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(56) Documents Cited:
IE 199400320 A2 **US 3605136 A**

(58) Field of Search:
INT CL **A61G**
Other: **EPODOC, WPI**

(54) Title of the Invention: **Improvements in or relating to stretcher locking systems**
Abstract Title: **Apparatus for securing a stretcher in an ambulance**

(57) An ambulance 10 has a patient transport compartment 12 with a stretcher locking system indicated generally at 16. A locking device 22 is operable to receive and secure a stretcher 20. A mounting arrangement 24 for the locking device includes an actuator (44, figure 4) to drive the lock arrangement between a plurality of pre-set positions, thereby moving the stretcher between corresponding positions. The actuator may be a linear actuator, such as a hydraulic or pneumatic cylinder and may be controlled by a button, footswitch or other trigger 46. The mounting arrangement may comprise supporting surfaces 18 upon which the stretcher is positioned, and these may move correspondingly with the locking device. The mounting arrangement may be located within a well in the floor of the ambulance and may comprise a track along which a carriage 40 may be driven. The carriage may carry the locking device and support surfaces. In a preferred embodiment, the system is arranged to move a stretcher in a direction transverse to the length of the stretcher. An ambulance comprising a stretcher locking system is also disclosed.

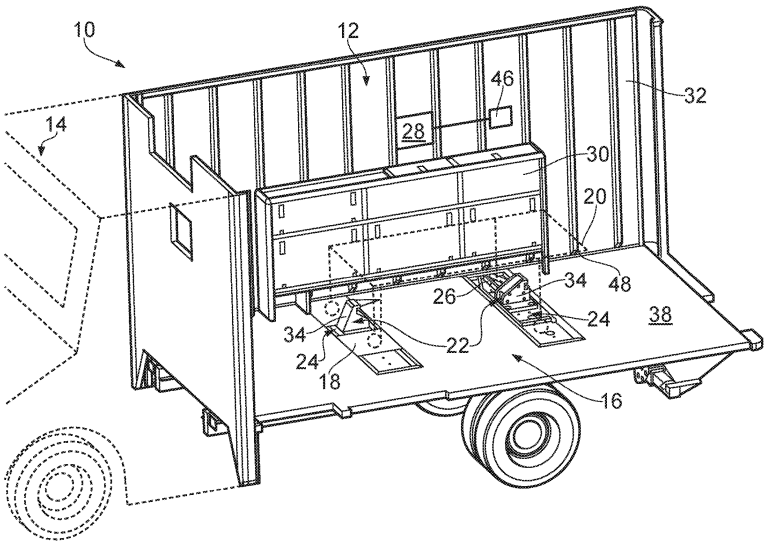

FIG. 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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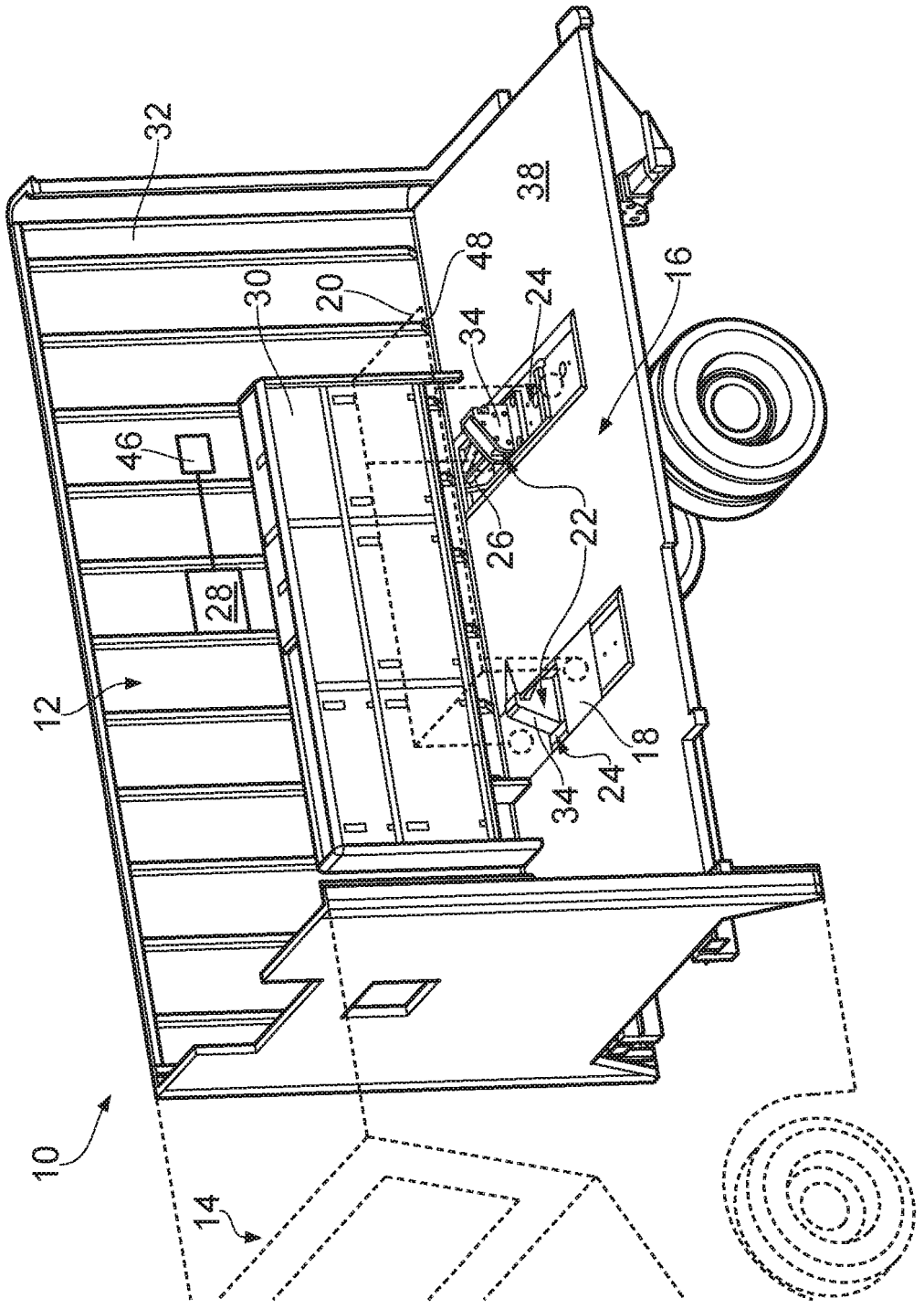

