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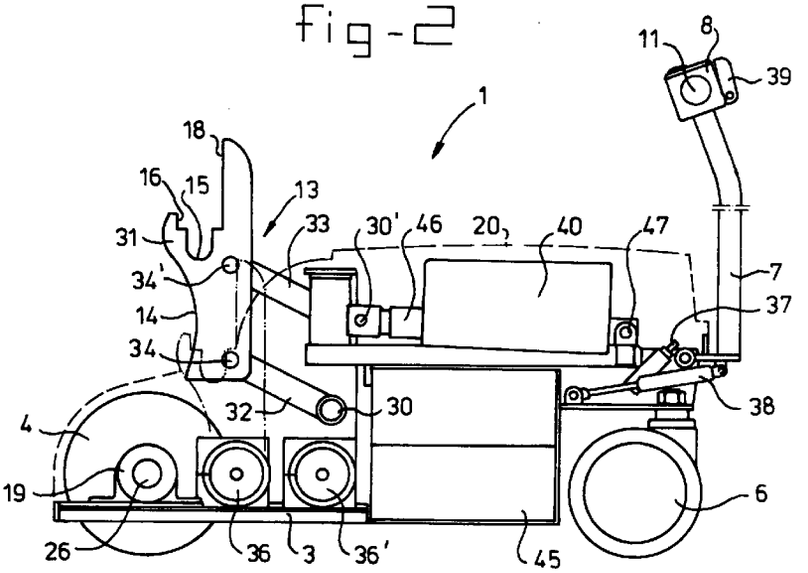
(54) Mobile lifting device

(57) The invention relates to a mobile lifting device (1) for moving objects (2) which are movable on wheels or for moving persons seated on a chair. The lifting device (1) is provided with a frame (3) with electrically driven drive wheels (4,5) , a pivotable steering wheel (6) and a steering rod (7) connected to the frame (3). The lifting device (1) comprises a lifting unit (13) having a claw-shaped element (14) or a coupling element having a stroke of between 10 and 30 cm. The claw-shaped element (14) can be brought into direct engagement with an object (2) to be moved. In the case where a coupling element is provided, an attachment (52), which interacts with the object (2) to be moved, is first fitted thereon. By lifting one side of an object (2) placed on wheels (17,17') so that at least one wheel (17) of the object remains in contact with the ground, said object (2) can be moved and manoeuvred in a simple manner. By placing a, preferably detachable, attachment (32) on the lifting unit (13), the lifting device (1) can be equipped for lifting and moving a chair and a person seated thereon.

Fig-2



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Description

The invention relates to a mobile lifting device for moving objects which are movable on wheels. The invention also relates to a device for moving a person seated on a chair.

Devices for moving relatively heavy objects, comprising a mobile frame and a lifting device mounted thereon, are known. The known devices frequently comprise an arm which can be introduced under an object to be moved, after which said arm is raised mechanically or hydraulically so that the object in its entirety comes away from the ground. The device, together with the object, is then moved to the desired position, during which operation the wheels of the lifted object are not effective. The disadvantage of the known devices is that these have to have a lifting device with a relatively long stroke in order to raise the objects to be moved off the ground. Furthermore, the lifting mechanism has to be of relatively powerful construction in order to raise the heavy objects in their entirety.

One aim of the present invention is to provide a lifting device with which relatively heavy objects can be moved in a simple manner. A further aim of the invention is to provide a lifting device which is relatively small and easy to operate and with which relatively heavy objects can be transported quietly with little effort.

To this end, a mobile lifting device according to the invention is characterised in that the lifting device comprises:

- a frame, which is movable over a floor or other surface and has two drive wheels and one steering wheel,
- a steering rod, hingeably connected to the frame, comprising a handle, positioned transversely on one end of the steering rod, for operation and steering of the lifting device by an operator walking behind the device,
- an electric drive for turning the drive wheels, which drive can be operated from the handle,
- a lifting unit which is at a distance of between 5 cm and 50 cm away from the floor and has at least one claw-shaped element comprising a lifting surface, a pulling surface positioned transversely to the lifting surface, and a pushing surface for engaging on an object to be moved, the lifting unit being movable over a distance of between 10 cm and 50 cm in a vertical direction transverse to the floor.

