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(54) **METHOD AND SYSTEM FOR THE HEIGHT-ADJUSTMENT OF SELF-LOADING STRETCHER SUPPORT IN RESCUE VEHICLES AND RESCUE VEHICLE EQUIPPED WITH SAID SYSTEM**

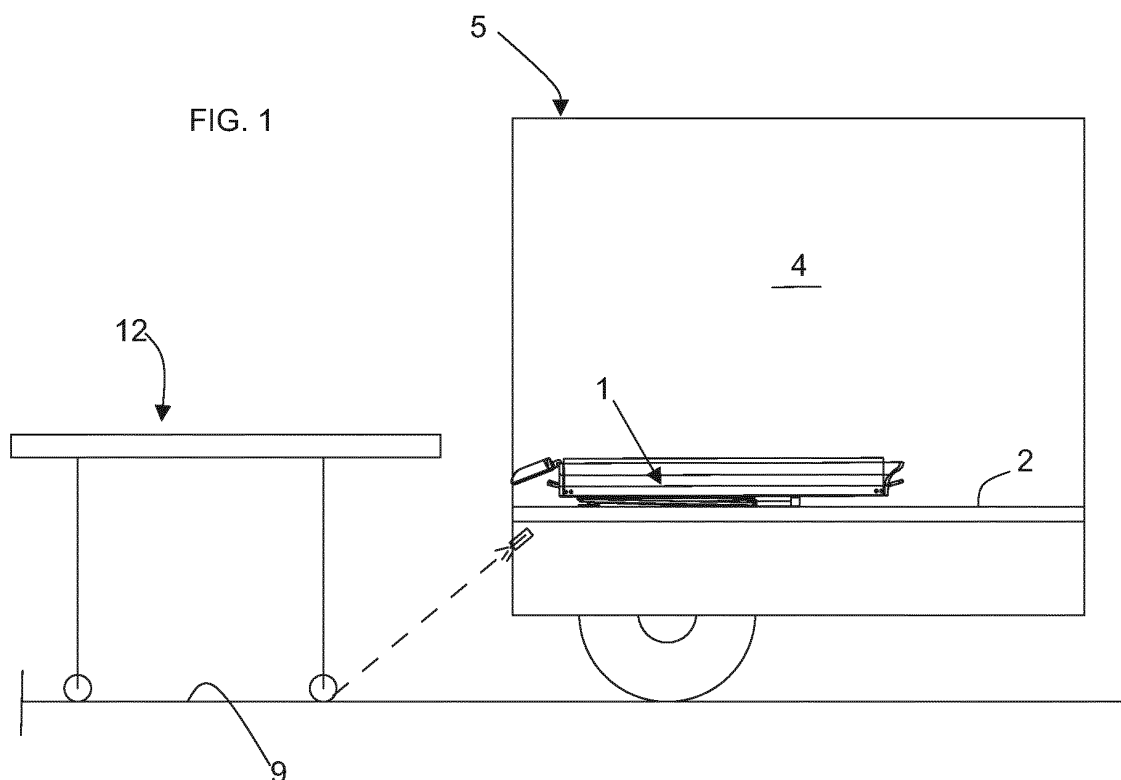
(57) The invention relates to a system for adjusting the height of self-loading stretcher supports in health compartments of rescue vehicles.

In particular, means for changing and adjusting the support-deck distance are arranged between said support and the deck of the health compartment.

These means allow recovering possible unbalancing

from the ideal value of the loading and unloading height of the self-loading stretcher onto or from the relative support.

The adjustment occurs as a function of the height of the vehicle and/or support with respect to the support surface of the self-loading stretcher in a loading/unloading position, i.e. outside the vehicle.



Description

[0001] The present invention relates to the field of equipment for rescue vehicles, such as ambulances, for the transportation of injured, ill or disabled people on stretchers, to receive said patients in a health compartment and carry them to a hospital.

[0002] In particular, the invention is designed to optimize the loading and unloading steps of the so-called self-loading stretchers, where this term means beds provided with retractable legs and swivel wheels, used solely for loading the patient on the vehicle, for example from the patient's home to the rescue vehicle.

[0003] Ambulances usually carry the injured person on a self-loading stretcher in turn positioned inside the health compartment.

[0004] The self-loading stretcher is kept into position by the interposition of a support resting on the deck of the vehicle compartment. In addition, the purpose of the support is to also allow positioning the patient prone and sloping and moving him/her laterally and vertically into the health compartment, always keeping him/her lying on the stretcher.

[0005] A drawback of the systems that currently employ self-loading stretchers occurs if the support surfaces of the vehicle and the stretcher are not the same, or if the height of the support changes from the ideal condition due to changes related to the wear of the vehicle.

