



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.05.2012 Bulletin 2012/18

(51) Int Cl.:
A61G 3/00 (2006.01)

(21) Application number: **11187060.6**

(22) Date of filing: **28.10.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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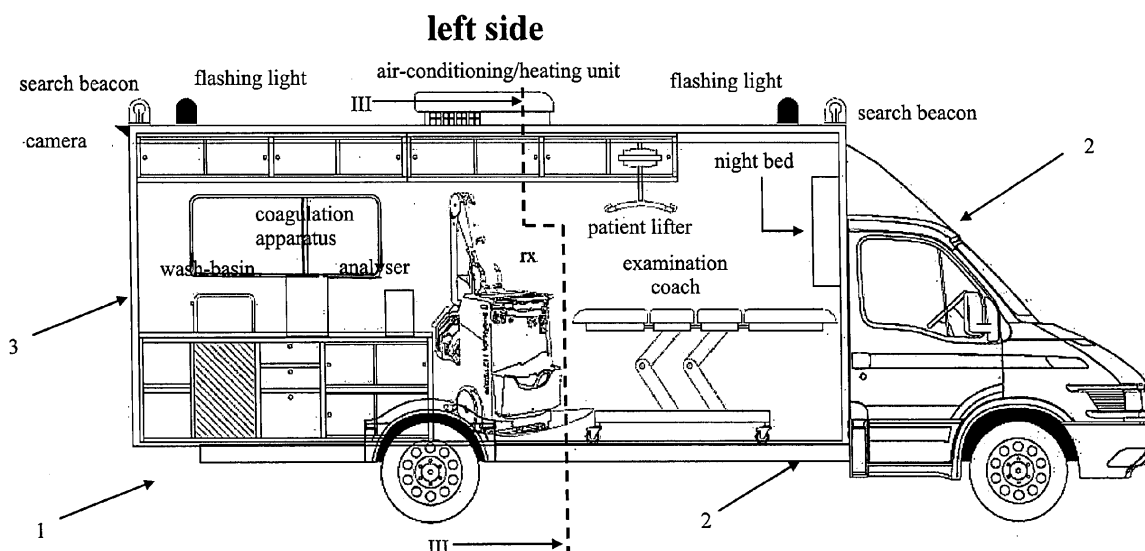
(30) Priority: **29.10.2010 IT MI20100328 U**

(54) **Medical vehicle**

(57) A medical vehicle, comprising: a bearing and actuation structure (2); an operating compartment (3), mounted on said bearing and actuation structure (2); wherein said operating compartment (3) is provided with one or more of the following devices/instruments: an examination coach; a night bed, tiltable between a non-

operating configuration of minimum bulkiness, and an operating configuration; a patient-lifting device, slidably mounted on a top wall of said operating compartment (3) and intended for patients' shifting inside said operating compartment (3); an X-ray apparatus, for taking X-ray examinations.

FIG. 1



Description

[0001] The present invention relates to a medical vehicle. The vehicle according to the invention particularly applies to home help to patients suffering from amyotrophic lateral sclerosis (ALS).

[0002] The amyotrophic lateral sclerosis is a neurological degenerative disorder also known as "motor neuron disease", "Charcot disease" or "Lou Gehrig's disease".

[0003] To give a more precise picture of the scope within which the invention falls, some data relating to the disorder in question are hereinafter reproduced.

[0004] The incidence is of about 2 cases on 100.000 individuals whose average onset age is between 50 and 80 years. In Lombardia about 300 individuals in the provinces of Milano, Como and Lecco (with an overall increase of 75-100 new cases/year).

[0005] If cases having a quickly inauspicious prognosis and sudden deaths (8-10%) are excluded, after 3-4 years about 50% of the patients is still living while after 10 years only about 10%. Worsening is progressive and presently there is no cure. The disease causes have not been ascertained yet; there is still great uncertainty on the matter.

[0006] The disease, depending on the beginning, can cause difficulties in speaking, swallowing, breathing (a symptom becoming increasingly more important is dyspnoea) and muscular alteration/degeneration until complete paralysis.

[0007] Therefore, there is a progressive loss of self-government with a decrease in the ability to communicate, until almost complete isolation of the patient.

[0008] However, the patient's mind and his/her intellectual faculties remain substantially unchanged.

[0009] Thus a context is defined in which a great number of subjects are directly or indirectly concerned with this disease and with the consequences the disease causes. Clearly, the situation is very serious and the practical-care aspects resulting therefrom become increasingly more complicated.

[0010] Often the costs for assisting the patient and his/her family become unbearable exactly due to the complete lack of self-government of the individuals suffering from this disease, even for carrying out the simplest movements.

[0011] In addition to the financial aspect, which surely is of very difficult management, generally there is an inadequate offer and development of home help, quite insufficient for the real requirements of the patient and his/her family.

[0012] The situation is made more difficult by the fact that, due to the great number of physical and biological functions that in the individual are impaired by the disease, the patient needs to be assisted by several different medical specialists.