As a result of the relatively small stroke of the lifting unit, the parts of the object to be moved which are located close to the lifting unit can be raised over a relatively small distance, whilst the wheel or the wheels of the object which are located some distance away from the lifting unit remain in contact with the ground. In this way, the object to be moved is brought into a position where on one side it rests on one or more of its own wheels and on the other side it rests on the steerable lifting and pulling device, as a result of which the object can be moved in a simple manner and manoeuvred into a desired position. The object to be moved can be, for example, a hospital bed which is mounted on four wheels. Beds of this type are heavy and in general difficult to manoeuvre, despite the fact that the beds are provided with swivel castors. By using the lifting device according to the invention, two wheels of the bed are raised from the ground and thus rendered inoperative. As a result, the bed can be moved in a simple manner by moving it on its rear wheels and it can be manoeuvred into the correct position without unnecessary effort. By making use of the lifting device according to the invention, it would be possible to dispense with two wheels per hospital bed.

The device according to the invention is also suitable for moving objects other than beds, such as, for example, containers, having two or more wheels.

The invention also relates to a lifting device of the abovementioned type in which the lifting unit is constructed as a coupling element and an attachment which is detachably connected to the coupling element without the use of tools. The coupling element can, for example, comprise one or more pins over which the attachment, such as, for example, a claw-shaped element or a supporting element of some other shape which is provided with matching sleeves, can be slid.

The invention also relates to a mobile lifting device for moving a person seated on a chair, characterised in that the device comprises:

- a frame which is movable over a floor and has two drive wheels and one steering wheel,
- a steering rod, hingeably connected to the frame, comprising a handle, positioned transversely on one end of the steering rod, for operation and steering of the lifting and pulling device by an operator walking behind the device,
- an electric drive for turning the drive wheels, which drive can be operated from the handle,
- a lifting unit which is at a distance of between 20 cm and 50 cm away from the floor, comprising two arms located parallel to the floor, which arms extend above the frame to engage on a seat of a chair.

The mobile lifting device according to the invention can be moved beneath a chair, after which the lifting unit is made to engage on the underside of the seat. The chair is raised a number of centimetres from the floor, after which the chair and the person seated thereon can be moved in a simple manner. The lifting unit is preferably provided with a footrest to support the feet of a person seated on the lifted chair. This prevents the feet of the person coming into contact with the floor when the chair is moved and the person can be moved with a small stroke of the lifting unit.

Preferably, the lifting and pulling device according to the invention comprises three wheels, the steering

wheel being located on a perpendicular bisector of the axle of the drive wheels. The steering wheel can be operated by lateral movement of the steering rod. In this way a very small turning circle of the device can be obtained. Preferably, the steering wheel is pivotably connected to the frame and the steering rod is rigidly connected to the frame.

In a further embodiment of the mobile lifting device according to the invention, the vertical arm of the lifting device is connected to two parallel drive arms, an upper drive arm of which is hingeably connected to a horizontally movable drive element. A second end of the lower drive arm is hingeably connected to the frame of the lifting device. In this way a compact and efficient lifting device is obtained which has a relatively small stroke.

Preferably, the lifting device comprises a switch for interrupting the drive for the drive wheels. The switch is actuated when the steering arm is in a furthest vertical position. The steering arm is connected to the frame via a resilient element which pulls said steering arm into the vertical position as soon as the steering rod is released by an operator.

Furthermore, the handle of the steering rod can have a push-bar switch located close to the centre of the handle. It may happen that when the lifting device is in motion the steering rod becomes trapped below the waist of the operator and can no longer be brought into the vertical position and thus the device can no longer be switched off. In this case the lifting device is immediately deactivated by means of the push-bar switch on the handle of the steering rod. Preferably, both the drive for the wheels and the drive for the lifting unit are electric and the device is provided with a rechargeable battery, preferably 4 rechargeable batteries.

In a further embodiment of a mobile lifting device according to the invention, a number of attachments are provided which can be attached to the lifting unit to engage on different objects. No tools are needed to connect the attachments. By using the attachments, a large number of different objects, such as mobile beds, mobile containers, food trolleys, order trucks in warehouses, sterilisation trolleys, chairs, mobile pallets and the like, can be moved by a single lifting device according to the invention. By using an attachment with a support wheel it is also possible to move objects which themselves do not have any wheels.