[0006] In fact, the design conditions take into account and adjust the position of the support inside the vehicle deck as a function of the height of the stretcher required for the automatic opening and closing thereof.

[0007] If any special and not ideal situations are encountered, such as when the vehicle is on the road while the stretcher carriage is on a sidewalk, the standard transfer condition changes and this can cause:

- an abnormal opening or closing, or
- the need for further intervention by the rescue personnel, or even
- the jibbing of the stretcher and the impossibility of loading and/or unloading.

[0008] The object of the present invention is to obviate the above technical drawbacks by providing a loading system which takes into account and also controls the actual height of the support from the ground as a function of the support surface of the self-loading stretcher when it is outside the vehicle, ready for being introduced onto the support or for being picked from the support.

[0009] A first advantage is being able to ensure a proper loading and unloading height of the self-loading stretcher even when conditions are outside the design parameters. In this regard, it should be noted that the conditions may vary both due to variations that may affect the vehicle over time, such as tires, shock-absorbers etc., and due to "immediate" variations due to interventions carried out with the stretcher or vehicle in non-standard

conditions.

[0010] Therefore, the invention provides for adjusting the height of the support inserted in the health compartment, an adjustment which provides the vertical variation of the stretcher support with respect to the deck of the health compartment; such an adjustment is established and is a function of the position of the self-loading stretcher when positioned outside the vehicle, a position corresponding to the loading and unloading surface; this value is measured with respect to a reference on the vehicle or on the support; once this value has been obtained, it is compared with that required for opening and closing the self-loading stretcher with respect to the support in the vehicle.

[0011] Once the discrepancy between said values has been verified, a system for the height-adjustment of the support (with respect to the internal deck) can be controlled by manual or automatic actuation means, specifically electrical.

[0012] Another object of the invention is to provide at least one means capable of detecting said position of the loading/unloading surface of the stretcher and communicating the detected value(s) to a control unit, which generates an alarm signal to the operator who can thus control the lowering or lifting of the support adjustment system and restore the correct conditions for loading/unloading the self-loading stretcher.

[0013] Said determination of the surface height value is carried out by means of one or more optical or infrared sensors, which can be positioned on the vehicle and arranged so as to point to said loading/unloading area.

[0014] The detected signal is treated and processed, alongside any other reference values of the fixed type, so as to determine the required value.

[0015] In addition, the invention may provide that, in case of electrical control, once the existence of a condition of stretcher support height not consistent with the ideal one has been established, in addition to an alarm the system may also generate a restoration by automatically controlling the lifting and lowering to the new correct condition.

[0016] Therefore, the support-deck lifting system also includes one or more electric control units communicating with sensors and motors in order to maintain the correct mutual height between the support and the self-loading stretcher. In this way, the loading and unloading height of the stretcher is suitable for opening and closing thereof.

[0017] Another object of the invention is the motor vehicle for first aid and transportation of injured or ill people, comprising a support for self-loading stretchers in the rear stretcher loading compartment and means for adjusting the height thereof with respect to the internal deck of the compartment itself, as a function of the height of the stretcher surface once the latter is situated outside the stretcher in loading or unloading conditions.

[0018] In addition to the movable support, the vehicle comprises height detection sensors which measure the

height in order to carry out the comparison with the reference parameters and determine whether the loading and unloading steps of the self-loading stretcher comply with the required procedures.

[0019] Therefore, the invention allows establishing different heights of the support with respect to the deck and always allowing the optimal introduction or extraction of the self-loading stretcher.

[0020] Said objects and advantages are all achieved by the stretcher support to be installed in health compartments of ambulances, object of the present invention, which is characterized by the appended claims.

[0021] This and other features will be more apparent from the following description of some of the configurations, illustrated purely by way of example in the accompanying drawings.

- Figure 1 and 2: show the back of a motor vehicle used for first aid and transportation of injured or ill people; the stretcher loading compartment is provided with a stretcher support according to the invention; means for adjusting the support-deck distance are provided to recover possible unbalancing from the ideal value of the loading and unloading height of the self-loading stretcher onto or from the relative support.
- Figure 3: shows the support alone with the relative lifting and lowering system,
- Figure 4: shows a front view of the above system in lifted and lowered configuration,
- Figure 5: shows an example of the electrical or mechanical support lifting system alone.

[0022] With particular reference to the figures, reference numeral 1 indicates as a whole a stretcher support to be installed in health compartments of rescue vehicles such as ambulances.

