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(54) Ladder device for a high-rise structure which is out of plump

(57) Ladder device (1) for a high-rise structure (2) which is out of plumb, in which the ladder device (1) comprises at least two ladders located opposite one another having substantially parallel elongate upright profiled sections (5) which are connected to one another at regular intervals by means of rungs (4).

The ladder device (1) is in particular suitable for use with a pipe-laying installation on a ship for laying a pipe on the seabed, in which a high-rise structure (2) of the pipe-laying installation is cardanically attached to the ship and is tiltable in all directions relative to the ship.

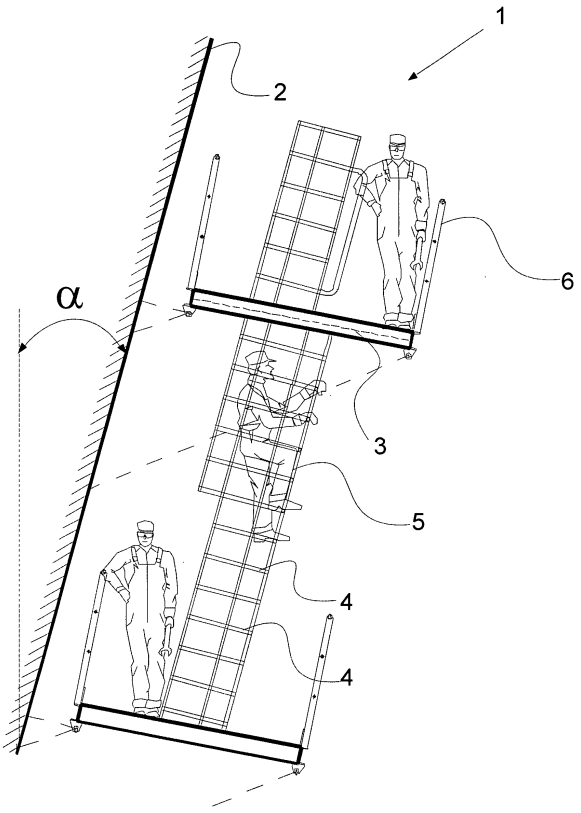

Fig. 1

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Description

[0001] The present invention relates to a ladder device for a high-rise structure which is out of plumb. In the state of the art, much use is made of ladders which are fixedly connected to the respective high-rise structure for maintenance and other work to be carried out. In many cases, these ladders are provided with a protective cage construction. This cage construction offers a better hold to those climbing the ladder and guides falling objects downwards.

[0002] One of the problems with ladder devices of this type on high-rise structures is that it is difficult to use these if the high-rise structure moves and the angle at which the high-rise structure is out of plumb alternates. This will be the case, in particular, when the high-rise structure is situated on a ship. The high-rise structure may, for example, be a stand, a crane, a drilling installation or a pipe-laying installation, for example a J-lay tower, on a ship. When the high-rise structure is situated on a ship, it will in each case be out of plumb at different angles as a result of, for example, loads on the ship, for example during hoisting operations, or wave motion. If the high-rise structure is, for example, a J-lay tower, the angle will change, for example because of the progress of the process of laying pipes. Initially, the J-lay tower will be straight until the pipe reaches the bottom. Then, the J-lay tower will be placed at an angle in order to achieve an angle which is advantageous for laying pipes. The high-rise structure may, for example, be out of plumb by 0-20°.

[0003] If a high-rise structure is out of plumb and provided with a conventional ladder device, it may make it relatively difficult or easy to climb. A high-rise structure may possibly be out of plumb in several directions, which determines if the ladder is difficult or easy to climb. Thus, there are J-lay towers which are positioned cardanically and are able to tilt in all directions relative to a vertical position. The ladder device becomes relatively difficult to climb if the ladder is at an angle of inclination, the angle of inclination being smaller than 90° relative to a horizontal, for example the sea surface. Someone who wants to climb the stairs will have to grasp the rungs of the ladder device with his hands and thus support part of his own weight himself. It will be clear that this results in the high-rise structure being difficult to climb.

