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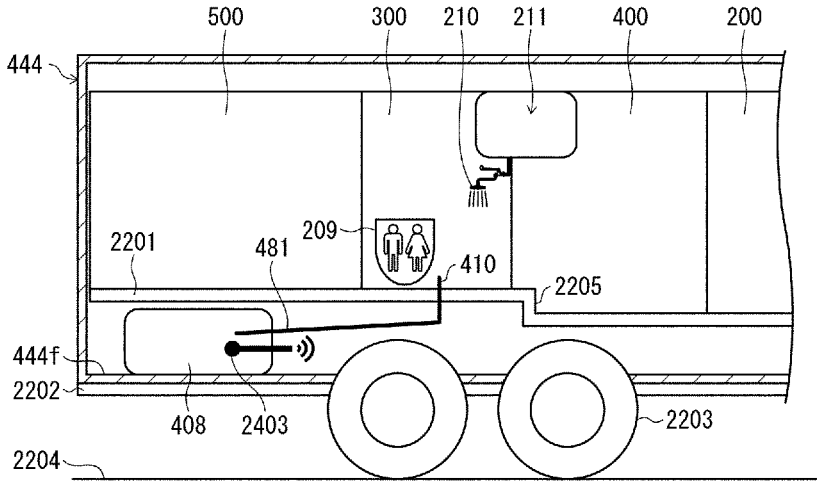
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(54) **Title:** RADIONUCLIDE-CONTAINING SUBSTANCE ADMINISTRATION FACILITY

(54) 発明の名称： 放射性核種含有物質投与施設

図 6



(57) **Abstract:** The present invention provides a radionuclide-containing substance administration facility in which the function of storing radioactive wastewater can be suitably provided within a radiation-controlled area. An administration facility unit (101) comprises: a floor (2201) that is arranged across a plurality of rooms, has a step structure (2205), has on one side of the step structure (2205) a region located at a higher position than a region on the other side of the step structure, and is provided with a space between the region on the one side and a shielding wall; a radioactive wastewater storage tank (408) accommodated in the space; and a pipe (481) that guides the radioactive wastewater from a drain port (410) provided in the region on the one side to the tank (408).

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規則4.17に規定する申立て：
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一　国際調査報告（条約第21条(3)）

(57) 要約：放射線管理区域内に放射線排水を貯留する機能を良好に配置することができる放射性核種含有物質投与施設を提供する。投与施設ユニット（１０１）は、複数の部屋に渡って配設される床（２２０１）であって、段差構造（２２０５）を有し、該段差構造（２２０５）を挟んで一方側の領域が他方側の領域よりも高い位置にあり、該一方側の領域と前記遮蔽壁との間に空間が設けられている床（２２０１）と、前記空間に収容された放射性排水貯留タンク（４０８）と、前記一方側の領域に設けられた排水口（４１０）から該タンク（４０８）へと放射性排水を導く配管（４８１）と備える。

Description

Title of Invention:

RADIONUCLIDE-CONTAINING SUBSTANCE ADMINISTRATION FACILITY

Technical Field

[0001]

The present invention relates to a radionuclide-containing substance administration facility for administering a substance containing a radionuclide to a human.

Background Art

[0002]

When a radionuclide-containing substance is administered so as to treat a disease such as a cancer, an administration target is forced to receive treatment and rest in a radiation controlled area for a certain period of time so that the general public is not exposed to radiation generated from the radionuclide-containing substance administered to the body of the administration target. Generally, a radiation controlled area for treatment and resting is referred to as, for example, a radiation therapy sickroom, and is surrounded by a shielding body structure for protection against radiation. As a result, in a space corresponding to a

residential section for a patient, all of six surfaces at the top, bottom, front, rear, left, and right are covered with a shielding body. Under the circumstances, it is difficult to provide a window which, in an ordinary sense, exists in a general sickroom etc. in a radiation uncontrolled area. Thus, it is impossible to realize daylighting. For example, Non-Patent Literature 1 also discloses a sickroom which is closed and in which there is no window.

Citation List

[Non-patent Literature]

[0003]

[Non-patent Literature 1]

HIGASHI, Tatsuya, the Sixth Conference on the Way of Providing Cancer Examination and Treatment, proceedings, reference material 5 "Present Circumstances on Nuclear Medicine Treatment (radioisotope therapy, radioisotope treatment, targeted radioisotope treatment)" (pp. 19-29 of the proceedings), conference date: June 16, 2016

Summary of Invention

Technical Problem

[0004]

In a very general radiation controlled area that is installed in a strong building, that is, an existing radiation

controlled area, it is possible to design a relatively large equipment housing building. However, a patient feels stressed in a case where the patient is forced to stay in a space in which there is no window and which is closed.

[0005]

Moreover, in a case where it is considered to set, as a radiation controlled area, a structure which has a very limited indoor space, for example, an extremely small space such as a house trailer, a residential room has a minimum necessary size. The inventors of the present invention have been making efforts to develop and improve a mobile radiation therapy sickroom which enables treatment with use of an α-emitter and hospitalization therein, and have recently realized a radiation therapy sickroom in the form of a house trailer, so that the inventors of the present invention have been attracting the world's attention. Such a mobile radiation controlled area is divided into a plurality of rooms including a residential room. A space assigned as the residential room has a limited size, and is covered with a shielding body as described above, so that the space has an environment in which it is impossible to provide a window.

[0006]

Thus, in a conventional radiation controlled area, the opportunity to come into contact with the nature or the outside world is lost, even though a patient is in a situation

of being under extremely high mental stress, i.e., receiving treatment and resting due to a disease. Therefore, there is attenuation of the quality of the patient's life (Quality of Life, QOL) which attenuation is difficult to quantify.

[0007]

Under the circumstances, it is an object of an aspect of the present invention to provide a radionuclide-containing substance administration facility which is capable of improving the quality of a residential environment in a radiation controlled area.

Solution to Problem

[0008]

In order to attain the above object, a radionuclide-containing substance administration facility in accordance with an aspect of the present invention is a radionuclide-containing substance administration facility which has a radiation controlled area including a residential room, including: a shielding wall which separates an inside and an outside of the radiation controlled area; an inner wall which, on inside of the shielding wall, covers a side surface or a top surface of the residential room; and a false window which is provided to the inner wall and in which a lighting device or a display device is embedded.

Advantageous Effects of Invention

[0009]

In an aspect of the present invention, it is possible to provide a radionuclide-containing substance administration facility which is capable of improving the quality of a residential environment in a radiation controlled area.

Brief Description of Drawings

[0010]

Fig. 1 is a plan view illustrating an internal structure of a radionuclide-containing substance administration facility unit (administration facility unit) in accordance with an embodiment of the present invention.

Fig. 2 is a cross-sectional view illustrating the administration facility unit that is illustrated in Fig. 1 and that is in a state of being cut vertically along a lengthwise direction of the unit at a position including a toilet room.

Fig. 3 is a plan view illustrating, in the plan view of the administration facility unit in Fig. 1, various configurations that are provided to an air conditioning device provided to the administration facility unit.

Fig. 4 is a schematic view illustrating a configuration of the air conditioning device illustrated in Fig. 3.

Fig. 5 is a plan view illustrating, in the plan view of the administration facility unit in Fig. 1, various configurations that are provided to the administration facility unit and that relate to water supply and drainage.

Fig. 6 is a partial cross-sectional view mainly illustrating a position in the administration facility unit at which position a radioactive wastewater storage tank relating to the drainage illustrated in Fig. 5 is disposed.

Fig. 7 is a partial cross-sectional view that illustrates a variation of the administration facility unit illustrated in Fig. 1 and that mainly illustrates a position in the administration facility unit at which position the radioactive wastewater storage tank is disposed.

Fig. 8 is a perspective view illustrating the inside of a residential room of the administration facility unit illustrated in Fig. 1.

Fig. 9 illustrates a cross section of the administration facility unit illustrated in Fig. 1, and illustrates the inside of the residential room of the administration facility unit as viewed from a side on which a side surface to which a sliding door is provided is located.

Fig. 10 illustrates a cross section of the administration facility unit illustrated in Fig. 1, and illustrates the inside of the residential room of the administration facility unit as viewed from a side opposite from the side on which the sliding door is provided.

Fig. 11 is a cross-sectional view taken along a line A-A' illustrated in Fig. 9.

Fig. 12 is a cross-sectional view taken along a line B-

B' illustrated in Fig. 9.

Fig. 13 illustrates a position in an indoor space of the administration facility unit illustrated in Fig. 1 at which position a false window is installed.

Description of Embodiments

[0011]

The following description will discuss a radionuclide-containing substance administration facility unit provided with an air conditioning device in accordance with an embodiment of the present invention.

[0012]

[Radionuclide-containing substance administration facility unit]

Radionuclide-containing substance administration facilities are each a unit structure including equipment necessary to administer a radionuclide-containing substance (hereinafter simply referred to as a radioactive substance) to a human. In the present embodiment, a radionuclide-containing substance administration facility unit (hereinafter referred to as an administration facility unit) is considered as one of the radionuclide-containing substance administration facilities. The administration facility unit is a conveyable or self-propelled radionuclide-containing substance administration facility which includes a radiation

controlled area and a sickbed that is installed in the inside of the radiation controlled area. The term "conveyable" means being capable of being conveyed by a transport means (such as a vehicle, a railroad, a ship, and an aircraft) or lifted by a lifting machine (such as a crane). The term "self-propelled" indicates a vehicle which moves by its own power and which has a relatively large space therein, like, for example, a bus.

[0013]

The radiation controlled area is formed in at least a part of the administration facility unit. The radiation controlled area indicates an area that is stipulated in the relevant acts, laws, and regulations which govern use of radiation for the purpose of safe handling and management of a radioactive substance or a radiation generation device (radiation from the radiation generation device). For example, according to the "Act on the Regulation of Radioisotopes, etc.", which is a relevant act in Japan, a dose limit is 1.3 mSv per three months at the boundary of a radiation controlled area (hereinafter referred to as a radiation controlled area boundary) and 250 μSv per three months at the boundary of a place of business (hereinafter referred to as a place-of-business boundary). A radiation controlled area which satisfies the dose limit at a place-of-business boundary can be disposed to a land and a facility

which do not fall under the place of business stipulated in the above act, without any complicated procedure. For example, according to the stipulation in the above act, the type and the thickness of a shield depend on, for example, a nuclide used in a radiation controlled area and the amount of the nuclide used. Therefore, depending on a nuclide, shielding from at least one or all of α particles, β particles, and γ rays is required for a shield of the radiation controlled area which forms at least a part of the administration facility unit. For example, clinical use of the radiation controlled area is assumed. In this case, in the case of I-131, it is necessary to surround a radiation source with a lead shield having a thickness of 7.5 cm and provide a lead shield having a thickness of 7.5 cm between the radiation source and a worker. In the case of Ac-225, a lead shield having a thickness of not less than 0.3 mm is needed.

[0014]

The administration facility unit in accordance with the present embodiment enables, for example, a clinical study, a clinical trial, and treatment with use of a substance containing an α-particle emitting radionuclide in the radiation controlled area.

[0015]

The α-particle emitting radionuclide (also referred to as α-emitter) indicates an atom containing an atomic nucleus

which emits at least one α particle and decays. Therefore, the substance containing the α-particle emitting radionuclide indicates the atom itself and a compound in which the atom and the other one or more atoms are bound to each other. The α-particle emitting radionuclide indicates every publicly known α-decay nuclide. A preferable α-particle emitting radionuclide is a nuclide that falls under one or more selected from the group consisting of the following (1) to (3).

[0016]

(1) A nuclide which has a half-life that allows the nuclide to be easily handed as a therapeutic agent.

(2) A nuclide for which a production method is established.

(3) A nuclide whose efficacy with respect to a cell or a living body is reported.

[0017]

Note that the half-life of the above (1) is, for example, not longer than 40 days, preferably not longer than 30 days, more preferably not longer than 20 days, and even more preferably not longer than 14 days. (2) is preferably a nuclide produced for an animal experiment (such as Tb-149, Pb-212, Bi-212, Bi-213, At-211, Ra-223, Ra-224, and Ac-225), more preferably a nuclide produced for a human clinical study (such as Pb-212, Bi-213, At-211, Ac-225, and Ra-223), and

most preferably a commercially available nuclide (such as Ra-223). (3) is selected from the group consisting of Tb-149, Pb-212, Bi-212, Bi-213, At-211, Ra-223, Ra-224, and Ac-225, whose efficacy with respect to a cell or a living body is reported.

[0018]

In recent years, pharmaceuticals containing α-particle emitting radionuclides have been expected as pharmaceuticals which form the core of TRT, because the pharmaceuticals have high therapeutical effects and cause less side effects with respect to neighboring tissues (also the pharmaceuticals fall under a part of the Third Basic Plan to Promote Cancer Control Program). Xofigo (registered trademark), which was approved by the FDA in May 2013 as the world's first pharmaceutical containing an α-particle emitting radionuclide and was also approved as a pharmaceutical by the Ministry of Health, Labour and Welfare in Japan in March 2016, is currently the only pharmaceutical containing an α-particle emitting radionuclide in Japan. Enhancement of radiation therapy in the Third Basic Plan to Promote Cancer Control Program clearly includes practical use of pharmaceutical candidates which contain α-particle emitting radionuclides and which are different from Xofigo (registered trademark). However, under the present circumstances, there is no place in which

various tests (not administration for treatment) are conducted in order for the pharmaceutical candidates to be approved as pharmaceuticals by the Ministry of Health, Labour and Welfare in Japan. This is because use of the pharmaceutical candidates is permitted only in radiation controlled areas. Moreover, there are a small number of sickbeds in the radiation controlled areas (approximately 150 beds nationwide). In the radiation controlled areas, amounts in which radiation nuclides are permitted to be used are determined for every certain period of time (for example, one year) in accordance with the scale of mainly provided equipment. Therefore, unless existing treatment and existing inspection are reduced from the previous year, it is impossible to additionally use the above sickrooms to test the pharmaceutical candidates (including administration of the pharmaceutical candidates to humans). On the other hand, a large amount of cost (approximately 400 million to 500 million Japanese yen) is required to newly or additionally construct a building including such a sickroom. Therefore, it is least expected to newly or additionally construct a building. In order to solve various problems as described above, the inventors of the present invention conducted diligent studies, and developed an administration facility unit which serves as a mobile radiation therapy sickroom that enables treatment with use

of a substance containing an α-particle emitting radionuclide and hospitalization therein.

[0019]

The administration facility unit in accordance with the present embodiment is realized as a structure which is not a building by itself, and provided with the radiation controlled area which is conveyable and which enables administration of an α-particle emitting radionuclide (a substance containing an α-particle emitting radionuclide) therein (in which a sickbed is installed).

[0020]

By causing the administration facility unit to be specialized in use of an α-particle emitting radionuclide, it is possible to realize, by a relatively light-weight and thin lead shield having a thickness of approximately not less than 0.3 mm, a "shield" which is installed in the radiation controlled area in order to suppress the dose of radiation emitted to the outside of the radiation controlled area to a level equal to or lower than that stipulated in the relevant acts, laws, and regulations. By employing such a light-weight and thin shield, it is possible to significantly reduce the weight of the radiation controlled area including the sickbed. The radiation controlled area which is reduced in weight enables conveyance of the administration facility unit. Realization of the administration facility unit which is

conveyable makes it less necessary to newly or additionally construct a building as a building for housing equipment etc., and accordingly makes it possible to reduce a cost for newly or additionally constructing a building. Realization of the administration facility unit which is conveyable enables easy installation and easy removal of the administration facility unit itself (installation of the administration facility unit in any place and at any time).