[0023] The figure only shows a partial view of a vehicle 5, an ambulance, and precisely its health compartment 4, its rear deck 2, where the emergency service staff operates and where the patient on stretcher 12 is accommodated.

[0024] As said, the injured person is carried on a stretcher; in the case of a self-loading stretchers, an intermediate element is always used which is defined precisely by the term stretcher-support 1. Normally resting on deck 2 of the vehicle compartment 5, the support keeps stretcher 12 into position and allows possible positioning of the patient prone and sloping, or moving him/her laterally inside the health compartment, always keeping him/her lying on the stretcher.

[0025] The stretcher support has a substantially parallelepiped shape geometry. Its surface 6 is adapted to support preferably a self-loading stretcher 12, while the lower one 7, in operating configuration, faces deck 2.

[0026] As can be seen from the figures, the invention is embodied in the introduction of a stretcher support handling system. The system is indicated with reference nu-

meral 10.

[0027] Support 1 and system 10 cooperate with each other, so as to allow the adjustment of the distance between support 1 and the internal deck of the vehicle.

[0028] The adjustment means of the adjustment system 10 can be electrically and/or manually controlled. In case of electrical actuation, a motor M provides for adjusting system 10 in extension or retraction, so as to adjust the height of the support with respect to the internal deck of the compartment, as a function of the height of the vehicle and/or support with respect to the support surface of the self-loading stretcher 12, when this is in loading/unloading position outside vehicle 5.

[0029] The reference value is determined with respect to a reference on the vehicle or on the support; said value is compared with that required for opening and closing the self-loading stretcher with respect to the support into the vehicle.

[0030] Therefore, the invention is completed by using at least one optical or infrared sensor 8 for determining a parameter defined as the vertical distance between the support and an external reference on the ground, corresponding to the loading/unloading area of the self-loading stretcher.

[0031] The sensor or sensors are fixed and positioned on the vehicle so as to directly point the defined loading/unloading area 9. The detected signal is treated and processed by a control unit 12, alongside any other reference values of the fixed type, so as to determine the required height value.

[0032] Figure 2 shows that the sensor can detect the shorter distance of area 9 compared to figure 1; in fact, there is a step that lifts stretcher 12 with respect to the ideal condition. In this way, system 10 is lifted to restore the ideal distance condition and allow the insertion of the stretcher into the compartment, and especially the extraction step preventing dangerous jibbing of the legs.

[0033] In the case of electric movement of the support height adjustment system, the invention provides the power connection and supply also for a light area arranged around the perimeter of support 1.

[0034] The advantage is a better diffusion of light into the health compartment for the patient, who in this way does not receive direct light when lying on the stretcher.

[0035] In addition to the provision of power supply for adjusting the support, the invention provides the power connection and supply to a light point or area arranged under the rear slide, normally provided, of the stretcher support.

[0036] The advantage is to facilitate loading the self-loading stretcher.

[0037] Therefore, as a whole, the motor vehicle for first aid and transportation of injured or ill people comprises:

- a deck and at least one relative stretcher support in the stretcher loading compartment,
- arranged between said support and deck,
- means for adjusting the support-deck distance for

recovering possible unbalancing from the ideal value of the loading and unloading height of the self-loading stretcher onto or from the relative support.

[0038] The above adjustment occurs by monitoring the height of the vehicle and support with respect to the support surface of the self-loading stretcher in a loading/unloading position, considering the parameters required for opening and closing the self-loading stretcher with respect to the support.

[0039] As regards the stretcher support, it is noted that one of the different possible models currently employed is described and taken as example herein, and the invention generically includes all supports, such as those provided with freedom of lateral displacement, those provided with internal compartments for storing objects.

[0040] Summarizing, the method for the height-adjustment of stretcher supports positioned in health compartments of rescue vehicles and for supporting self-loading stretchers provides for the manual or automatic adjustment of the height of the support inserted in the health compartment with respect to the internal deck of the compartment itself; the adjustment occurs as a function of the height of the vehicle or support with respect to the area support surface of the self-loading stretcher in a loading/unloading position; said value being established with respect to a reference on the vehicle or on the support; said value is compared with that required for opening and closing the self-loading stretcher with respect to the support in the vehicle.

[0041] The adjustment of the vertical height between the stretcher support and the deck of the health compartment occurs by determining a parameter defined as the vertical distance between the support and an external reference on the ground, corresponding to the loading/unloading area of the self-loading stretcher.

[0042] The adjustment can be done:

- a. manually through manual actuation means, or
- b. automatically through electric actuation means.