[0004] It is an object of the present invention to overcome this drawback, at least partially, and/or to provide a usable alternative for a ladder device. In particular, it is an object of the invention to provide a ladder device for a high-rise structure which is out of plumb on a ship, which also offers protection and convenience to someone who wants to climb the ladder.

[0005] This object is achieved by a ladder device for a high-rise structure which is out of plumb as defined in claim 1. The ladder device according to the invention comprises at least two ladders located opposite one another having substantially parallel elongate upright profiled sections which are connected to one another at regular intervals by means of rungs.

[0006] One of the advantages is that it no longer matters in which direction a high-rise structure is out of plumb. A user is always between the at least two ladders located opposite one another. Due to the ladders located opposite one another, a user of the ladder device can always climb the ladder of the ladder device which is easiest to climb. One of the ladders of the ladder device is always at an angle which is convenient for the user. A ladder which is not being used offers the user of the ladder device improved hold and protection during climbing. Especially in the vicinity of hoisting activities, the metal construction of the ladder device protects an individual while climbing.

[0007] In a particular preferred embodiment according to the invention, the rungs of the ladders located opposite one another are integrated with one another. This offers a great advantage from a structural point of view, as a saving in processing and installation costs is achieved.

[0008] In another particular embodiment, the rungs are designed in the shape of rings, for example in the shape of circles. These rings are positioned at a regular distance from one another and connected to one another by means of uprights. The distance is preferably between 25 and 40 centimetres. Particularly preferably, this distance is approximately 30 centimetres, since a widely used USCG standard (US Coast Guard) is then met. A user of the ladder device will be in the centre of the ring-shaped rungs and will climb up on that side of the ladder device which is easiest to climb. By using ring-shaped rungs, it no longer matters in which direction the high-rise structure is out of plumb. The ladder device in each case provides a side which is convenient to climb. The ring-shaped rungs also result in the user being protected and having a better grip. In order to provide protection and grip, the diameter of the ring-shaped rungs is preferably not larger than 110 centimetres. Furthermore, the diameter is preferably at least 50 centimetres in order to offer sufficient freedom of movement during a climb. Preferably, the dimensions are chosen in accordance with the USCG standard.

[0009] In a particular embodiment according to the invention, several ladder devices are connected to one another by means of a landing. The landing may for example be used to reach a work station or to walk from one ladder to the other ladder. A landing benefits safety. In the unlikely event of objects falling down, for example during maintenance, these will remain on the landing. In that case, falling objects do not present any danger to someone who is situated at a lower level in another coupled ladder device.

[0010] In a particular embodiment according to the invention, the ladder devices are placed with their axial axis parallel to the high-rise structure, but the landing is inclined to the axial axis of the ladder devices. This angled position of the landing gives the advantage that the incline that occurs as a result of the high-rise structure being out

of plumb, is partially compensated for. The angled position of the landing can be achieved by connecting the landing to the high-rise structure using a system of rods. Consequently, the landing is connected to the high-rise structure in a pivoting manner. The system of rods ensures that the landing remains substantially horizontal, so that it is possible for someone to walk over the landing without much of a problem. It will be clear that many designs are conceivable in order to set the landing at an angle. Thus, it is for example possible to use a hydraulic cylinder to set the incline of the landing.

[0011] Further preferred embodiments are defined in the other subclaims.

[0012] The invention will be explained in more detail below with reference to the attached drawings which show a practical design of the invention, but should not be regarded as being limiting, in which:

Fig. 1 shows a side view of a ladder device according to the invention;
Fig. 2 shows a side view of two ladder devices with a landing according to the invention;
Fig. 3 shows a top view of a high-rise structure provided with ladder devices according to the invention;
Fig. 4 shows a top view of two ladder devices with a landing according to the invention; and
Fig. 5 shows a side view of a ladder device with an inclined landing according to the invention.