[0021]

Furthermore, by causing the administration facility unit to be specialized in use of an α-particle emitting radionuclide, it is possible to reduce the dose of radiation which reaches the boundary of the radiation controlled area. Moreover, regarding "air supply and exhaust equipment" which is installed in the radiation controlled area, a reduction in radiation which reaches the boundary of the radiation controlled area makes it possible to employ air supply and exhaust equipment having a small capacity.

[0022]

In addition, by causing the administration facility unit to be specialized in use of an α-particle emitting radionuclide, it is possible to employ a light-weight and thin shield for a "storage tank" in which wastewater containing a radioactive substance is stored and which allows shielding from radiation. Therefore, the storage tank is significantly

reduced in weight so as to be installable in the radiation controlled area (that is, conveyable). This makes it possible to make it unnecessary to reserve a cost for burying the storage tank under the ground or reserve a site on the ground at which site the storage tank is installed.

[0023]

The administration facility unit can be installed in an unused area (parking lot) in an existing facility (hospital) and can be used as a detached ward of a medical facility. The detached ward of the medical facility can be a treatment room or a clinical study room. The following description will discuss an example in which the administration facility unit is used as a clinical study room.

[0024]

The administration facility unit is conveyed to a parking lot of a hospital by the above-described transport means, and installed at the parking lot. A medical professional belonging to the hospital can go to the administration facility unit and conduct a clinical study (for example, administration of a test substance to a subject). The medical professional can also remotely manage and monitor the subject with use of equipment in the administration facility unit. During a test period, the subject can spend his/her time in the administration facility unit, and can further receive medical examination and treatment,

as necessary.

[0025]

The administration facility unit does not need to belong exclusively to a single hospital. After the test period ends or while no test is scheduled, the administration facility unit can be transferred to another hospital or the like and used for work other than a clinical study (for example, also as a treatment room). One or more administration facility units are shared or temporarily lent or borrowed by a plurality of hospitals, because the one or more administration facility units are conveyable. Therefore, the administration facility unit can also satisfy demands for treatment actions which demands vary depending on regions, over various regions.

[0026]

The following (a) to (c) are exemplified as preferable requirements for the radiation controlled area in which a clinical study is conducted.

[0027]

(a) Preferable requirements as medical space (conforming to the Medical Care Act in Japan)

-A space as a sickbed and facility equipment (such as a sickroom, a bed, a toilet, a washstand, and a storage shelf)

-A simplified bed (equipment on which a patient can lie in a place other than the sickbed, for example, during

administration)

-An on-call function (bell)

-Lighting equipment

-Air conditioning equipment

-Facility equipment for keeping the quality of a life high (such as a TV set, a refrigerator, a shower, WiFi (registered trademark), and a silencing device)

-Installation of an emergency exit that is located on a side different from a side on which a usual entry and a usual exit are made.

[0028]

(b) Requirements as radiation controlled area (conforming to the Act on the Regulation of Radioisotopes, etc.)

-Air supply and exhaust equipment and filters (keeping the concentration of a radioactive substance at a level lower than a certain level)

-A fume hood and a filter (for avoiding scattering of a radiopharmaceutical handled as an unsealed radiation source)

-Wastewater storage equipment for radioactive wastewater

-A shielding body (shielding wall) that separates, from the other spaces, a place and a space each of which can have a high dose of radiation

-A waste storage box which has sufficient shielding

properties and sufficient fire resistance

-A radiation source storage box which has sufficient shielding properties and sufficient fire resistance

-A radiation detector and a radiation meter (contamination inspection at the time of an entry and an exit, monitoring of exhaust and wastewater)

-A locking function for restricting an entry of a general individual, including an inpatient

[0029]

(c) Preferable requirements specific to mobile body

-Communication equipment for conveying information to/from a parent facility such as a main hospital

-A patient remote monitoring device (CCTV)

-A nursing robot

-Power source equipment (a power generator, power storage equipment, or equipment which receives electric power supplied from an external power source)

-A clean water storage tank and a wastewater storage tank which preferably have the same volume (for example, approximately 4,000 L)

-A hauled function required during movement

-Means for fixing the unit (a wheel clamp of a vehicle, an anchor, and an outrigger function)

-Impact resistance and robustness (no earthquake resistance is required for the unit itself)

-For the purpose of effective utilization of a space, connectivity and expandability which make it possible to install incidental equipment and functions, such as a wastewater tank and a power generator, in an adjacent place such as another mobile body

[0030]

[Specific example of administration facility unit]

An example of the administration facility unit in accordance with the present embodiment which satisfies the above requirements (a) to (c) and a combination with a transport means (a vehicle on which the example administration facility unit is loaded) are illustrated in Figs. 1 and 2. In the following description, configurations denoted by reference signs are specific examples for satisfying the requirements (a) to (c) at minimum.

[0031]

As illustrated in Figs. 1 and 2, an administration facility unit 101 is loaded on a hauling vehicle 102. The administration facility unit 101 includes, in a radiation controlled area, a residential room 200, a work room 400, a toilet room 300 (provided with a flush toilet 209 and a shower 210), a storage room 600, a management room 500, and a duct space 800 (Fig. 2).

[0032]

One of partitions provided between the residential

room 200 and the work room 400 is a sliding door 202. A door which is not locked is provided between the work room 400 and the toilet room 300. Therefore, an individual who is inside the administration facility unit 101 can freely enter and leave the residential room 200, the work room 400, and the toilet room 300, and can use equipment in these three rooms. A door 101a which corresponds to an entrance of the administration facility unit 101, a door 600a which is provided between the work room 400 and the storage room 600, and a door 600a which is provided between the storage room 600 and the management room 500 are each locked by an electronic lock. Therefore, an individual who cannot open the electronic lock (an individual who does not possess an electronic entry permit) cannot enter the management room 500 and the storage room 600.

[0033]

<Residential room 200>

The residential room 200 includes a bed 201 (sickbed), a lighting unit 213, an electrical outlet 214 (100V, 15A), on-call equipment 301, a monitoring camera 302, a false window 303, a supply air outlet port 402, an exhaust inlet port 403, a radiation controlled area dosimeter 417, a desk, a shelf, a wireless LAN, a storage space, a refrigerator, a microwave, a television set, and an air-conditioning sensor (temperature and humidity).

[0034]

The residential room 200 includes equipment which enables the residential room 200 to fall under a medical space conforming to the Medical Care Act, which enables a subject to stay at rest and comfortably, and which enables a medical professional to observe the course of a clinical study. In the residential room 200, a substance which contains an α-particle emitting radionuclide and which is a clinical study drug, an investigational agent, or an approved pharmaceutical is administered to an administration target (hereinafter referred to as a subject or a patient). The subject or the patient can receive administration of a test substance while lying on the bed 201 in the residential room 200.

[0035]

The above-listed configurations which are included in the residential room 200 and which are not given reference signs are mainly configurations which further enhance habitability for the subject in the residential room 200. The lighting unit 213 is any lighting apparatus. Through the supply air outlet port 402, clean air is sent into the residential room 200 such that an airflow does not directly blow against the subject on the bed 201. The supply air outlet port 402 is connected to an air supply damper (manifold: 504) of an air supply device 450 of an air conditioning device 430 via a pipe that is disposed in the

duct space 800 (Fig. 2). Through the exhaust inlet port 403, air in the residential room 200 is exhausted. The exhaust inlet port 403 is connected to an exhaust device 470 of the air conditioning device 430 via a pipe that is disposed in the duct space 800 (Fig. 2). Air conditioning will be described later. The monitoring camera 302 captures an image of the inside of the residential room 200 (mainly, the bed 201), and transmits a state of the subject to the medical professional via the management room 500.

[0036]

The false window 303 is provided to one of inner walls each of which, on the inside of a shielding wall that separates the inside and the outside of the radiation controlled area, covers a side surface or a top surface of the residential room 200. The false window 303 will be described later.

[0037]

<Work room 400>

The work room 400 includes an electrical outlet 214, a contamination inspection room 420, a supply air outlet port 402, an exhaust inlet port 403, an unsealed radiation source handling fume hood 404, a radiation controlled area dosimeter 417, a simplified bed, and washing equipment 418. The unsealed radiation source handling fume hood 404 is a cabinet in which an unsealed radiation source taken out

from a shield is handled (for example, the radiation source is diluted to an administration concentration and the diluted radiation source is transferred to an administration container to prepare the test substance). Through the supply air outlet port 402, clean air is sent into the work room 400. The supply air outlet port 402 is connected to the air supply damper (manifold: 504) of the air supply device 450 of the air conditioning device 430 via a pipe that is disposed in the duct space 800 (Fig. 2). Through the exhaust inlet port 403, air in the work room 400 is exhausted. The exhaust inlet port 403 is connected to the exhaust device 470 of the air conditioning device 430 via a pipe that is disposed in the duct space 800 (Fig. 2). The simplified bed is a bed on which the subject can receive administration of the test substance while lying thereon. The washing equipment 418 is used to wash the subject's and the medical professional's hands and faces.

[0038]

The contamination inspection room 420 includes a contamination inspection apparatus (survey meter), a radiation controlled area boundary dosimeter, and the door. The contamination inspection room 420 is divided by a curtain (represented by a line formed by a plurality of connected characters "v" in Fig. 1). The contamination inspection apparatus is a small apparatus which detects a

dose on the body surface of an individual leaving the administration facility unit 101. The radiation controlled area boundary dosimeter is an instrument which measures a dose in air in the vicinity of the door, and determines an effective dose at a radiation controlled area boundary (described later).

[0039]

On an outer wall of the work room 400 (for example, an upper part of the door 101a), there is the monitoring camera 302, a sign, and a place-of-business boundary dosimeter. A staircase 555 is placed on the outside of the door 101a. The place-of-business boundary dosimeter is an instrument which measures a dose in air on the outside of the administration facility unit 101, and determines an effective dose at a place-of-business boundary (described later). Images of an individual who moves up and down the staircase 555 and an individual who opens and closes the door 101a are both captured and recorded by the monitoring camera 302. The sign which represents that the inside of the administration facility unit 101 is the radiation controlled area is attached to the door 101a. The same sign is also attached to an emergency exit (for example, an entrance 101b provided to the management room 500). Note that the staircase 555 does not need to be a part of the administration facility unit 101, and can be an assembly-type staircase

which is loaded on the vehicle 102.

[0040]

<Storage room 600>

The storage room 600 includes a storage box and a storage room dosimeter. The storage box houses the unsealed radiation source which is used in the unsealed radiation source handling fume hood 404 and a waste which may have a radioactive substance attached thereto. A wall of the storage box contains a substance which allows shielding from radiation (such as lead). A door of the storage box is locked. The storage room dosimeter is an instrument which measures a dose in air in the storage room 600.

[0041]

<Management room 500>

The management room 500 includes a supply air outlet port 402 and an exhaust inlet port 403. In addition, the management room 500 includes the air conditioning device 430, a computer 552, and power receiving equipment 553, as a plurality of types of equipment apparatuses.

[0042]

Through the supply air outlet port 402, clean air is sent into the management room 500. The supply air outlet port 402 is connected to the air supply damper (manifold: 504) of the air supply device 450 of the air conditioning device 430 via a pipe that is disposed in the duct space 800

(Fig. 2). Through the exhaust inlet port 403, air in the management room 500 is exhausted. The exhaust inlet port 403 is connected to the exhaust device 470 of the air conditioning device 430 via a pipe that is disposed in the duct space 800 (Fig. 2).

[0043]

The air conditioning device 430 carries out air conditioning in each of the rooms in the radiation controlled area. The air conditioning device 430 will be described later.

[0044]

The power receiving equipment 553 is equipment for receiving electric power supplied from the outside of the administration facility unit 101. The power receiving equipment 553 distributes the externally supplied electric power to all of the electrical outlets 214 via an EPS.

[0045]

The computer 552 is electrically connected to the above-described various devices which are electrically driven. The computer 552 outputs an electrical signal for driving each of the devices, in accordance with a preset program. The computer 552 records driving (such as air conditioning, a dose rate, entry/exit record, and CCTV data) of each of the devices which driving is indicated by the electrical signal. That is, the computer 552 controls and monitors the driving of each of the devices. The computer

552 transmits recorded information to a display device or a wireless communication section.

[0046]

<Toilet room 300>

The toilet room 300 includes the flush toilet 209 and the shower 210. The flush toilet 209 and the shower 210 receive water supplied from a supply water tank 211. Wastewater from the flush toilet 209 and the shower 210 is sent to a radioactive wastewater storage tank 408 (Fig. 2) through a radioactive wastewater discharge port 410 (drain port) provided under the floor of the toilet room 300. Although an example in which the flush toilet 209 and the shower 210 receive water supplied from the supply water tank 211 provided to the administration facility unit 101 has been described, the flush toilet 209 and the shower 210 may receive water supplied from the outside, for example. Alternatively, the flush toilet 209 and the shower 210 may receive water supplied from a supply water tank provided to a hauling part of the vehicle 102, for example.

[0047]

As has been described, the administration facility unit 101 includes equipment required for the radiation controlled area (mainly equipment in the four hundreds). The administration facility unit 101 further includes (i) things required for a sickroom and a treatment room each of which

enables hospitalization and medical practice therein and (ii) functions necessary to enhance the habitability for the subject residing in the administration facility unit 101 and enhance the quality of the life of the subject (mainly equipment in the two hundreds and three hundreds).

[0048]

The administration facility unit 101 includes a set of functions and devices for the medical professional and a relevant individual to carry out tasks related to the administration facility unit 101 (mainly equipment in the five hundreds), in spaces which are locked so that entries and exits of a large number of unspecified individuals are restricted.

[0049]

As has been described, the administration facility unit 101 is conveyed to a site (parking lot etc.) of an existing facility (hospital) by the power of the vehicle 102, and installed at the site. The administration facility unit 101 is fixed to the ground by a fixing tool (such as a wheel clamp (via the vehicle 102), an anchor, or an outrigger), as necessary, and used as an actual hospitalization facility. By the time when the administration facility unit 101 starts to be used, various procedures necessary in radiation control need to be completed with respect to the administration facility unit 101.

[0050]

The administration facility unit 101 includes at least one of power generation equipment, power storage equipment, and equipment that receives supplied electric power. The administration facility unit 101 can include the emergency exit (101b in Fig. 1) which is located in a place other than the main entrance (entrance having the door 101a), in order to secure the safety of the patient.

[0051]

Fig. 1 illustrates an example in which the administration facility unit 101 is divided mainly into four rooms (the residential room 200, the toilet room 300, the work room 400, and the management room 500). However, the administration facility unit 101 is not limited to an aspect in which the administration facility unit 101 is divided into four rooms, provided that the administration facility unit 101 falls under the radiation controlled area and does not violate the stipulation in the Medical Care Act. There can be an aspect in which the administration facility unit 101 is divided into five or more rooms (for example, an aspect in which there are two or more residential rooms 200 or work rooms 400). Alternatively, there can be an aspect in which the administration facility unit 101 is divided into two rooms (for example, an aspect in which the residential room 200 and the work room 400 are integrated into a single

section). In an example of the administration facility unit 101, a plurality of residential rooms 200 are connected to a single work room 400 such that the plurality of residential rooms 200 are in communication with the single work room 400. Further, for example, the residential room 200 can include a plurality of beds 201. Thus, the administration facility unit 101 can have any combination of sections, provided that the management room 500 is independent of the residential room 200 and the work room 400 by the electronic lock.