[0043] The determination of the height is carried out through optical or infrared sensors, which can be positioned at one point of the vehicle and arranged so as to point the loading/unloading area; the detected signal is treated and processed, alongside any other reference values of the fixed type, so as to determine the required height value.

[0044] The optimal parameter that defines the correct height of the support with respect to the self-loading stretcher (open at the side of the vehicle) is established by taking into account, among the others:

- a. The model of the rescue vehicle and/or the height of its deck from the ground,
- b. The size of the support,
- c. The size of the stretcher in the open and closed conditions,

d. The positioning of possible sensors.

[0045] The optimal parameter may be written or shown on the stretcher support or on the vehicle should the vehicle be provided with means for the only mechanical adjustment of the support.

Claims

1. Method for the height-adjustment of stretcher supports (1) positioned in health compartments (4) of rescue vehicles (5) and for supporting self-loading stretchers (12), the method being **characterized in that** it provides for the manual or automatic adjustment of the height of the support inserted in the health compartment with respect to the internal deck (2) of the compartment (4); the adjustment occurs as a function of the height of the vehicle and/or support with respect to the area (9) or external support surface of the self-loading stretcher (12) in a loading/unloading position; said value being established with respect to a reference on the vehicle or on the support; said value is compared with that required for opening and closing the self-loading stretcher with respect to the support in the vehicle; the adjustment is performed:

- a. manually through manual actuation means or,
- b. automatically through electric actuation means.

2. Method according to claim 1, **characterized in that** the determination of the height is carried out through optical or infrared sensors, which can be positioned at one point of the vehicle and arranged so as to point the loading/unloading area; the detected signal is treated and processed, alongside any other reference values of the fixed type, so as to determine the required height value.

3. Stretcher support (1) to be installed in health compartments of rescue vehicles such as ambulances, **characterized in that** it comprises an electrical or mechanical system (10) for adjusting the distance between the support 1 and the internal deck of the vehicle where it is positioned; the means for adjusting the system (10) can be controlled electrically and/or manually.

4. Support (1) according to claim 1, **characterized in that** it further comprises

- a. at least one optical or infrared sensor (8) for determining a parameter defined as the vertical distance between the support and an external reference on the ground, corresponding to the loading/unloading area of the self-loading

stretcher;

b. said one or more sensors are fixed and positioned on the vehicle so as to directly point the defined loading/unloading area;

c. the detected signal is treated and processed, alongside any other reference values of the fixed type, so as to determine the required height value.

5. Motor vehicle (5) for the first aid and transportation of injured or ill people, comprising at least one rear stretcher loading compartment defined by a deck and at least one relative stretcher support; the vehicle being **characterized in that** it comprises, arranged between said support and said deck, means for adjusting the support-deck distance, to recover possible unbalancing from the ideal value of the loading and unloading height of the self-loading stretcher onto or from the relative support; the adjustment is required should the height of the vehicle and/or support with respect to the support surface of the self-loading stretcher, surface outside the vehicle, not meet the pre-established values that consider the parameters required to open and close the self-loading stretcher with respect to the support.

6. Vehicle according to claim 5, **characterized in that** it further comprises:

a. one or more sensors, which can be generally connected to the vehicle, capable of acquiring a signal comparable with the reference (A) outside the vehicle;

b. a processing unit which gathers the signal of the one or more sensors, translates them into a corresponding numeric value and compares it with the optimal one, and in case of a different value it generates a warning or alarm requesting the actuation of the lifting or lowering of the support.

7. Motor vehicle, according to claim 5, **characterized in that** the optimal parameter (A) is established by considering, among others:

- a. The model of the rescue vehicle and/or the height of its deck from the ground,
b. The size of the support,
c. The size of the stretcher in the open and closed conditions,
d. The positioning of possible sensors,

the optimal parameter is also written on the stretcher support or on the vehicle should the vehicle be provided with means for the only mechanical adjustment of the support.

8. Motor vehicle, according to claim 5, **characterized**

in that the electrical system for actuating the lifting supplies power for at least one light area arranged around the perimeter of the support 1 and

9. Vehicle according to claim 7, **characterized in that** the electrical system for actuating the lifting supplies power for at least one light point or area arranged under the rear tiltable slide adapted to facilitate the operations of loading the self-loading stretcher.

