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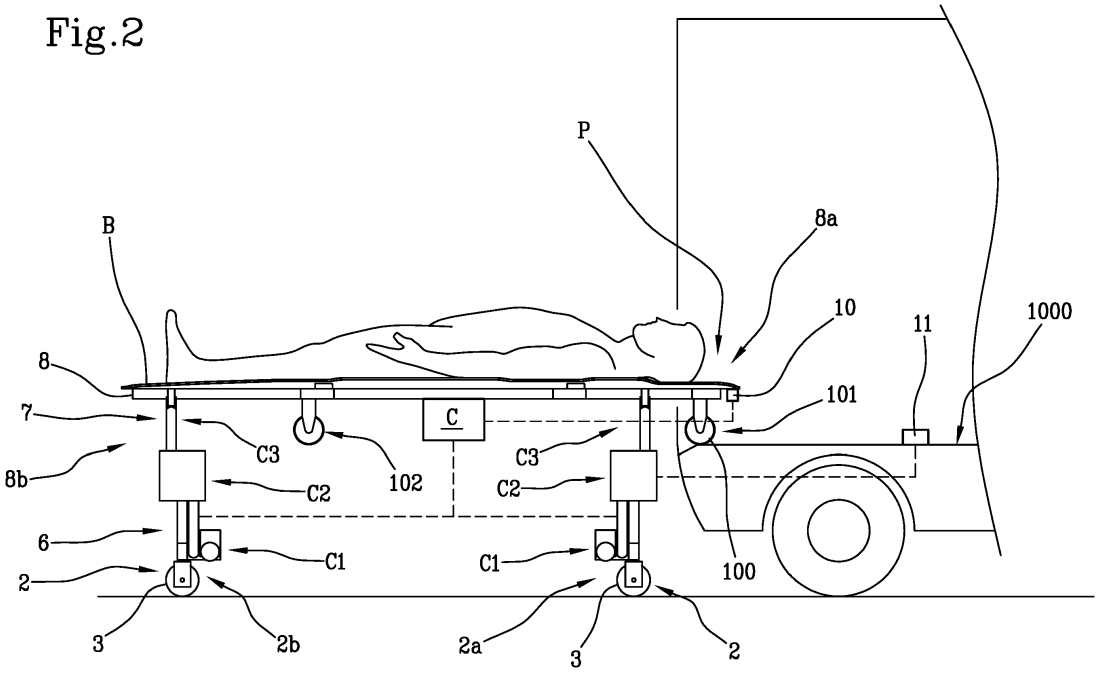
(54) **A FRAME FOR TRANSPORTING AND LOADING SYSTEM FOR A STRETCHER**

(57) A frame (1) for transporting a stretcher comprising at least one movement module (2) equipped with wheels (3) and configured for moving on a surface; a supporting platform (8) configured for receiving in coupling a table of a stretcher (B); supporting means (5) interposed between the movement module (2) and the supporting platform (8). These supporting means (5) comprise motor-driven articulated means configured for adjusting the height of the stretcher with respect to the surface. A control module is operatively connected to detection means configured for detecting the height of a loading portion (P) of the supporting platform (8) with respect to an external supporting surface. This control module is operatively connected to the supporting means (5) to automatically actuate them in such a way as to position the loading portion (P) of the supporting platform (8) at a predetermined height with respect to the external supporting surface in such a way that the loading portion (P) is parallel to the external supporting surface and rests on the external supporting surface in a first step of loading the stretcher (B) on the external supporting surface.

Fig.2

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## Description

**[0001]** The present invention relates to a frame for transporting a stretcher and a system for loading a stretcher.

**[0002]** The term stretcher, or litter, refers to a device for supporting a person, generally infirm, configured to allow the suitable movement of the same. Stretchers are widely used in the medical and paramedical professions in order to allow the transfer of a patient from the location in which she/he is located to a location suitable for the administration of adequate medical support.

**[0003]** In particular, stretchers are part of the basic equipment with which a common ambulance is equipped in order to allow paramedic staff to provide the necessary aid to people in need, for example at the location of a road accident or at the location where a person has fallen ill.

**[0004]** In these situations, the person is placed lying down on the stretcher, in a position suitable for limiting the occurrence of complications, in order to be able to transport the person onto the ambulance, and thanks to it also to transport the patient to a facility designed to provide suitable health care, for example a hospital.

**[0005]** Stretchers are also widely used inside the hospital, allowing the hospital staff to transport patients who cannot walk inside the facility, allowing the patients to have the necessary therapies they must undergo performed. Stretchers are generally connected to suitable transport frames configured to allow the support thereof and facilitate their movement.

**[0006]** In particular, the aforementioned structures have movement modules equipped with wheels which allow the responsible staff to move the stretcher by exerting force on the frame.

**[0007]** Furthermore, these frames can comprise articulated members which allow an adjustment of the positioning of the stretcher with respect to the ground. In the movement of the aforementioned frames, one particularly delicate operation is loading the frame onto a vehicle, for example an ambulance, in order to transfer the patient to a location which is different from that in which it is located.

**[0008]** The most common transport frames allow a manual loading of the stretcher, entrusting the task to the paramedic staff. In substance, the frame has movement means which can be folded and adjusted by the operators and are closed during the loading of the patient onto the ambulance.

**[0009]** Disadvantageously, this operation requires the use of skilled staff for the proper folding of the movement means. Still more disadvantageously, an erroneous application of the loading procedure can lead to the movement of the patient lying on a stretcher, resulting in a variation in the position in which the patient was initially placed.