[0052]

(Floor area of administration facility unit)

The floor area of the inside of the administration facility unit 101 is 15 m^2 to 40 m^2. In a case where the vehicle 102 is a large hauling vehicle which can travel on an ordinary road, the vehicle 102 can convey the administration facility unit 101 as a container or a house trailer (for example, having a floor area of 15 m^2 to 40 m^2). The weight of a conventional shield (concrete or lead shield) which can surround and cover a space having a floor area of not less than 15 m^2 (for example, a container or a house trailer) is much greater than 10 tons. As has been described, the administration facility unit 101 which requires only a thin and light-weight shield (for example, for which a wall surface of a container or a house trailer can be substituted) can be

conveyed by a vehicle which can travel on an ordinary road. From the viewpoint of the habitability, the volume of the inside of the administration facility unit 101 is preferably 20 m^3 to 120 m^3.

[0053]

(Size of administration facility unit)

The administration facility unit 101 is a container or a house trailer (each of which is conveyable). When a mobile controlled area of a house trailer type is designed, it is necessary to cause the dimensions and the weight (vehicle weight) of this house trailer to fall within the dimensions and the weight stipulated in the Road Traffic Act in Japan, in order to realize operation in which the characteristics of the house trailer, that is, quick response characteristics and movability that enable passage on an ordinary road and an expressway at any time are utilized. At the same time, a structure which can provide sufficient shielding from radiation is required for the house trailer as a controlled area. Therefore, the house trailer needs to be designed such that the above two elements are both achieved. The above Road Traffic Act stipulates a general limitation on the size of a vehicle body. Specifically, it is stipulated that a vehicle body shall have a total length of not longer than 12 m, a total width of not longer than 2.5 m, a total height is not higher than 3.8 m, and a total weight of not more than 20,000 kg

(20 t). These numerical values can be regarded as indicating the maximum standard for a general vehicle body. By way of exception, these standard values are respectively allowed to be expanded to a total length of 18 m, a total width of 3.5 m, a total height of 4.1 m, and a total weight of 36 t (36,000 kg). However, in order for a vehicle of an extended type to pass on an ordinary road etc., notification to and permission by a relevant authority are needed. This constitute an obstacle to the goal of easily realizing portability and quick response characteristics.

[0054]

As is the case with a general residential room, the inside of the controlled area corresponds to a living place for a resident (the subject, the medical professional). Also in order to install, effectively and with a margin, equipment etc. which are required for the controlled area, it is desirable that the inside of the controlled area be designed so as to have an appropriate size.

[0055]

In order to handle a sufficient amount of the radioactive substance in the controlled area, it is necessary to increase the thickness of a shielding body in accordance with the amount (radioactivity) of the radioactive substance to be handled, so as to suppress an exposure dose with respect to the general public. Generally, for shielding from

electromagnetic waves etc. such as radiation, particularly, gamma rays and X-rays, a high-density material, for example, lead (11.4 g/cm^3), iron (7.9 g/cm^3), tungsten (19.3 g/cm^3), or the like is employed. Note that these materials differ from each other in unit price. Thus, an effect on a material cost increases in proportion to the scale (dimensions) of a shielding body structure. Therefore, it is necessary to comprehensively optimize the dimensions of the house trailer, a total vehicle body weight, radiation to be handled, a material of the shielding body, the thickness of the shielding body, and a cost. In the present embodiment, the radioactive substance to be used in the controlled area is limited to an alpha radiation source which has a low penetration capability as radiation energy, and then the controlled area is designed. This makes it possible to sufficiently attenuate the radiation energy even with a simple shielding body. As a result, it is possible to reduce the material used for shielding, and possible to significantly reduce each of the manufacturing cost and the vehicle body weight.

[0056]

(Specific examples of shield and outer shell of administration facility unit)

A wall of the administration facility unit 101 includes a shield. Specifically, an outer shell of a container or a house

trailer each of which constitutes the administration facility unit 101 is configured as the shielding wall including the shield, and separates the inside and the outside of the administration facility unit 101, that is, the inside and the outside of the radiation controlled area. Namely, the outer shell of the container or the house trailer each of which constitutes the administration facility unit 101 includes a layer that is formed from the shield which is relatively thin and light-weight as described later.

[0057]

A material of the shield is a material which is generally used for a shield of a radiation controlled area, and examples thereof include lead, tungsten, iron, and concrete. From the viewpoint of shielding, the thickness of the shield made of one selected from these materials is not less than 0.03 mmPb, preferably not less than 0.5 mmPb, and more preferably not less than 1 mmPb, in terms of a lead equivalent. From the viewpoint of the weight, the thickness of the shield is not more than 5 cmPb, preferably not more than 1 cmPb, and more preferably not more than 1 mmPb, in terms of a lead equivalent. The lead equivalent and the numerical value thereof conform to a prescribed stipulation (for example, the stipulation in the "Notification No. 188 of the Ministry of Health, Labour and Welfare, the notification from the Director-General of the Pharmaceutical and Food

Safety Bureau to the prefectural governors"). An exhaust capacity which satisfies a concentration (dose) in air in a radiation controlled area is 50 m^3/hour to 500 m^3/hour, and an exhaust capacity which satisfies a concentration (dose) in air exhausted to the outside of the radiation controlled area is 1 m^3/hour to 1000 m^3/hour. An effective dose limit at a radiation controlled area boundary which effective dose limit falls within the range stipulated in the act is 1.3 mSv per three months, and an effective dose limit at a place-of-business boundary which effective dose limit falls within the range stipulated in the act is 250 μSv per three months.

[0058]

The outer shell can be made of, from the inside, LONCLEANLEUM (vinyl floor sheet) of 2 mm, a lead sheet of 0.3 mm, a structural plywood of 24 mm, a structural plywood of 9 mm, and a galvalume steel sheet (registered trademark) of up to 15 mm.

[0059]

(Specific example 1)

For example, the administration facility unit 101 for administration of Ac-225 is manufactured with use of the outer shell which includes a lead shield having a thickness of 0.3 mm. In this case, the exhaust capacity which satisfies the limit (dose) in air in the radiation controlled area is 92 m^3/hour, and the exhaust capacity which satisfies the

concentration limit (dose) in air exhausted to the outside of the radiation controlled area is 231 m^3/hour. In this case, the effective dose at the radiation controlled area boundary is 51 μSv per three months, and the effective dose at the place-of-business boundary is 215 μSv per three months. These effective doses fall below the standards stipulated in the act. In a case where the administration facility unit has a width of 2.3 m, a length of 7 m, and a height of 3.7 m, the weight of lead is 0.2 t and, thus, the total vehicle body weight (the sum of the weight of the administration facility unit 101 and the weight of the vehicle 102) is 4.5 t. Therefore, it is possible to travel on an ordinary road.

[0060]

(Specific example 2)

As another example, in the case of the administration facility unit 101 for administration of Ra-223, the administration facility unit 101 is manufactured with use of the outer shell which includes a lead shield having a thickness of 5 mm. In this case, the exhaust capacity which satisfies the limit (dose) in air in the radiation controlled area is 214 m^3/hour, and the exhaust capacity which satisfies the concentration limit (dose) in air exhausted to the outside of the radiation controlled area is 693 m^3/hour. In this case, the effective dose at the radiation controlled area boundary is 16 μSv per three months, and the effective

dose at the place-of-business boundary is 64 μSv per three months. These effective doses fall below the standards stipulated in the act. In a case where the administration facility unit has a width of 3.4 m, a length of 12 m, and a height of 2.8 m, the weight of lead is 9.5 t. Therefore, it is possible to travel on an ordinary road.

[0061]

(Specific example 3)

For example, the administration facility unit 101 for administration of Bi-213 is manufactured with use of the outer shell which includes a lead shield having a thickness of 0.25 cm. In this case, the exhaust capacity which satisfies the limit (dose) in air in the radiation controlled area is 222 m^3/hour, and the exhaust capacity which satisfies the concentration limit (dose) in air exhausted to the outside of the radiation controlled area is 463 m^3/hour. In this case, the effective dose at the radiation controlled area boundary is 47 μSv per three months, and the effective dose at the place-of-business boundary is 199 μSv per three months. These effective doses fall below the standards stipulated in the act. In a case where the administration facility unit has a width of 3.4 m, a length of 12 m, and a height of 2.8 m, the weight of lead is 4.8 t. Therefore, it is possible to travel on an ordinary road.

[0062]

(Air conditioning in administration facility unit)

In the administration facility unit 101, an air environment in each of the rooms (the residential room 200, the toilet room 300, the work room 400, and the management room 500) in the radiation controlled area is kept comfortable and under appropriate conditions by the air conditioning device 430 provided in the management room 500. The air conditioning device 430 is a mechanism for ventilation and adjustment of an air pressure, and differs from a mechanism for adjustment of a room temperature (so-called air conditioner).

[0063]

Fig. 3 is a schematic view illustrating installation of the air conditioning device 430 in the administration facility unit 101. The air conditioning device 430 includes the air supply device 450 that supplies air to each of the rooms, the exhaust device 470 that exhausts air from each of the rooms, and a bypass mechanism 490. The air supply device 450 and the exhaust device 470 are installed in the management room 500, and the pipes which are connected to these devices are disposed in the duct space 800 (Fig. 2). The bypass mechanism 490 is also installed in the management room 500.

[0064]

A specific configuration of the air conditioning device

430 is described with use of Fig. 4. In Fig. 4, each of the rooms (the residential room 200, the toilet room 300, the work room 400, the management room 500 illustrated in Fig. 3) in the administration facility unit 101 is represented as a room 700n (n means plurality; in a case where there are four rooms as described above, n=4).

[0065]

The air supply device 450 includes an external air inlet port 501, an intake air filter 502, an intake air blower 503, the air supply damper 504 (manifold), and air supply pipes 455. Each of the air supply pipes 455 extends from the air supply damper 504 to the supply air outlet port 402 provided to a corresponding one of rooms 700n (the residential room 200, the toilet room 300, the work room 400, and the management room 500). Each of the air supply pipes 455 includes a supply air volume adjustment valve 456.

[0066]

The exhaust device 470 includes exhaust pipes 475 each of which leads to the exhaust inlet port 403 provided to a corresponding one of the rooms, an exhaust damper 471, an exhaust filter 472, an exhaust blower 473, and an exhaust port 474. Each of the exhaust pipes 475 includes an exhaust volume adjustment valve 476.

[0067]

The bypass mechanism 490 includes a direct coupling

pipe 491 which directly couples the air supply damper 504 and the exhaust damper 471 and a flow rate adjustment valve 492 which is disposed in the direct coupling pipe 491 and which allows the flow rate of air flowing in the direct coupling pipe 491 to be adjusted. The bypass mechanism 490 (the direct coupling pipe 491 and the flow rate adjustment valve 492) is installed in the management room 500.

[0068]

The inside of the administration facility unit 101 (the radiation controlled area) is controlled to have a negative pressure so that the radioactive substance is not dissipated to a general public environment 103. That is, external air is taken in through the external air inlet port 501 with use of the intake air blower 503, cleaned with the filter 502, and is guided to the air supply damper (manifold; 504). Each of the air supply pipes 455, the number of which corresponds to the number (n) of the rooms 700, extends from the air supply damper 504 and is coupled to the supply air outlet port 402 installed in a corresponding one of the rooms 700n. The supply air volume adjustment valve 456 is provided to each of the air supply pipes 455. The volume of air supplied to each of the rooms 700 can be adjusted with use of the supply air volume adjustment valve 456.

[0069]

Supply air emitted into each of the rooms 700 is taken

in through the exhaust inlet port 403 which is also provided to each of the rooms 700. The supply air thus taken in passes through the exhaust volume adjustment valve 476, the exhaust damper 471, and the exhaust filter 472, and is then sucked by the exhaust blower 473. A volatile radioactive substance, such as a gaseous or particulate radioactive substance, may be generated in each of the rooms 700n in the radiation controlled area due to some work or the like. The volatile radioactive substance is collected by the exhaust filter 472. Therefore, a so-called radioactive contaminant is not released downstream of the exhaust blower 473, that is, to the general public environment 103 through the exhaust port 474.

[0070]

As described above, the inside of the radiation controlled area needs to be maintained at a negative pressure. Thus, both of the blowers 503 and 473 which are power sources for air supply and exhaust are operated in a state where an exhaust volume slightly exceeds a supply air volume. That is, the volume of air suctioned by the exhaust blower 473 is set so as to be slightly larger than the volume of air suctioned by the intake air blower 503 (that is, the volume of air let out downstream). Specifically, operation in which a pressure in the radiation controlled area is maintained at a pressure lower than the atmospheric

pressure is generally carried out. The exhaust volume adjustment valve 476 can be used to maintain air supply and exhaust balance (pressure difference management) in each of the rooms.

[0071]

The administration facility unit 101 is smaller than a very general radiation controlled area that is installed in a strong building. Therefore, in the administration facility unit 101, it is not easy to, with use of conventional air conditioning equipment, maintain a total exhaust volume and control the volume of air supplied to and the volume of air exhausted from each of the rooms. Thus, use of conventional air conditioning equipment may cause deterioration of the living environment of the patient in a very weak condition. Under the circumstances, in the administration facility unit 101, the direct coupling pipe 491 (pipe), which connects (directly couples) to the air supply damper 504 and the exhaust damper 471 and which allows a part of air sent from the air supply device to directly flow to the exhaust device without passing through each of the room, and the flow rate adjustment valve 492, which enables an airflow in the direct coupling pipe 491 to be arbitrarily adjusted in the range of 0% to 100%, are provided so as to form a short circuit (bypass) between the air supply device 450 and the exhaust device 470. That is, instead of an

inverter control mechanism of an exhauster which is generally carried out, the direct coupling pipe 491, which is a bypass, and the flow rate adjustment valve 492, which carries out a throttling function, are used. This makes it possible to easily realize air supply and exhaust in each of the rooms 700 while maintaining the total exhaust volume required at the exhaust port 474 of the radiation controlled area. The flow rate adjustment valve 492 allows the volume of air flowing in the direct coupling pipe 491 to be adjusted to any percentage in the range of 0% to 100%.

[0072]

A small device which is of a simple 0%/100% (on/off) operation type and which does not carry out inverter control can be selected for power (the intake air blower 503 and the exhaust blower 473) for realizing air supply and exhaust. The operating capacity (maximum capacity) thereof makes it possible to save an installation space for the air conditioning device 430 while securing the total exhaust volume required for the radiation controlled area.

[0073]

A radioactive substance of a certain amount or more is obligated, by the act, to be used in a radiation controlled area. Therefore, in a case where there is a radioactive substance that is desired to be used, it is necessary to specify the type and the maximum amount of the radioactive

substance to be used and a radiation controlled area which is desired to be used, and to obtain permission and approval for use from a prescribed organization (for example, the Nuclear Regulation Authority). Once conditions for handling the radioactive substance specified in an application document are determined, required supply air and exhaust volumes do not change, and, therefore, a timing when the bypass mechanism 490 (specifically, the flow rate adjustment valve 492) is operated is only the beginning of handling of the radioactive substance specified in the application document.

[0074]

However, as another opportunity, in a case where, for example, a nuclide used is changed to another or the amount of the nuclide used is increased or reduced, the flow rate adjustment valve 492 is operated. In particular, in a case where there is a request to reduce the supply air and exhaust volumes required for the radiation controlled area, such as a case where the amount of the nuclide used is reduced, it is possible to easily reduce total supply air and exhaust volumes while maintaining the air supply and exhaust balance (ratio) between the rooms 700, by opening the flow rate adjustment valve 492. In contrast, in a case where the amount of the nuclide used is increased, it is possible to easily increase the total supply air and exhaust volumes

while maintaining the balance in the same manner, by throttling the flow rate adjustment valve 492 which is previously opened.