FIG. 1

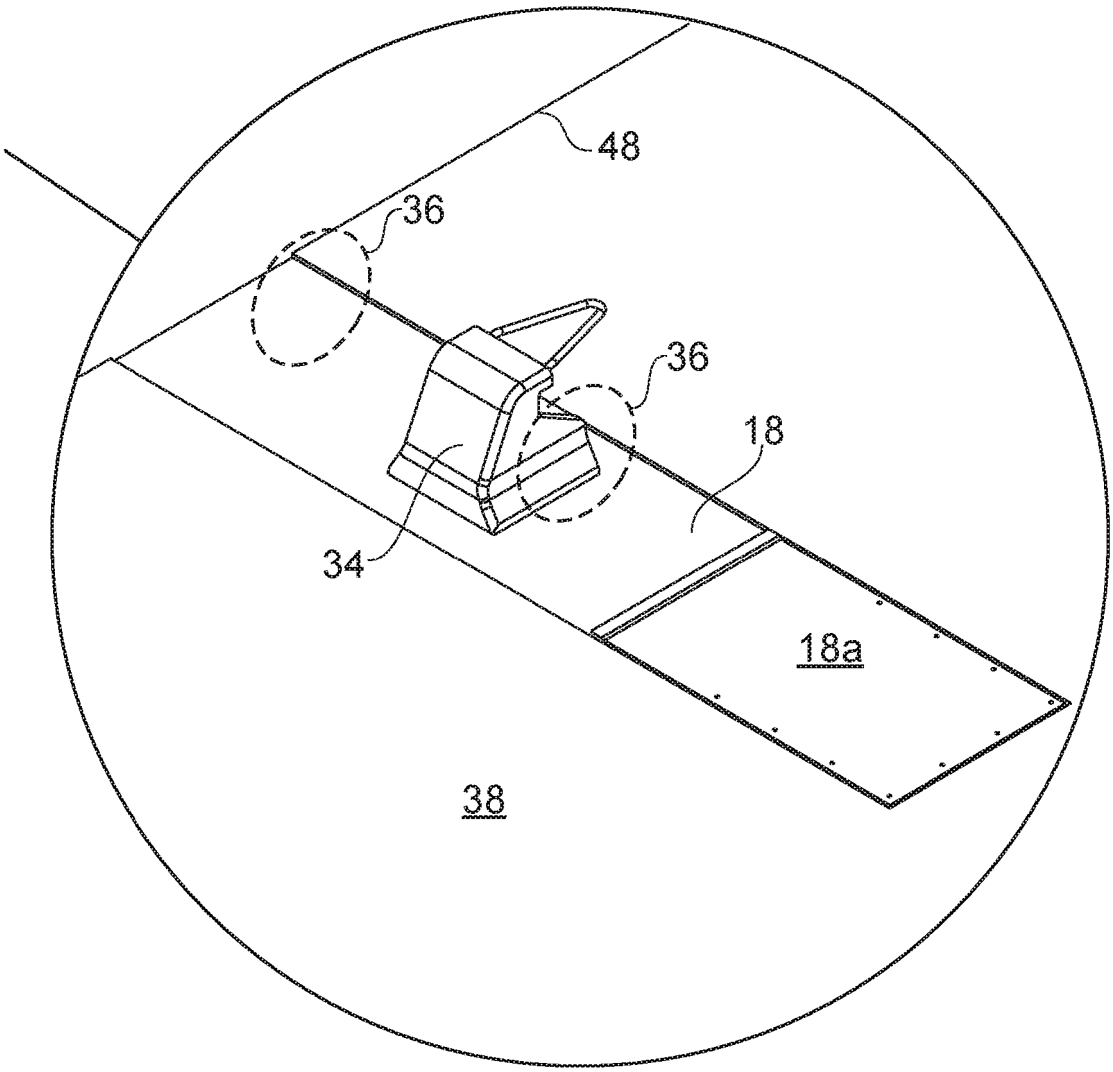

FIG. 2

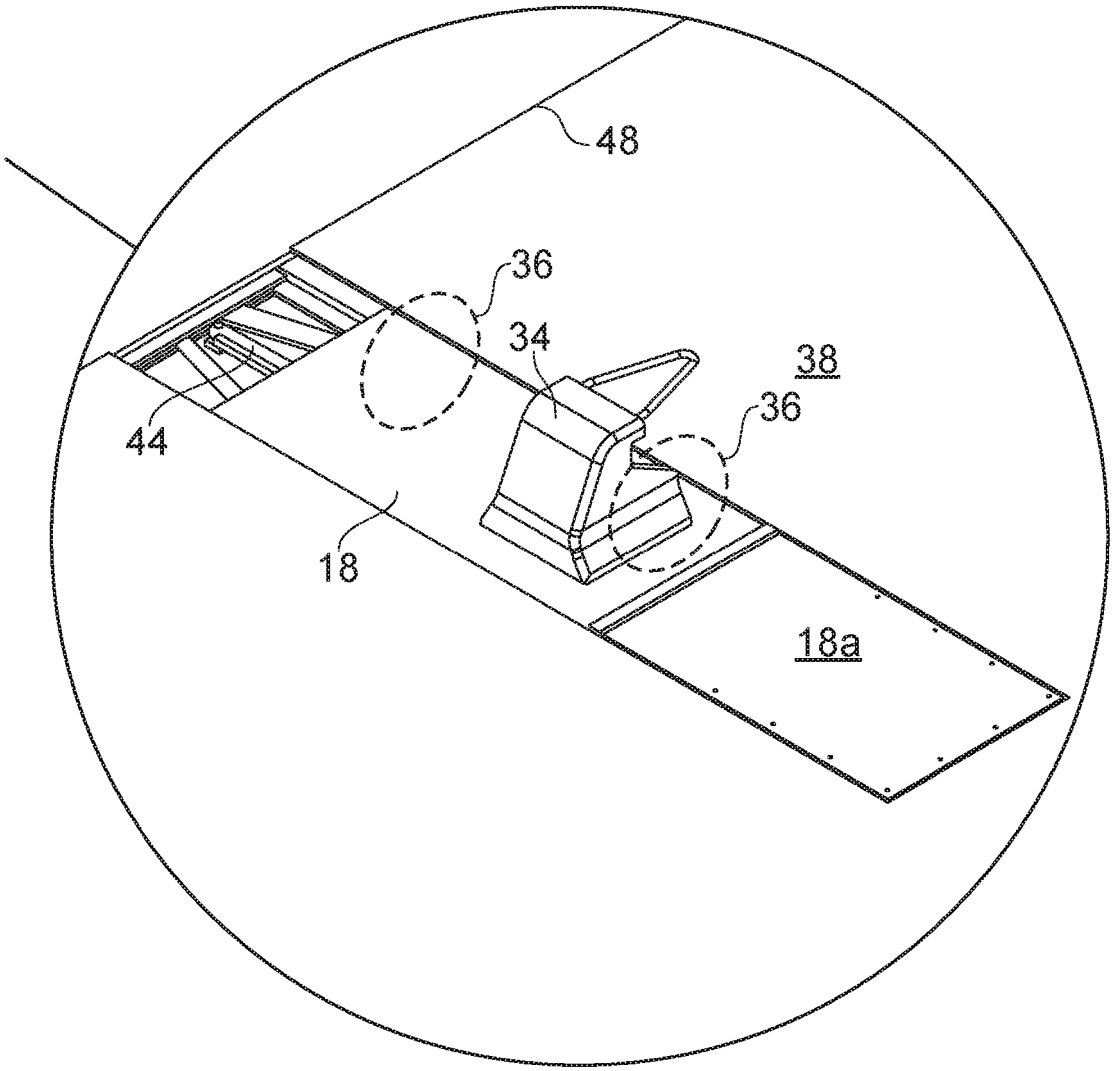

FIG. 3

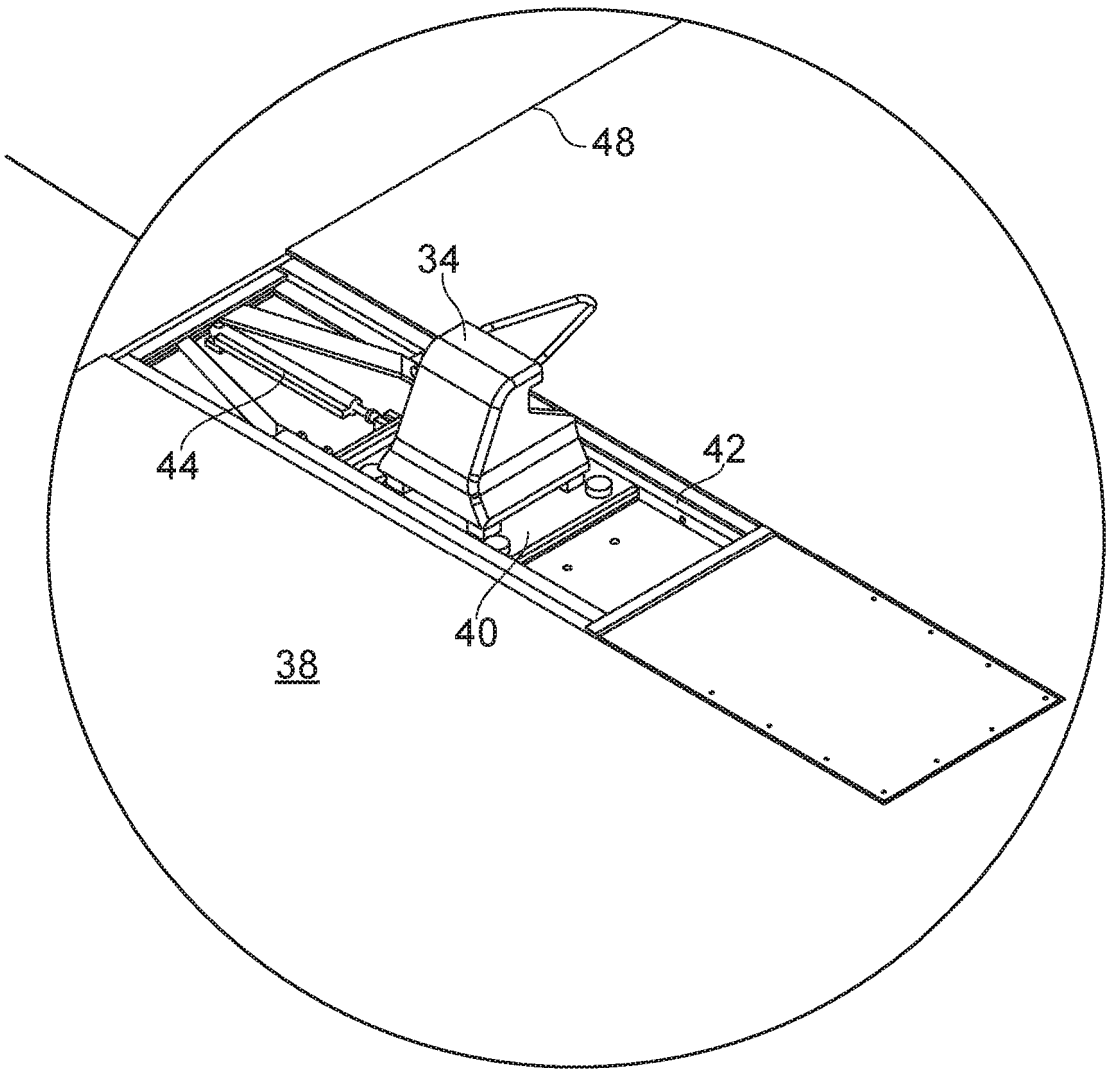

FIG. 4

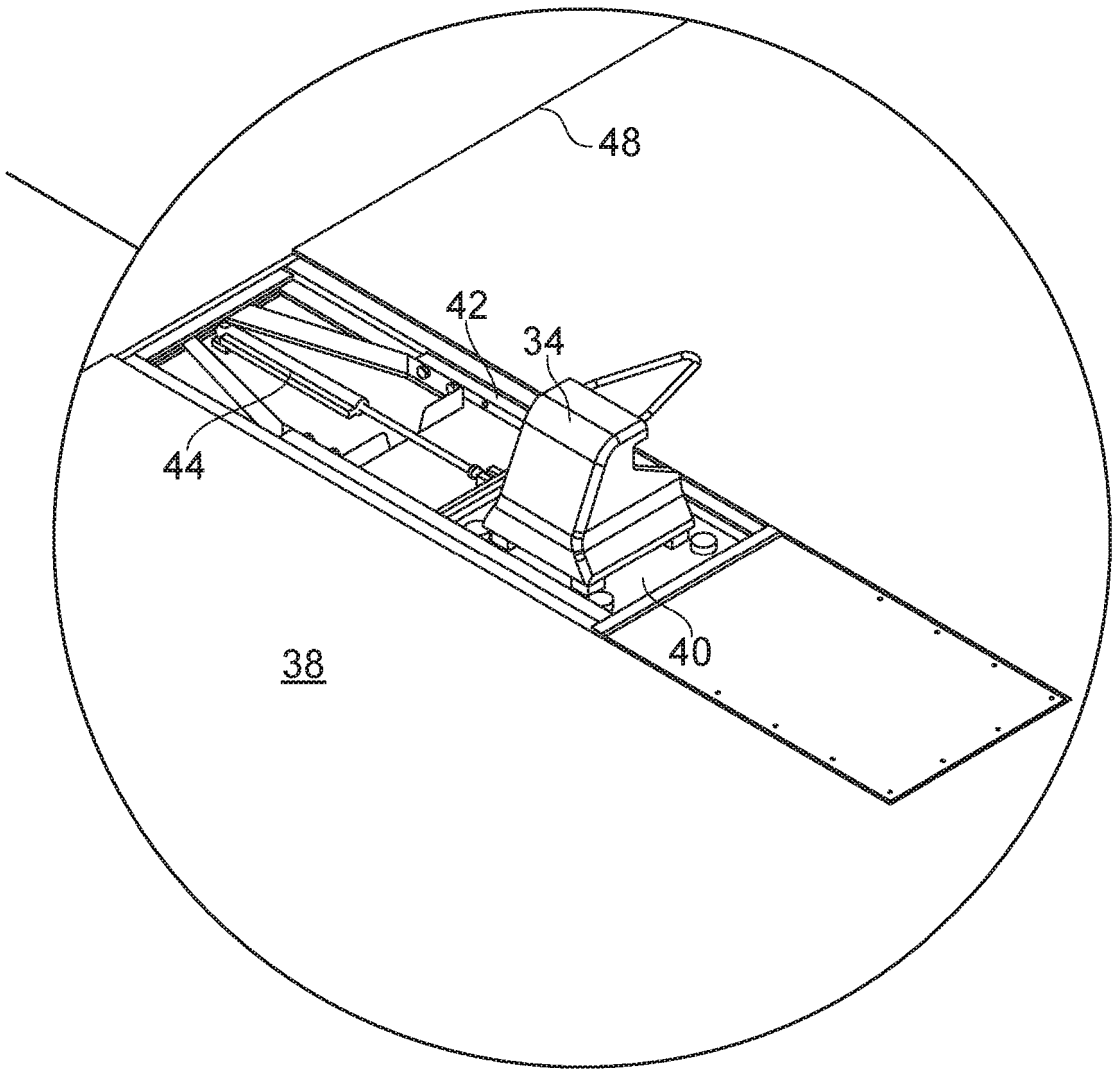

FIG. 5

Improvements in or relating to stretcher locking systems

The present invention concerns improvements in or relating to stretcher locking systems.

Stretcher locking systems are required, for example, when a patient is being transported by ambulance. The stretcher which bears the patient will occupy a patient transport compartment, usually at the rear of the vehicle, and will be locked to the floor of the patient transport compartment by a stretcher locking system. This ensures that the patient can safely be transported.

A patient being transported by ambulance will often be accompanied by a paramedic, doctor, nurse or other medical personnel who can provide appropriate care during the journey. However, once a stretcher has been locked in position, access to the appropriate body portion of the patient may be restricted by the locked position of the stretcher and the confines of the compartment. In other situations, the locked position of the stretcher may not be appropriate for the needs of the patient, particularly in the case of a large or bariatric patient.