**[0010]** The frames of more modern conception have assisted loading devices. In substance, once a portion of the frame is rested on the stretcher, an electromechanical system promotes a progressive folding of the movement means until it is possible to insert the patient in the ambulance.

**[0011]** Disadvantageously, these systems still rely on the care of the operator during this fundamental operation.

**[0012]** This drawback is particularly disadvantageous in so far as it can be the cause of an incorrect positioning of the patient during the transport in an ambulance.

**[0013]** The object of the present invention is therefore to provide a frame for transporting a stretcher capable of allowing a careful loading on an external supporting surface which does not require specific operator skills.

**[0014]** The stated technical task and specified objects are substantially achieved by a frame for transporting a stretcher comprising the features disclosed in one or more of the claims.

**[0015]** The dependent claims correspond to possible embodiments of the invention.

**[0016]** Further characteristics and advantages of the present invention will become more apparent from the indicative and thus non-limiting description of an embodiment of a frame for transporting a stretcher.

**[0017]** This description will be set out below with reference to the appended drawings, which are provided solely for indicative and therefore non-limiting purposes, in which:

- figure 1 is a schematic view of a frame for transporting a stretcher in accordance with one embodiment;
- figures 2-6 are a schematic representation of a sequence of operating conditions of a frame for transporting a stretcher in accordance with the present invention.

**[0018]** With reference to the accompanying drawings, the reference number 1 has been used to generally designate a supporting frame for a stretcher, indicated hereinafter as frame 1.

**[0019]** As can be seen in the embodiment shown in the appended figures, the frame 1 comprises two movement modules 2.

**[0020]** Each of these movement modules 2 comprises two wheels 3 respectively connected to the ends of a supporting crosspiece 4. In particular, the supporting crosspiece 4 is connected to supporting means 5 through a first connection portion C1.

**[0021]** For each movement module 2, these supporting means 5 comprise a first four-bar linkage mechanism 6 mounted on the movement module 2 and a second four-bar linkage mechanism 7 interposed between the first four-bar linkage mechanism 6 and a supporting platform 8 for a stretcher "B". The supporting platform 8 is configured for receiving in coupling a table of a stretcher "B" by reversible connection means (not shown in the appended figures) which allow a reversible connection between the supporting platform and the aforementioned

stretcher "B". Preferably, these reversible connection means comprise shape couplings of the male-female type and/or couplings of the screw-bolt type.

**[0022]** As can be seen in the appended figures, the aforementioned movement modules 2 are respectively connected to a front portion 8a of the supporting platform 8 and to a rear portion 8b of the supporting platform 8.

**[0023]** The first linkage mechanism 6 is connected to the second linkage mechanism 7 through a second connection portion C2. Moreover, the aforementioned second linkage mechanism 7 is connected to a crosspiece 9 by means of a third connection portion C3.

**[0024]** The crosspiece 9 is preferably equipped with receiving seats designed to allow a coupling, preferably a shape coupling, with the supporting platform 8. In accordance with a preferred embodiment the receiving seats are U-shaped to receive respective longitudinal members "L" of the supporting platform 8.

**[0025]** The relative movement of the aforementioned four-bar linkage mechanisms 6, 7 allows an adjustment of the positioning of the stretcher "B", connected thereto by means of the supporting platform 8, along a substantially vertical direction.

**[0026]** In particular, the coordinated adjustment of the supporting means 5 of the movement modules 2 connected respectively to the front portion 8a and rear portion 8b of the platform 8 allows compensating for the unevenness of the surface on which the frame 1 is moved.

**[0027]** In this way the differentiated adjustment of the supporting means 5 allows, during an operational movement of the frame 1, varying the angle of orientation of the supporting platform 8 corresponding to an angle of inclination with respect to a transverse direction of the stretcher "B".

**[0028]** In accordance with a further embodiment not shown in the appended figures, the four-bar linkage mechanisms 6, 7 can be absent and the supporting means 5 can comprise a robotic arm having a first portion connected to the movement module 2 and a second portion connected to the supporting platform 8.

**[0029]** In this case the supporting means 5 are designed to allow the adjustment of the height and at least one angle of orientation of the aforementioned supporting platform 8 during an operational movement of the frame 1, allowing to compensate for irregularities and/or inclinations of the surface on which the frame is moved while maintaining a predetermined spatial orientation of the supporting platform 8, for example a horizontal orientation with respect to an absolute reference system.

**[0030]** According to this embodiment, the supporting crosspiece 4 of the movement module 2 can also be realised in the form of a drive shaft on which the wheels 3 are directly placed.

**[0031]** In accordance with different embodiments not shown in the appended figures, the movement module 2 can comprise a different number of wheels 3 and the aforementioned wheels 3 can have a different arrangement from the previously mentioned arrangement without altering the inventive concept of the present invention.

**[0032]** Preferably these supporting means 5 are actuated through the use of at least one electromechanical actuator (not shown in the appended figures). These actuators, preferably, are at least partially connected to the movement module 2.

**[0033]** The frame 1 comprises a control module "C" configured for at least realising a loading of the transport frame 1 on an external supporting surface 1000, for example a supporting surface of an ambulance.

**[0034]** This control module "C" is operatively connected to detection means for detecting the height of a loading portion "P" of the supporting platform 8 with respect to the aforementioned external supporting surface 1000.

**[0035]** Preferably this loading portion "P" of the supporting platform 8 comprises at least one supporting wheel 100 designed to rest on the external supporting surface in a first loading step.

**[0036]** According to a particular embodiment of the present invention illustrated in figures 2-6, the frame 1 comprises a first pair of supporting wheels 101 positioned in the front portion 8a of the supporting platform 8 and a second pair of supporting wheels 102 positioned in a substantially central portion of the aforementioned supporting platform 8.

