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(54) **Lifting platform for use in a ship.**

(57) A lifting platform designed for use in a ship, comprising two parallel loading floors (1, 2) placed one over the other, a lifting mechanism for moving the lifting platform in the vertical direction between different decks, and guide elements (10, 11) for guiding the platform and keeping it steady. The loading floors (1, 2) are connected to each other by vertical supporting poles (4) placed in the vertical middle plane of the lifting platform.

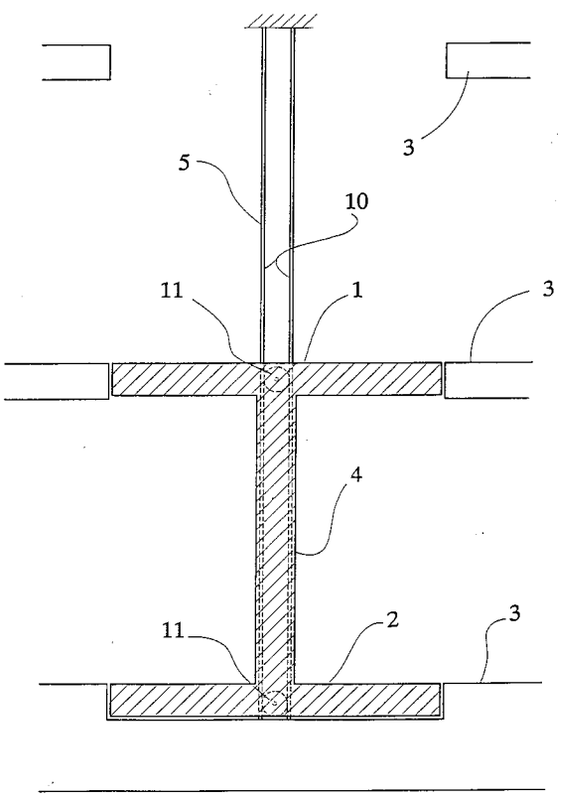

Fig. 3

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The present invention relates to a lifting platform designed for use in a ship, comprising at least two parallel loading floors placed one over another, a lifting mechanism for moving the lifting platform vertically between different decks, and guide elements for guiding the platform and keeping it steady.

Fig. 1 presents a previously known lifting platform in a simplified form. The platform is rectangular in cross-section and comprises two parallel loading floors placed one over the other. The height difference between the loading floors is equal to that between the decks of the ship, so that both loading floors are simultaneously in level with the corresponding ship deck. This allows faster loading and unloading of the ship because two decks can be loaded or unloaded at the same time. The lifting platform has two vertical side walls, which, together with the loading floors, form a rectangular cross-section. Moreover, the lifting platform is provided with a hydraulically operated lifting mechanism and a guide wheel arrangement, which, due to the structure of the platform, comprises at least four transverse guide wheels and at least four longitudinal ones.

A drawback with this prior-art solution is that the lifting platform is heavy due to the two side walls and requires plenty of space in the widthwise direction because at least part of the guiding arrangement is placed outside the side walls of the platform. Because of the large weight, the lifting mechanism also has to be of a sufficiently heavy construction.

The object of the present invention is to achieve a reliable lifting platform for use in a ship which is free of the drawbacks mentioned above. The lifting platform of the invention is characterized by what is presented in the claims.

An advantage of the solution of the invention is that it uses a steel structure which is lighter than in the previously known solution and in which the moments are only half as high. This allows a lighter and stronger construction. A further advantage is that the lifting cylinders of the lifting mechanism can be placed in the dead space near the guide columns, thus reducing the total width of the structure. The total width is further reduced by the fact that the wheels used as guide elements can be so placed that they are not outside the sides of the lifting platform as in the prior-art solution. Moreover, the guide wheel arrangement is simple and only two wheels are needed in the longitudinal direction, whereas the prior-art solution requires four wheels. Another advantage increasing flexibility is the open structure of the sides of the lifting platform. This means e.g. that a trailer or lorry can enter and leave the platform in an oblique direction if necessary. In addition, a lorry or railway carriage can be loaded or unloaded from the side by means of fork-lift trucks. In the prior-art solution, this not possible because of the side walls.

In the following, the invention is described in detail by the aid of an example by referring to the drawings attached, in which

- Fig. 1 presents a lifting platform as used in prior art, seen in cross-section from one end,
- Fig. 2 presents an embodiment of the lifting platform of the invention as seen from one side,
- Fig. 3 presents the lifting platform of Fig. 2 as sectioned along line III-III in Fig. 2, and
- Fig. 4 presents the lifting platform of Fig. 2 in top view.