[0075]

Note, here, that, in a case where permission for use is given with respect to the radiation controlled area and the type and the maximum amount of the radioactive substance which are specified in the application document, permission and approval are generally given to the entire radiation controlled area (that is, the administration facility unit 101), not to each of the rooms 700n, as inferred from the above-described examination items. In this case, it is guaranteed that estimated exposure doses with respect to a worker in the radiation controlled area (the administration facility unit 101) and the general public environment 103 are equal to or lower than the internationally determined standard values (not more than 1 mSv per week in a radiation controlled area; not more than 1.3 mSv per three months at a radiation controlled area boundary; not more than 250 μSv per three months at a place-of-business boundary). Thus, although there are some exceptions, conditions such as the scale of each of the rooms 700 and the total number (n) of the rooms 700 are not important matters that determine a result of the examination for permission and approval.

[0076]

As has been described, in the administration facility unit 101, control of air conditioning in the radiation controlled area is carried out by the air conditioning device 430 which is provided with the bypass mechanism 490 including the direct coupling pipe 491, which directly couples the air supply damper 504 and the exhaust damper 471, and the flow rate adjustment valve 492.

[0077]

According to this configuration, it is possible to easily realize air supply and exhaust in each of the rooms 700 while maintaining the total exhaust volume required at the exhaust port 474 in the radiation controlled area.

[0078]

Furthermore, according to this configuration, it is unlikely to cause a turbulent airflow in each of the rooms 700n due to ensuring of an excessive exhaust volume, and also it is possible to prevent generation of a so-called wind noise at the supply air outlet port 402 or the exhaust inlet port 403.

[0079]

Moreover, according to this configuration, it is possible to contribute to maintenance and improvement of the indoor environment of the room 700n (the residential room 200 illustrated in Figs. 1 and 2).

[0080]

Moreover, according to this configuration, it is possible to avoid excessive ventilation in each of the rooms 700n. Therefore, it is possible for a separately provided air conditioner to efficiently adjust a room temperature. As illustrated in Fig. 3, the air conditioner can be mounted in the work room 400 as an air conditioner 900 embedded in the ceiling, and adjusts the room temperature of each of the rooms through a pipe extending to each of the rooms.

[0081]

In addition, according to this configuration, it is also possible to avoid a risk of excessive decompression in the radiation controlled area. Thus, inconvenience, such as requirement of excessive power to open and close the door which partitions the rooms due to a pressure difference generated by excessive decompression, is not caused. Therefore, it is possible to provide a living environment that is low-load regarding various elements.

[0082]

In addition, this configuration allows installation of a small exhauster having a simple function. This makes it possible to make the indoor environment comfortable, while securing the total exhaust volume. Since it is possible to select an exhauster having a simple function, it is possible to reduce an introduction cost. Furthermore, in operation, release from operational malfunction which is caused by, for

example, a failure of a so-called electronic device is realized.

[0083]

Moreover, the house trailer type structure contributes to reductions in size and weight of a building that is determined as the controlled area. That is, construction of a large building made of heavy concrete generally requires several hundred million Japanese yen worth investment, and the inside of the building is generally determined as a controlled area. However, since it is possible to determine, as a controlled area, a house trailer for which the present invention is employed, it is possible to reduce a cost by approximately 1/10 regarding a so-called investment amount (mainly construction cost).

[0084]

Note that the above-described bypass mechanism 490 can also be applied to an air conditioning device in a radiation controlled area provided in an existing general building.

[0085]

(Drainage equipment and peripheral equipment)

A waste liquid discharged from a radiation controlled area may contain a radioactive substance. Therefore, strict radiation control is required for wastewater which has been moved to equipment equivalent to a so-called sewer. Specifically, it is stipulated that the average radioactivity

concentration (Bq/cm^3) of the wastewater for three months shall not exceed the limit stipulated in the act. The same regulation applies to the administration facility unit that is a mobile radiation controlled area, without an exception. Therefore, the following operation is carried out. That is, as has been described, the wastewater (waste liquid) from the flush toilet 209 etc. is sent to the radioactive wastewater storage tank 408 through the radioactive wastewater discharge port 410 which is located under the floor of the room, and temporarily stored in the radioactive wastewater storage tank 408. After the above radioactivity control is carried out, the wastewater is discharged (released) to a sewer etc. of the general public.

[0086]

As illustrated in Fig. 5, the radioactive wastewater storage tank 408 (represented by a two-dot dash line in Fig. 5) is installed in the administration facility unit 101 (in the controlled area). Specifically, the radioactive wastewater storage tank 408 is installed under the floor of the management room 500. Fig. 6 is a cross-sectional view illustrating a part of the administration facility unit 101. Fig. 6 also illustrates a part of the vehicle 102, and illustrates a state where the administration facility unit 101 is placed on a chassis 2202 to which wheels 2203 of the vehicle 102 are provided.

[0087]

In the administration facility unit 101, a floor 2201 in the management room 500 is provided at a position higher than that of a bottom part 444f of the outer shell 444 including the shielding wall which separates the inside and the outside of the administration facility unit 101 (the shielding wall which separates the inside and the outside of the radiation controlled area). The floor 2201 in the management room 500 and the bottom portion 444f are apart from each other. A distance by which the floor 2201 and the bottom portion 444f are apart from each other can be 10 cm to 25 cm. The radioactive wastewater storage tank 408 is housed in a space between the floor 2201 and the bottom part 444f. That is, the radioactive wastewater storage tank 408 is installed in the radiation controlled area (inside the outer shell 444). The position of the radioactive wastewater storage tank 408 is fixed by an appropriate fixing tool or a fixing device. Thus, the radioactive wastewater storage tank 408 is not displaced or excessively shaken, while the administration facility unit 101 is loaded on the chassis 2202, to which the wheels 2203 of the vehicle 102 are provided, and conveyed on a ground surface 2204.

[0088]

The bottom part 444f of the outer shell 444 that constitutes the administration facility unit 101 is

substantially horizontal. On the other hand, regarding the rooms (the residential room 200, the toilet room 300, the work room 400, and the management room 500) provided in the administration facility unit 101, the height of the floor 2201 which is disposed over these rooms is not uniform. As illustrated in Fig. 6, there is a level difference structure 2205, and a region on one side of the level difference structure 2205 is located at a position higher than that of a region on the other side. The region on one side includes the floor in the management room 500 and the floor in the toilet room 300 as described above. The region on the other side includes the floor in the work room 400 and the floor in the residential room 200.

[0089]

The height of the level difference structure 2205 can be, but is not limited to, 10 cm to 20 cm as a length along the vertical direction. The level difference structure 2205 does not need to match the boundary between the management room 500 and the work room 400 and does not need to match the boundary between the toilet room 300 and the work room 400. In a case where the radioactive wastewater storage tank 408 is disposed only in a part of a space under the floor in the management room 500 as illustrated in Fig. 5, the level difference structure 2205 may be provided between a region of the floor in the management

room 500 which region corresponds to the above part and the remaining region of the floor in the management room 500.

[0090]

Under the region of the floor which region is located at the higher position with the level difference structure 2205 as a boundary (the region on one side), a spacer for holding the space can be installed between the floor and the bottom part 444f of the outer shell 444.

[0091]

The radioactive wastewater discharge port 410 located under the floor in the toilet room 300 is located at a position higher than that of the radioactive wastewater storage tank 408. Therefore, in the outer shell 444, the pipe axis of a waste liquid pipe 481 which couples the radioactive wastewater discharge port 410 and the radioactive wastewater storage tank 408 is inclined such that a pipe end opening of the waste liquid pipe 481 which pipe end opening is located on the radioactive wastewater storage tank 408 side faces downward in the vertical direction. By this inclination, the waste liquid is naturally transferred to the radioactive wastewater storage tank 408 through the waste liquid pipe 481, without use of power such as that of a pump. In a case where the radioactive wastewater discharge port 410 is provided directly above the radioactive wastewater

storage tank 408, the waste liquid pipe 481 disposed therebetween may be configured such that the waste liquid pipe 481 is not inclined and the waste liquid flows vertically downward.

[0092]

There is not particular stipulation regarding the capacity (dimensions) of the radioactive wastewater storage tank 408, and the capacity only needs to fall within a range in which the radioactive wastewater storage tank 408 fits in the space. An opening to which a lid is attached is provided to an upper surface of the radioactive wastewater storage tank 408. Through the opening, it is possible to drain the stored radioactive wastewater to the outside of the tank with use of a pump.

[0093]

In order not to cause an event of an overflow from the radioactive wastewater storage tank 408 for some reason, a water level sensor 2403 including a device which detects the timing of discharge of water and which announces an alert is introduced to the radioactive wastewater storage tank 408. This ultimately makes it possible to detect the timing of storage of the wastewater early, and possible to avoid an accidental water leakage. A part of the wastewater in the radioactive wastewater storage tank 408 can be collected through the above-described opening, to which the lid is

attached, for examination of the dose of radiation in the wastewater.

[0094]

Note that wastewater from the washing equipment 418 (Fig. 2) installed in the work room 400 can be stored in a small tank 419 which is small and portable and which is installed below a radioactive wastewater discharge port of the washing equipment 418 (Fig. 2). The small tank can be, for example, a polyethylene tank disposed under a hand wash basin of the washing equipment in the work room 400. However, the wastewater from the washing equipment 418 can also be stored in the radioactive wastewater storage tank 408 through the radioactive wastewater discharge port of the washing equipment 418. In the case where an aspect is employed in which radioactive wastewater from the washing equipment 418 is stored in the radioactive wastewater storage tank 408, only a part of the entire region of the floor in the work room 400 which part includes the washing equipment 418 is included in the region which is at the position higher than that of the level difference structure 2205 (the region on one side), similarly to the floor in the toilet room 300. The part of the entire region can include a region in which a drainage pipe is installed, the drainage pipe being disposed from a region of the floor which region corresponds to the radioactive wastewater discharge port of

the washing equipment 418 to the radioactive wastewater storage tank 408.

[0095]

In the present embodiment, as an example of water supply, a form independent of general city water which can be continuously supplied can be employed. Namely, a so-called reservoir type water supply system which is realized by installing the supply water tank 211 can be employed. In view of the fact that supply water stored in the supply water tank 211 is transferred to the radioactive wastewater storage tank 408 in the course of time, the supply water tank 211 is preferably designed and operated as follows in order to drastically avoid the problem that the waste liquid flows over the radioactive wastewater storage tank 408. That is, the volume and the actual supply water storage amount of the water supply tank 211 are set to be smaller than those of the radioactive wastewater storage tank 408 so that the total supply water preparation amount always falls below the volume of the radioactive wastewater storage tank 408.

[0096]

As described above, the administration facility unit 101 is configured such that the level difference structure 2205 is provided to the floor 2201 so that the region on one side of the level difference structure 2205 is located at the position higher than that of the region on the other side. The

space is formed between (i) the region of the floor 2201 which region is located on one side and which region is located at the higher position and (ii) the bottom part 444f (shielding wall) of the outer shell 444 (structure constituted by the shielding wall that separates the inside and the outside of the radiation controlled area) which constitutes the administration facility unit 101, and the radioactive wastewater storage tank 408 is housed in the space. This makes it possible to dispose the radioactive wastewater storage tank 408 in the outer shell 444, that is, in the radiation controlled area.

[0097]

Further, the radioactive wastewater discharge port that is of the radioactive wastewater discharge port 410 located under the floor in the toilet room 300 in the work room 400 and that is included in the region of the floor 2201 which region is located at the higher position is located at the position higher than that of the radioactive wastewater storage tank 408. This makes it possible to guide the radioactive wastewater to the radioactive wastewater storage tank 408 through the waste liquid pipe 481 which couples the radioactive wastewater discharge port and the radioactive wastewater storage tank 408.

[0098]

The floor 2201 in the residential room 200 is included

in the region which is located on the other side and which is located at a lower position. This makes it possible to make a ceiling height in the residential room 200 higher than ceiling heights in the rooms included in the region which is located on one side and which is located at the higher position. Thus, it is possible to provide a comfortable living environment without causing a feeling of oppression and/or a feeling of closeness to the subject residing in the residential room 200. [0099]

In the case of a controlled area provided in a general building, a wastewater storage tank is often prepared in the bottommost layer, such as a basement floor, of the building. Specifically, wastewater generated on an upper floor is transferred to a tank in the bottommost layer due to the gravity, and stored in the tank. After it is confirmed, as appropriate, that the wastewater has a radioactivity concentration equal to or lower than the stipulated radioactivity concentration as a result of physical attenuation or dilution, the wastewater is discharged (released) to a sewer of the general public. That is, since the waste liquid which may contain the radioactive substance is stored in the tank for a certain period of time, it is required to provide a means which prevents an individual from easily approaching the tank or provide appropriate shielding around the tank, as a safeguard against radiation. However,

access to the bottommost layer (basement floor) of a general building is often limited naturally, and the storage tank surrounded by a concrete foundation is equivalent to being naturally surrounded by a shielding structure. Thus, no significant problem occurs in radiation control.

[0100]

The controlled area provided to the administration facility unit 101 which is different from a building and which is mobile, like a house trailer, always exists in a state of floating from the ground surface. Therefore, it is impossible to employ a natural shielding structure such as a structure in which the wastewater storage tank is also buried underground. That is, when the wastewater storage tank which is installed in the mobile controlled area is designed, it is required that the wastewater storage tank be located in the bottommost layer of the entire vehicle body, be housed in a shielding body structure as a safeguard against radiation, and have a strong structure which allows the wastewater storage tank to withstand a physical impact etc. caused by a traffic accident etc.

[0101]

In the administration facility unit 101, an aspect is realized in which the space satisfying the above requirements is realized between the floor in the rooms in the controlled area and a bottom body of the shielding wall

(the outer shell) that separates the inside and the outside of the controlled area and the radioactive wastewater storage tank 408 is housed in the space.

[0102]

(Variation of drainage equipment and peripheral equipment)

In the above aspect, the bottom portion 444f of the outer shell 444 is substantially horizontal, as illustrated in Fig. 6. However, the present invention is not limited to the above aspect, and may employ an aspect in which the bottom part 444f has a structure in which a region of the bottom part 444f in which region the radioactive wastewater storage tank 408 is placed slightly protrudes toward the ground surface. This variation is described with reference to Fig. 7. The bottom part 444f of the outer shell 444 includes a wastewater storage tank placement surface 444f1 and a surface 444f2 which is the other region. The placement surface 444f1 is located at a position closer to the ground surface than the surface 444f2. That is, the bottom portion 444f of the outer shell 444 has a structure in which the placement surface 444f1 is recessed vertically downward.

[0103]

In this variation, the shield (for example, a lead sheet) may be uniformly installed with respect to the placement surface 444f1 and the surface 444f2. However, in the case of

an aspect in which the entire surface of the radioactive wastewater storage tank 408 itself is covered with a shield and the shield of the bottom part 444f and the shield of the radioactive wastewater storage tank 408 are coupled to each other without a gap, no shield (for example, a lead sheet) may be disposed to a part constituting the placement surface 444f1. In a case where the entire surface of the radioactive wastewater storage tank 408 itself is covered with a shield, a steel sheet having a thickness of 4.5 mm can be used as the shield.

[0104]

Also in the aspect illustrated in Fig. 7, the level difference structure 2205 is provided to the floor 2201, and the floor 2201 in the management room 500 (the region on one side) has a high floor structure, as in the aspect illustrated in Fig. 6. In the aspect illustrated in Fig. 7, a region facing the floor 2201 in the management room 500 which floor 2201 has a high floor structure is the placement surface 444f1. Thus, a distance by which the placement surface 444f1 and the floor 2201 in the management room 500 are apart from each other is longer than a distance by which the bottom part 444f and the floor 2201 in the management room 500 are apart from each other in Fig. 6. That is, in the aspect illustrated in Fig. 7, it is possible to secure a large space for installing the radioactive wastewater

storage tank 408, as compared with the aspect illustrated in Fig. 6. This makes it possible to install a large radioactive wastewater storage tank 408.