Examples of the present invention provide a stretcher locking system, comprising:

a mounting arrangement which, in use, mounts a lock arrangement which is operable to hold a stretcher at a position defined by the position of the lock arrangement;

wherein the mounting arrangement defines a plurality of positions for a lock arrangement mounted on the mounting arrangement;

and further comprising an actuator arrangement operable to drive the mounting arrangement, in use, to move a lock arrangement between positions defined by the mounting arrangement and thereby to move a stretcher held by the lock arrangement between corresponding positions.

The system may further comprise a lock arrangement mounted on the mounting arrangement. There may be a plurality of mounting arrangements, each mounting a

respective lock arrangement, in use. There may be a plurality of actuator arrangements operable to drive respective mounting arrangements.

There may be at least one supporting surface to support a stretcher standing on the supporting surface or surfaces, during use. The supporting surface or surfaces may be mounted by the mounting arrangement or arrangements to be moved, in use, with a respective lock arrangement when the actuator arrangement drives the mounting arrangement.

The or each supporting surface may be at substantially the same level as the floor surrounding the system.

The system may comprise two supporting surfaces, the actuator arrangement being operable to coordinate movement of the supporting surfaces.

The actuator arrangement or arrangements may be operable to move the mounting arrangement or arrangements between a plurality of pre-set positions. The actuator arrangement may be manually triggered and operable, when triggered, to move the mounting arrangement or arrangements to another pre-set position. There may be two or more pre-set positions.

The actuator arrangement may comprise a user control. The user control may be located at the mounting arrangement or may be positioned remotely, for convenient manual access while a stretcher is held by a lock arrangement. The user control may comprise a button or footswitch.

The mounting arrangement may comprise a track corresponding with the or each lock arrangement mounted, in use, on the mounting arrangement and along which the corresponding lock arrangement is movable, in use, the track defining the positions available for the lock arrangement. The mounting arrangement may comprise a carriage which, in use, is captive along the track and on which the corresponding lock arrangement is mounted, in use. The actuator arrangement may comprise a linear actuator operable to drive the carriage along the track.

The actuator arrangement and the mounting arrangement may be located within a well in a floor surrounding the system.

The mounting arrangement and actuator arrangement may be operable, in use, to move a stretcher in a direction which is transverse to the length of the stretcher.

Examples of the present invention also provide an ambulance comprising:

a patient transport compartment to receive a stretcher bearing a patient; and

a stretcher locking system in accordance with any of the preceding definitions.

The mounting arrangement may mount the supporting surface or surfaces at substantially the same level as the floor of the compartment. The mounting arrangement may be housed in a well in the floor of the compartment.

The actuator arrangement may comprise a manually operable trigger positioned within the compartment at a height above the height of a stretcher.

