the lower room 22. However, if the height H of the lower room 22 is made excessively high, the height of the wheelhouse 2 becomes excessively high. Desirably, the height H of the lower room 22 is set to such a height that the operator or worker can perform their work in a crouching or sitting position in the lower room 22.

[0035] FIG. 2 shows a support structure of the division floorboard 3. As shown in FIG. 2, the division floorboard 3 is placed on a frame 30 standing on the deck 20 of the wheelhouse 2. The frame 30 is structured by: a plurality of support pillars 31 standing on the deck 20 of the wheelhouse 2; and beams 32 connecting between the support pillars 31.

[0036] For example, the division floorboard 3 may be made of at least one material selected from among, for example, a wood slab, a wood or resin panel, and a thin steel plate. The division floorboard 3 need not be a structural member defined as a structural member of the ship 1, but may be any structural member that has sufficient strength to be able to support the weight of the equipment placed on the division floorboard 3 and the weight of the operator on the division floorboard 3. Although it is desirable that the division floorboard 3 be made of a non-combustible material, the division floorboard 3 is not required to comply with the requirements of the A class division or the B class division in terms of the passage of smoke and flame and the limitation of temperature increase.

[0037] The division floorboard 3 is provided with an access hatch 38 for allowing the operator or worker to access the lower room 22 from the upper room 21, or to access the upper room 21 from the lower room 22. One wheelhouse 2 may be provided with a plurality of access hatches 38. Each access hatch 38 is a hatchway with an opening/closing cover 33. The opening/closing cover 33 may be configured as a slidable type, a trapdoor type, or a removable type. The lower room 22 is provided with a ladder or ladders 34 for accessing the access hatch or hatches 38.

[0038] In the wheelhouse 2 of the ship 1 with the above-described configuration, processing units 51, power supply units, etc., are installed in the lower room 22, and a console 50 mounted with at least one of an output device 52 and an input device 53 is installed in the upper room 21. The output device 52 is means for outputting information from the processing units 51, and has an information transmitting function and/or a state indicating function. The input device 53 is means for inputting a command or information to the processing units 51, and has a function of controlling various states of the ship 1. It should be noted that the equipment mounted on the

console 50 is not limited to the above examples. For example, the console 50 may be mounted with communication equipment.

[0039] FIG. 1 shows one console 50 included in a navigation and maneuvering workstation of the wheelhouse 2, and also shows the processing units 51 for the console 50. However, as an alternative, a plurality of consoles 50 may be installed in the wheelhouse 2. In the wheelhouse 2, not only the navigation and maneuvering workstation but also a docking workstation, a monitoring and secondary navigation workstation, a safety workstation, a voyage planning workstation, etc., are installed. At least one console may be provided for each workstation. Each console is mounted with equipment and instruments corresponding to the functions of the workstation.

[0040] The console 50 has a substantially level console desk, and the console desk is provided with the input device 53. On the console 50, the output device 52 is installed on the visual line of the operator facing the console desk.

[0041] The output device 52 mounted on the console 50 may be, for example, at least one of the following: a display; a touch panel; an alarm lamp; and an alarm unit. The output device 52 mounted on the console 50 may include, for example, indicators of various instruments, such as a gyrocompass and a GPS device. As one example, the console of the navigation and maneuvering workstation may be mounted with various output devices 52, such as an engine monitor, a long range radar, the screen of a bridge information unit, the screen of an electronic chart unit, and a short range radar.

[0042] The input device 53 mounted on the console 50 may be, for example, at least one of the following: a keyboard; a lever; a joystick; a button; a switch; a dial; and a touch panel. As one example, the console of the navigation and maneuvering workstation may be mounted with various input devices 53, such as an autopilot dial of the bridge information unit, an engine telegraph, a thruster dial, a joystick lever, a steam whistle switch, a steering wheel, an operating unit including an onboard telephone or the like, an operating panel of the electronic chart unit, a navigation light and steam whistle control board, and a thruster and steering control board.

[0043] The processing units 51 and the output device 52 are electrically connected to each other by communication cables (so that the processing units 51 and the output device 52 can transmit and receive signals to and from each other). Output signals from the processing units 51 are outputted from the output device 52. Similarly, the processing units 51 and the input device 53 are electrically connected to each other by communication cables. Commands and information-containing signals inputted from the input device 53 are inputted to the processing units 51. Moreover, power supply cables that supply electric power from an unshown onboard

power source are connected to the processing units 51, the output device 52, and the input device 53. Hereinafter, such cables as communication cables and power supply cables are referred to as cables 60.

[0044] A wiring hole 55, through which the cables 60 are passed, is formed in the division floorboard 3. The wiring hole 55 extends through the division floorboard 3. It is preferred that the wiring hole 55 is formed in the division floorboard 3 at a position below the leg or near the leg of the console 50 in order to conceal the wiring hole 55 from the wheelhouse 2 for the aesthetic purposes.