[0105]

(Specific examples of false window 303 in residential room 200)

The radiation controlled area is surrounded by a shielding structure for preventing leakage of radiation and attenuating the radiation. Namely, all six surfaces, i.e., upper, lower, front, rear, left, and right surfaces are surrounded by the shielding wall. Thus, it is impossible to provide a window which has almost no shielding effect and which destroys air conditioning balance. In a space in which there is no window, it is impossible to let daylight in, and also it is impossible to loot out at a view etc. As a result, the inside of the radiation controlled area become a so-called closed space. This increases a risk of attraction of claustrophobia, a feeling of oppression, a feeling of closeness, and/or the like with respect to an individual living inside. In order to avoid this risk, in addition to lighting equipment, entertainment equipment such as a television set is provided to the residential room 200 in the radiation controlled area, and the false window is provided to the residential room 200 in the radiation controlled area so as to produce a connection with the nature and the

outside world.

[0106]

Fig. 8 illustrates the inside of the residential room 200 as viewed with a side on which the sliding door 202, which partitions the residential room 200 and the work room 400, is provided as a front side and with a side surface 205, which is opposite from a side surface to which the sliding door 202 is provided, as a far side. Fig. 9 is a view illustrating the inside of the residential room 200 in the radiation controlled area as viewed from the side on which the sliding door 202 illustrated in Fig. 8 is provided. However, for convenience, Fig. 9 omits the side surface of the residential room 200 to which side surface the sliding door 202 is provided and an inner wall which covers the side surface. Fig. 9 also illustrates the bed 201 which is also disposed in the residential room 200, in order to identify a position in the residential room 200 at which position the false window 303 is disposed. In Fig. 9, configurations which are disposed in the residential room 200 and which are other than the false window 303 are represented by broken lines. Fig. 10 is a view illustrating the inside of the residential room 200 as viewed from the side surface opposite from the side surface to which the sliding door 202 illustrated in Fig. 8 is provided. For convenience, Fig. 10 omits the side surface which is located at the front.

[0107]

On the inside of the outer shell 444 (shielding wall) which is illustrated in Fig. 6 and which includes the shield that separates the inside and the outside of the radiation controlled area, the residential room 200 is defined by four side surfaces which are respectively located at the front, rear, left, and right of the residential room 200 and the top surface of the residential room 200 being covered with the inner walls. The floor 2201 can also be configured as an inner wall. Namely, on the inside of the outer shell 444 (see Fig. 6), the residential room 200 is defined by a first inner wall 222a, a second inner wall 222b, a third inner wall 222c, and a fourth inner wall 222d which respectively cover four side surfaces that are respectively located at the front, rear, left, and right of the residential room 200, an fifth inner wall 222e that covers the top surface of the residential room 200, and the floor 2201 that covers a floor surface of the residential room 200. In other words, each of the inner walls 222a to 222d and the floor 2201 is disposed in the radiation controlled area. In the present example, an inner wall on the side on which the sliding door 202 is provided is referred to as the first inner wall 222a. An inner wall which is opposite from the first inner wall 222a is referred to as the second inner wall 222b. A pair of inner walls which are opposed to each other and which are separated by the first inner wall

222a and the second inner wall 222b are referred to as the third inner wall 222c and the fourth inner wall 222d.

[0108]

Each of the inner walls 222a to 222d does not need to be a shielding body, and can be constituted by an inner wall material of a general room. For example, from the inside, a REATEC sheet (a wall sheet made of vinyl chloride), a lead sheet having a thickness of 0.3 mm, and a gypsum board having a thickness of 12.5 mm can be employed. The thickness of each of the inner walls 222a to 222d can be selected, as appropriate. Each of the inner walls 222a to 222d can include a reinforcing material, as necessary.

[0109]

In the entire administration facility unit 101, the residential room 200 is located on the side closest to the vehicle 102, among the rooms of the administration facility unit 101. That is, in a case where the vehicle 102 is traveling forward, the residential room 200 is located on the forward side in a traveling direction (forward side in a hauling direction), among the rooms of the administration facility unit 101. In a case where, as described above, the administration facility unit 101 has a width of 3.4 m, a length of 12 m, and a height of 2.8 m, among four inner walls at the front, rear, left, and right in the residential room 200, the second inner wall 222b is an inner wall which is located

at the forward side in the traveling direction (forward side in the hauling direction), and the third inner wall 222c and the fourth inner wall 222d are respectively provided along walls of the outer shell 444 that form the length, which is 12 m, of the administration facility unit 101.

[0110]

The bed 201 is a single bed, and is disposed such that the long-side direction of the bed 201 is along the third inner wall 222c. The head side of the subject lying on the bed 201 can be directed to the first inner wall 222a to which the sliding door 202 is provided, and the leg side of the subject can be directed to the second inner wall 222b to which the false window 303 is disposed. Note that the head side of the subject lying on the bed 201 may be directed to the second inner wall 222b to which the false window 303 is disposed, and the leg side of the subject may be directed to the first inner wall 222a to which the sliding door 202 is provided. The bed 201 can be fixed to the floor 2201 or the like, as necessary.

[0111]

The residential room 200 includes, in addition to the bed 201 and the other equipment described above, a handrail 305, a light switch 306, a desk, a wireless LAN, and an air conditioning sensor (temperature and humidity), as illustrated in Fig. 8. The electrical outlet 214 (100V, 15A)

and the on-call equipment 301 can be disposed on a small article storage space 2225 provided to the second inner wall 222b.

[0112]

The false window 303 is installed to the second inner wall 222b. The side surface which is covered with the second inner wall 222b is a side surface to which the pipes of the air supply and exhaust system, various wires, or the other equipment are not installed, among four side surfaces at the front, rear, left, and right of the outer shell 444 of the administration facility unit 101. Regarding the installation height of the false window 303 from the floor 2201, the false window 303 is provided at a position higher than the position of the subject lying on the bed 201.

[0113]

Fig. 11 is a cross-sectional view taken along a line A-A' illustrated in Fig. 9. Fig. 12 is a cross-sectional view taken along a line B-B' illustrated in Fig. 9. The false window 303 is installed in a gap between the second inner wall 222b and the outer shell 444. The false window 303 is configured to emit light toward the inside of the residential room 200 through an opening 222b1 provided to a part of the second inner wall 222b. A panel 222b2 made of a light transmitting material is fitted to the opening 222b1 provided to the second inner wall 222b, and can be, for example, an acrylic

or glass panel. The periphery of the panel 222b2 is surrounded by a frame body 222b3. The frame body 222b3 is designed to be suggestive of a window frame, when viewed from the inside of the residential room 200.

[0114]

In the false window 303, a lighting device is embedded. As illustrated in Figs. 11 and 12, the false window 303 serving as a lighting device includes a light source 3031 at a position corresponding to a back surface of the frame body 222b3. Light emitted from the light source 3031 is emitted from the panel 222b2 toward the inside of the residential room 200, while the light is irregularly reflected by the panel 222b2, which is made of a light transmitting material, and the back surface 3032 of the false window 303 (lighting device). Light emitted from the light source 3031 can have a color tone similar to the color of external light (sunlight). Therefore, when a viewer (mainly the subject) sees the false window 303 from the inside of the residential room 200, the viewer can feel as if the false window 303 is a window through which external light comes in. This reduces a feeling of closeness that can occur in the subject residing in the residential room 200. Thus, it is possible to provide a comfortable indoor treatment environment.

[0115]

The false window 303 serving as a lighting device has

a light control function. Therefore, it is possible to increase or decrease light intensity in accordance with time, and accordingly possible to artificially reproduce daylighting as with sunlight. Thus, it can be expected to assist the subject sleeping in the residential room 200 in naturally waking up. Further, the physical condition of the subject may be measured with time via, for example, a sensor that measures the physical condition of the subject (heartbeat, blood pressure, or the other vital sign), and the false window 303 may change a color tone in the residential room 200 on the basis of obtained information (measurement result). This also makes it possible to stabilize the health condition of the subject. For example, when a heart rate is increased, the false window 303 emits light that changes the color tone in the residential room 200 to a cold color tone. This makes it possible to suppress the subject's excessive elation.

[0116]

The false window 303 is not limited to a lighting device, and may be realized by embedment of a display device. In a case where the false window 303 is realized as a display device, a known display device is employed. A display surface of the display device is superposed on the panel 222b2 that is fitted to the opening 222b1 provided to the second inner wall 222b. Note that the display surface of the display device may be constituted by the panel 222b2.

[0117]

The false window 303 which is a display device can display a specific still image or moving image. It is possible to display an image that can cause the subject to feel as if the false window 303 is a real window, that is, a window through which the outside world can be viewed.

[0118]

Further, as another example, it is possible to use the false window 303 as a window through which the outside world can be checked, by causing the false window 303 which is a display device to display an image (video) obtained from a camera (for example, the monitoring camera 302 installed on the outer wall of the work room 400 in Fig. 1) or the like installed to the outer wall of the controlled area. Obtainment of information on the outside, such as a visitor and the other information, in real time helps to reduce the subject's feeling of isolation.

[0119]

As another example, it is possible to use the false window 303 which is a display device, as an information medium for having a conversation with any individual, as in a so-called video conference. For example, it is possible to use the false window 303 for two-way conversation or confirmation with an outpatient section etc. in a hospital or for communication with a close relative or an individual

concerned, such as a visit to the patient. The false window 303 can be used as a general digital user interface.

[0120]

The false window 303 which is a display device can also enable reference to a matter that can be accessed by the subject on an electronic medical record. Thus, it is possible to use the false window 303 as a digital tool which can project a schedule and the other information regarding a treatment plan, such as elapsed treatment time, a schedule before an exit, and the next scheduled medical examination date, so that, for example, the subject and the medical expert can share the progress of a treatment action, a doctor can make an explanation to the patient, or a nurse can explain a future medical examination and treatment plan. The false window 303 which is a display device can also retrieve various inspection images (such as a CT image and a PET image) from a given storage device and display the various inspection images.

[0121]

Even in a case where any of the aspects is employed for the false window 303, the false window 303 itself is wall-mounted equipment. Therefore, it is possible to significantly reduce a work load such as fixing required at the time of movement.

[0122]

Note, here, that the position of the false window 303 in the entire administration facility unit 101 and the positional relationship between the false window 303 and the bed 201 are illustrated in Example 1 in Fig. 13. The planar shape of the entire administration facility unit 101, which is of a house trailer type, is a rectangular shape, as illustrated also in Fig. 1. In the entre administration facility unit 101 having a rectangular shape as a planar shape, the false window 303 is disposed to the inner wall on one of a pair of side surfaces which are along a widthwise direction. The bed 201 is disposed along the inner wall on one of a pair of side surfaces which are along a lengthwise direction.

[0123]

Note, here, that, as illustrated in Example 2 in Fig. 13, also in a case where (i) the residential room 200 is defined on the side of one of the pair of side surfaces which are of the administration facility unit 101 having a rectangular shape as a planar shape and which are along the widthwise direction and (ii) the planar shape of the residential room 200 is a square shape (the shape of the floor surface is a square shape), the position of the false window 303 and the position of the bed 201 are the same as those in Example 1 in Fig. 13. That is, the false window 303 is disposed to a side surface that corresponds to one of the pair of side surfaces which are of the administration facility unit 101 having a

rectangular shape as a planar shape and which are along the widthwise direction, among four side surfaces of the residential room having a square shape as a planar shape. The bed 201 is disposed along a side surface that corresponds to one of the pair of side surfaces which are of the administration facility unit 101 having a rectangular shape as a planar shape and which are along the lengthwise direction, among four side surfaces of the residential room having a square shape as a planar shape.

[0124]

The above description has discussed an aspect in which the false window 303 is provided to the second inner wall 222b of the residential room 200. Alternatively or in addition, the false window 303 can be installed to the other inner wall(s) 222a, 222c, and/or 222d.

[0125]

An aspect may be employed in which the false window 303 is provided to the fifth inner wall 222e covering the top surface of the residential room 200. Also in this aspect, it is also possible to further install the false window 303 to the second inner wall 222b or the inner wall(s) 222a, 222c, and/or 222d which cover the side surfaces at the left, right, front, and rear of the residential room 200.

[0126]

The false window 303 provided to the fifth inner wall

222e covering the top surface is expected to be substituted for a skylight. The false window 303 can be realized as a lighting device which changes the color tone of the light source so that the color tone matches a color tone in real time. Further, the false window 303 can be realized as a display device which displays an image of a view that could be seen through a skylight (a view of the sky such as a starry sky and the sky at sunset).

[0127]

In the above description, an aspect is employed in which only a single false window 303 is installed substantially at the center of the second inner wall 222b. However, an installation position is not limited to the center. Moreover, the number of false windows 303 installed may be two or more. Further, an aspect may be employed in which an image corresponding to the installation position is displayed. That is, in a case where the false window 303 is installed to an upper part of the second inner wall 222b, the false window 303 can be configured like the above-described skylight.

[0128]

The false window 303 may be configured to switch between appropriate combinations of the above-described plurality of examples. For example, an aspect may be employed in which the false window basically emits light

from the light source 3031 but temporarily switches to an image of a treatment plan in a case where a doctor or the other makes an explanation.

[0129]

As described above, it is very meaningful that providing the false window 303 to the residential room 200 improves the quality of the subject's life. When a radiopharmaceutical is administered so as to treat a disease such as a cancer, the subject is forced to receive treatment and rest in the controlled area for a certain period of time so that the general public is not exposed to radiation generated from the radiopharmaceutical administered to the body of the subject. Generally, a controlled area for treatment and resting is referred to as, for example, a radiation therapy sickroom, and is surrounded by a shielding body structure for protection against radiation. As a result, in a space corresponding to a residential section for a patient, all of six surfaces at the top, bottom, front, rear, left, and right are covered with a shielding body. Under the circumstances, it is difficult to provide a window which, in an ordinary sense, exists in a general sickroom etc. in an uncontrolled area. Thus, it is impossible to carry out ventilation or realize daylighting. That is, the opportunity to come into contact with the nature or the outside world is lost, even though the patient is in a situation of being under extremely high mental

stress, i.e., receiving treatment and resting due to a disease. Therefore, there is attenuation of the quality of the patient's life (Quality of Life, QOL) which attenuation is difficult to quantify. It is significant that the false window 303 minimizes this attenuation and thereby enables realization of a comfortable indoor treatment environment.

[0130]

The above description has discussed the administration facility unit which enables a clinical study, a clinical trial, and treatment with use of a substance containing an α-particle emitting radionuclide clinical, but the present invention is not limited to this case. For example, the administration facility unit in accordance with the present embodiment enables a clinical study, a clinical trial, and treatment with use of a substance containing a β-particle emitting radionuclide. For example, I-131 (iodine) can be used. Alternatively, Y-90, Lu-177, Sc-47, Sm-153 (yttrium, lutetium, scandium, samarium), or Cu-67 (copper) can be used.

[0131]

The present invention is not limited to the configurations described in the above embodiments, but may be altered in various ways by a skilled person within the scope of the claims. The present invention also encompasses such alterations in its technical scope.

[0132]

Aspects of the present invention can also be expressed as follows:

<1> A radionuclide-containing substance administration facility which has a radiation controlled area including a residential room and which is conveyable, including:

a shielding wall which separates an inside and an outside of the radiation controlled area;

an inner wall which, on inside of the shielding wall, covers a side surface or a top surface of the residential room; and

a false window which is provided to the inner wall and in which a lighting device or a display device is embedded.