The lifting platform comprises an upper loading floor or upper floor 1 and a lower loading floor or lower floor 2. The loading floors are placed one over the other and they are parallel to each other and essentially of the same size. The height difference between their upper surfaces is essentially equal to that between the upper surfaces of the ship decks 3. Moreover, the upper surfaces of the loading floors are parallel to the upper surfaces of the ship decks, normally horizontal. The length and width of the lifting platform are sufficient for the platform to carry trailers, railway carriages, containers and suitable smaller-sized goods. The upper and lower floors are connected to each other by means of vertical supporting poles 4 which, as seen from the end, are placed along the vertical center axis of the lifting platform. The number and longitudinal location of the supporting poles 4 depends on the length of the lifting platform and the location of the fixed vertical guide columns 5 provided in the ship. The lifting platform of the invention has four supporting poles and they are located near each guide column 5 in such a way that a horizontal gap of suitable width is left between the pole and the column. The structure is additionally reinforced by diagonal struts 6 provided between each outermost supporting pole and the next inner supporting pole. Between the two inner supporting poles runs a guide column 5 which, as seen from the side, is located in the middle of the lifting platform. Correspondingly, as seen from the side and from the middle of the lifting platform, a guide column 5 is located outside each outer supporting pole. Both the upper and lower floors are provided with three rectangular holes 7 for the guide columns, which are rectangular in cross-section. The holes at the ends of the floors are open at their outer ends. As seen from above, the holes are located in a straight line and their longitudinal center line coincides with the longitudinal center line of the lifting platform.

The lifting mechanism consists of a hydraulic unit, which is not shown in the drawings. Connected to the hydraulic unit are two lifting cylinders 8 working in the vertical direction, one being placed at each end of the lifting platform. The frame of each lifting cylinder is fixed to the inner surface of the corresponding guide column, which is separated from the outermost supporting pole 4 by a suitable gap to accommodate the lifting cylinder. In this description, "inner" and "outer" surfaces or elements are so defined that, when the lifting platform is seen from one side or end or from above, the surface or element lying closest to the corresponding center line of the lifting platform is the inner surface or element and, similarly, the one lying farther away is the outer surface or element. In the vertical direction, the frame of the lifting cylinder is mounted between the upper and lower floors, at a point close to the lower surface of the upper floor. In this way, a sufficient space is provided for the movable lifting arm of the lifting cylinder when the platform is in its lower position. When the lifting platform is in its low position, the lifting arm is almost completely inside the cylinder part of the lifting cylinder. As the lifting platform is designed to be raised and lowered between two decks, the length of the lifting arm must be essentially equal to the height difference between the deck levels. The upper end 9 of the vertically movable lifting arm is fixed to the upper floor 1.

The guide columns 5 are provided with vertical guide grooves 10 to prevent lateral motion of the lifting platform. In each of the outer guide columns the guide groove is made in the outer surface of the column, whereas in the middle column the groove is sunk in one of the side surfaces. Each guide groove accommodates two guide wheels 11 so located in the vertical direction that the upper guide wheel is essentially at the level of the upper floor while the lower guide wheel is somewhat below the lower floor.

The horizontal axles of the guide wheels are supported by bearings suitably mounted on the upper and lower floors. The lifting platform is guided in the transverse direction by the guide wheels running in the grooves of the outer guide columns - generally four wheels - and in the longitudinal direction by the two guide wheels placed in the groove of the middle column. The lateral surfaces of the guide grooves constitute the guide surfaces for the guide wheels.

It is obvious to a person skilled in the art that different embodiments of the invention are not restricted to the examples described above, but that they may instead be varied within the scope of the following claims. Thus, the lifting mechanism may consist e.g. of a rope drum or an elevator machine type traction sheave connected to an electric motor either directly or via a reduction gear, the lifting ropes passing over the drum or sheave. Moreover, the number of loading floors need not be restricted to two if it is considered necessary and economical to use a platform with three or more loading floors, depending on the properties of the ship. The width of the loading floors is so chosen that each floor can accommodate e.g. two trailers or railway carriages side by side, one on each side of the row of supporting poles. However, this is not a strict rule for the floor width, but wider or narrower floors can be used, depending on the construction of the ship. In addition, the separate supporting poles may be replaced with a supporting wall with suitable gaps for the guide columns.