A few embodiments of a lifting device according to the invention will be explained in more detail with reference to the appended drawing. In the drawing:

Figure 1 shows a side view of a lifting device according to the invention when moving a hospital bed,

Figure 2 shows a side view of a lifting device according to the invention,

Figure 3 shows a top view of the lifting device in Figure 2,

Figure 4 shows a side view of a lifting device comprising a lifting unit for lifting a person seated on a chair,

Figures 5 and 6 show an embodiment of an attachment which can be attached, without the use of tools, to the lifting unit of a lifting device according to the invention to adapt the device to different geometries of the objects to be moved, and

Figure 7 shows an attachment with an additional support wheel.

Figure 1 shows a mobile lifting device 1 comprising a frame 3 having two drive wheels 4 and a steering wheel 6. A steering rod 7 is connected to the frame 3 and has a handle 11. A lifting unit 13 with, for example, a claw-shaped element 14 is located at the front of the lifting device 1. The claw-shaped element 14 can be brought into contact with, for example, the frame of a hospital bed 2 mounted on wheels 17, 17'. As shown in Figure 2, the lifting unit 13 comprises a lifting surface 15, a pulling surface 16 and a pushing surface 18. The lifting unit 13 can be moved up and down by operating the handle 11. The lifting device 1 is moved under the frame of the bed 2 with the lifting unit 13 in a lowest position, in which position said unit is at a distance of about at least 5 cm away from the floor 9. The lifting surface 15 is then brought into contact with the frame of the bed 2 and the frame is raised a few centimetres from the ground. As a result the front wheels 17' are raised from the floor 9, whilst the rear wheels 17 remain resting on the floor. The wheels of the lifting device are electrically driven to move forward or in reverse by operation of the handle 11 by an operator 10. This causes the pushing surface 18 or the pulling surface 16 to come into contact with the frame of the bed 2 and said bed is moved over the floor 9, easily steerable in the forward or reverse direction. The effort required on the part of the operator 10 for this operation is restricted to steering of the bed as it is pulled along, which steering can be effected by lateral movement of the steering rod 7.

Once the bed 2 has arrived at the desired position, the lifting unit 13 is moved downwards so that the frame of the bed comes free from the claw-shaped element 14. The lifting device is then moved away from under the bed. One embodiment of the lifting device 1 is approximately 70 cm long, 40 cm wide (the width direction is perpendicular to the plane of the drawing in Figure 1) and has a maximum height of about 30 cm. In a preferred embodiment, the stroke of the lifting unit 13 is about 11.5 cm. The drive wheels 4 of the lifting device 1 are driven by two electric motors, which are powered by a battery, with battery charger, incorporated in the lifting device. A maximum speed of about 5 km per hour can be reached, with a maximum pulling force of about 750 kg.

In place of a claw-shaped element 14, the lifting unit 13 can also have, for example, two vertical pins with a rectangular, circular or polygonal cross-section. Using these pins various attachments can be connected which are provided with sleeves which fit over the pins and which can be slid over the pins in a simple manner.

Preferably, the lifting unit 13 is likewise driven by an electrically powered drive unit with which a load of up to 400 kg can be lifted over a distance of between 10 cm and 50 cm. In many cases it is possible to move the objects mounted on wheels which have to be moved by moving the lifting unit 13 just a few centimetres.

Figure 2 shows a side view of an embodiment of the lifting device according to the invention. In this figure the steering rod 7 is shown in a shortened version. The lifting device 1 comprises two drive wheels 4 which are rotatable about an axle 26 which is located perpendicular to the plane of the drawing, which axle 26 is rotatably mounted in a bearing 19. A steering wheel 6 is located on the perpendicular bisector of the axle 26. The steering wheel 6 is connected to the frame 3 such that it is rotatable about a vertical shaft and can be operated by moving steering rod 7 in a direction which is perpendicular to the plane of the drawing in Figure 2. Each of the wheels 4 and 5 is driven by an electric motor 36, 36'. The motors 36, 36' are 24 V DC motors which are continuously variable and move the lifting device at a maximum speed of 5 km/h. Each motor 36, 36' is equipped with a planetary reduction mechanism, so that the speed can be adjusted to a low speed range for manoeuvring the lifting device by the operator and can be adjusted to the high speed range for moving the lifting device.

The motors 36, 36' are powered by a battery set 45. The battery set 45 comprises four 12 V batteries rated at 18 A hours. Motors 36, 36' drive the wheels 4 and 5 in a forward or reverse direction over the floor 9 in response to rotation of a handle 11 by the operator in a direction away from the operator or towards the operator.