[0013] In the light of the above, it is apparent that a chronic patient frequently has complicated and detailed problems that greatly affect the patient's quality of life

and the life of the members of his/her family. Therefore, for the patients' family the organisation of an integrated assistance between the treatments that can be carried out at home and those necessarily calling for hospitalisation is made necessary. Often the family is inclined to chose home care instead of hospitalisation also in the difficult situations in which complicated pathologies have to be managed that require a continuous and permanent assistance and use of a technological support for survival (e.g. mechanical ventilation).

[0014] Accordingly, the present invention aims at providing a medical vehicle capable of assisting patients suffering from ALS, comatose-state patients, patients that have suffered for cerebral haemorrhages, etc.

[0015] In particular, it is an aim of the invention to make available a medical vehicle that can provide an individual or multidisciplinary specialised support to particular types of patients sparing both the patients and the members of their family inappropriate hospitalisation and discomfort.

[0016] The above has very positive consequences also from an economic point of view, since the patient has the possibility to avoid direct costs related to hospitalisation and the different indirect costs associated therewith.

[0017] It is a further aim of the invention to provide a medical vehicle ensuring a service to be offered that is able to promote discharge from hospital of chronic patients and to reduce the "dependence" on the different centres.

[0018] Another aim of the invention is to provide a medical vehicle capable of managing the new acute phases to which the patients can be subjected to a substantially domestic level, thus reducing the overall number of emergency calls with sure hospitalisation.

[0019] It is a further aim of the invention to provide a medical vehicle that can be inserted in a service capable of allowing a reduction in the overall number of hospitalisations per year (which clearly has positive repercussions in terms of comfort and economic management).

[0020] Another aim of the invention is to provided a medical vehicle that can facilitate adaptation of the ventilator to the patient at home.

[0021] A further aim of the invention is to provide a medical vehicle that can allow the patent to be quickly settled at home with the greatest assistance and in particular in case of ventilator-dependent patients that otherwise would have to remain in hospital for an indeterminate period of time.

[0022] The foregoing and further aims are substantially achieved by a medical vehicle as described in the appended claims.

[0023] Further features and advantages will become more apparent from the detailed description of a preferred but not exclusive embodiment of the invention. This description is taken hereinafter with reference to the accompanying drawings given by way of non-limiting example, in which:

- Fig. 1 diagrammatically shows a side view from the left of the medical vehicle according to the invention;
- Fig. 1a diagrammatically shows the same side view as in Fig. 1, in which the vehicle is in a different operating configuration;
- Fig. 2 diagrammatically shows a side view from the right of the medical vehicle according to the invention;
- Fig. 3 diagrammatically shows a partial section taken along line III-III of the vehicle in Fig. 1;
- Fig. 4 is a diagrammatic plan view of the vehicle seen in Figs. 1 and 2;
- Fig. 4a diagrammatically shows the same plan view as in Fig. 4, in which the vehicle is in a different operating configuration;
- Fig. 5 diagrammatically shows a plan view from the bottom of a structural element of the vehicle in accordance with the invention;
- Fig. 6 diagrammatically shows a plan view from the top of the structural element in Fig. 5.

[0024] With reference to the drawings, the medical vehicle in accordance with the invention has been generally identified by reference numeral 1.

[0025] The medical vehicle 1, as mentioned above, is advantageously used for assistance in situ, i.e. substantially assistance at home, of patients suffering from greatly debilitating pathologies, such as ALS, serious respiratory disorders, comatose state, cerebral haemorrhages, complex disability, and of patients subjected to non-invasive or invasive ventilation or oxygen therapy.

[0026] Vehicle 1 (Figs. 1, 1a, 2, 4, 4a) is a powered vehicle, substantially similar to a van.

[0027] Powering can be of any nature. Advantageously, the type of engine and the performance features thereof will be also selected depending on the load that has to be carried. In the following specification it will be possible to appreciate which can be the components of such a load.

[0028] Vehicle 1 first of all comprises a bearing and actuation structure 2 that, as said, can be similar to that of a conventional vehicle for road haulage.

[0029] Vehicle 1 further comprises an operating compartment 3 in which the necessary instruments for medical effectiveness are advantageously housed.

[0030] By way of example, the operating compartment 3 can have a substantially parallelepiped conformation. The volume can be substantially equal to about 20 m³, for example.

[0031] Preferably, in the operating compartment 3 an examination coach ("examination coach" in Figs. 1 and 1a) is housed, on which the patient can be laid during the treatment received in the medical vehicle 1.

[0032] The examination coach can be removably put on a base surface or bottom surface of the operating compartment 3; in particular, the examination coach can be equipped with a plurality of wheels or rollers mounted to the base of the examination coach itself to enable

movement of same. This movement is useful, by way of example, for carrying the patient from his house to the inside of the operating compartment.