[0013] Fig. 1 shows a side view of the top section of a ladder device 1 according to the invention. The figure shows the high-rise structure 2 which is out of plumb at an angle α. As a result, the ladder device 1, which in this case runs parallel with the neighbouring wall of the high-rise structure, is also at an angle. Halfway along the ladder, an individual is shown, who is standing with his feet on the rungs 4 and is also holding onto the rungs of the ladder device with his hands. The individual is in the centre within the ring-shaped rungs of the ladder device. In this case, the ring-shaped rungs are in the shape of a circle and have a diameter which is such that an individual has sufficient freedom of movement to climb the ladder device. Furthermore, the diameter of the rungs has been chosen such that a cage structure is created which offers protection and a better hold to the climber. The rungs 4 are at a regular distance from one another and are securely welded to the uprights 5. A landing 3 is provided at the top of the ladder device, which is suitable to enable an individual to walk from one part of the ladder construction to the other.

[0014] Fig. 2 shows a ladder device 1 which is connected to a second ladder device by means of a landing 3. The figure shows the landing 3 in the form of a platform with a railing 6. Fig. 2 shows that the ladder construction as a whole can also be out of plumb in another direction at an angle (β) relative to the high-rise structure. When the ladder device is used with a J-lay pipe-laying tower on a ship, the ladder device may also be inclined in the direction shown. As is furthermore apparent from Fig. 3, the ladder device has ring-shaped rungs 4, in this case in the shape of a circle. This is particularly advantageous when the angles of inclination vary in several directions. An individual can always climb the ladder device in a convenient position. The climber will not be impeded by having to support his/her own weight by his/her arms.

[0015] Fig. 3 shows a top view of a high-rise structure with two ladder constructions 7 connected thereto. It can clearly be seen in this top view that the rungs are of a ring-shaped design so that the high-rise structure 2 can still readily be climbed when the high-rise structure is tilted. This Fig. 3 illustrates a J-lay tower as a high-rise structure 2 in the top view. The J-lay tower may, for example, form part of a pipe-laying installation on a ship. It will have to be possible to climb the tower for maintenance or other activities. An individual will thus be able to climb upwards from the centre of the ring-shaped rungs and to walk from a first ladder device to a work station or a subsequent ladder device by way of the landing 3. This can also be seen in the top view, as shown in Fig. 4.

[0016] Figs. 4 and 5 show the connection of the ladder device to the landing. The ladder device is open on one side, so that an individual is able to reach the landing. At the location of the landing, the metal cage construction is double bent, so that protection and hold are provided there as well.

[0017] Fig. 5 shows a side view of the top section of a ladder device with a landing 3 connected thereto. The landing 3 is inclined relative to the axial centre axis of the ladder device 1. The angle (γ) of the landing 3 to the horizontal (for example the sea surface) is advantageous if the high-rise structure 2 is tilted. The inclination of the landing 3 in that case at least partially compensates for the oblique position of the high-rise structure. Together with the rods 6, 7, the pivot eyelets 3a indicate how the landing 3 could possibly be arranged in a pivoting manner by means of a system of rods.

Claims

1. Ladder device for a high-rise structure which is out of plumb, **characterized in that** the ladder device (1) comprises at least two ladders located opposite one another having substantially parallel elongate upright profiled sections (5) which are connected to one another at regular intervals by means of rungs (4).

2. Ladder device according to claim 1, in which at least two ladders located opposite one another are at a distance of at least 50 centimetres and at most 200 centimetres from one another.

3. Ladder device according to claim 2, in which at least two ladders located opposite one another are at a distance of at least 80 centimetres and at most 110

centimetres from one another.

4. Ladder device according to claim 1, in which the rungs (4) are essentially straight and elongate.

5. Ladder device according to claim 1, in which the rungs (4) of the ladders located opposite one another are integrated with one another.

6. Ladder device according to claim 1, in which the rungs (4) in the ladder device are continuous.

7. Ladder device according to claim 1, in which the rungs (4) are substantially ring-shaped.

8. Ladder device according to claim 6 or 7, in which the diameter of the rungs (4) is at least 50 centimetres and at most 200 centimetres.

9. Ladder device according to claim 8, in which the diameter of the rungs (4) is at least 80 centimetres and at most 110 centimetres.

10. Ladder device according to claim 6 or 7, in which the largest dimension within the circumference of the rungs (4) is at least 80 centimetres and at most 110 centimetres.

11. Ladder device according to one of the preceding claims, in which the ladder device (1) comprises a landing (3) having a tread surface leading towards a similar second ladder device (1).