The claw-shaped element 14 of the lifting unit 13 comprises a vertical arm 31 which is connected at two hinge points 34, 34' to an upper drive arm 33 and a lower drive arm 32. Instead of being constructed with a claw-shaped element 14, the lifting unit 13 can be constructed as one or more flattened vertical tubes over which a separate attachment, such as a claw-shaped element, can be placed. This is shown diagrammatically in Figure 6.

One end of the upper drive arm 33 is hingeably connected at a hinge point 30' to electric lifting motor 40. The lower drive arm 32 is connected to the frame 3 at hinge point 30. By sliding out a rod 46, the claw-shaped element 14 is moved downward into a position which is indicated by a broken line. A rear of the lifting motor 40 is connected at a hinge point 47 so that the position of the lifting motor can vary when the rod 46 slides out. In this way a powerful vertical lifting movement can be obtained with a relatively short horizontal stroke of the lifting motor 40. A suitable lifting motor 40 is a 24 V DC motor with a permanent magnet, such as is manufactured by LINAK under model number Model LA28.

One end of the steering rod 7 is connected to a gas spring 38 so that the steering rod is pulled into a vertical position by the gas spring. When it reaches this position the steering rod 7 actuates a switch 37 which interrupts the power supply to the motors 36, 36'. As a result, the lifting device 1 is not able to move on its own after the steering rod 7 has been released by an operator.

A control panel 8 is located on the handle 11 of the steering rod 7. Control buttons for moving the lifting unit 13 are accommodated on this panel. A push-bar switch 39 is accommodated on an operator side of the control panel 8, which push-bar switch 39 extends over virtually the entire width, located transverse to the plane of the drawing, of the control panel 8 (about 20 cm). Pressing push-bar switch 39 interrupts the power supply from the battery 45 to the motors 36, 36'. This prevents the operator from becoming trapped by the control rod 7 of the moving lifting device when the lifting device 1 is reversing.

The lifting device 1 is covered by a plastic protective cover 20, for example a cover made of ABS-APDF material.

Figure 3 shows a top view of the lifting device 1 in Figure 2. The motors 36, 36' are connected via a chain to the axle 26. A battery charger 29 and a control box 49 are accommodated on either side of the lifting motor 40. The control box 49 contains a 24 V electronic voltage control, a 30 A thermal fuse for each motor 36, 36' and a 5 A thermal fuse for the lifting motor 40.

Figure 4 shows a mobile lifting device in which a detachable attachment 52 has been placed in the claw-shaped elements 14 of the lifting unit 13. The attachment 52 comprises two parallel arms 54, only one arm of which is visible in the side view in Figure 4, which arms can be brought into contact with an underside of a chair. In this way a chair and the person seated thereon can be lifted from the ground and transported. During transportation, the feet of the person seated on the chair rest on the footrest 25 of the attachment 52.

Figures 5 and 6 show a separate attachment 52, which can have a number of different shapes, for attachment to the lifting unit 13, without tools being required for this. By using attachments such as those shown in Figures 5 and 6, the lifting device can be adapted to different geometries of objects to be moved, which objects can be mobile pallets, food trolleys, linen trolleys, waste containers, sterilisation trolleys, order trucks in warehouses, etc.

Figure 7 shows an attachment 52 which has an extendable support wheel 55. The support wheel 55 allows relatively heavy objects to be transported on two arms 54, only one arm of which is visible in the side view in Figure 7, which objects do not have any wheels permanently attached to such an object. The support wheel 55 acts as a running wheel for the objects and prevents the lifting device from tipping forwards when lifting and moving the objects. As is shown in Figure 7, the wheel 55 is mounted in a sleeve 56 and can slide therein in the vertical direction. A steel cable 58 is attached to a top of the wheel suspension 57 and drops down in a vertical channel which extends over the entire length of the sleeve 56.

The cable 58 is fed via a guide 61 to a bracket 59 which is attached to a front of the frame 3. The cable end 60 is attached to the arms 54. When the attachment 52 is lifted by the lifting unit 13, the cable 58 is tensioned and the support wheel 55 is pressed onto the floor 9. By this means relatively heavy objects can be lifted and moved using an arm which is relatively long compared with the lifting unit 13.