FIG. 1

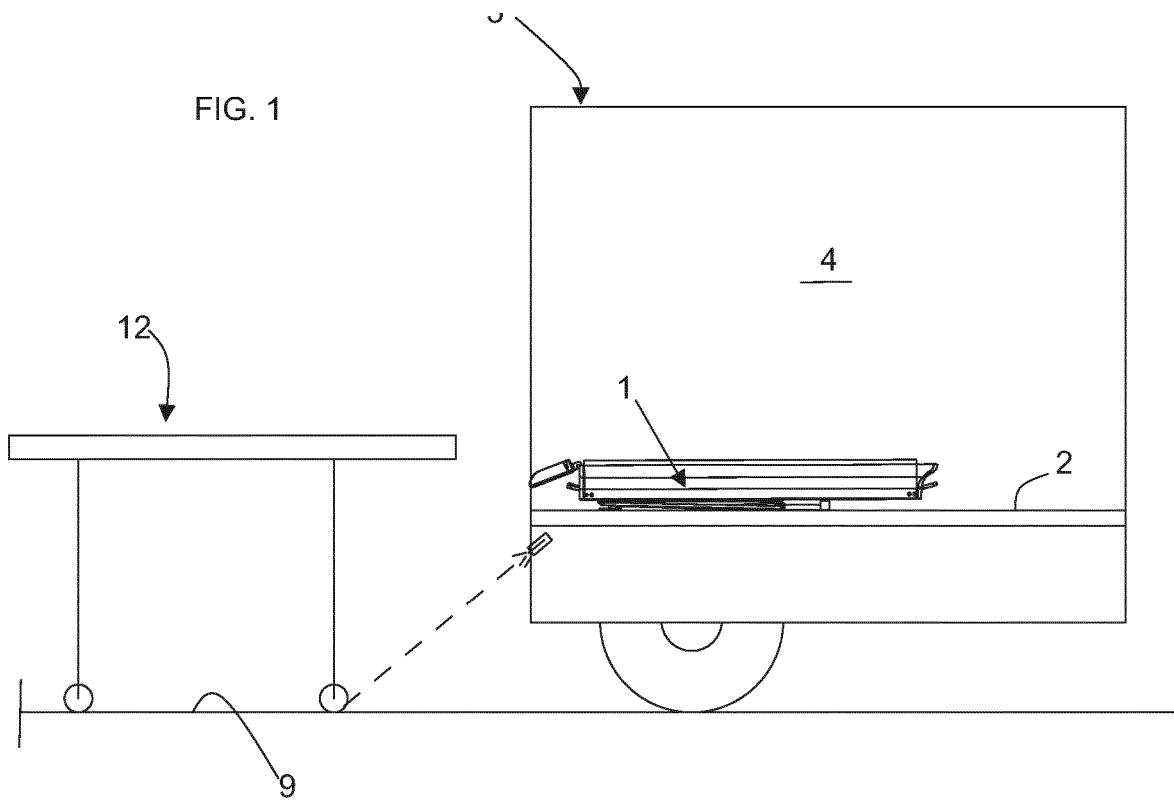
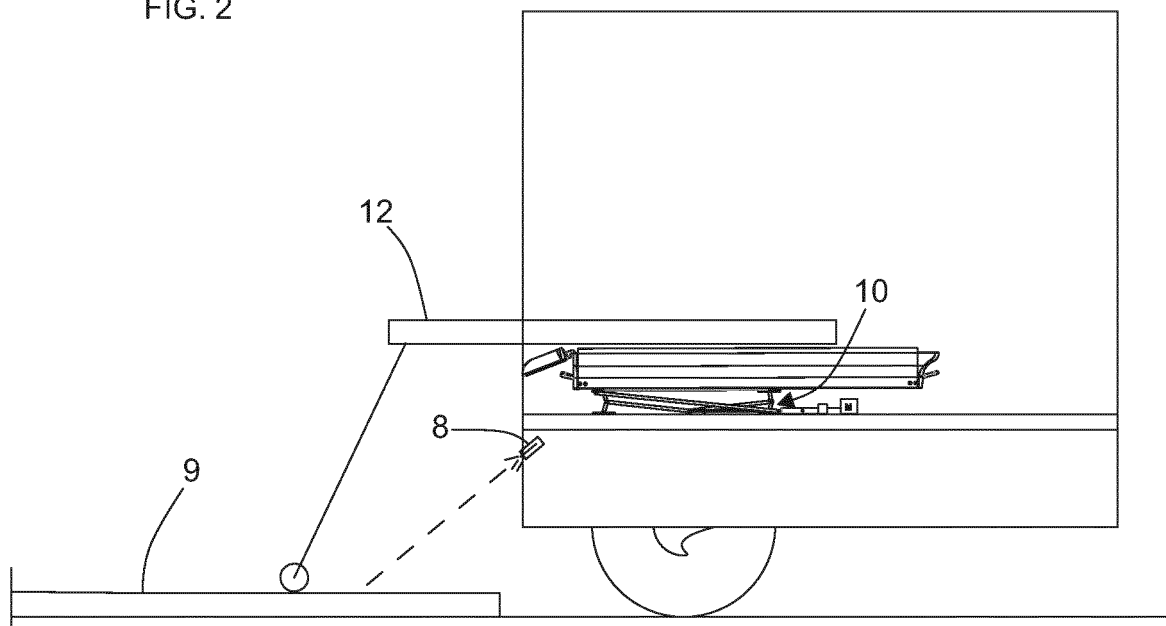