12. Ladder device according to one of the preceding claims, in which the landing (3) is connected to the high-rise structure (2) in a pivoting manner.

13. Ladder device according to one of the preceding claims, in which the landing (3) is connected to the high-rise structure (2) by means of a system of rods.

14. Ladder device according to one of the preceding claims, in which the angle (γ) between the tread surface of the landing (3) and the axial axis of the ladder device (1) is adjustable.

15. Ladder device according to one of the preceding claims, in which the tread surface of the landing (3) diverges from a right angle relative to the axial axis of the ladder device (1) by at most 10°.

16. Ladder device according to one of the preceding claims, in which the landing (3) is positioned at an angle (γ) of at least 3° and at most 10° relative to the ladder device (1).

17. High-rise structure (2) which is out of plumb at alternating different angles, provided with a ladder device (1) according to one of claims 1-16.

18. Pipe-laying installation on a ship for laying a pipe on the seabed, for example a J-lay tower, in which a high-rise structure (2) is tiltable about at least one axis relative to the ship, in which the high-rise structure (2) is provided with a ladder device (1) according to one of claims 1-16.

19. Pipe-laying installation on a ship for laying a pipe on the seabed, in which a high-rise structure (2) of the pipe-laying installation is cardanically attached to the ship and is tiltable in all directions relative to the ship, in which the high-rise structure (2) is provided with a ladder device (1) according to one of claims 1-16.

20. Pipe-laying installation on a ship for laying a pipe on the seabed, in which a high-rise structure of the pipe-laying installation comprises at least one tower which is freely tiltable relative to the ship, the tower being provided with a ladder device (1) according to one of claims 1-16.