[0033] Preferably, in the operating compartment 3 a night bed ("night bed" in Figs. 1 and 1a) is provided. In greater detail, Fig. 1 shows the night bed in a non-operating configuration in which it is positioned in such a manner as to reduce the room taken up. When it is in this configuration, the night bed is not used. Preferably, in the non-operating configuration, the night bed is disposed in such a manner that its planar extension is substantially parallel to the partition panel separating the operating compartment 3 from the driver cab.

[0034] Fig. 1a on the contrary shows the same night bed in an operating configuration, in which the bed is positioned in such a manner that it can be used. Preferably, in the operating configuration, the night bed is such disposed that its planar extension is transverse, and in particular substantially perpendicular, to the aforesaid partition panel.

[0035] It should be also appreciated that the non-operating and operating configurations of the night bed are also shown in Figs. 4 and 4a, respectively. In particular, in Fig. 4 the non-operating configuration is identified by the only inscription "night bed", while in Fig. 4a the operating configuration is identified by the inscription "open night bed".

[0036] Said partition panel is diagrammatically shown in Fig. 3. In the same figure it is possible to see the night bed that in order to indicate the modes of engaging it to the partition panel is identified by the inscription "disappearing tiltable bed". For the sake of clarity, this inscription is also reproduced in Fig. 2.

[0037] The night bed or disappearing tiltable bed can be useful to enable the members of the family of the patient utilising vehicle 1 to rest, if necessary. Alternatively, the night bed or disappearing tiltable bed can be used by the medical staff, should it be necessary.

[0038] Preferably, provided within the operating compartment 3 is a patient lifting device or patient lifter ("patient lifter" in Figs. 1 and 1a). This device can be used for transferring the patient from a stretcher or other provisional transport means used for carrying the patient, to the aforesaid examination coach.

[0039] In the preferred embodiment, the patient lifting device is in engagement with one or more rails fastened to the top wall of the operating compartment 3. In particular, the patient lifting device is configured for running along said rails, so as to enable the necessary shifts at the inside of compartment 3.

[0040] As diagrammatically shown in Fig. 5, the rail (or rails) on which the patient lifting device can run is substantially parallel to the major longitudinal extension of the operating compartment 3.

[0041] Also shown in Fig. 5 is lighting means ("overhead lights") enabling availability of the light necessary to perform the required operations inside the operating compartment. Preferably, a X-ray apparatus ("rx" in Figs.

1 and 1a) is positioned inside the operating compartment 3.

[0042] The X-ray apparatus is able to take radiograms in situ, so as to enable the medical staff to dispose of the necessary radiograms substantially immediately. In particular, the X-ray apparatus can be a multipurpose X-ray apparatus for taking an X-ray of the thorax, the bone sectors, etc.

[0043] Positioning of the X-ray apparatus can be understood also looking at Fig. 5.

[0044] Preferably, also provided inside the operating compartment 3 is an "analyser" and/or a "coagulation apparatus" ("analyser" and "coagulation apparatus" in Figs. 1 and 1a, respectively).

[0045] The analyser enables the medical staff present therein to perform the necessary chemical/biological analyses for treatment of the patient. The coagulation apparatus is advantageously used by the medical staff to help in coagulation operations.

[0046] Preferably, within the operating compartment 3 a wash-basin is provided ("wash-basin" in Figs. 1 and 1a) that can be advantageously used by the medical staff for any need. Advantageously associated with the wash-basin is a container for water collection

[0047] Preferably, a thermal air-conditioning/heating unit ("air-conditioning/heating unit" in Figs. 1 and 1a) is mounted on top of the operating compartment 3. By means of this thermal unit a comfortable temperature for both the patient and the medical staff can be maintained inside the operating compartment 3. Positioning of the thermal unit can be understood also looking at Fig. 6.

[0048] Preferably, a plurality of revolving spotlights (generally known as "flashing lights") is mounted on top of the operating compartment 3. In particular, as shown in Figs. 1, 1a and 6, four revolving spotlights are provided, each mounted in the vicinity of the corners of the rectangular top surface of the operating compartment 3.

[0049] Preferably, on top of the operating compartment 3 a plurality of search beacons is mounted. In particular, as viewed from Figs. 1, 1a and 6, two search beacons are provided, mounted each at the longitudinal ends of the rectangular top surface of the operating compartment 3, at a substantially central position.

[0050] Preferably, a camera is mounted on top of the operating compartment 3, at the longitudinal end of the rectangular top surface of the operating compartment 3 opposite to the driver cab. In particular, the camera is mounted at a substantially central position, as diagrammatically shown in Fig. 6.

[0051] This camera is advantageously used by the driver of the medical vehicle 1 during movement of same and in particular during operations requiring control of the presence of obstacles in the vicinity of the rear part of the vehicle 1 itself.

[0052] Preferably, an electric generator is associated with the operating compartment 3, to supply all the devices/apparatus used in the operating compartment with electric power. The electric generator is denoted in Figs.

2 and 3 as "tec-30 generator".