FIG. 2



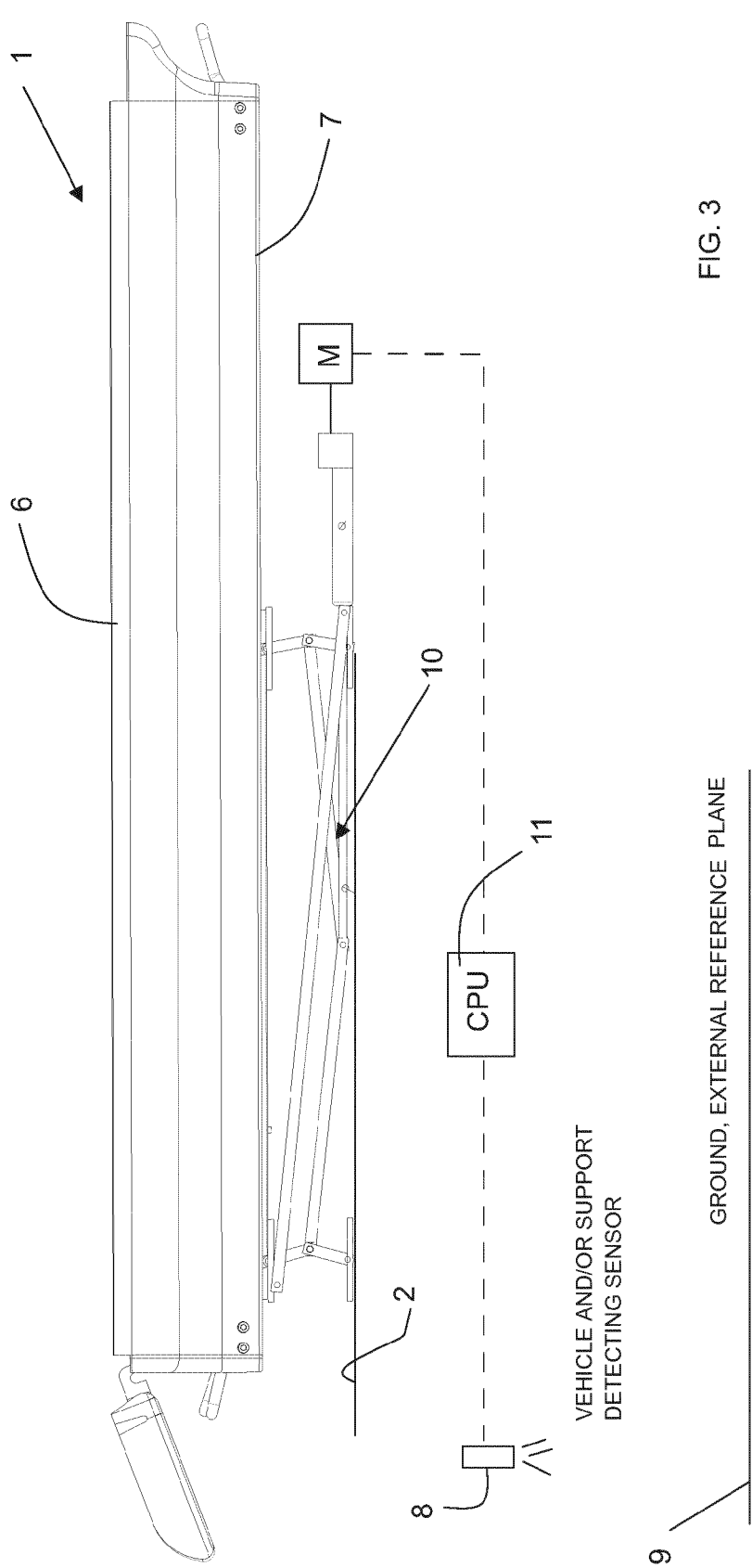
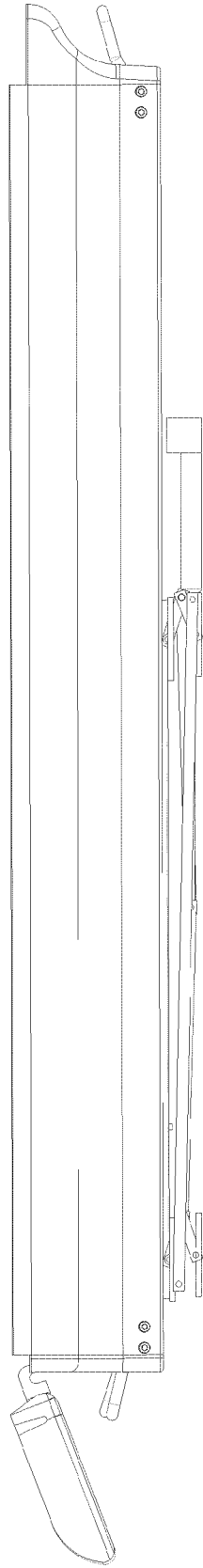