[0045] The division floorboard 3 is not the bulkheads and decks between a control station and its adjacent areas. Therefore, the portion of the division floorboard 3, through which the wiring hole 55 extends, does not require conventional fire proofing. One example of the conventional fire proofing of the wiring-hole-extending portion of the division floorboard 3 is to fill the gap between the cables 60 and their coaming that forms the wiring-hole-extending portion with a fire-resisting sealing material, and then covering the wiring-hole-extending portion with a thermal insulating plate member.

[0046] Desirably, the processing units 51 are installed immediately below the wiring hole 55 in order to make the length of the cables 60 short and make the wiring simple. The processing units 51 are mounted on the frame 30 intended for supporting the division floorboard 3. In the present embodiment, a mounting plate 37 is provided extending in a bridging manner between the plurality of support pillars 31 forming the frame 30, and the processing units 51 are fixed to the mounting plate 37. Thus, since the support pillars 31 (pillar members) for supporting the division floorboard 3 also have the function of supporting the processing units 51, support members that are intended only for supporting the processing units 51 can be eliminated. This makes it possible to secure the working space for the operator or worker while securing the wiring space and installation space for the equipment, such as the processing units 51, in the lower room 22.

[0047] The frame 30 may be provided with a cable hanger 39. The cable hanger 39 is intended for guiding and retaining the cables 60 laid in the lower room 22. The cable hanger 39 may be installed on the upper part of the frame 30, and thereby unshown ducts, piping, and the like can be laid below the cables 60. This makes it possible to prevent the cables 60 from interfering with the ducts, piping, and the like, and also makes it possible to neatly arrange the ducts and piping, the cables 60, the processing units 51, etc., in the limited space of the lower room 22.

[0048] As described above, in the structure of the wheelhouse 2 of the ship 1 according to

the present embodiment, the processing units 51, which are accommodated in the cabinet of a console in the conventional art, are installed in the lower room 22, and the console 50 installed in the upper room 21 is mounted with the input device 53 and the output device 52. Thus, the console 50 according to the present embodiment is reduced in size compared to a conventional console integrated with the cabinet. Such reduction in the size of the console 50 makes it possible to expand the operation space for the operator in the wheelhouse 2 and improve the ease of operation in the wheelhouse 2. Also, the deck space of the wheelhouse 2 can be reduced while securing the same amount of operation space for the operator as in the conventional art. Moreover, by adopting the console 50 thus reduced in size, the degree of freedom is increased in terms of the layout of the equipment in the wheelhouse 2 compared to a conventional wheelhouse 2.

[0049] In order to further reduce the size of the console 50, the number of alarm units provided on the console 50 may be reduced. In this case, a small number of main alarm units are provided on the console 50, and other individual alarm units each configured to give specific alarm details are provided in the lower room 22. The main alarm unit(s) is/are intended for notifying the operator of the presence of malfunctioning when some kind of malfunctioning occurs.

[0050] The other individual alarm units are installed on, or in the vicinity of, the casing of the processing units 51 in the lower room 22, and upon receiving signals from the processing units 51 or other instruments, output alarms accordingly. The main alarm unit(s) herein may be at least one of an alarm lamp and an alarm speaker, and the other individual alarm units may be, for example, alarm lamps. When detecting malfunctioning, the processing units 51 cause both the main alarm unit(s) and the other individual alarm units to output alarms. Then, when notified of the occurrence of malfunctioning from the main alarm unit(s), the operator visually checks, from the upper room 21, the other individual alarm units installed in the lower room 22, thereby identifying specific alarm details.

[0051] In order for the operator to be able to visually check, from the upper room 21, various types of equipment installed in the lower room 22, such as the processing units 51 and the alarm units, at least a part of the division floorboard 3 may be provided with a transparent portion 35. The transparent portion 35 of the division floorboard 3 forms a single flat surface together with the surrounding division floorboard 3, and is made of a transparent material that achieves transparency to the inside of the lower room 22 from the upper room 21. The transparent material to be adopted is, for example, a plate material having sufficient strength to be able to bear the weight of the operator, such as tempered glass or polycarbonate.

[0052] Instead of or in addition to the transparent portion 35, the division floorboard 3 may be provided with an inspection opening 36 for allowing the inside of the lower room 22 to be visually checked from the upper room 21. The inspection opening 36 is an opening through which the operator looks at the inside of the lower room 22 from the upper room 21, or the operator puts their hands into the lower room 22 through the opening to perform particular work. The inspection opening 36 may be provided with a transparent or non-transparent cover.

[0053] As described above, the operator or worker can visually check the state of the various types of equipment installed in the lower room 22 through the transparent portion 35 and/or the inspection opening 36 of the division floorboard 3 without moving into the lower room 22. Then, the operator or worker can move from the upper room 21 into the lower room 22 through the access hatch 38 to perform maintenance of the various types of equipment as necessary.

[0054] The upper room 21 and the lower room 22 of the wheelhouse 2 are provided with fire alarms 41 and 42, respectively. Accordingly, when a fire occurs in the upper room 21 and/or the lower room 22, the operator or ship crew is promptly notified of the occurrence of the fire. It should be noted that, in a conventional underfloor wiring structure, the installation of a fire alarm in the underfloor wiring space is not required as an obligation.