Claims

1. Lifting platform designed for use in a ship, comprising at least two parallel loading floors (1, 2) placed one over the other, a lifting mechanism for moving the lifting platform in the vertical direction between different decks (3), and guide elements (10, 11) for guiding the platform and keeping it steady, **characterized** in that the loading floors (1, 2) are connected to each other by elements placed in the vertical middle plane of the lifting platform.

2. Lifting platform according to claim 1, **characterized** in that the upper loading floor (1) is connected to the lower loading floor (2) by a row of vertical supporting poles (4) placed in the vertical middle plane of the lifting platform between the floors.

3. Lifting platform according to claim 1 or 2, **characterized** in that each loading floor is provided with three rectangular holes (7) of which two are at the ends of the floor and one in its middle, said holes being arranged in a straight line relative to each other.

4. Lifting platform according to any one of the preceding claims, **characterized** in that the lifting platform is provided with two lifting cylinders (8) which are placed in the longitudinal middle line of the lifting platform between the outer supporting pole (4) and a guide column (5) mounted on the ship, said lifting cylinders being attached to the guide column (5).

5. Lifting platform according to any one of the preceding claims, **characterized** in that all guide wheels (11) and guide grooves (10) serving as guide elements are located relatively close to the vertical middle line of the lifting platform.

6. Lifting platform according to claim 5, **characterized** in that the guide wheels (11) are supported on horizontal axles by bearings suitably mounted on the upper and lower floors (1, 2), said wheels running in vertical guide grooves (10) of guide columns (5).

7. Lifting platform according to claim 6, **characterized** in that in each of the outer guide columns the guide groove (10) is made in the outer surface of the column, whereas in the middle column the groove is sunk in one of the side surfaces.