FIG. 3



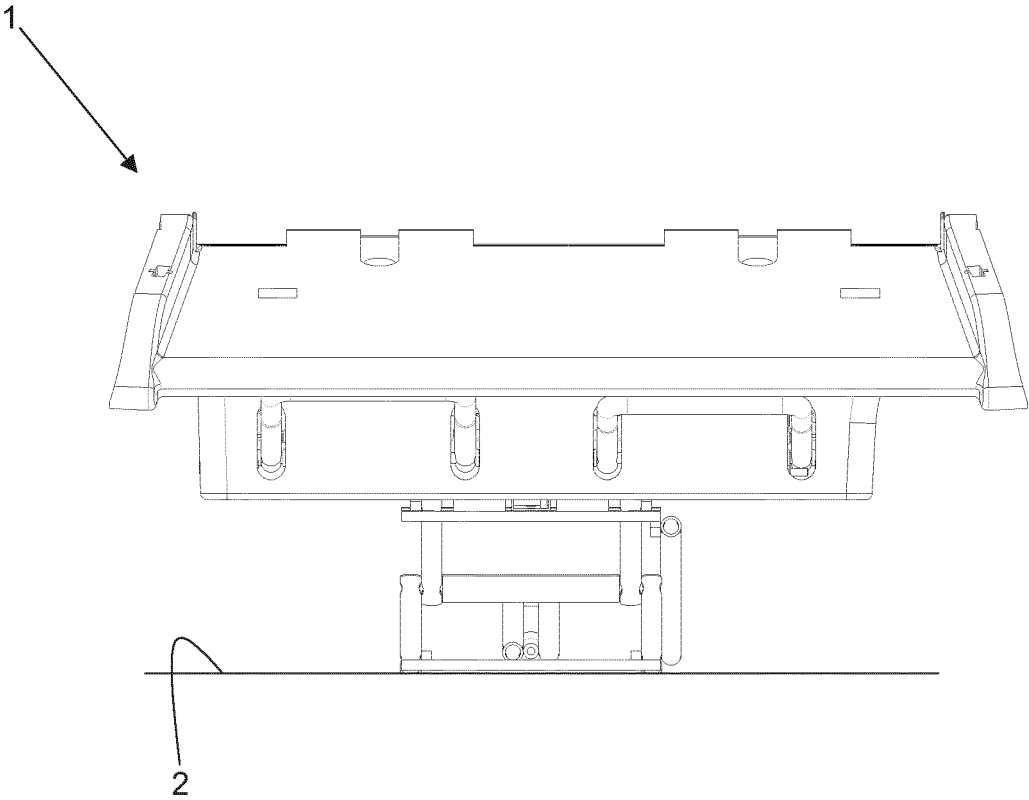
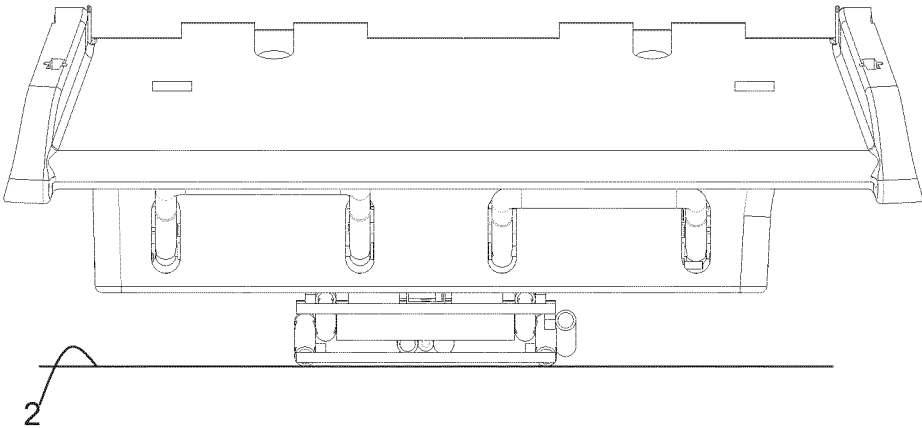