Claims

1. Mobile lifting device (1) for moving objects (2) which are movable on wheels, characterised in that the device comprises:

   - a frame (3), which is movable over a floor or other surface and has two drive wheels (4, 5) and one steering wheel (6),
   - a steering rod (7), hingeably connected to the frame (3), comprising a handle (11), positioned transversely on one end of the steering rod (7), for operation and steering of the lifting device by an operator walking behind the device,
   - an electric drive (36, 36') for turning the drive wheels (4, 5), which drive can be operated from the handle (11),
   - a lifting unit (13) which is at a distance of between 5 cm and 50 cm away from the floor (9) and has at least one claw-shaped element (14) comprising a lifting surface (15), a pulling surface (16) positioned transversely to the lifting surface, and a pushing surface (18) for engaging on an object to be moved, the lifting unit (13) being movable over a distance of between 10 cm and 50 cm in a vertical direction transverse to the floor.

2. Mobile lifting device (1) according to Claim 1, characterised in that the device has at least one attachment (52) which can be detachably attached, without the use of tools, to the lifting unit (13), for lifting different objects.

3. Mobile lifting device (1) for moving objects (2) which are movable on wheels, characterised in that the device comprises:

   - a frame (3) which is movable over a floor or other surface and has two drive wheels (4, 5) and one steering wheel (6),
   - a steering rod (7), hingeably connected to the frame (3), comprising a handle (11), positioned transversely on one end of the steering rod (7), for operation and steering of the lifting device by an operator walking behind the device,
   - an electric drive (36, 36') for turning the drive wheels (4, 5), which drive can be operated from the handle (11),
   - a lifting unit (13) which is at a distance of between 5 cm and 50 cm away from the floor (9), wherein the lifting unit comprises a coupling element firmly connected to the lifting device and an attachment (52) which is detachable from the coupling element and can be detachably coupled, without the use of tools, to the coupling element for lifting different objects.

4. Mobile lifting device (1) for moving a person seated on a chair, characterised in that the device comprises:

   - a frame (3) which is movable over a floor or other surface and has two drive wheels (4, 5) and one steering wheel (6),
   - a steering rod (7), hingeably connected to the frame (3), comprising a handle (11), positioned transversely on one end of the steering rod (7), for operation and steering of the lifting device by an operator walking behind the device,
   - an electric drive (36, 36') for turning the drive wheels (4, 5), which drive can be operated from the handle,
   - a lifting unit (13) which is at a distance of between 20 cm and 50 cm away from the floor (9), comprising two arms (54) located parallel to the floor (9), which arms (54) extend above the frame to engage on a seat of a chair.

5. Mobile lifting device (1) according to Claim 4, characterised in that the lifting unit (13) is provided with a footrest (25) for supporting the feet of a person seated on a lifted chair.

6. Mobile lifting device (1) according to one of the preceding claims, characterised in that the lifting device has three wheels (4, 5, 6), wherein the steering wheel (6) is located on a perpendicular bisector of the axles (26) of the drive wheels (4, 5), is rotatable about a shaft oriented transversely to the floor and can be swivelled by lateral movement of the control rod (7).

7. Mobile lifting device (1) according to one of the preceding claims, characterised in that the lifting device has at least one vertical arm (31) which is provided at one end with a claw-shaped element (14) comprising a lifting surface (15), a pulling surface (16), positioned transversely to the lifting surface, and a pushing surface (18), for engaging on an object to be moved.

8. Mobile lifting device (1) according to one of the preceding claims, characterised in that the vertical arm (31) is connected to two parallel drive arms (32, 33), each of which is connected by a first end, at a hinge point (34, 34'), located on the vertical arm (31), to the vertical arm, wherein a second end of the upper drive arm (33) is hingeably connected to

a horizontally movable drive element (40, 46), and wherein a second end of the lower drive arm (32) is hingeably connected to the frame (3).

9. Mobile lifting device (1) according to one of the preceding claims, characterised in that the device has a switch (37) for interrupting the drive to the drive wheels (4, 5), and wherein the steering arm (7) is connected via a resilient element (39) to the frame (3) so that, when it is released, the steering arm (7) is in a virtually vertical position and actuates the switch (37).

10. Mobile lifting device (1) according to one of the preceding claims, characterised in that the handle (11) has a push-bar switch (39), located close to the centre of the handle, for interrupting the drive to the drive wheels when said switch comes into contact with the body of the operator.

11. Mobile lifting device (1) according to one of the preceding claims, characterised in that the lifting device is connected to an electric lifting motor (40).