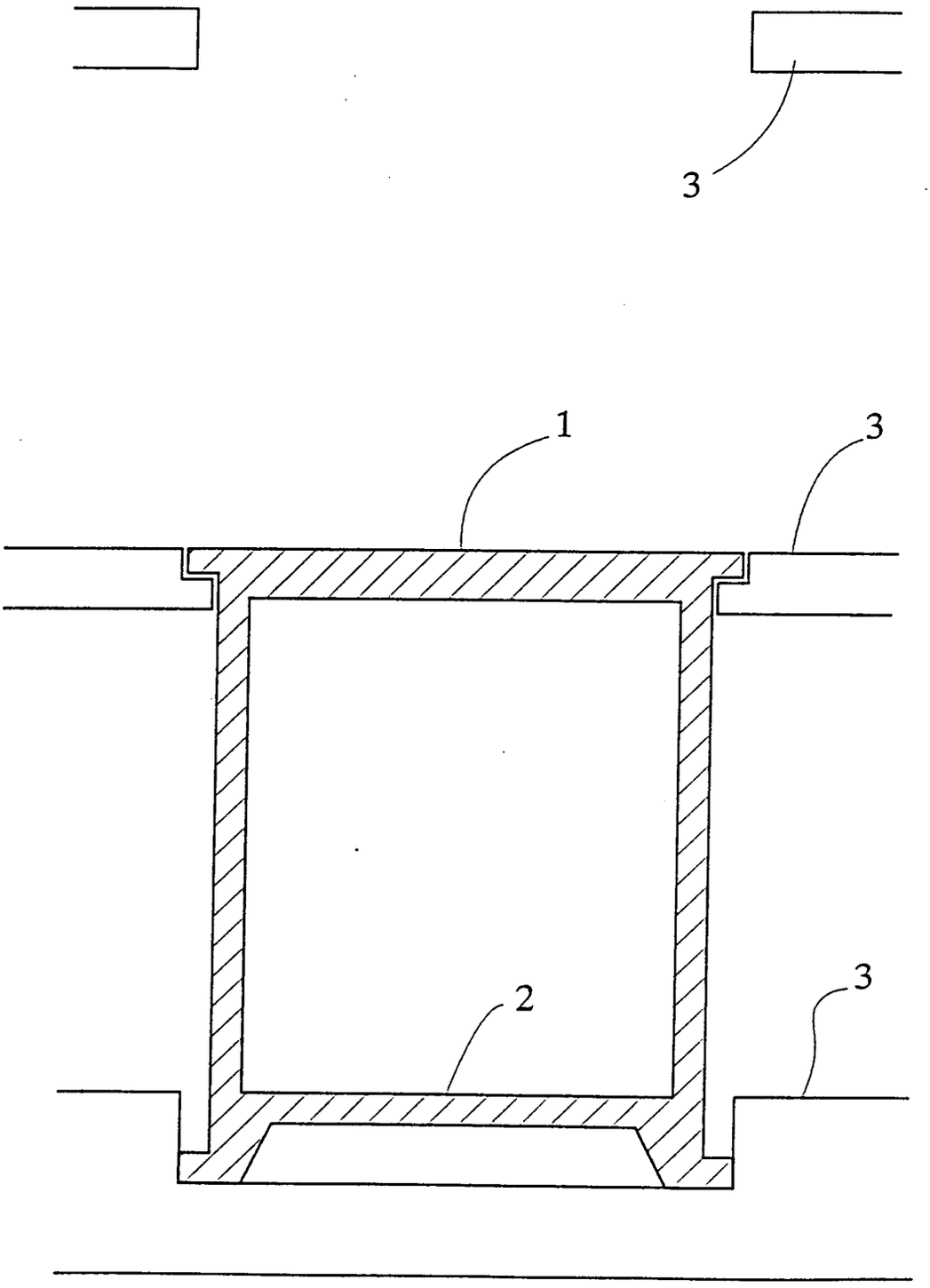

Fig. 1

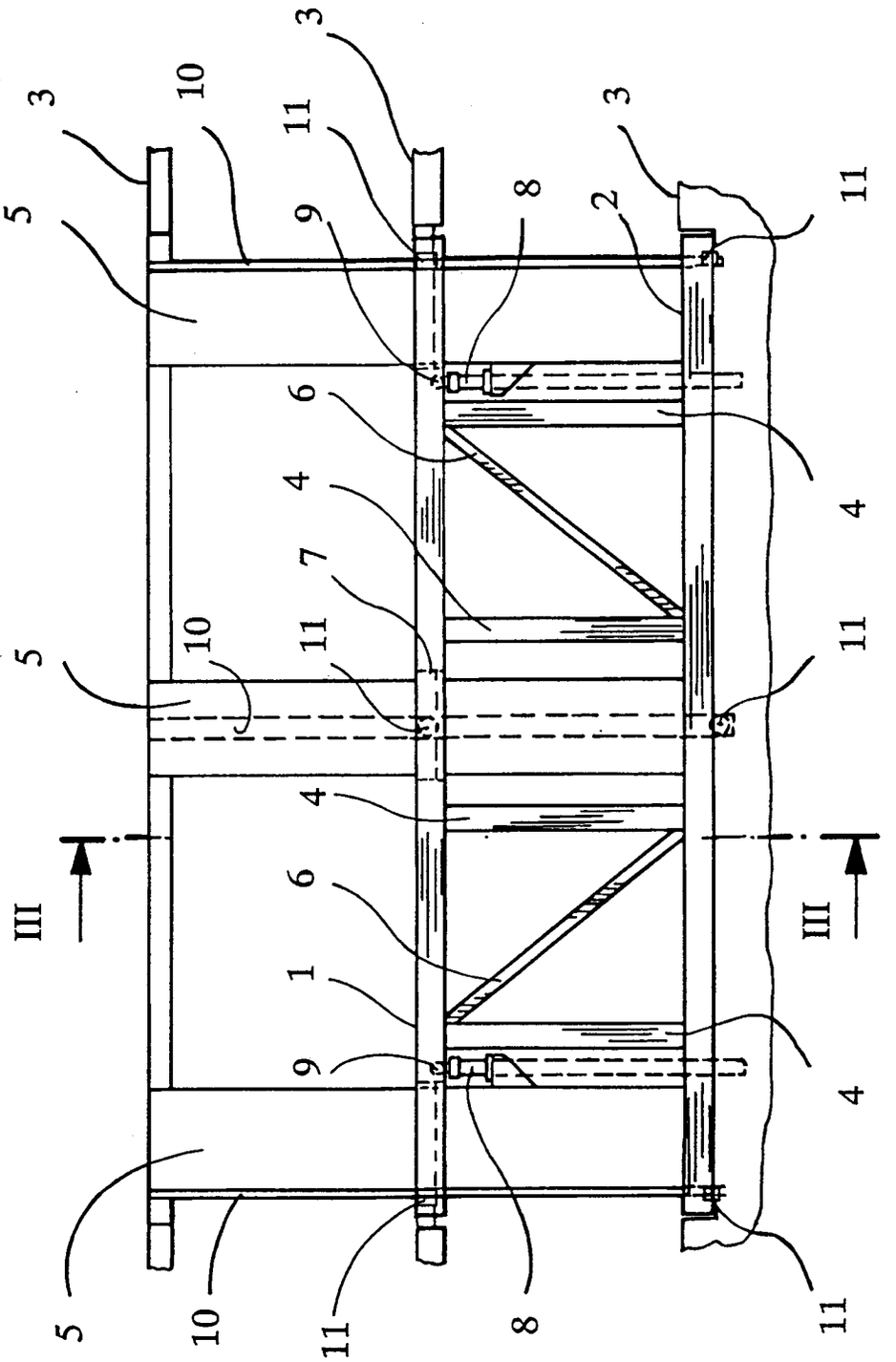