[0053] Preferably, vehicle 1 is provided with a movable footboard or electrohydraulic footboard ("electrohydraulic footboard" in Fig. 5) having a tiltable operation, mounted at the rear end of the operating compartment 3. This footboard can be advantageously used to enable access to the operating compartment to patients carried in a wheelchair. This movable footboard can also be used for patients carried in a stretcher.

[0054] The medical staff can instead have access to the operating compartment 3 through a lateral access.

[0055] As diagrammatically shown in Figs. 1 and 1a, the operating compartment can be also provided with cabinets, windows and refrigerator for conservation of prostheses and drugs as well as with shelves for housing medical instruments.

[0056] Advantageously, all walls of the operating compartment 3 are covered with a layer of a lead-based material so as to insulate the external environment from the radiation emitted when X-ray apparatuses are used for taking radiograms.

[0057] Also the possible windows will be made of an appropriate material such as anti-radiation glass sealed with lead.

[0058] Preferably, the medical vehicle 1 has an electric connection with the outside to support or replace the aforesaid generator at least temporarily.

[0059] Preferably, the medical vehicle 1 has a connection with the outside for supplying drinking water to the inside of the operating compartment 3.

[0060] Preferably, the medical vehicle 1 has a connection with the outside for supplying oxygen (O₂) to the inside of the operating compartment 3.

[0061] Preferably, the medical vehicle 1 is provided with a radio connection for remote communication exchange.

[0062] Preferably, vehicle 1 is equipped with a television system for receiving television programs so as to enable the patients to take advantage of same.

[0063] In the preferred embodiment, the medical vehicle 1 is provided with solar panels, in particular with photovoltaic panels, suitably associated with one or more inverters and one or more batteries for electric energy storage. In this way, the medical vehicle 1 can be self-governing and independent in terms of energy over long periods of time.

[0064] Preferably in addition or as an alternative to what described above, one or more of the following devices or instruments can be provided inside the operating compartment 3:

- Hemogasanalyser;
- Electrocardiograph;
- Fibroscope (direct vision, execution of bronchial aspiration; revision of tracheostome, etc.);
- Fibrogastroscope (gastroscopies, introduction or replacement of PEGs, etc.);
- Abdominal echograph;

- Portable Echocardiograph;
- Electric aspirator for secretions;
- Oxygen enricher/concentrator.

[0065] In addition or as an alternative to what above stated, the operating compartment can be equipped for carrying out surgical interventions of the outpatient type too (e.g. tracheotomies).

[0066] Advantageously, the operating compartment 3 can be provided with a computerised station, for managing and controlling one or more devices/instruments indicated in the present specification.

[0067] The detected data can be sent, through the computerised station, to processors connected thereto through a remote connection so as to make said data reach qualified staff capable of offering immediate medical advice.

[0068] Preferably, the data are encrypted before transmission.

[0069] By means of the computerised station it is also possible to store and/or print data concerning the carried out medical services.

[0070] Advantageously, one or more of the devices/instruments mentioned in the present specification are mounted inside the operating compartment 3 in a removable manner. In this way, these devices/instruments can be easily carried inside the patient's house in case transfer of the patient inside the operating compartment 3 is not appropriate.

[0071] The invention achieves important advantages.

[0072] In fact, the medical vehicle herein described and claimed allows services to be provided that include periodical home visits/examinations enabling the patient's necessities to be analysed following a predetermined frequency and these necessities to be faced by suitable treatments preventing arising of emergency situations that, obviously, can only cause discomfort, problems and complications.

[0073] In addition, supplying at home the aforesaid services is beneficial to the economic condition of the patients and the patients' families in a very important manner, taking into account the costs that continuous hospitalisations can cause.

Claims

1. A medical vehicle, comprising:

- a bearing and actuation structure (2);
- an operating compartment (3), mounted on said bearing and actuation structure (2); wherein said operating compartment (3) is provided with one or more of the following devices/instruments:
- an examination coach;
- a night bed, tiltable between a non-operating configuration of minimum bulkiness, and an op-

erating configuration;

- a patient-lifting device, slidably mounted on a top wall of said operating compartment (3) and intended for patients' shifting inside said operating compartment (3);
- an X-ray apparatus, for taking X-ray examinations.

2. A medical vehicle as claimed in claim 1, wherein said patient-lifting device is slidably in engagement with one or more rails fastened to said top wall, said one or more rails being disposed in a direction substantially parallel to a major longitudinal extension of said operating compartment (3).

3. A medical vehicle as claimed in anyone of the preceding claims, wherein said operating compartment (3) is further provided with a thermal unit at least partly mounted on the top wall of said operating compartment (3) for air-conditioning and/or heating of the inner volume of said operating compartment (3).

4. A medical vehicle as claimed in anyone of the preceding claims, further comprising one or more solar panels, preferably photovoltaic panels, to supply the devices/instruments present inside the operating compartment (3) with electric power.

5. A medical vehicle as claimed in claim 4, wherein said solar panels are mounted externally of said operating compartment (3) on said top wall.