**[0037]** In particular, the term "front" refers to the direction of loading of the frame 1 on the external supporting surface.

**[0038]** Advantageously the supporting wheels 100 simplify the operation of loading the frame 1 onto the external supporting surface, favouring the movement of the supporting platform 8.

**[0039]** The aforementioned detection means can comprise an optical sensor 10, preferably of the laser type, associated with the frame 1 and designed to detect the height of the supporting platform 8 with respect to the external supporting surface 1000. The control module associated with the optical sensor 10 automatically actuates the supporting means 5 such that the loading portion "P" of the supporting platform 8 is placed at a predetermined height with respect to the external supporting surface.

**[0040]** In addition or as an alternative to the optical sensor 10, at least part of the detection means can be associated with the external supporting surface 1000 and comprise for example a sensor 11 associated with the external supporting surface 1000 and configured for generating a signal indicating the height of the external supporting surface itself. In this case the control module "C" comprises a communication module configured for receiving this signal and for processing the height of the loading portion "P" of the supporting platform 8 with respect to the external supporting surface 1000 as a function of the signal that is sent and of the configuration of the supporting means 5.

**[0041]** Preferably, the aforementioned signal is a wireless type signal, for example a Bluetooth signal.

**[0042]** According to different embodiments of the present invention, the communication module can comprise wired connectors and the signal can be of a different type without altering the inventive concept of the present invention.

**[0043]** The control module receives the signal from the sensor 11 and automatically actuates the supporting means 5 in such a way that the loading portion "P" of the supporting platform 8 is placed at a predetermined height with respect to the external supporting surface.

**[0044]** In particular, the aforementioned predetermined height is such that the loading portion "P" is parallel to the external supporting surface and the supporting wheel 100 rests on the external supporting surface in a first step of loading the stretcher "B".

**[0045]** The frame 1 preferably comprises a load cell, for example interposed between the supporting platform 8 and the supporting means 5. In this case the control module "C" is operatively connected to the load cell to detect a condition of resting of the loading portion "P" on the external supporting surface 1000 during the first loading step and to actuate the supporting means 5 so that they adopt a loading condition in which they are enclosed or collected within the space of the supporting platform.

**[0046]** In a first embodiment the system comprises at least one first load cell 12a located in a front portion 8a of the frame 1, between the supporting platform 8 and a front movement module 2a and at least one second load cell 12b located in a rear portion 8b of the frame 1, between the supporting platform 8 and a rear movement module 2b.

**[0047]** In a second embodiment a first pair of load cells 12a is provided positioned in a front portion 8a of the transport frame 1 between the supporting platform 8 and a front movement module 2a and a second pair of load cells 12b is positioned in a rear portion 8b of the transport frame 1 between the supporting platform 8 and a rear movement module 2b.

**[0048]** The system with two pairs of load cells is described below, being a functionally equivalent variant to the system equipped with load cells.

**[0049]** In particular, the first pair of load cells 12a is operatively connected to the control module "C" for controlling the front movement module 2a as soon as the resting of the first pair of wheels 101 is detected, and the second pair of load cells 12b is operatively connected to the control module "C" to control the rear movement module 2b as soon as the resting of the second pair of wheels 102 is detected.

**[0050]** If the frame 1 comprises an automatic adjusting mechanism of the height and/or inclination of the supporting platform 8, the control module "C" is preferably configured for inhibiting the action of this automatic adjusting mechanism during the step of loading on the external supporting surface, following the detection of resting carried out by the load cell(s).

**[0051]** In use, during a loading step, a user places the frame 1 near the external supporting surface 1000, for example the platform of an ambulance. The control module "C" detects the height of the loading portion "P" of the supporting platform 8 with respect to the aforementioned external supporting surface and automatically actuates the supporting means 5 to bring the first pair of supporting wheels 101 resting on the external supporting surface (figure 2). The detection of the height of the loading portion "P" can occur for example as a result of the reading performed by the optical sensor 10 that directly detects the height of the loading portion with respect to the external supporting surface and/or by the interaction between the control module "C" and the sensor 11 associated with the external supporting surface 1000 which indicates the height at which the external supporting surface itself is located.

**[0052]** Alternatively to the optical sensor, the detection of the height of the loading portion "P" can be carried out through a radio frequency sensor, or a radio altimeter.

**[0053]** When at least one load cell detects that the first pair of supporting wheels 101 is arranged resting on the external supporting surface, the control module actuates the supporting means 5 connected to the front movement module 2a so that they automatically adopt the loading condition in which they are enclosed or collected within the space of the supporting platform 8 (figure 3).

**[0054]** Subsequently the user can proceed with the movement of the frame 1 in the insertion direction on the external supporting surface (figure 4). In substance, the user progressively pushes the frame 1 inside the ambulance. During this step the load cells detect a plurality of measurements in such a way that they determine the positioning of the frame with respect to the external supporting surface. These measurements are processed by the control module in such a way that, when the second pair of wheels 102 is also resting on the external supporting surface, the control module actuates the supporting means 5 connected to the rear movement module 2b so that they automatically adopt the loading condition in which they are enclosed or collected within the space of the supporting platform 8 (figure 5). The user proceeds, furthermore, to the movement of the frame 1 on the external supporting surface until the entire frame is completely positioned on the aforementioned external supporting surface (figure 6). In this way, the frame is completely positioned inside the ambulance.

**[0055]** According to a further aspect, the present invention relates to a loading system for a stretcher comprising the aforementioned transport frame 1 and said detection means comprising the sensor 11 associated with the external supporting surface 1000. In the loading system the control module "C" comprises the communication module configured for receiving the signal from the sensor 11 as described previously.