[0133]

<2> The radionuclide-containing substance administration facility described in <1>, wherein:

a bed is installed in the residential room, the bed being used by a subject to whom a radionuclide-containing substance is administered; and

the false window has a light control function, and increases or decreases light intensity in accordance with time.

[0134]

<3> The radionuclide-containing substance

administration facility described in <1> or <2>, wherein

the false window has a light control function, and changes a color tone in the residential room with use of a result of measurement carried out by a sensor which measures a physical condition of a subject who resides in the residential room and to whom a radionuclide-containing substance is administered.

[0135]

<4> The radionuclide-containing substance administration facility described in <3>, wherein:

the sensor measures a heart rate of the subject to whom the radionuclide-containing substance is administered; and

in a case where the heart rate of the subject is increased, the false window emits light which changes the color tone in the residential room to a cold color tone on the basis of the result of the measurement carried out by the sensor.

[0136]

<5> The radionuclide-containing substance administration facility described in any one of <1> through <4>, wherein:

the false window includes a surface panel that is disposed on a side from which light is emitted, a back panel that is opposed to the surface panel, and a light source that

is disposed between the surface panel and the back panel; and

the false window is configured such that the surface panel is disposed to a false window installation opening which is provided to the inner wall and that a configuration of the false window which configuration is located on a back panel side of the surface panel is disposed in a gap between the inner wall and the shielding wall which is adjacent to the inner wall.

[0137]

<6> The radionuclide-containing substance administration facility described in any one of <1> through <5>, wherein

the false window is the display device, and displays a specific still image or moving image.

[0138]

<7> The radionuclide-containing substance administration facility described in any one of <1> through <6>, further including

a camera which is provided to an outer wall of the radionuclide-containing substance administration facility and which captures an image of an outside world, wherein

the false window is the display device, and immediately displays a video which is captured by the camera.

[0139]

<8> The radionuclide-containing substance administration facility described in any one of <1> through <7>, wherein

the false window is the display device, and is an information medium which is used by a subject who resides in the residential room and to whom a radionuclide-containing substance is administered so as to have a conversation with any individual.

[0140]

<9> The radionuclide-containing substance administration facility described in any one of <1> through <8>, wherein

the radionuclide-containing substance administration facility is conveyable or self-propelled.

[0141]

<10> The radionuclide-containing substance administration facility described in any one of <1> through <9>, wherein

the radionuclide-containing substance administration facility is a radionuclide-containing substance administration facility unit in form of a container or a house trailer.

[0142]

<11> The radionuclide-containing substance administration facility described in <10>, wherein:

the radionuclide-containing substance administration facility unit can be moved by a vehicle for hauling; and

in the radionuclide-containing substance administration facility unit, the false window is provided to the inner wall which is disposed on the inside of the shielding wall that is located on a forward side in a direction of hauling by the vehicle.

Industrial Applicability

[0143]

The present invention can be used for a treatment facility in which a therapeutic agent containing a radionuclide is developed, an approval test for a developed therapeutic agent is conducted, and treatment with use of an approved therapeutic agent is provided.

Reference Signs List

[0144]

101: Administration facility unit (radionuclide-containing substance administration facility unit), 101b: Entrance, 102: Vehicle, 200: Residential room, 201: Bed, 205: Side surface, 209: Flush toilet, 210: Shower, 211: Supply water tank, 213: Lighting unit, 214: Electrical outlet, 222a: First inner wall, 222b: Second inner wall, 222b1: Opening (false window installation opening), 222b2: Panel (surface panel), 222b3:

Frame body, 222c: Third inner wall, 222d: Fourth inner wall, 222e: Fifth inner wall, 300: Toilet room, 301: On-call equipment, 302: Monitoring camera (camera), 303: False window, 306: Light switch, 400: Work room, 402: Supply air outlet port, 430: Air conditioning device (equipment apparatus), 403: Exhaust inlet port, 408: Radioactive wastewater storage tank, 410: Radioactive wastewater discharge port, 420: Contamination inspection room, 444: Outer shell, 444f: Bottom part, 450: Air supply device, 455: Air supply pipe, 456: Supply air volume adjustment valve, 470: Exhaust device, 471: Exhaust damper, 472: Exhaust filter, 473: Exhaust blower, 474: Exhaust port, 475: Exhaust pipe, 476: Exhaust volume adjustment valve, 481: Waste liquid pipe (pipe), 490: Bypass mechanism, 491: Direct coupling pipe (pipe), 492: Flow rate adjustment valve, 500: Management room, 501: External air inlet port, 502: Filter, 502: Intake air filter, 503: Intake air blower, 504: Air supply damper, 600: Storage room, 700: Room, 800: Duct space, 2202: Chassis, 2203: Wheel, 2204: Ground surface, 2205: Level difference structure, 2403: Water level sensor, 3031: Light source, 3032: Back surface (back panel)

Claims

[Claim 1]

A radionuclide-containing substance administration facility which has a radiation controlled area including a residential room, comprising:

a shielding wall which separates an inside and an outside of the radiation controlled area;

an inner wall which, on inside of the shielding wall, covers a side surface or a top surface of the residential room; and

a false window which is provided to the inner wall and in which a lighting device or a display device is embedded.

[Claim 2]

The radionuclide-containing substance administration facility as set forth in claim 1, wherein:

a bed is installed in the residential room, the bed being used by a subject to whom a radionuclide-containing substance is administered; and

the false window has a light control function, and increases or decreases light intensity in accordance with time.

[Claim 3]

The radionuclide-containing substance administration facility as set forth in claim 1 or 2, wherein

the false window has a light control function, and changes a color tone in the residential room with use of a result of measurement carried out by a sensor which measures a physical condition of a subject who resides in the residential room and to whom a radionuclide-containing substance is administered.

[Claim 4]

The radionuclide-containing substance administration facility as set forth in claim 3, wherein:

the sensor measures a heart rate of the subject to whom the radionuclide-containing substance is administered; and

in a case where the heart rate of the subject is increased, the false window emits light which changes the color tone in the residential room to a cold color tone on the basis of the result of the measurement carried out by the sensor.

[Claim 5]

The radionuclide-containing substance administration facility as set forth in any one of claims 1 through 4, wherein:

the false window includes a surface panel that is disposed on a side from which light is emitted, a back panel that is opposed to the surface panel, and a light source that is disposed between the surface panel and the back panel; and

the false window is configured such that the surface panel is disposed to a false window installation opening which is provided to the inner wall and that a configuration of the false window which configuration is located on a back panel side of the surface panel is disposed in a gap between the inner wall and the shielding wall which is adjacent to the inner wall.

[Claim 6]

The radionuclide-containing substance administration facility as set forth in any one of claims 1 through 5, wherein

the false window is the display device, and displays a specific still image or moving image.

[Claim 7]

The radionuclide-containing substance administration facility as set forth in any one of claims 1 through 6, further comprising

a camera which is provided to an outer wall of the radionuclide-containing substance administration facility

and which captures an image of an outside world, wherein the false window is the display device, and immediately displays a video which is captured by the camera.

[Claim 8]

The radionuclide-containing substance administration facility as set forth in any one of claims 1 through 7, wherein the false window is the display device, and is an information medium which is used by a subject who resides in the residential room and to whom a radionuclide-containing substance is administered so as to have a conversation with any individual.

[Claim 9]

The radionuclide-containing substance administration facility as set forth in any one of claims 1 through 8, wherein the radionuclide-containing substance administration facility is conveyable or self-propelled.

[Claim 10]

The radionuclide-containing substance administration facility as set forth in any one of claims 1 through 9, wherein the radionuclide-containing substance administration facility is a radionuclide-containing substance administration facility unit in form of a container or a house

trailer.

[Claim 11]

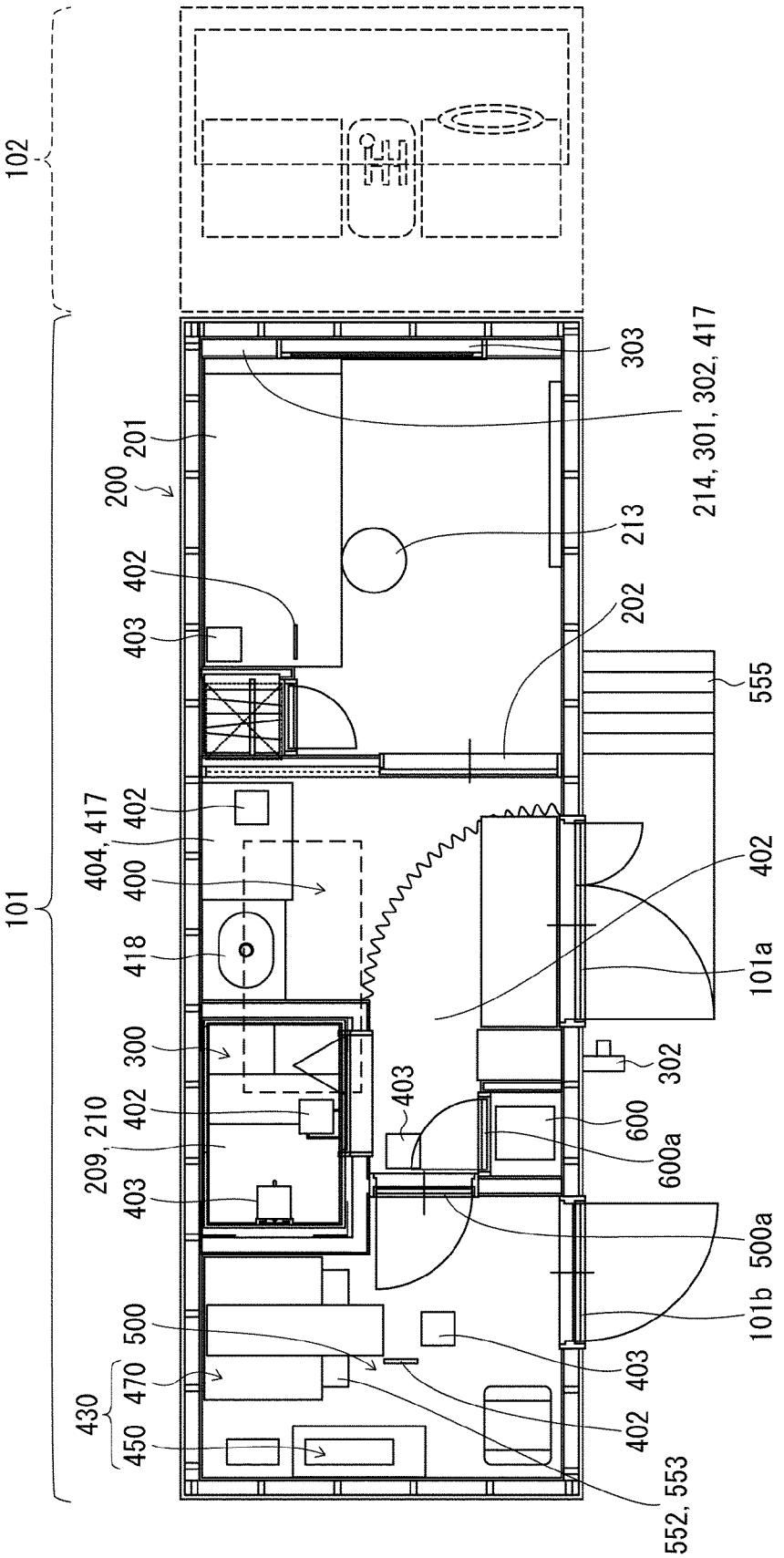
The radionuclide-containing substance administration facility as set forth in claim 10, wherein:

the radionuclide-containing substance administration facility unit can be moved by a vehicle for hauling; and

in the radionuclide-containing substance administration facility unit, the false window is provided to the inner wall which is disposed on the inside of the shielding wall that is located on a forward side in a direction of hauling by the vehicle.

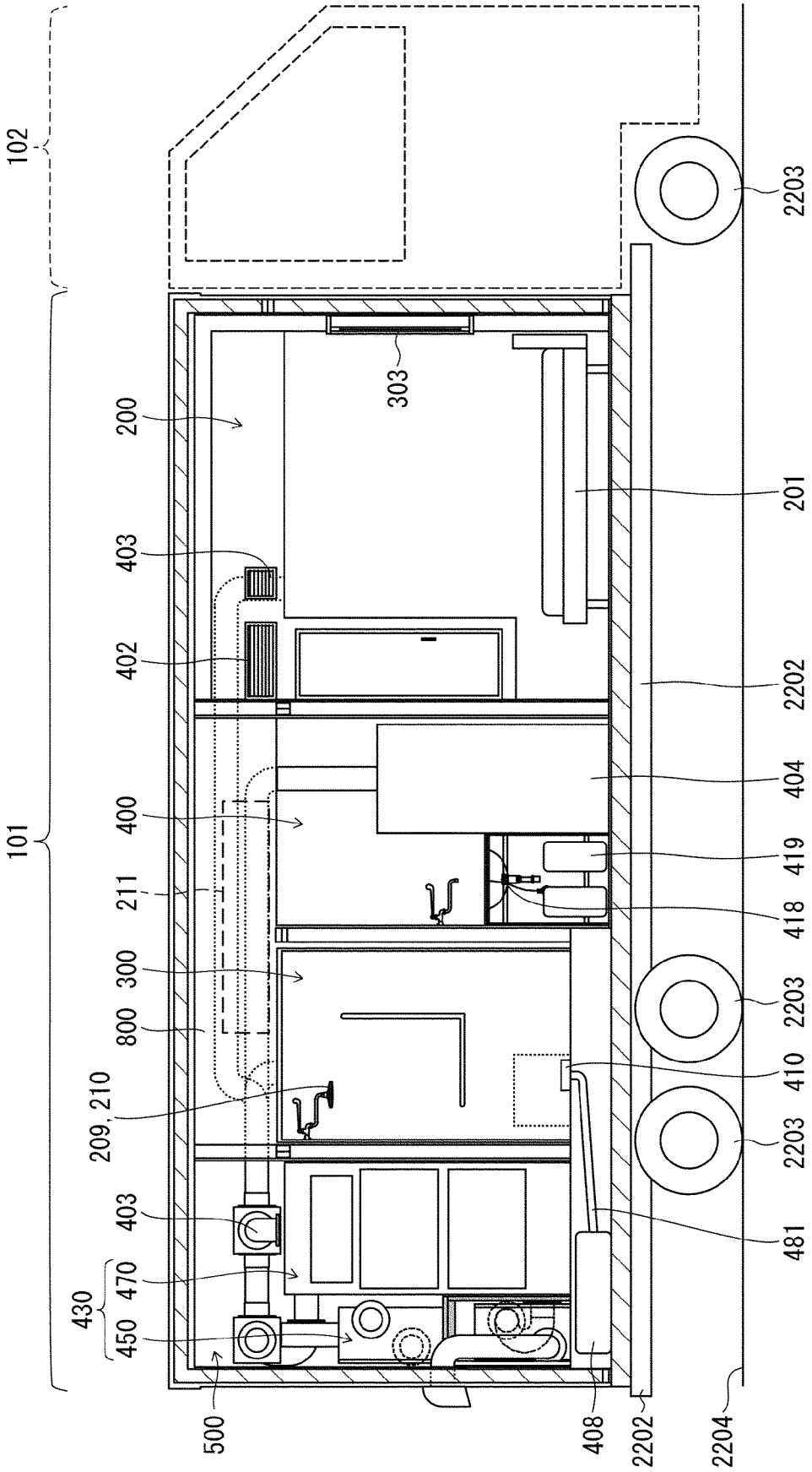
[図1]