6. A medical vehicle as claimed in claim 4 or 5, further comprising one or more inverters and one or more batteries associated with said one or more solar panels to store the electric power supplied by the latter.

7. A medical vehicle as claimed in anyone of the preceding claims, wherein said operating compartment (3) is provided with a shield preferably obtained through layers of lead-based material, for insulating the external environment from the radiation generated by said X-ray apparatus.

8. A medical vehicle as claimed in anyone of the preceding claims, wherein said operating compartment (3) is provided with one or more of the following instruments/devices:

- Hemogasanalyser;
- Electrocardiograph;
- Fibroscope (direct vision, execution of bronchial aspiration; revision of tracheostome, etc.);
- Fibrogastroscope (gastroscopies, introduction or replacement of PEGs, etc.);
- Abdominal echograph;
- Portable Echocardiograph;
- Electric aspirator for secretions;

- Oxygen enricher/concentrator.
- Analyser
- Coagulation apparatus;
- Wash-basing, preferably associated with a container for water collection.

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9. A medical vehicle as claimed in anyone of the preceding claims, wherein said operating compartment (3) is further provided with a television system, configured for receiving television programs and enabling the patients to take advantage of same.

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10. A medical vehicle as claimed in anyone of the preceding claims, wherein said operating compartment (3) is further provided with a computerised station, configured for performing one or more of the following functions:

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- management and control of one or more of said instruments/devices/apparatus;
- storage of the detected data;
- printing of the detected data;
- remote transmission of the detected data, preferably following application of a cryptography algorithm.