**[0056]** It can therefore be seen that the present invention achieves the intended objects thanks to a frame for transporting a stretcher capable of allowing the loading of the patient on an ambulance under optimum conditions thanks to the presence of a control module that allows

accurately and automatically adjusting the positioning of the stretcher with respect to an external supporting surface.

**[0057]** Advantageously, the transport frame ensures an accurate positioning of the transported person in the stretcher in both the movement condition and in the transport condition inside an ambulance.

**[0058]** Advantageously, the adjustment of the frame with respect to the ambulance is obtained automatically and does not require the action of an operator. Moreover, the use of the transport frame is intuitive and does not require the intervention of a specialised operator.

## Claims

**1.** A frame (1) for transporting a stretcher, comprising:

- at least one movement module (2) equipped with wheels (3) and configured for moving on a surface;
- a supporting platform (8) configured for receiving in coupling a table of a stretcher (B);
- supporting means (5) interposed between the at least one movement module (2) and the supporting platform (8), the supporting means comprising motor-driven articulated means configured for adjusting the height of the stretcher relative to the surface;

**characterised in that it comprises** a control module (C) operatively connected to detection means for measuring the height of a loading portion of the supporting platform (8) with respect to an external supporting surface (1000),
the control module (C) being operatively connected to the supporting means (5) for actuating them automatically in such a way as to position the loading portion (P) of the supporting platform (8) at a predetermined height relative to the external supporting surface (1000), the predetermined height being such that the loading portion (P) is parallel to the external supporting surface (1000) and rests on the external supporting surface (1000) in a first step of loading the stretcher (B) on the external supporting surface.

**2.** The transport frame according to claim 1, comprising at least one load cell interposed between the supporting platform (8) and the supporting means (5) and operatively connected to the control module (C), the load cell being configured for detecting the resting of the loading portion (P) on the external supporting surface (1000) during the first loading step and the control module being configured for controlling the supporting means (5) in such a way that they adopt a loading condition wherein they are enclosed or collected within the space of the supporting platform (8) when the load cell detects the resting of the loading portion (P) on the external supporting surface (1000).

**3.** The transport frame according to claim 2, comprising at least one first load cell (12a) located in a front portion (8a) of the transport frame (1) between the supporting platform (8) and a front movement module (2a) and at least one second load cell (12b) located in a rear portion (8b) of the frame (1) between the supporting platform (8) and a rear movement module (2b), wherein the first load cell is operatively connected to the control module for controlling the front movement module (2a) in such a way that it adopts the loading condition and the second load cell is operatively connected to the control module for controlling the rear movement module (2b) in such a way that it adopts the loading condition.

**4.** The transport frame according to any one of the preceding claims, wherein the detection means comprise a sensor (11) associated with the external supporting surface (1000) configured for generating a signal indicating the height of the external supporting surface and wherein the control module comprises a communication module configured for receiving the signal and configured for processing the height of the loading portion (P) of the supporting platform (8) with respect to the external supporting platform (1000) as a function of the signal and of the configuration of the supporting means (5).

**5.** The transport frame according to any one of the preceding claims, wherein the loading portion (P) of the supporting platform (8) comprises at least one supporting wheel (100) designed to rest on the external supporting surface (1000) during the first loading step.

**6.** The transport frame according to claim 5, comprising a first pair of wheels (101) positioned in a front portion (8a) of the supporting platform (8) and a second pair of wheels (102) positioned in a substantially central portion of the supporting platform (8).

**7.** The transport frame according to any one of the previous claims, wherein the detection means are at least partially associated with the frame and comprise, for example, at least one optical sensor (10) designed to measure the height of the supporting surface (8) with respect to the external supporting surface (1000) or a radiofrequency sensor (radio altimeter) designed to measure the height of the surface.