FIG. 4



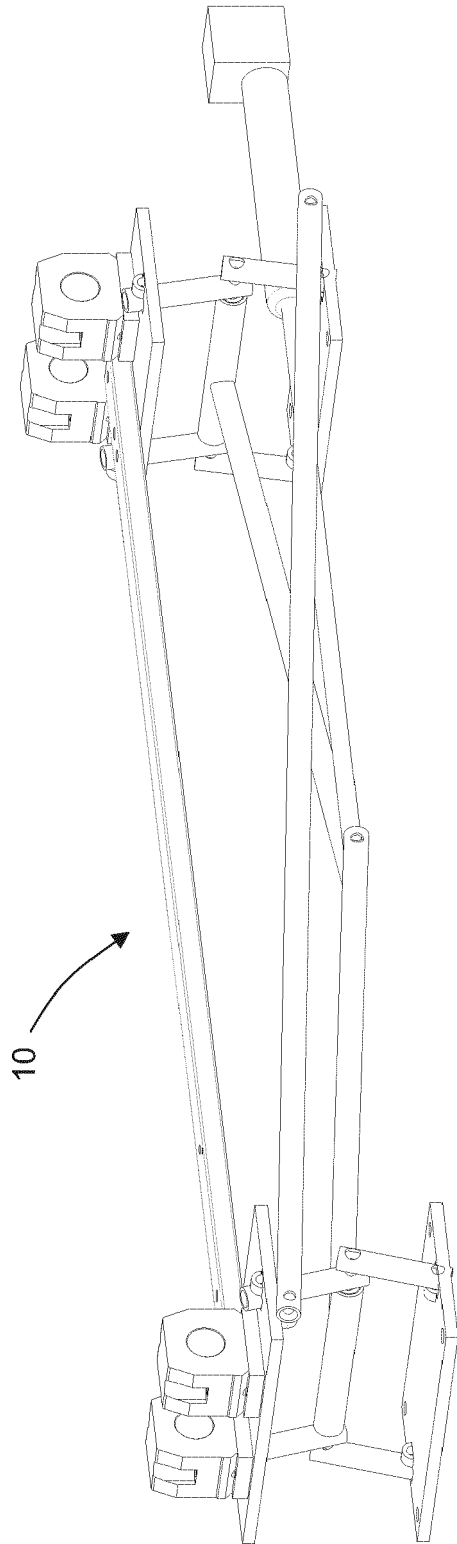
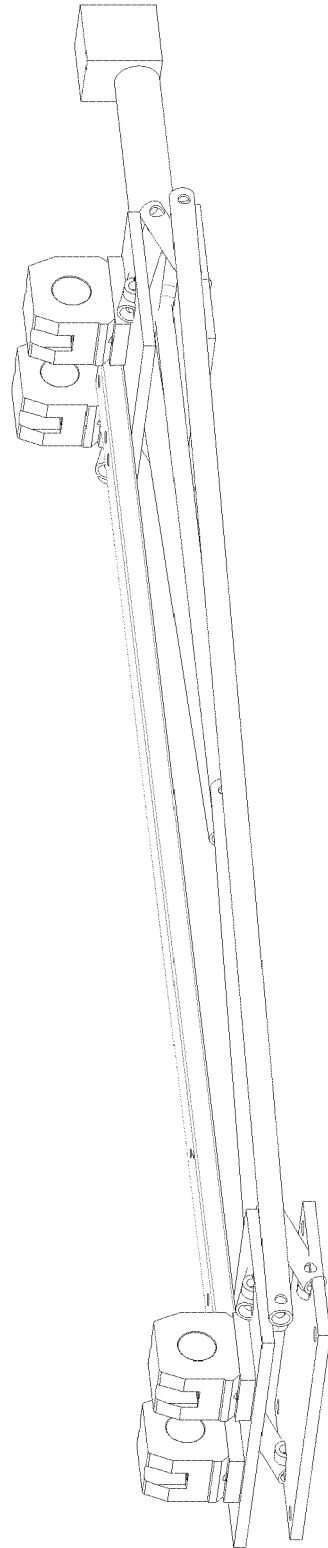


FIG. 5





EUROPEAN SEARCH REPORT

Application Number
EP 16 15 9046

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 July 2016	Examiner Gkama, Alexandra
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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