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FIG. 1

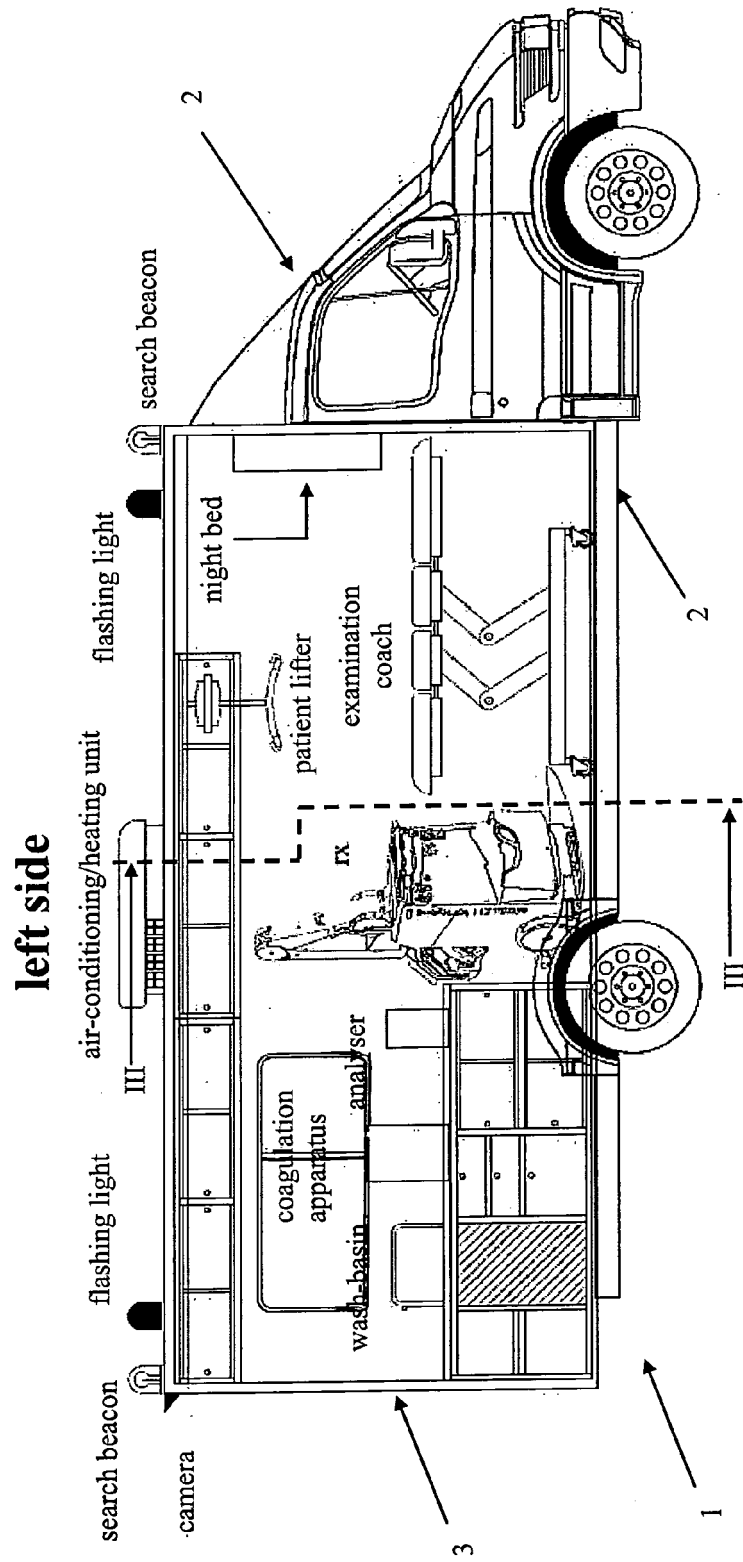


FIG. 1a

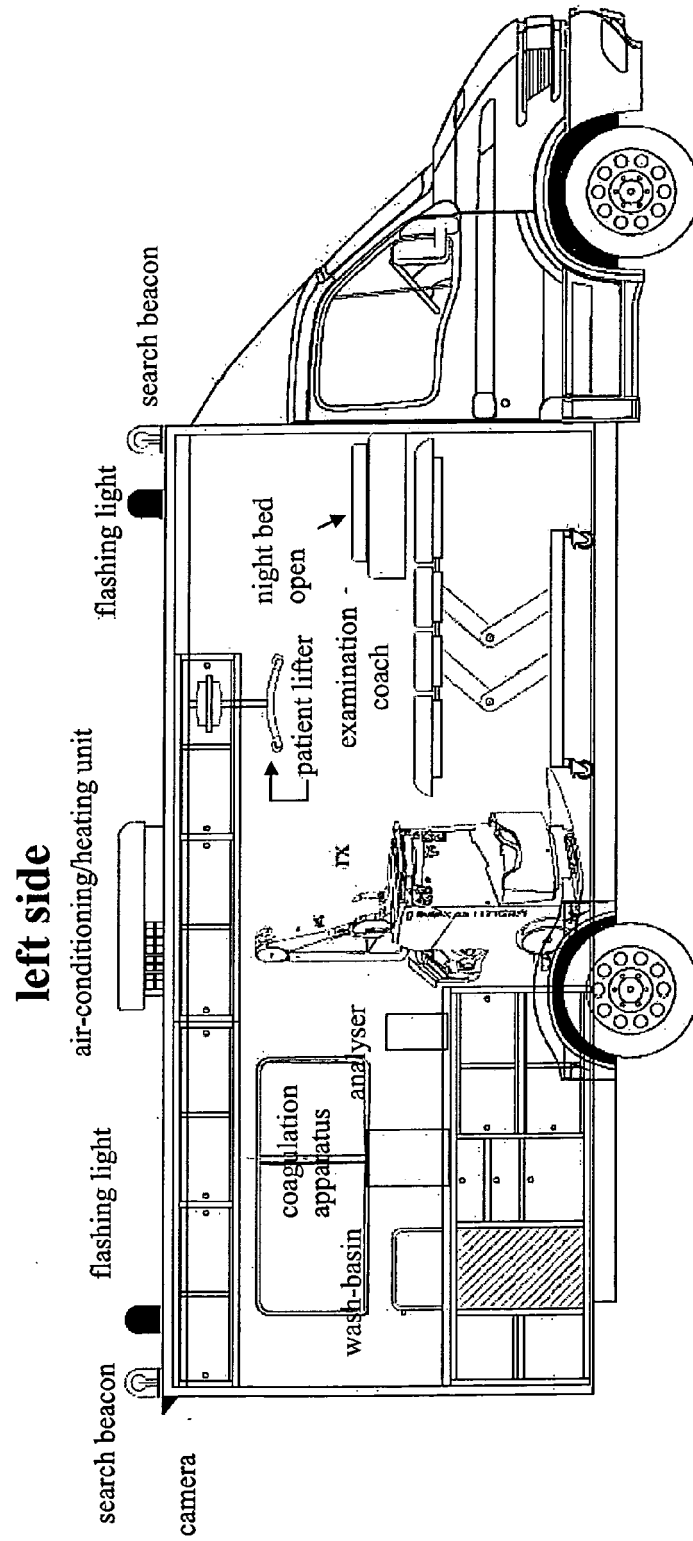


FIG. 2