Examples of the present invention will now be described in more detail, by way of example only, and with reference to the accompanying drawings, in which:

Fig 1 is a perspective view of an ambulance incorporating an example of the present invention, partly schematic and partly cut away;

Fig 2 is a perspective view of part of the floor of the passenger transport compartment of the ambulance of Fig 1, showing the arrangement in a first condition;

Fig 3 corresponds with Fig 2, showing the arrangement in a second condition; and

Fig 4 and Fig 5 correspond respectively with Fig 2 and Fig 3, showing the arrangement with supporting surfaces removed.

Fig 1 illustrates an ambulance 10 having a patient transport compartment 12 behind a cab 14 and having rear doors (not shown) to allow a stretcher bearing a patient to be loaded into or out from the compartment 12.

Within the patient transport compartment 12, the ambulance 10 is provided with a stretcher locking system indicated generally at 16. The system 16 has a mounting arrangement indicated generally at 24. In use, the mounting arrangement mounts a lock arrangement 22 which is operable to hold a stretcher at a position defined by the position of the lock arrangement 22. The mounting arrangement defines a plurality of positions for a lock arrangement 22 mounted on the mounting arrangement, as will be described. The system 16 further comprises an actuator arrangement 26 operable to drive the mounting arrangement 24, in use, to move a lock arrangement 22 between positions defined by the mounting arrangement 24 and thereby to move a stretcher 20 held by the lock arrangement 22 between corresponding positions.

First example

In the first example as illustrated in the drawings, the system 16 further comprises at least one supporting surface 18 to support a stretcher 20 standing on the supporting surface or surfaces 18, during use. In this example, there are two supporting surfaces 18. A lock arrangement 22 is operable, in use, to lock the stretcher 20 to the supporting surfaces 18. The mounting arrangement 24 also mounts the supporting surfaces 18, in use. This allows the supporting surfaces 18 to be moved, in use, with the lock arrangement 22. The mounting arrangement 24 defines a variety of positions for the supporting surfaces 18, as will be described. An actuator arrangement 26, only part of which is visible in Fig 1, is operable to drive the mounting arrangement and thus also to drive the lock arrangement 22 and the supporting surfaces 18 between positions defined by the mounting arrangement 24. A control arrangement indicated schematically at 28 forms part of the actuator arrangement 26 and is operable to cause the supporting surfaces 18 and the lock arrangement 22 to move between defined positions and to carry the stretcher 20 between corresponding positions, as will be described.

In this example, the patient transport compartment 12 is provided with a range of storage lockers (or other equipment or apparatus) 30 along one side wall 32.

The item 20, termed herein a "stretcher", provides a bed on wheels or castors, on which a patient may lie while being loaded into or out from the compartment 12, and during a journey in the ambulance 10. Many different designs of stretcher for ambulance use are well known. In some cases, the bed portion is detachable from a trolley or dolly portion; in other cases, these portions are not detachable. The legs, trolley or dolly of the stretcher may be collapsible, for example to assist in loading and unloading. It is to be understood that the term "stretcher" is not intended herein to be restricted to any one of these examples, but is intended to encompass all of them and equivalent alternatives. Similarly, the ambulance may be a road vehicle, rail vehicle, aircraft, mortuary ambulance, hearse, or any other vehicle used for carrying a live or deceased body on a stretcher or similar wheeled support.

Turning to Fig 2, one of the supporting surfaces 18 is shown. It is to be understood that the other supporting surface 18 and associated structures, particularly of the mounting arrangement 24, correspond with the structures now to be described, and are therefore not described separately, in the interests of brevity.

A lock mechanism 34 is mounted on the mounting arrangement 24 and will therefore move with the surface 18, as the surface 18 moves. When a stretcher 20 is loaded into the ambulance 10, two of the castors 36 of the stretcher 20 will stand on the surface 18, in this example. Conveniently, the castors 36 may be straddling the lock mechanism 34, to allow the stretcher 20 to be locked to the surface 18, by operation of the lock mechanism 34, but other relative positions are possible for the lock mechanism 34 and the castors 36. The design, construction and positioning of the lock mechanism 34 are only intended to be illustrative and will, in practice, depend on the design of the stretcher 20, to ensure that the stretcher 20 can be securely locked by engagement between the lock mechanism 34 and an appropriate part of the structure of the stretcher 20.

Fig 2 clearly illustrates that the upper face of the surface 18, on which the castors 36 rest, is at substantially the same level as the floor 38 of the compartment 12. This allows the castors 36 to roll onto the surface 18 from the floor 38, or off the surface 18 onto the floor 38, when the stretcher 20 is being loaded or unloaded.

The surface 18 is mounted on the mounting arrangement 24, to be described in more detail below. At this stage, it is appropriate to note that the mounting arrangement 24 provides a first position for the surface 18, illustrated in Fig 2, and a second position illustrated in Fig 3. Both of the surfaces 18 have corresponding first and second positions. The surface 18 slides under a fixed surface 18a as it moves to the second position of Fig 3.