Fig-1

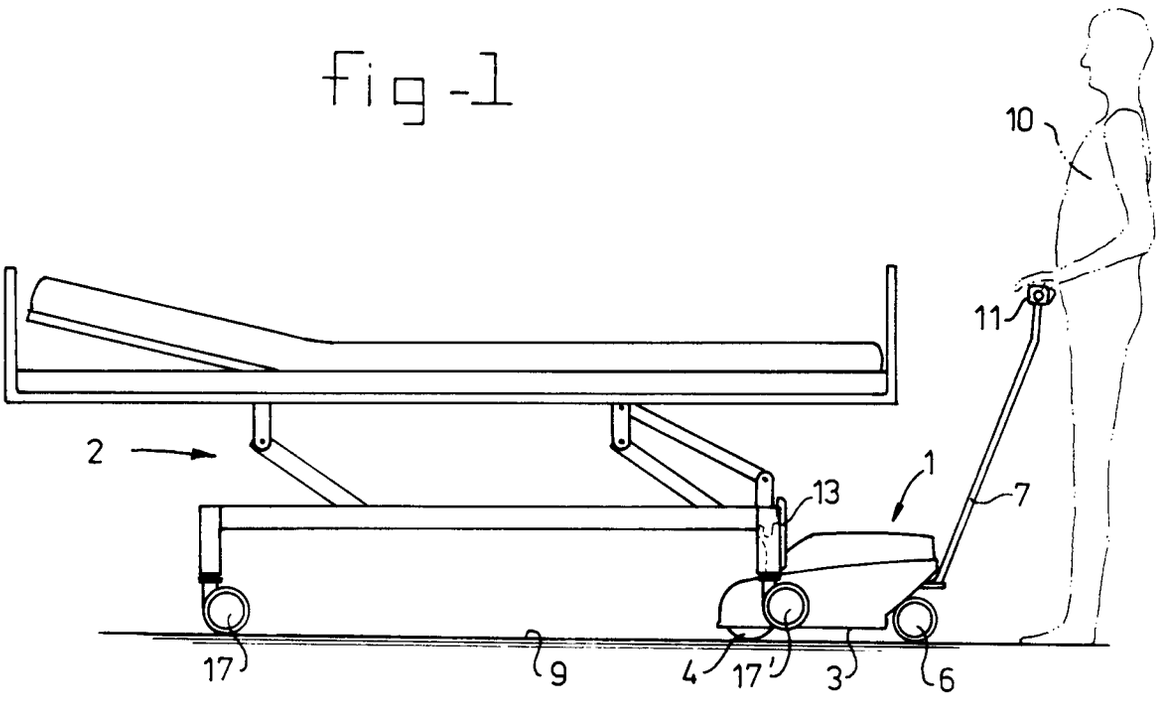
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Fig-2

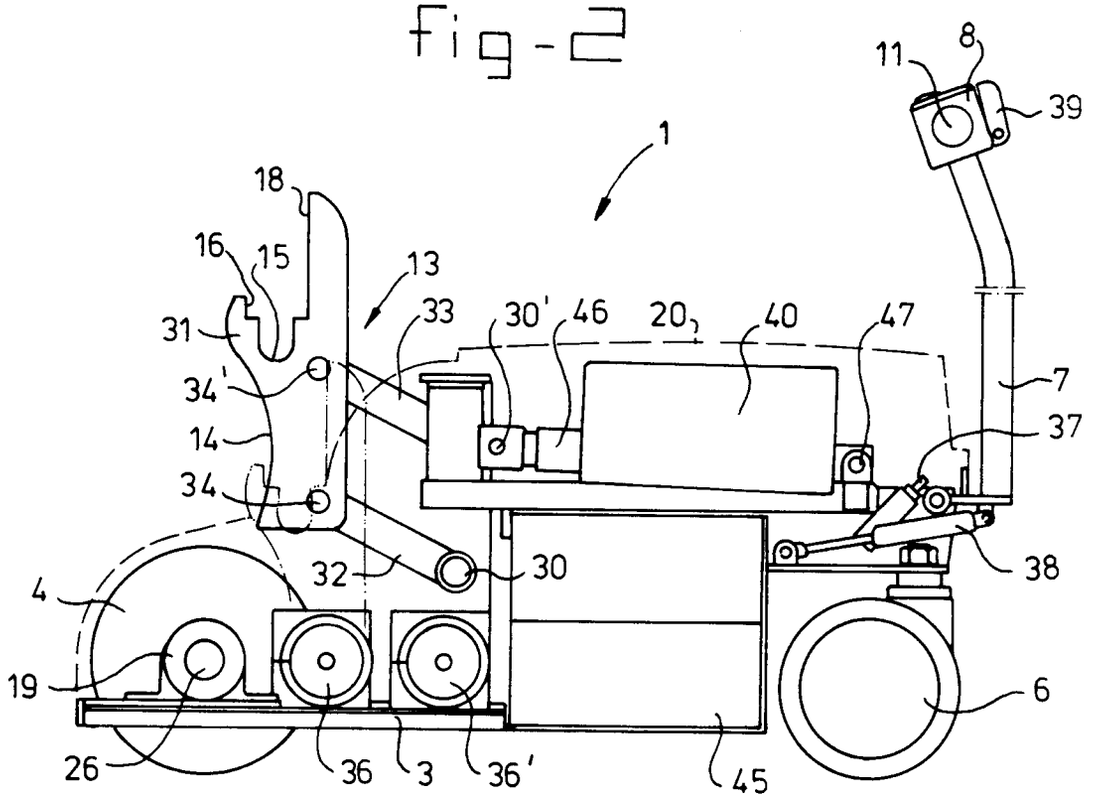
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Fig-3