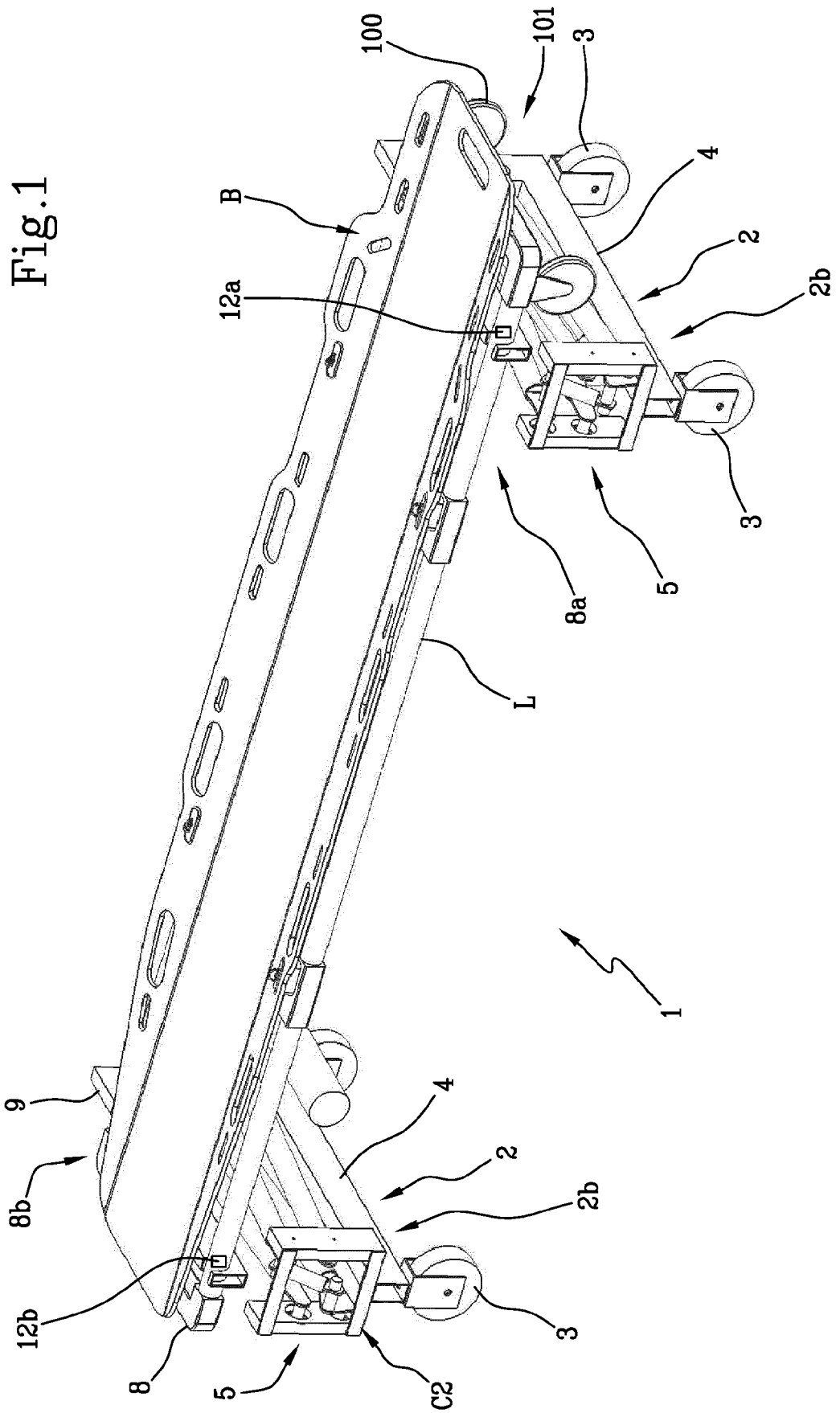
**8.** A loading system for a stretcher, comprising:

a transport frame (1) according to any one of the preceding claims and wherein the detection

means comprise a sensor (11) associated with the external supporting platform (1000) configured for generating a signal indicating the height of the external supporting surface,

wherein the control module (C) comprises a communication module configured for receiving a signal from the sensor (11) and is configured for processing the height of the loading portion (P) of the supporting platform (8) with respect to the external supporting platform (1000) as a function of the signal and of the configuration of the supporting means (5).