Fig 4 and Fig 5 show the surface 18 removed to reveal the mounting arrangement 24. The mounting arrangement 24 is located within a well in the floor 38 and thus is below the level of the floor 38. A carriage 40 is captive along a track 42. The track 42 may cooperate with the carriage 40 by means of ballbearings or other bearing arrangements (not shown) in order to provide smooth movement of the carriage 40 along the track 42. The carriage 40 carries the lock mechanism 34 and normally also carries the supporting surface 18, so that the locking mechanism 34, surface 18 and carriage 40 will all move together as the carriage 40 moves along the track 42. Thus, the track 42 of the mounting arrangement 24 defines a plurality of positions for the surface 18. One of these positions is the first position (Fig 2 and Fig 4). Another position is the second position (Fig 3 and Fig 5). The carriage 40 and thus the surface 18 and the locking mechanism 34 can move through intermediate positions between the first and second positions, by movement of the carriage 40 along the track 42.

The position of the carriage 40 along the track 42, and thus the position of the surface 18 and the locking mechanism 34, is dictated by the actuator arrangement 26, which includes the control arrangement 28. The actuator arrangement 26 includes an actuator 44 for each of the carriages 40. The actuator 44 is a linear actuator, in this example, such as a hydraulic or pneumatic cylinder. The actuator 44 is able to extend or retract in order to push or pull the carriage 40 along the track 42.

Activation of the actuator 44 is provided by the control arrangement 28, which includes a manually operable trigger 46. In this example, the trigger 46 is positioned within the compartment 12 at a height above the height of a stretcher, so that the trigger 46 remains conveniently accessible to ambulance personnel at all times. In particular, it is not necessary for personnel to reach down to floor level in order to

operate the trigger 46. The trigger could be positioned at other positions. The trigger could be a button or switch to be operated by hand, a footswitch or another form of trigger device. When the trigger 46 is operated, a signal is sent to the control arrangement 28 to cause the actuator 44 to be activated, thus causing the carriage 40 to be moved and thus causing the surface 18 to move. This movement will carry with it the stretcher 20, when locked to the surface 18 by the locking mechanism 34.

There may be more than one trigger 46, at respective convenient positions, any one of which can be used as just described.

The control arrangement 28 activates the actuators 44 of both surfaces 18, in such a way as to coordinate movement of the surfaces 18, keeping them aligned.

The actuator 44 provides pre-set positions for the surface 18, in this example. In this example, two pre-set positions are provided, namely the first position and the second position as described above. The pre-set nature of these positions can be achieved by providing appropriate position switches, limit switches or other sensors (not shown). Thus, the arrival of the carriage 40 at one of the pre-set positions is detected by the control arrangement 28 or otherwise, to cause the activator 44 to be deactivated. In this example, a single operation of the trigger 46, which may require only a brief activation of the trigger 46, will result in the surface 18 being moved from the first position to the second position, or from the second position to the first position. Correct positioning of the surface 18 at one or other of the positions is assured by the pre-set nature of the positions. Accordingly, ambulance personnel can reliably reposition the stretcher 20 by simply operating the trigger 46. The surface 18 will then move to and be locked in the new position without any manual intervention from the personnel. This provides simplicity and convenience for the personnel. Manual intervention with mechanisms at floor level is not required, which may convey advantages in relation to hygiene, contamination etc. The movement carries the stretcher 20 in a direction which is transverse to the length of the stretcher 20. The surface 18 can be moved when loaded with a stretcher or beforehand, in preparation for a stretcher to be loaded.

In this example, the first position for the surface 18 is relatively close to the sidewall 32 and corresponds with a standard stretcher configuration. Proximity between the stretcher 20 and the lockers 30 may restrict access along one side of the stretcher 20. Alternatively, the stretcher 20 may be too close to the lockers 30 for comfortable or safe accommodation of a large or bariatric patient, and will not allow sufficient room for ambulance personnel to be positioned in this area, thus restricting access to one side of the patient. In that case, the trigger 46 can be used to move the surface 18 to the second position, thus moving the stretcher 20 away from the lockers 30. This provides better access to a patient, between the stretcher 20 and the lockers 30, or provides more space between the stretcher 20 and the lockers 30 for accommodation of a patient, particularly a large or bariatric patient. The trigger 46 can also be used to move the surface 18 back toward the lockers 30, if desired.

The surface 18 can be provided as a plate or sheet member, such as a metal sheet set into the well to have an upper face at the same level as the floor 38, or overlapping the edges of the floor 38, adjacent the well, so that the edges of the sheet slide across the floor 38. In the latter case, the face of the surface 18 will be slightly higher than the face of the floor 38 but using suitably thin metal sheet will ensure that no noticeable step is created to interfere with movement of the castors 36 from the floor 38 onto the surface 18, or from the surface 18 onto the floor 38.

The drawings indicate that when the surface 18 moves to the second position, part of the mounting arrangement 24 is exposed. However, this part is adjacent the edge 48 of the floor 38 and although no longer covered by the surface 18, will remain covered by the presence of the lockers or other equipment 30. Thus, exposure of this part of the mounting arrangement 24 is not expected to create any additional hazard, such as a tripping hazard.