図 1


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101
200
201
303
214, 301, 302, 417
213
202
402
403
555
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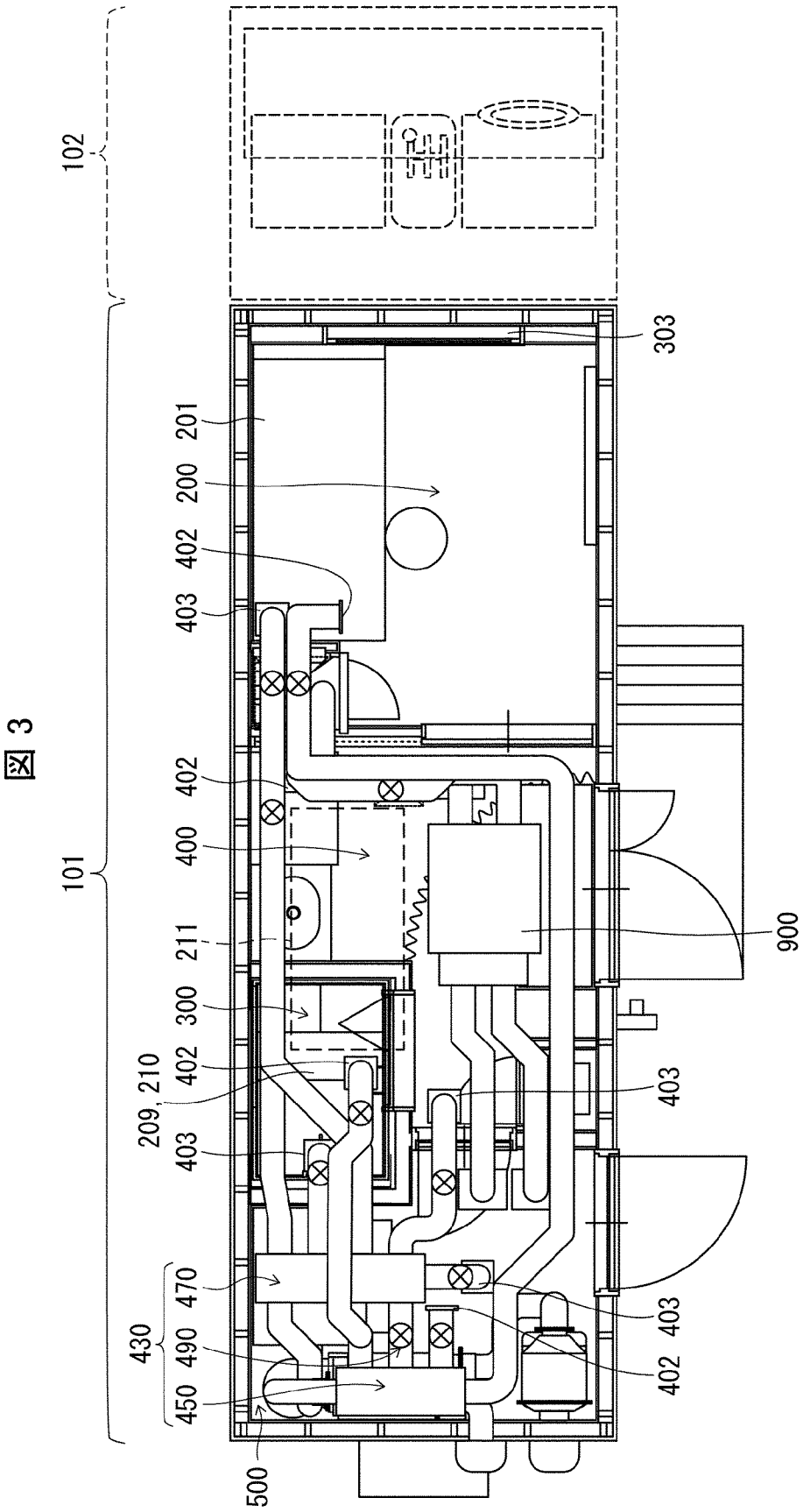
[図2]

図2


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101
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303
201
403
402
2202
404
400
419
211
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2203
410
209, 210
2203
481
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450
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2202
2204
2203

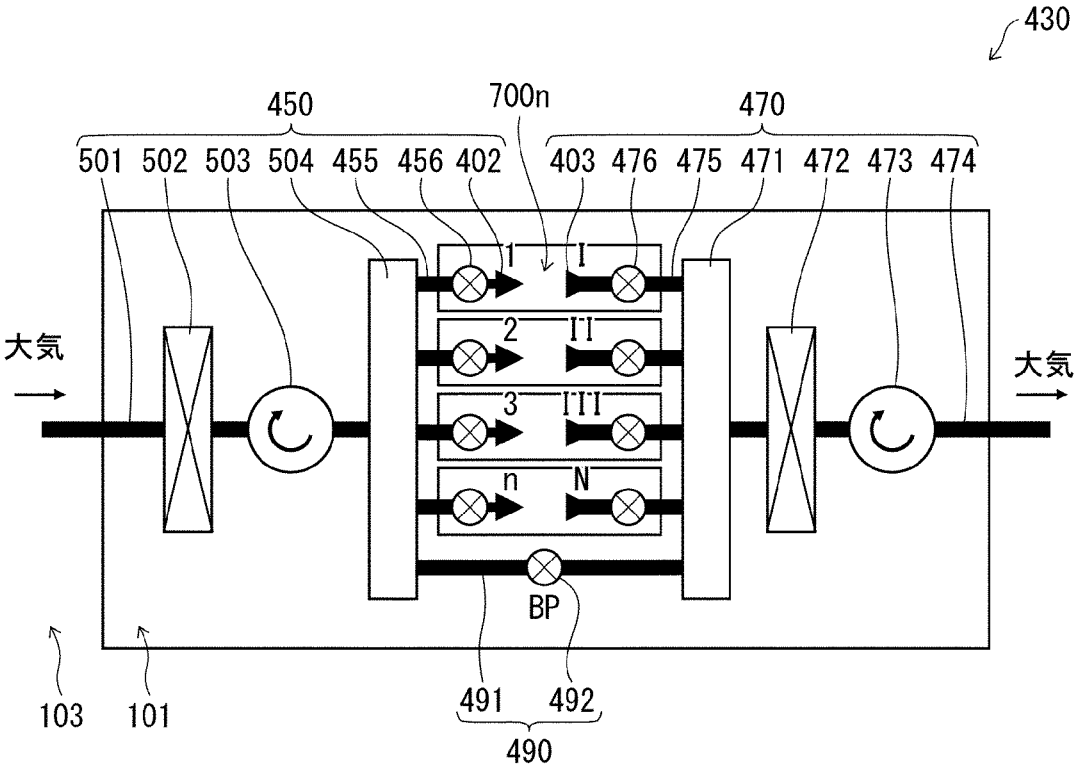
[図3]

図3


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101
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211
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209, 210
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900
403
403
402

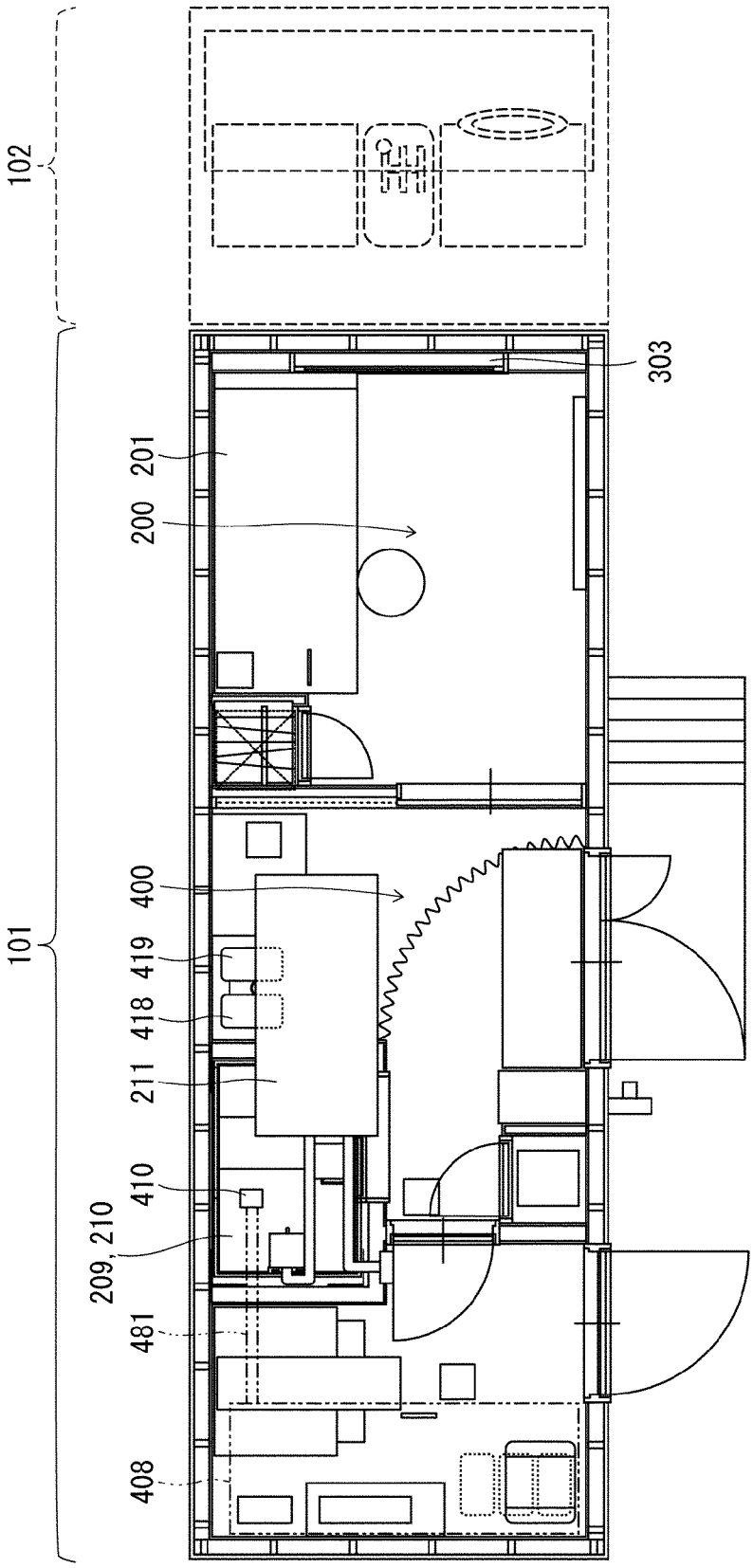
[図4]

図 4


430
450
700n
470
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2 II
3 III
n N
BP
大気
大気
103 101
491 492
490

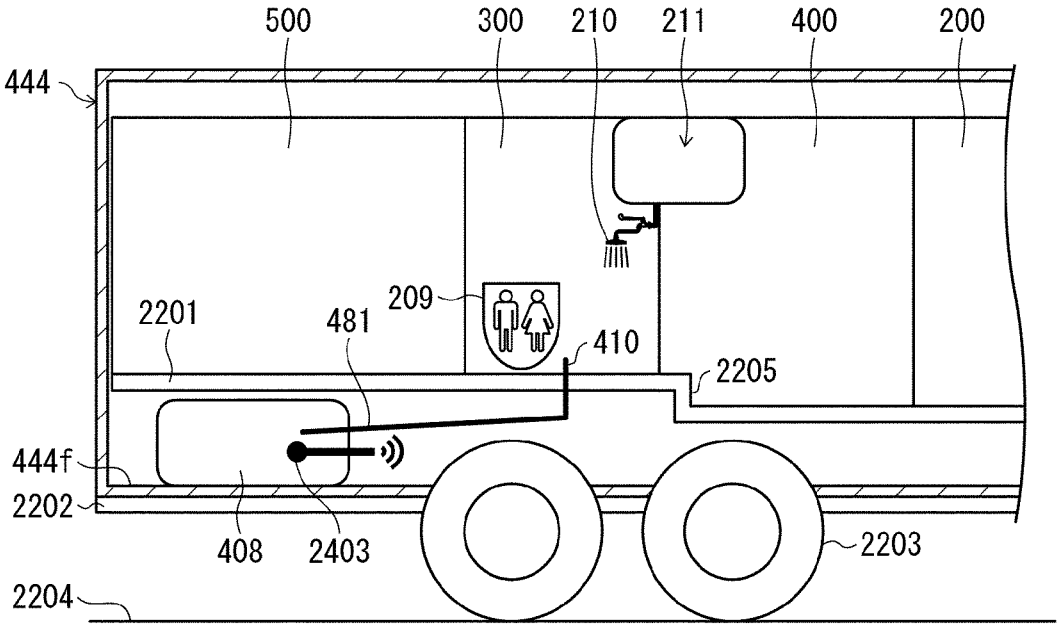
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図5



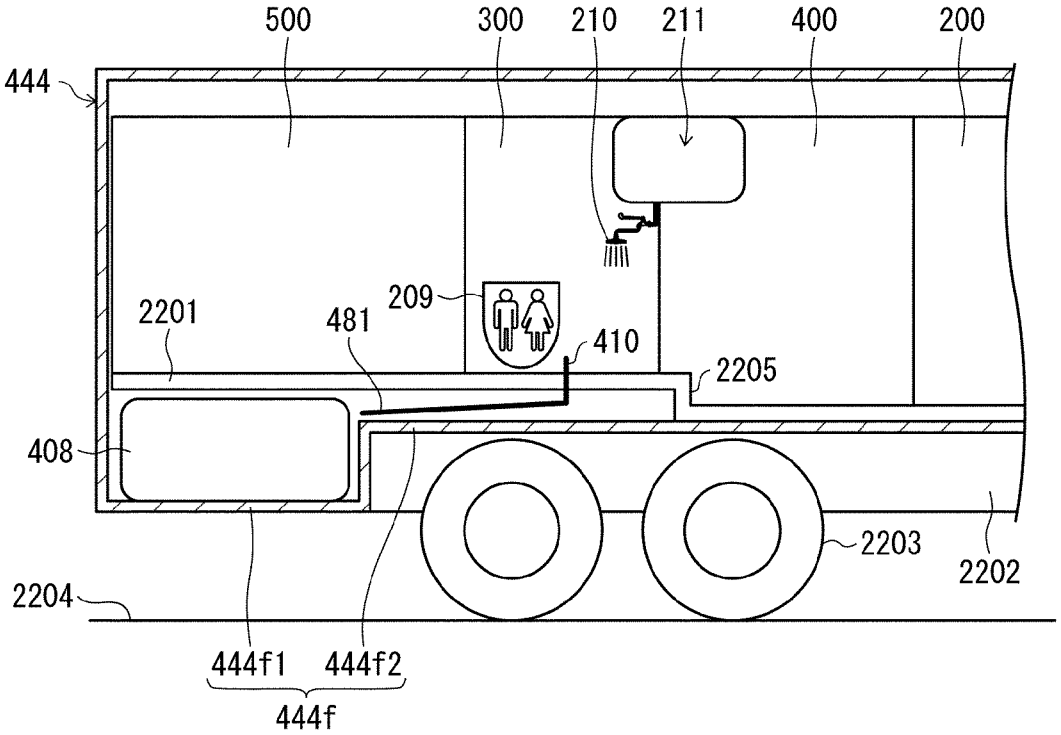
[図6]

図 6


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400
200
444
209
2201
481
410
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2202
408
2403
2203
2204