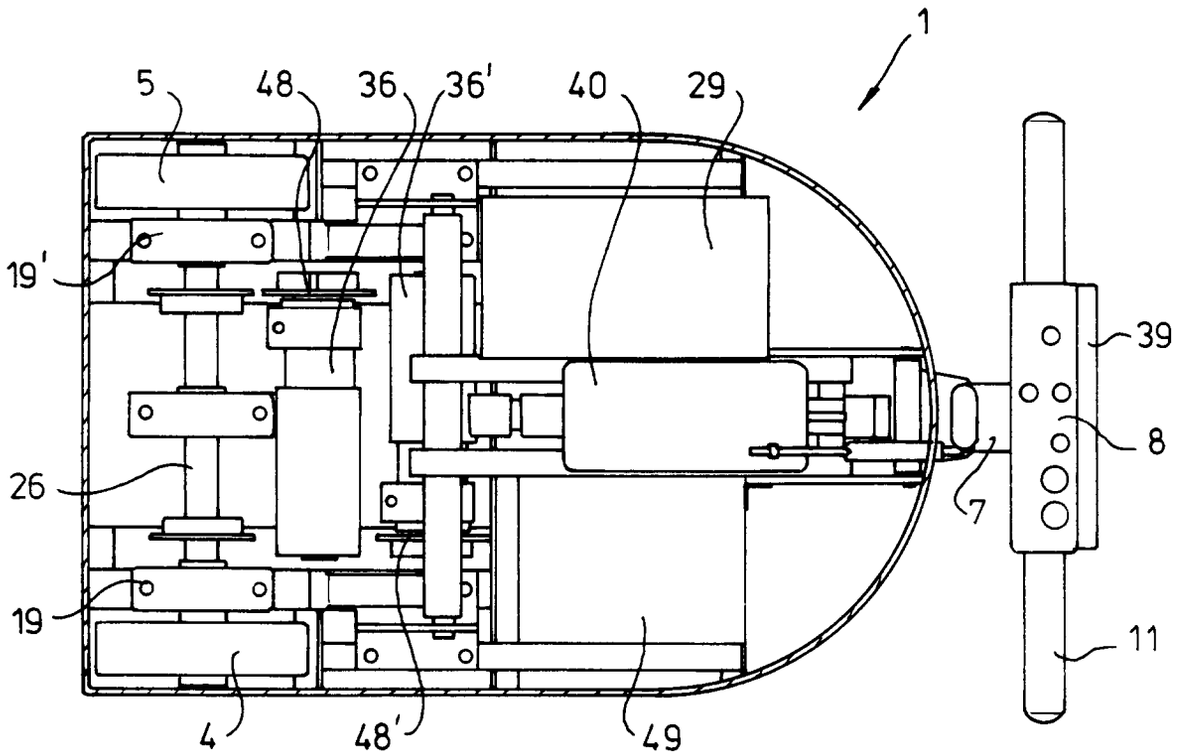


Fig-4

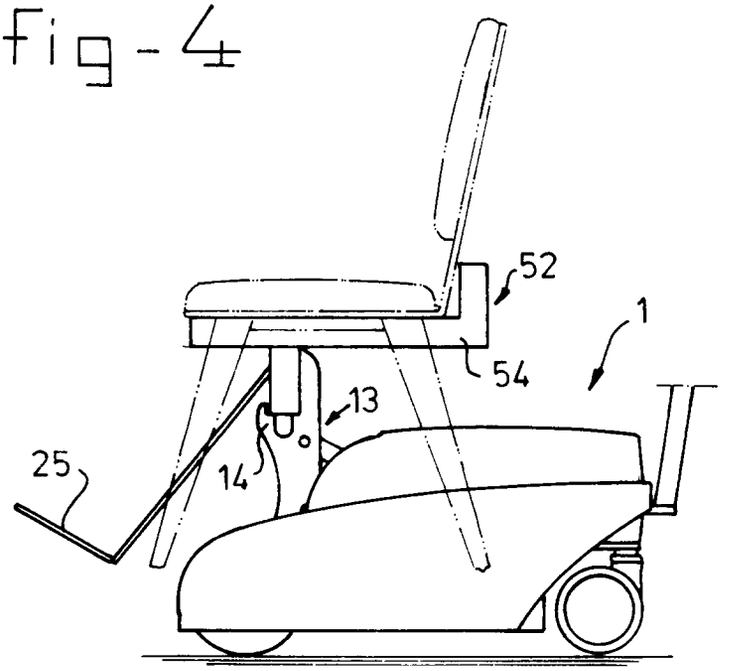


Fig-5

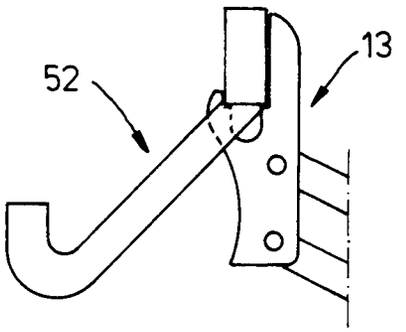


Fig-6

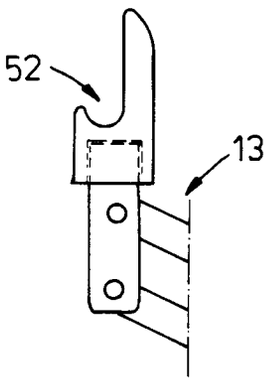
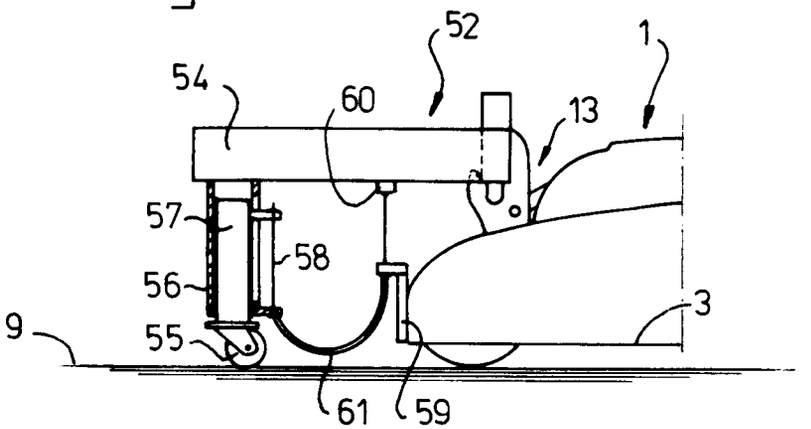


Fig-7



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EUROPEAN SEARCH REPORT

Application Number
EP 96 20 2682

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y	US-A-3 417 833 (MC RAE) 24 December 1968 * the whole document * ---	1,7 3,4	B66F5/02
Y	US-A-2 568 827 (SCHALLOCK) 25 September 1951 * the whole document * ---	3,4	
X A	DE-U-88 10 335 (JOOS) 23 March 1989 * the whole document * ---	1 3,4	
X A	CH-A-533 570 (A. MATTILLE & FILS) 28 February 1973 * the whole document * ---	1 3,4,6	
A	DE-C-897 805 (WENNBERG) 23 November 1953 * the whole document * ---	9	
A	US-A-3 724 586 (GOODACRE) 3 April 1973 * column 3, line 10-41 * ---	10	
A	US-A-4 721 429 (FUJITA) 26 January 1988 ---		TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	US-A-2 543 308 (WOLF) 27 February 1951 -----		B66F B60S B62B B62D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 November 1996	Van den Berghe, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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