Fig.1



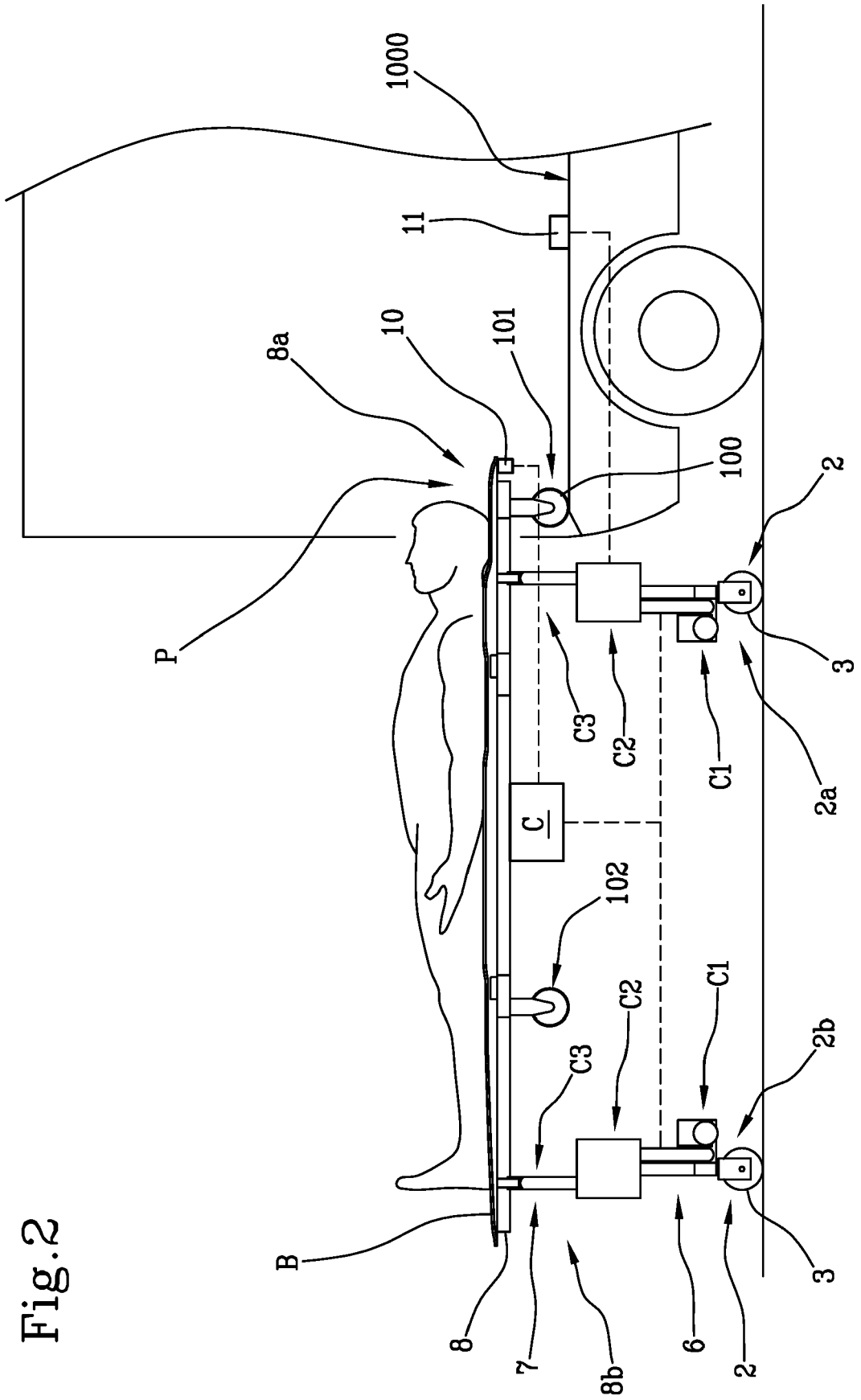
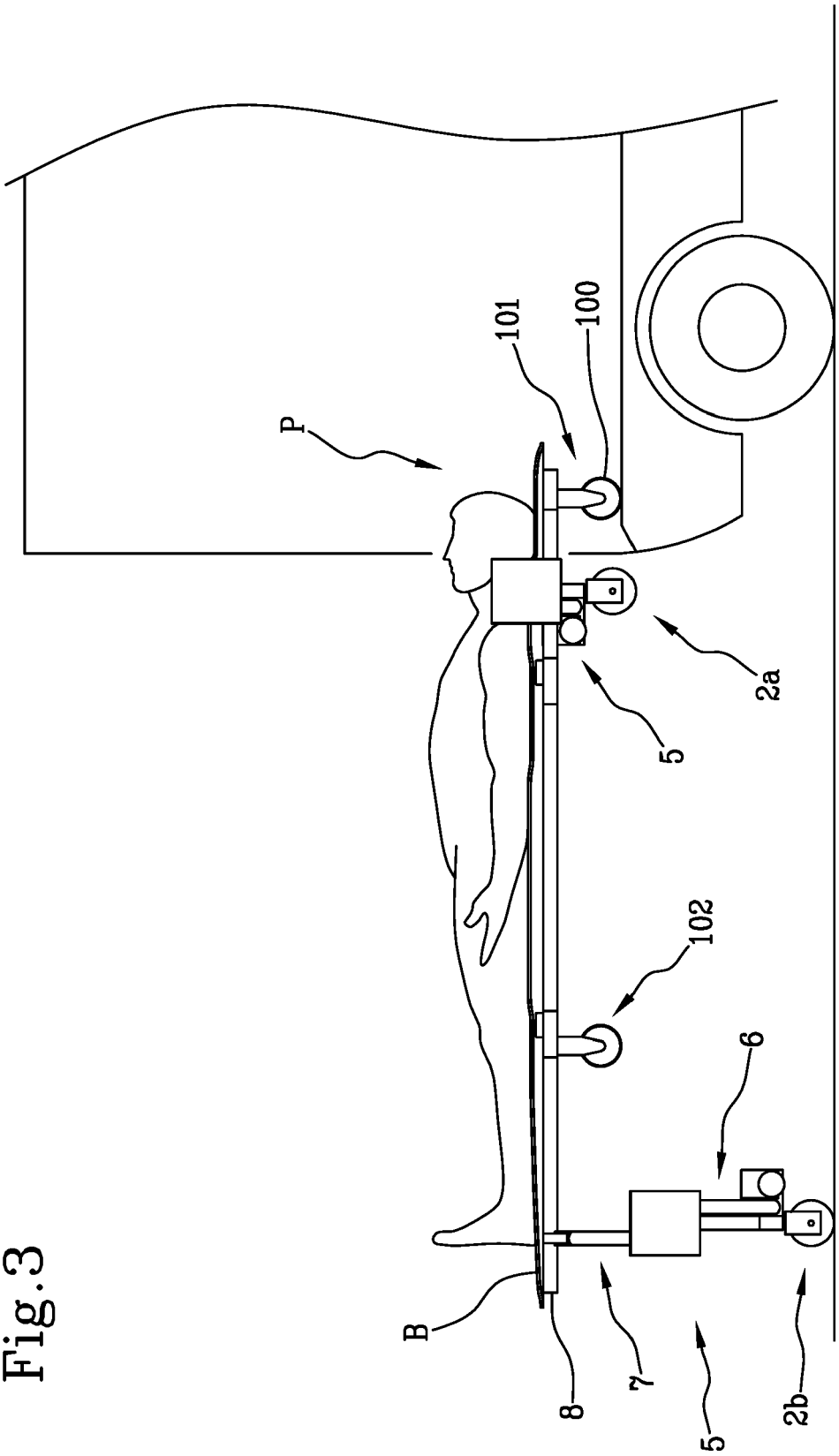