right side

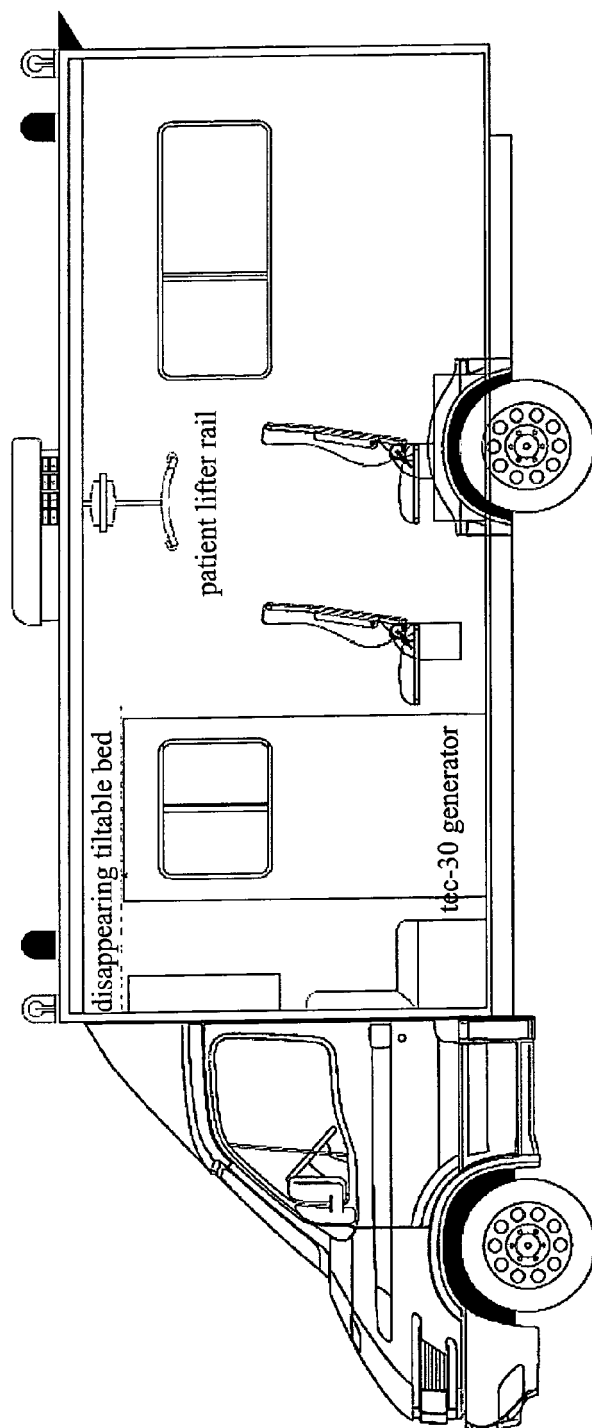


FIG. 3

bulkhead

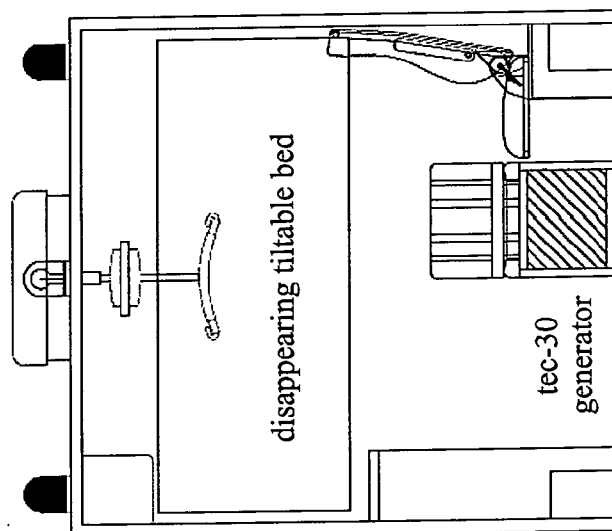


FIG. 4

plan view

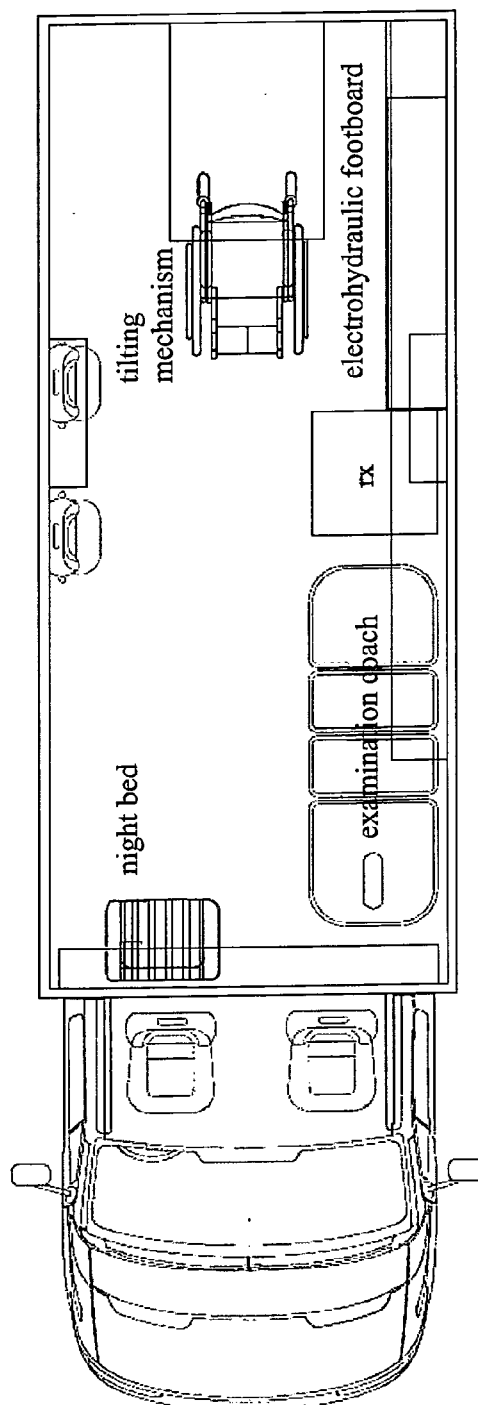