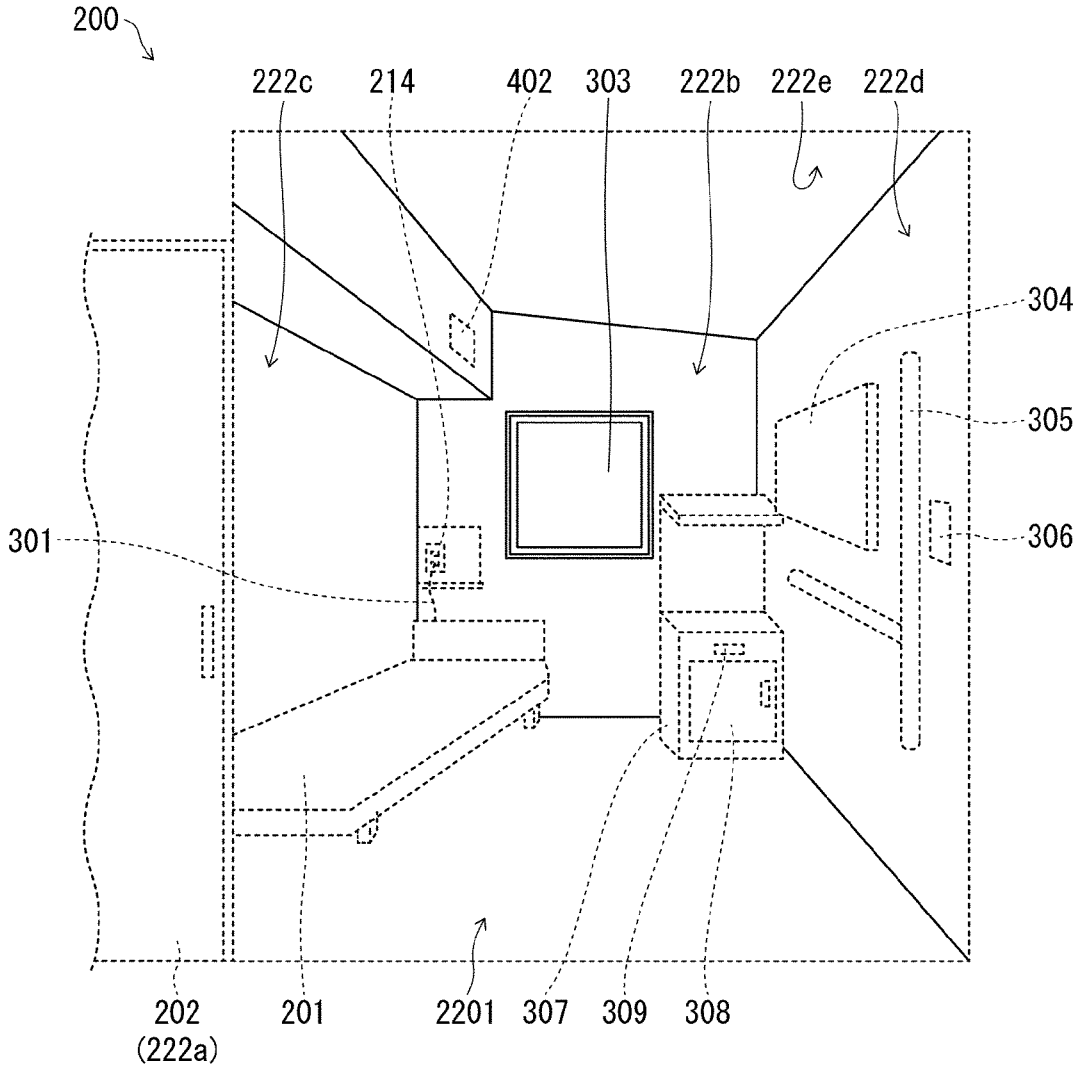
[図7]

図 7


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2204
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444f2
444f

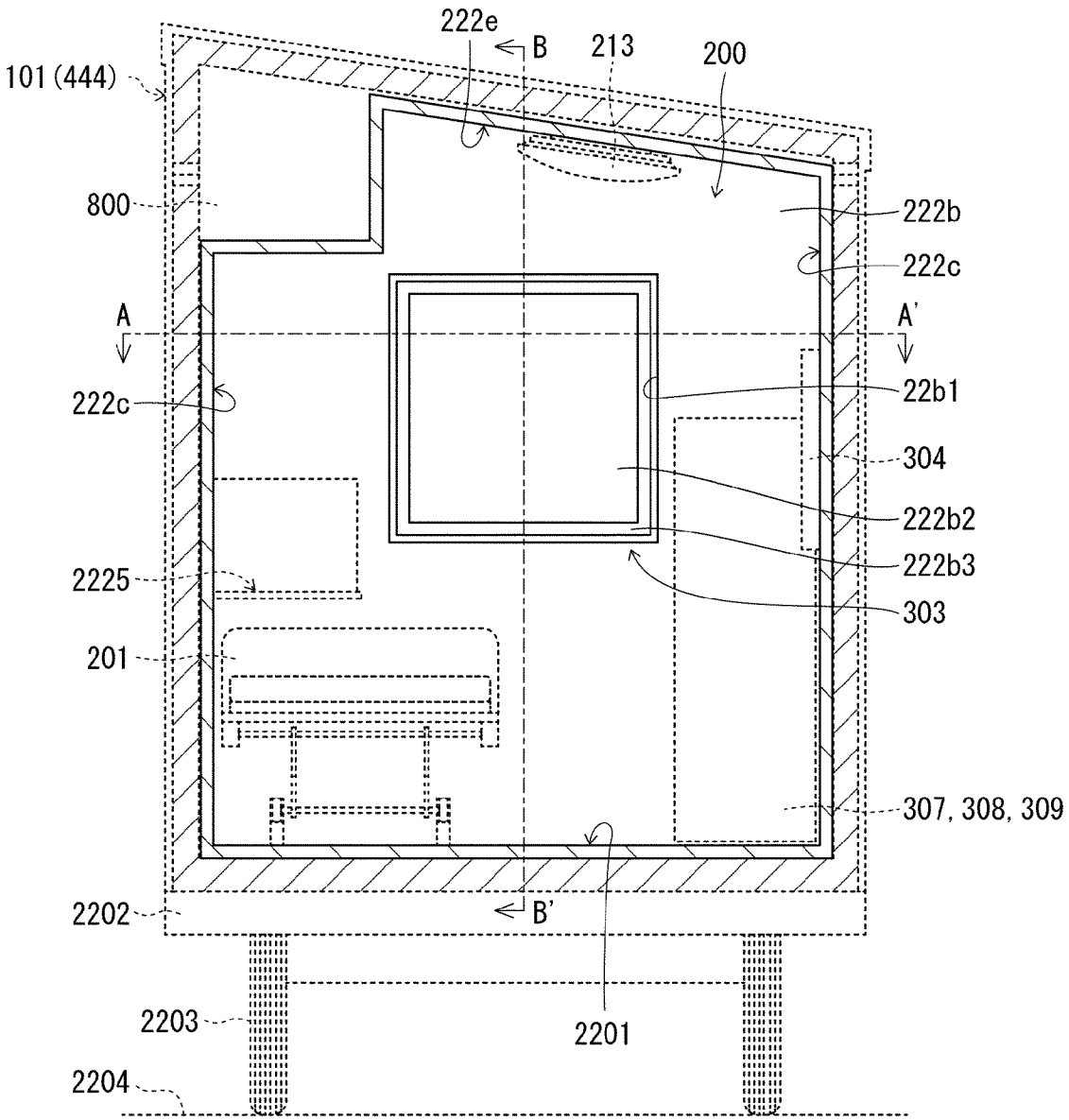
[図8]

図 8


200
222c
214
402
303
222b
222e
222d
304
305
306
301
202
(222a)
201
2201
307
309
308

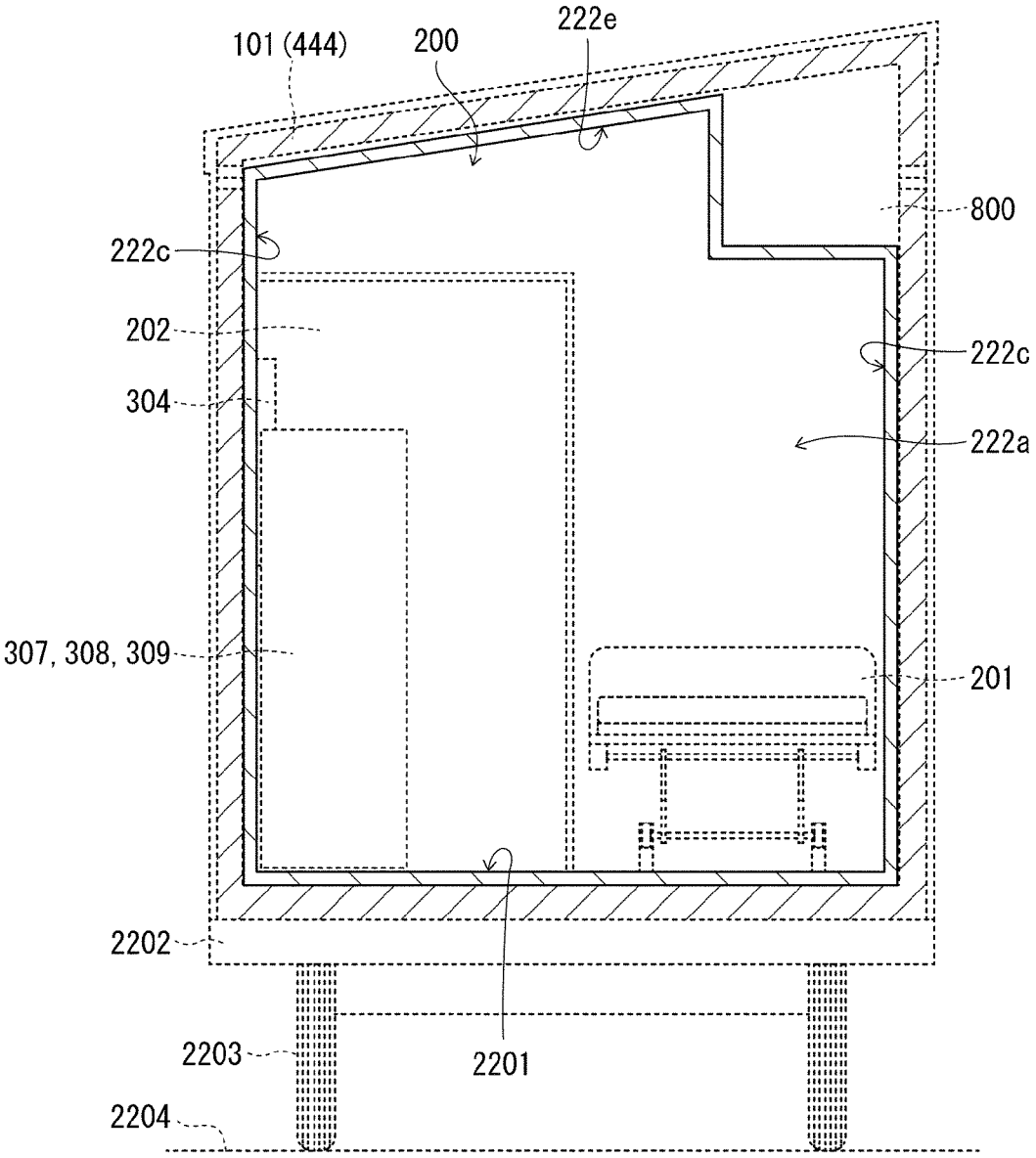
[図9]

図 9


222e
B
213
200
101 (444)
800
222b
222c
A
A'
222c
22b1
304
222b2
222b3
2225
303
201
307, 308, 309
2202
B'
2203
2201
2204

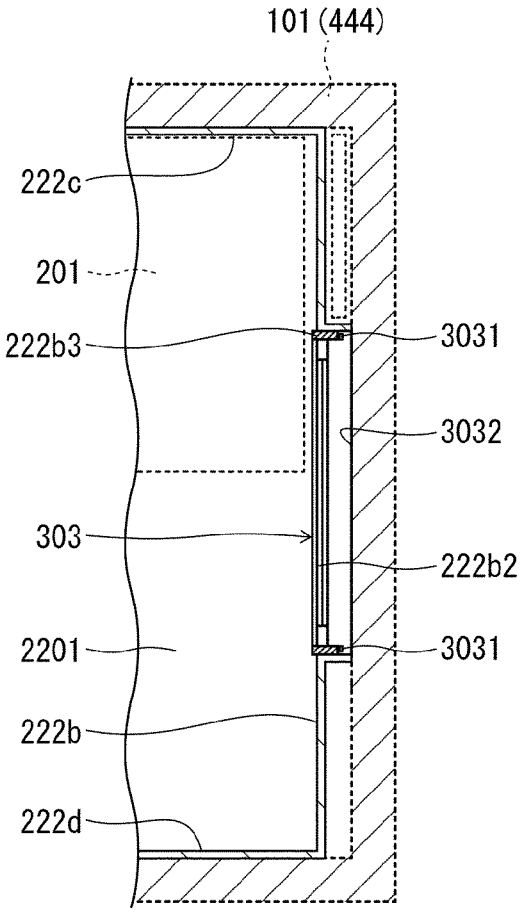
[図10]

図 10


101 (444)
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222c
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222c
304
222a
307, 308, 309
201
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2203
2201
2204

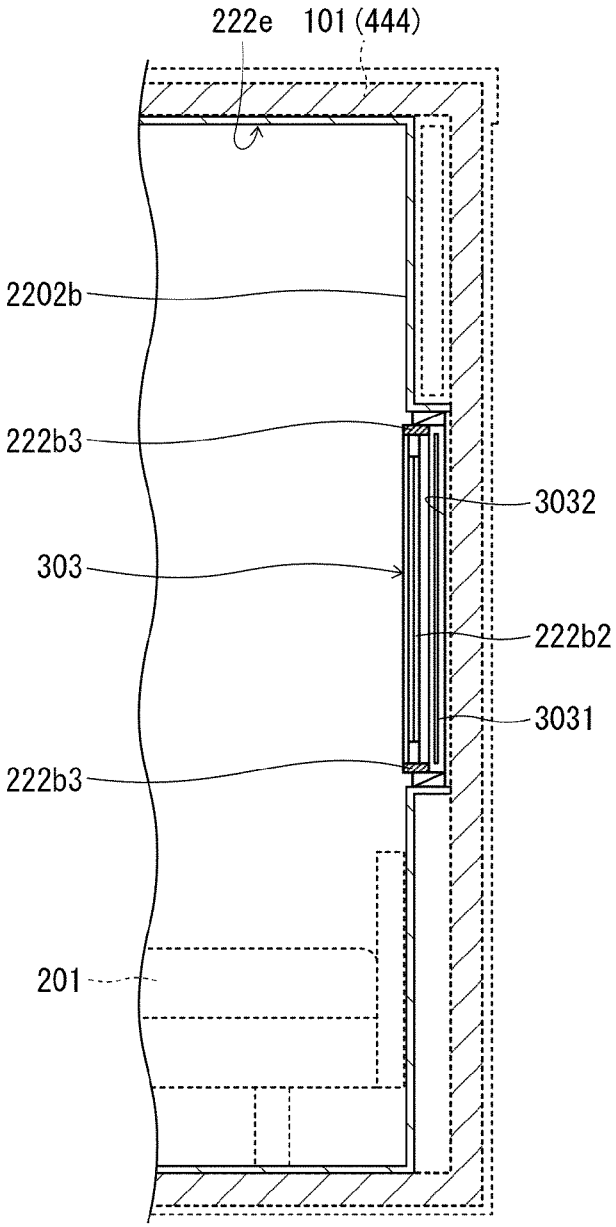
[図11]

図 11


101 (444)
222c
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222b3
3031
3032
303
222b2
2201
3031
222b
222d

[図12]

図 12



[図13]

図 13