Fig.2

Fig.3



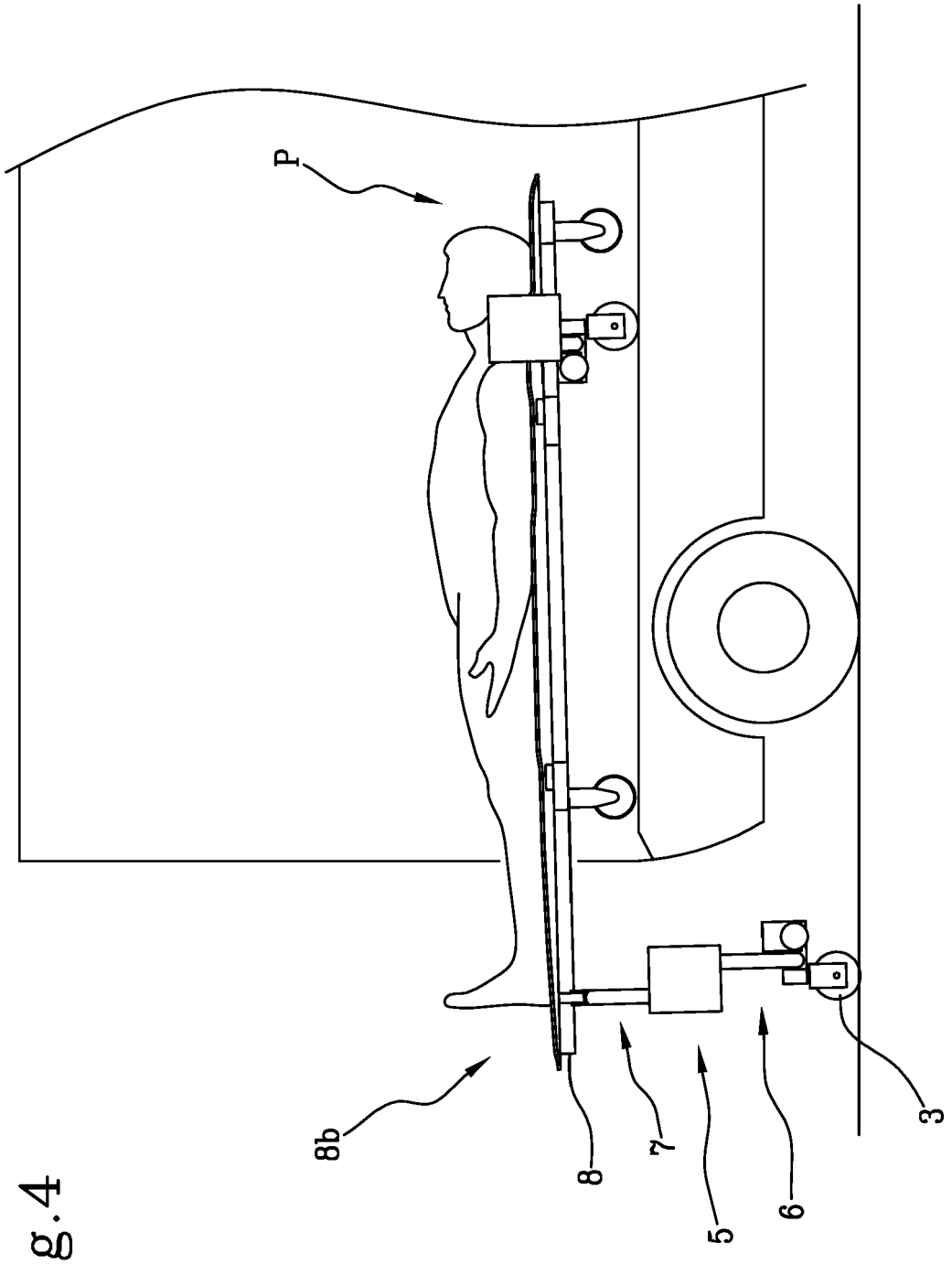



Fig.4

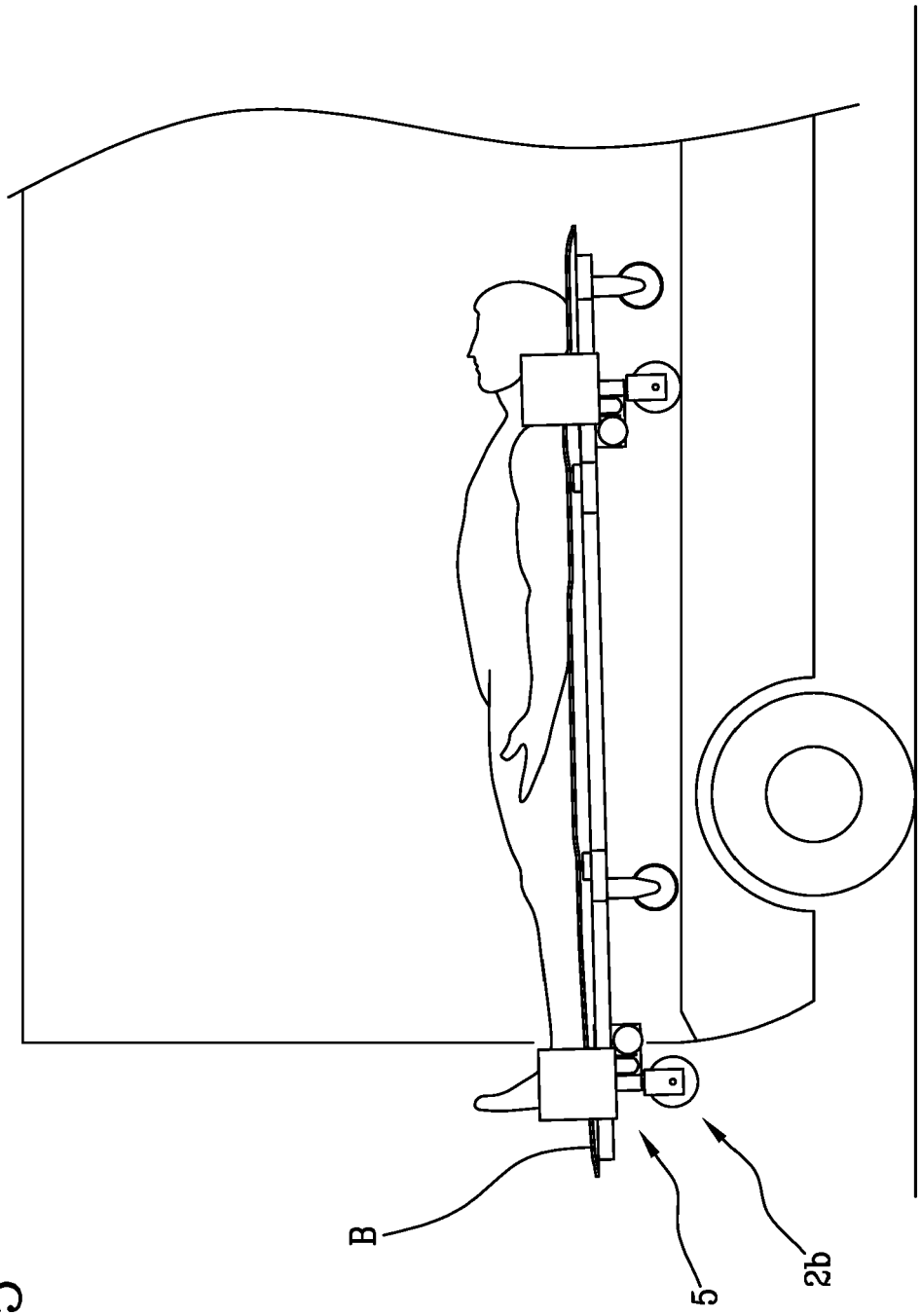



Fig.5

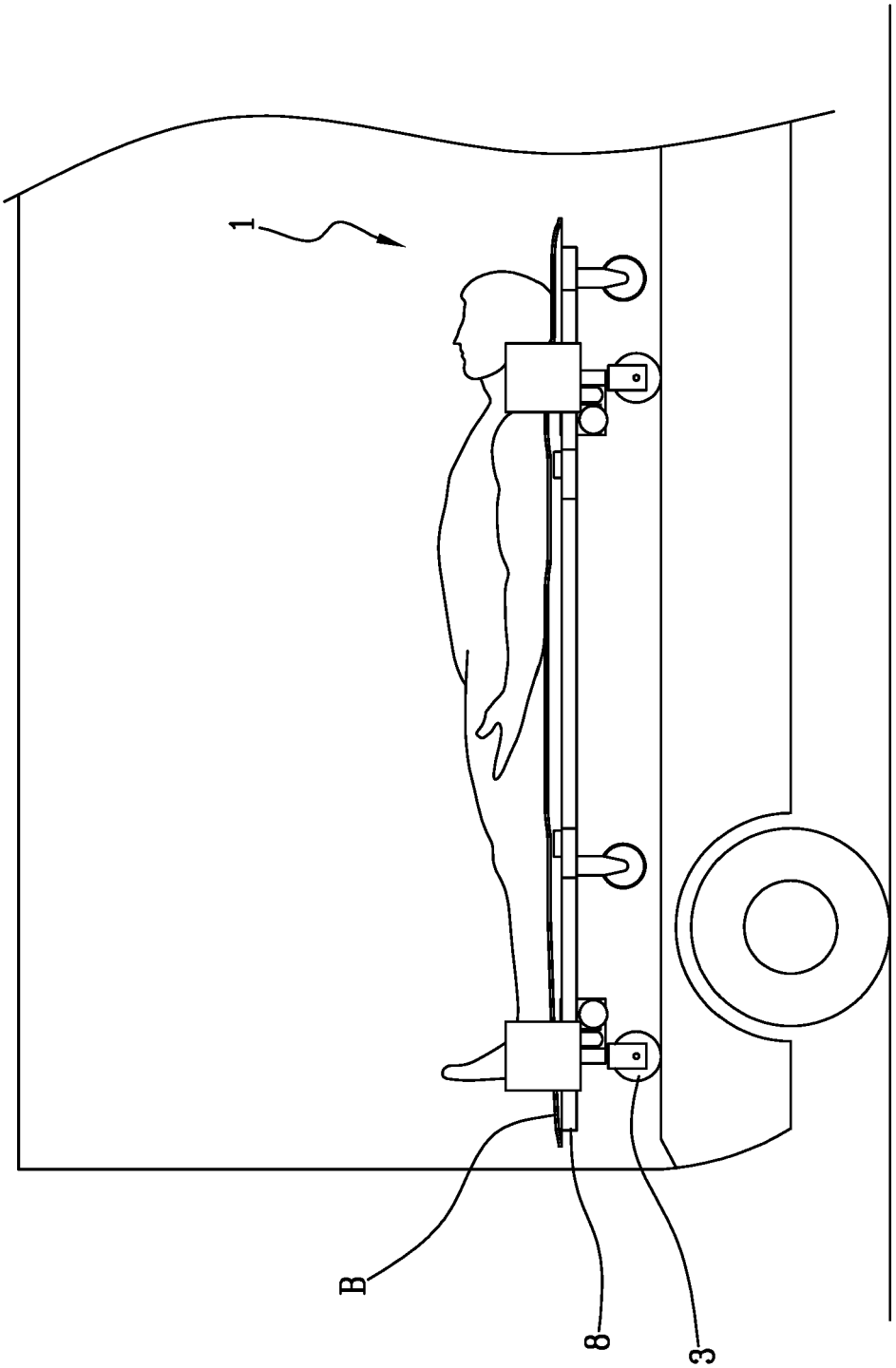



Fig.6

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# EUROPEAN SEARCH REPORT

Application Number
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| The Hague | 6 August 2019 | Birlanga Pérez, J |

CATEGORY OF CITED DOCUMENTS

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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 17 8708

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