FIG. 4a

plan view

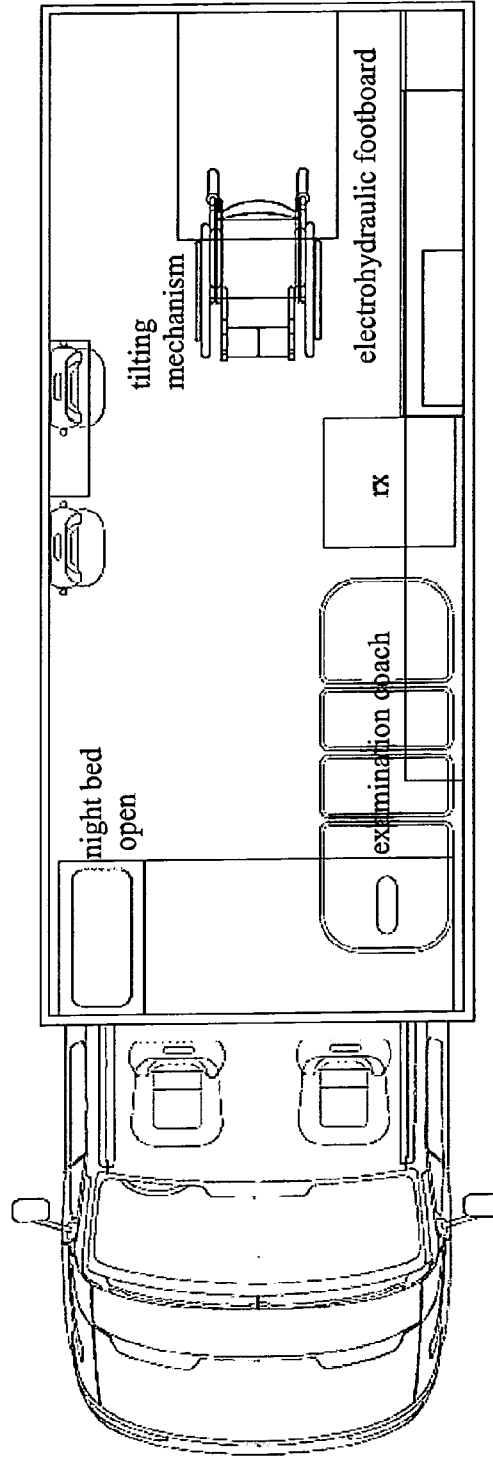


FIG. 5

plan view

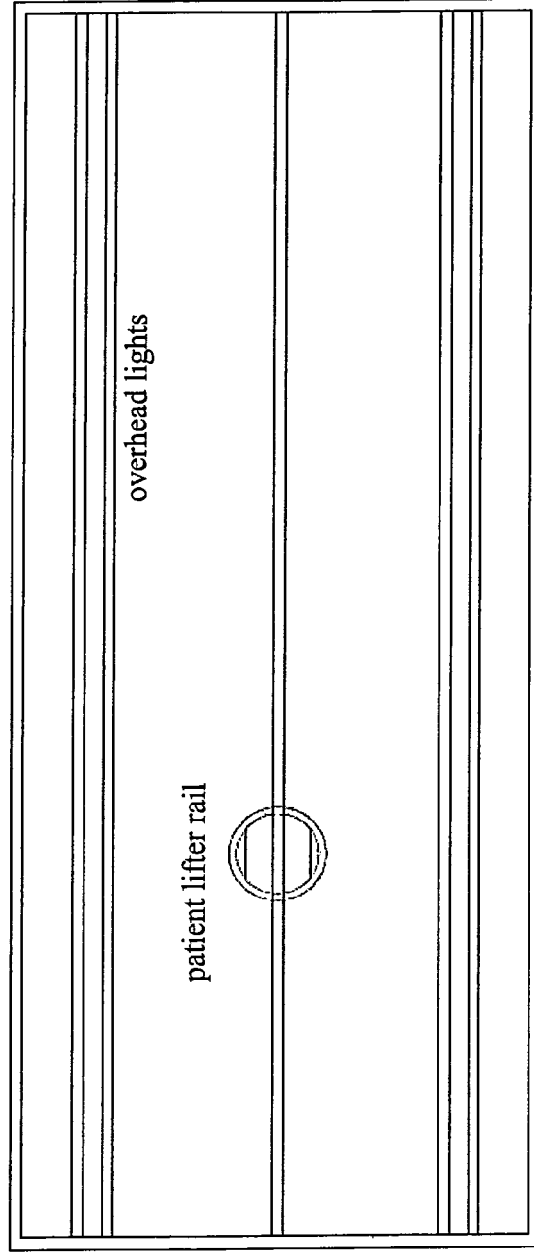


FIG. 6

plan view