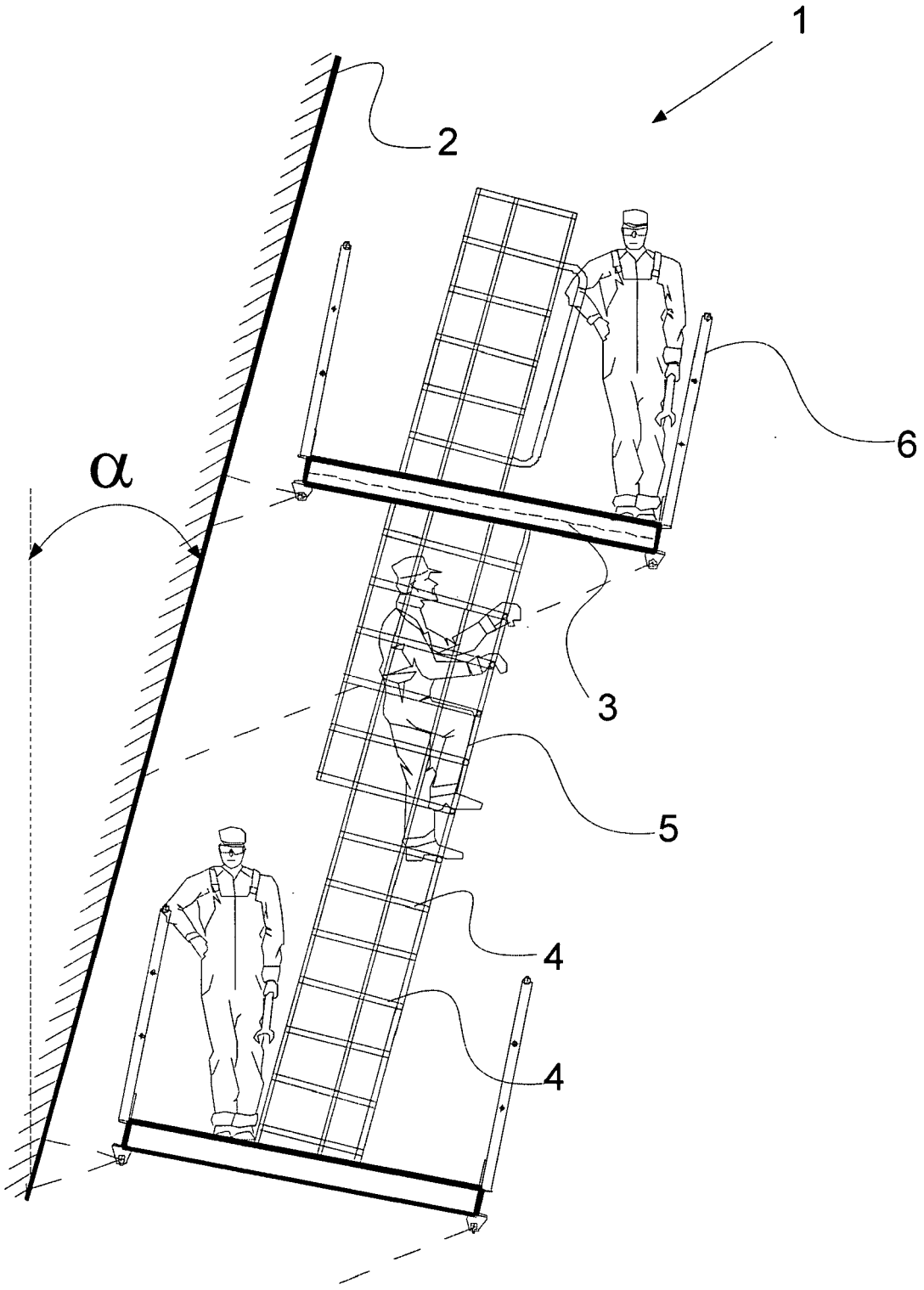

Fig. 1

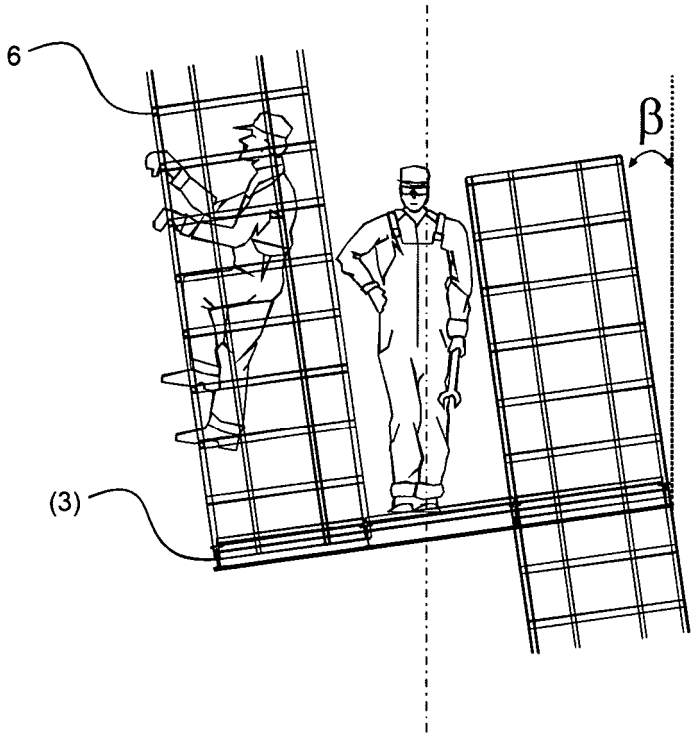

Fig. 2

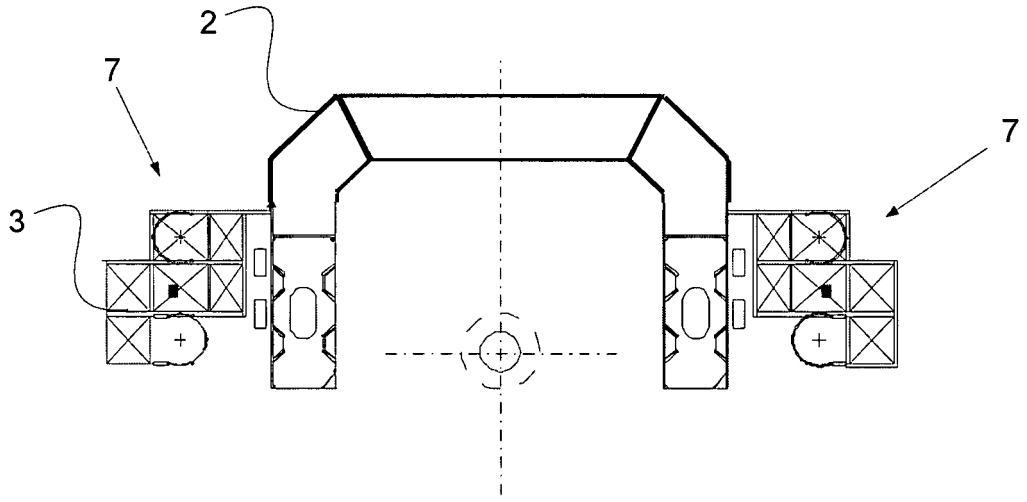

Fig. 3