Second example

A second example (not illustrated) differs from the illustrated example primarily by omitting the use of movable surfaces 18 on which the stretcher stands, and which move with the lock mechanisms 34. In this second example, the stretcher castors 36 stand on the conventional floor of the compartment 12 and the stretcher is locked

down by engagement with the lock mechanisms 34. The lock mechanisms 34 can be moved in the manner described above in relation to the first example. As the lock mechanisms 34 are moved, a stretcher 20 which is held by the lock mechanisms 34 will also be pulled across the floor of the compartment 12. The use of castors 36, which is common in many stretcher designs, assists in allowing this movement. Thus, in this second example, the stretcher 20 does not stand on a moving surface, but is pulled across a static surface by movement of the lock mechanisms 34 relative to that surface. It will be readily understood that if the stretcher 20 has fixed wheels rather than castors, the use of a moving surface such as that described above in relation to the first example, would be more appropriate.

Many variations and modifications to the apparatus described above can be made without departing from the scope of the invention. Many different mechanisms could be devised for locking the stretcher 20 to the surface 18, as has been indicated. Many different forms and techniques could be used for the mounting arrangement and actuator arrangement in order to move the surface 18 in the manner described. Many different technologies could be used for the control arrangement and trigger mechanism.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

CLAIMS

1. A stretcher locking system, comprising:

a mounting arrangement which, in use, mounts a lock arrangement which is operable to hold a stretcher at a position defined by the position of the lock arrangement;

wherein the mounting arrangement defines a plurality of positions for a lock arrangement mounted on the mounting arrangement;

and further comprising an actuator arrangement operable to drive the mounting arrangement, in use, to move a lock arrangement between positions defined by the mounting arrangement and thereby to move a stretcher held by the lock arrangement between corresponding positions.

2. A system according to claim 1, further comprising a lock arrangement mounted on the mounting arrangement.

3. A system according to claim 2, there being a plurality of mounting arrangements, each mounting a respective lock arrangement, in use.

4. A system according to claim 2 or 3, there being a plurality of actuator arrangements operable to drive respective mounting arrangements.

5. A system according to any preceding claim, there being at least one supporting surface to support a stretcher standing on the supporting surface or surfaces, during use.

6. A system according to claim 5, wherein the supporting surface or surfaces is or are mounted by the mounting arrangement or arrangements to be moved, in use, with a respective lock arrangement when the actuator arrangement drives the mounting arrangement.

7. A system according to claim 5 or 6, wherein the or each supporting surface is at substantially the same level as the floor surrounding the system.

8. A system according to any of claims 5 to 7, comprising two supporting surfaces, the actuator arrangement being operable to coordinate movement of the supporting surfaces.

9. A system according to any preceding claim, wherein the actuator arrangement or arrangements are operable to move the mounting arrangement or arrangements between a plurality of pre-set positions.

10. A system according to claim 9, wherein the actuator arrangement are manually triggerable and operable, when triggered, to move the mounting arrangement or arrangements to another pre-set position.

11. A system according to claim 9 or 10, there being two or more pre-set positions.

12. A system according to any preceding claim, wherein the actuator arrangement comprises a user control.

13. A system according to claim 12, wherein the user control is located at the mounting arrangement.

14. A system according to claim 12, wherein the user control is positioned remotely of the mounting arrangement, for convenient manual access while a stretcher is held by a lock arrangement.

15. A system according to claim 12, 13 or 14, wherein the user control comprises a button or footswitch.

16. A system according to any preceding claim, wherein the mounting arrangement comprises a track corresponding with the or each lock arrangement mounted, in use, on the mounting arrangement and along which the corresponding lock arrangement is movable, in use, the track defining the positions available for the lock arrangement.

17. A system according to claim 16, wherein the mounting arrangement comprises a carriage which, in use, is captive along the track and on which the corresponding lock arrangement is mounted, in use.

18. A system according to claim 16 or 17, wherein the actuator arrangement comprises a linear actuator operable to drive the carriage along the track.

19. A system according to any preceding claim, wherein the actuator arrangement and the mounting arrangement are located within a well in a floor surrounding the system.

20. A system according to any preceding claim, wherein the mounting arrangement and actuator arrangement are operable, in use, to move a stretcher in a direction which is transverse to the length of the stretcher.

21. A stretcher locking system substantially as described above, with reference to the accompanying drawings.

22. An ambulance comprising:
a patient transport compartment to receive a stretcher bearing a patient; and
a stretcher locking system in accordance with any of claims 1 to 21.

23. An ambulance according to claim 22, wherein the mounting arrangement mounts the supporting surface or surfaces at substantially the same level as the floor of the compartment.

24. An ambulance according to claim 22 or 23, wherein the mounting arrangement is housed in a well in the floor of the compartment.

25. An ambulance according to claim 22, 23 or 24, wherein the actuator arrangement comprises a manually operable trigger positioned within the compartment at a height above the height of a stretcher.

26. An ambulance substantially as described above, with reference to the accompanying drawings.

27. Any novel subject matter or combination including novel subject matter disclosed herein, whether or not within the scope of or relating to the same invention as any of the preceding claims.

Intellectual Property Office

Application No:	GB1422306.9	**Examiner:**	Mr David McWhirter
Claims searched:	1-26	**Date of search:**	12 May 2016

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-4, 9-12, 14-17, 22 & 25	US 3605136 A (VICHNESS) see whole document
A	None	IE 199400320 A2 (REILLY ROYALTIES LTD) see page 5 lines 12-20

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A61G

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
None		