[0055] The lower room 22 of the wheelhouse 2 is provided with an automatic dry chemical fire extinguisher 43. If the ambient temperature of the automatic dry chemical fire extinguisher 43 becomes a predetermined temperature or higher, the automatic dry chemical fire extinguisher 43 reacts with the heat and self-activates to disperse dry chemicals. Thus, since the lower room 22 is provided with the fire extinguisher, which is configured to sense a temperature increase caused by a fire and automatically disperse the dry chemicals, initial firefighting can be done promptly. It should be noted that, in a conventional underfloor wiring structure, the installation of a fire extinguisher in the underfloor wiring space is not required as an obligation.

[0056] The wheelhouse 2 is further provided with an air conditioner configured to perform air conditioning of the upper room 21 and the lower room 22 separately. That is, an indoor unit 56 and an indoor unit 57 of the air conditioner are installed in the upper room 21 and the lower room 22, respectively. It should be noted that a single outdoor unit corresponding to both the indoor units 56 and 57, or outdoor units corresponding to the respective indoor units 56 and 57, may be provided. Since the wheelhouse 2 is provided with such an air conditioner, the temperature and humidity of the lower room 22, in which various types of equipment including the heat-generating processing units 51 are installed, and the temperature and humidity of the upper room 21, which is the operation space, can be suitably adjusted.

[0057] Although the preferred embodiment of the present invention is as described above, the above-described structure of the wheelhouse 2 of the ship 1 can be modified as described below.

[0058] For example, in the above-described embodiment, the output device 52 and the input device 53 are integrally mounted on the console 50. However, as an alternative, the output device 52 and the input device 53 may be provided separately. FIG. 3 shows one variation of the structure of the wheelhouse 2 of the ship 1 according to the above-described embodiment. In the variation shown in FIG. 3, a display as one example of the output device 52 and a console desk as one example of the input device 53 are separately installed in the upper room 21. Cables 60 connecting between the output device 52 and the processing units 51, and cables 60 connecting between the input device 53 and the processing units 51, are laid into the lower room 22 through different wiring holes 55, respectively. It should be noted that, in FIG. 3, the same members as, or similar members to, those described in the foregoing embodiment are denoted by the same reference signs as those used in the foregoing embodiment, and a detailed description of the variation shown in FIG. 3 is omitted herein.

[0059] From the foregoing description, numerous modifications and other embodiments of the present invention are obvious to a person skilled in the art. Therefore, the foregoing description should be interpreted only as an example and is provided for the purpose of teaching the best mode for carrying out the present invention to a person skilled in the art. The structural and/or functional details may be substantially altered without departing from the spirit of the present invention.

### **Reference Signs List**

- [0060]
- 1 ship
  - 2 wheelhouse
  - 3 division floorboard
  - 9 cabin
  - 20 deck (of the wheelhouse)
  - 21 upper room
  - 22 lower room
  - 30 frame
  - 31 support pillar
  - 32 beam
  - 33 opening/closing cover

- 34 ladder
- 35 transparent portion
- 36 inspection opening
- 37 mounting plate
- 38 access hatch
- 39 cable hanger
- 41, 42 fire alarm
- 43 automatic dry chemical fire extinguisher
- 50 console
- 51 processing unit
- 52 output device
- 53 input device
- 55 wiring hole
- 56, 57 air conditioner indoor unit
- 60 cables

**CLAIMS**

1. A ship wheelhouse structure comprising:
  - a division floorboard provided above a deck of a wheelhouse, the deck being made of steel plates and thermally insulated, the division floorboard dividing the wheelhouse into an upper room and a lower room;
  - a processing unit installed in the lower room;
  - a console installed in the upper room and mounted with at least one of an input device and an output device of the processing unit; and
  - at least one wiring hole formed in the division floorboard, the wiring hole being a hole through which a cable connecting between the processing unit and the input device and a cable connecting between the processing unit and the output device are passed.
2. The ship wheelhouse structure according to claim 1, wherein a height of the lower room is greater than or equal to 900 mm but less than 2000 mm.
3. The ship wheelhouse structure according to claim 1 or 2, wherein the division floorboard is provided with a transparent portion for allowing an inside of the lower room to be visually checked from the upper room.
4. The ship wheelhouse structure according to any one of claims 1 to 3, wherein the division floorboard is provided with an inspection opening for allowing the lower room to be visually checked from the upper room.
5. The ship wheelhouse structure according to any one of claims 1 to 4, wherein the division floorboard is provided with an access hatch for allowing a person to access the lower room from the upper room.
6. The ship wheelhouse structure according to any one of claims 1 to 5, comprising an air conditioner configured to perform air conditioning of the upper room and the lower room separately.
7. The ship wheelhouse structure according to any one of claims 1 to 6, comprising fire alarms provided in the upper and lower rooms, respectively.

8. The ship wheelhouse structure according to any one of claims 1 to 7, comprising an automatic dry chemical fire extinguisher provided in the lower room.
9. The ship wheelhouse structure according to any one of claims 1 to 8, comprising a plurality of pillar members provided on the deck of the wheelhouse in a standing manner, the pillar members supporting the division floorboard, wherein  
the processing unit is mounted on the pillar members.