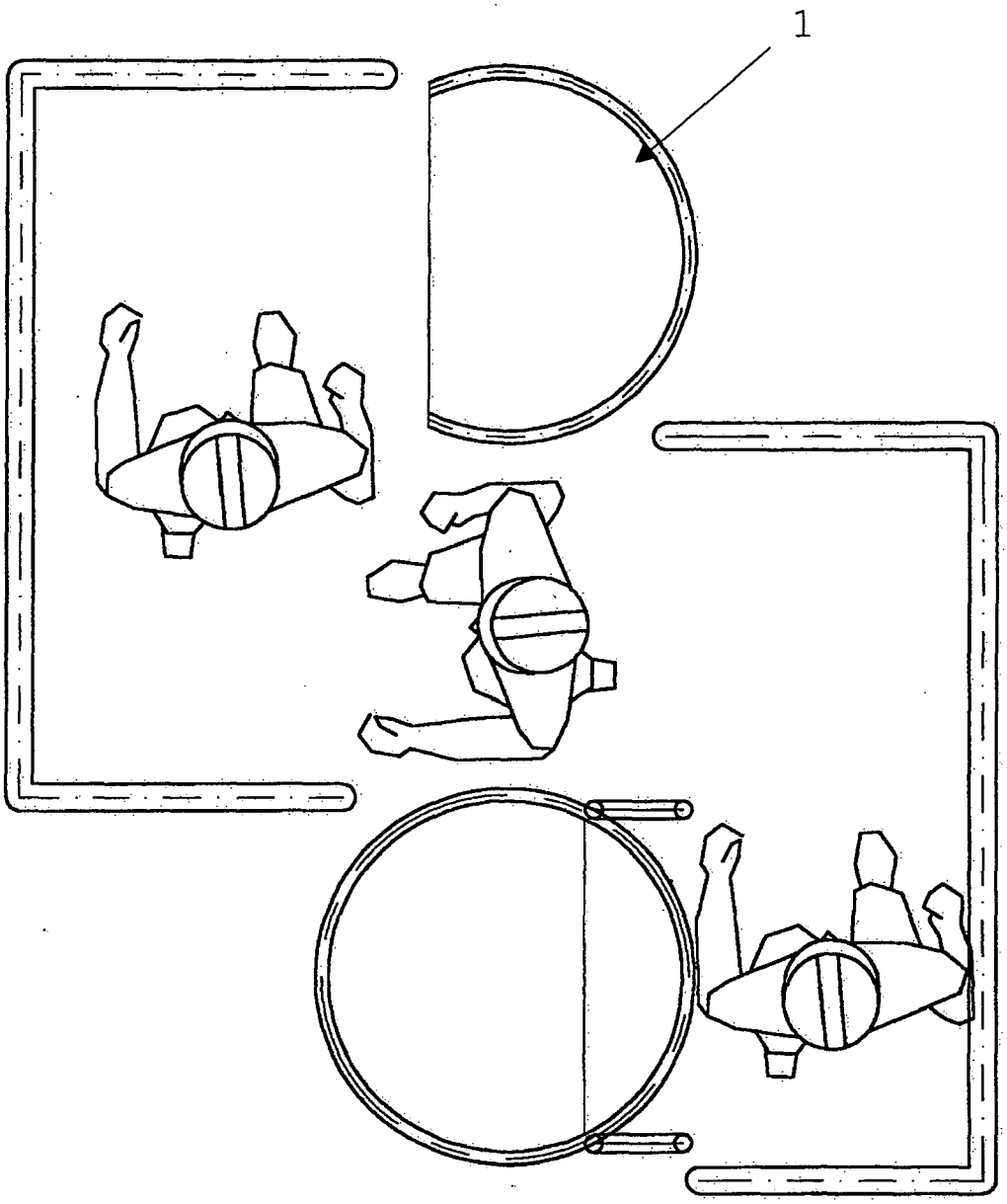

Fig. 4

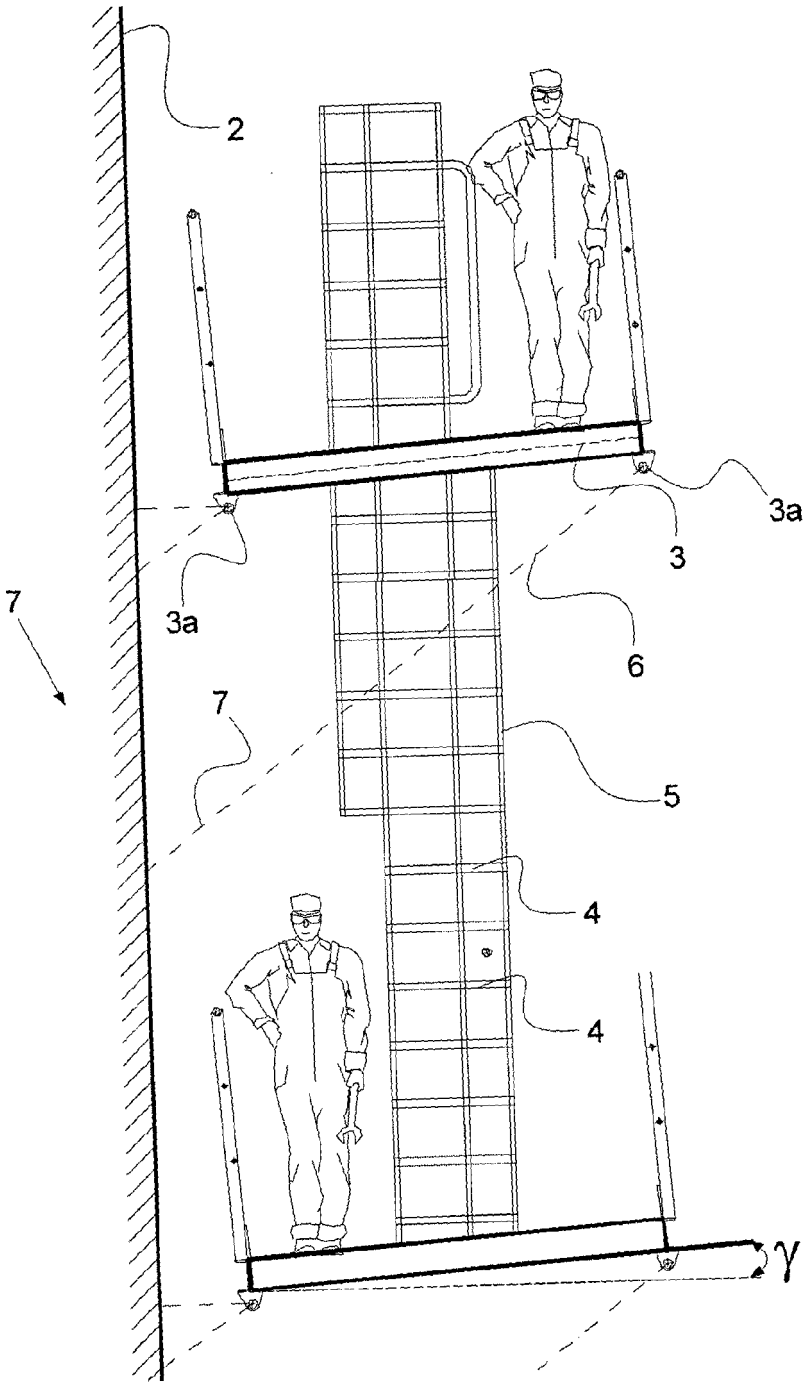

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 06 07 6327

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 October 2006	Demeester, Jan

CATEGORY OF CITED DOCUMENTS

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