Fig. 2

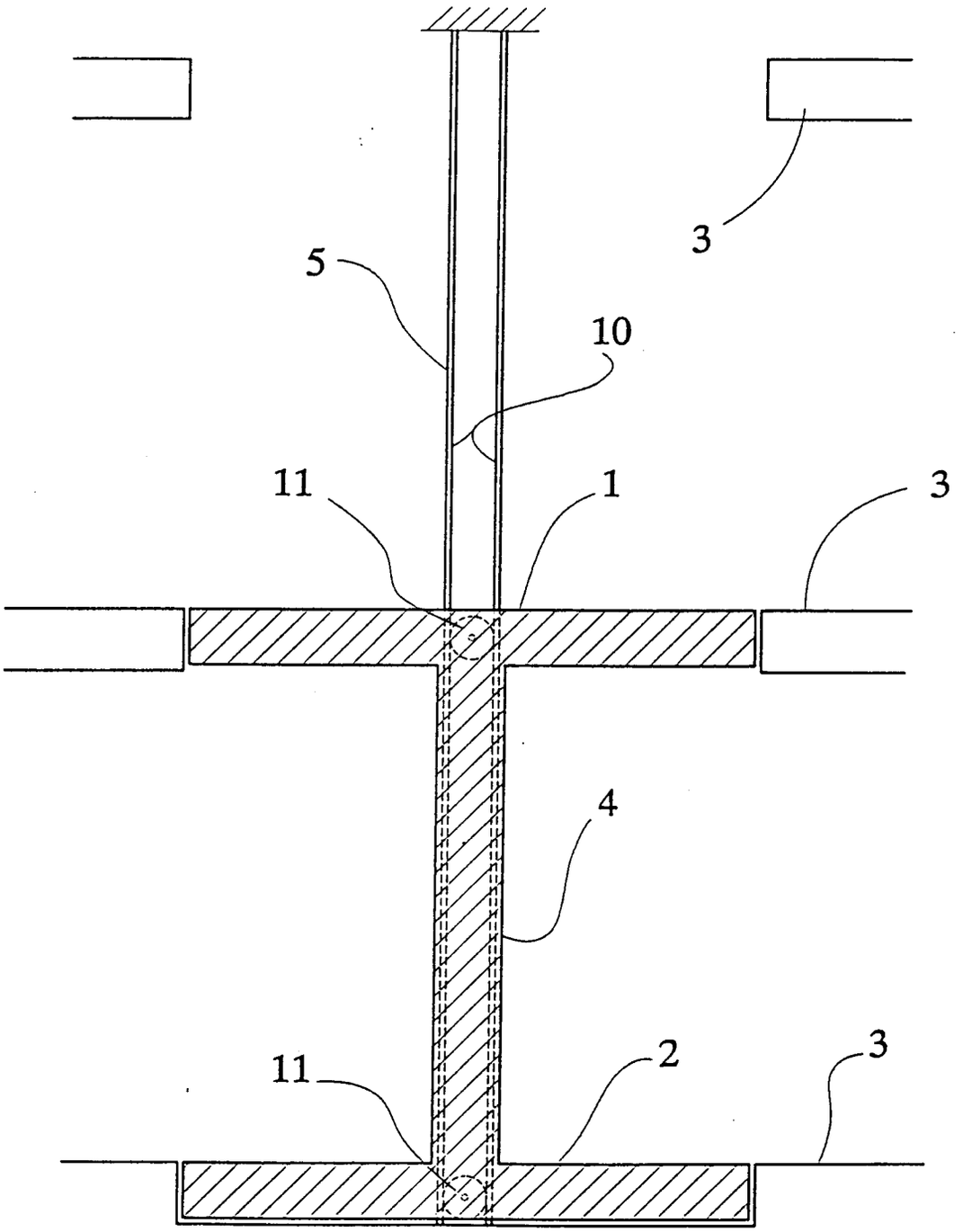

Fig. 3

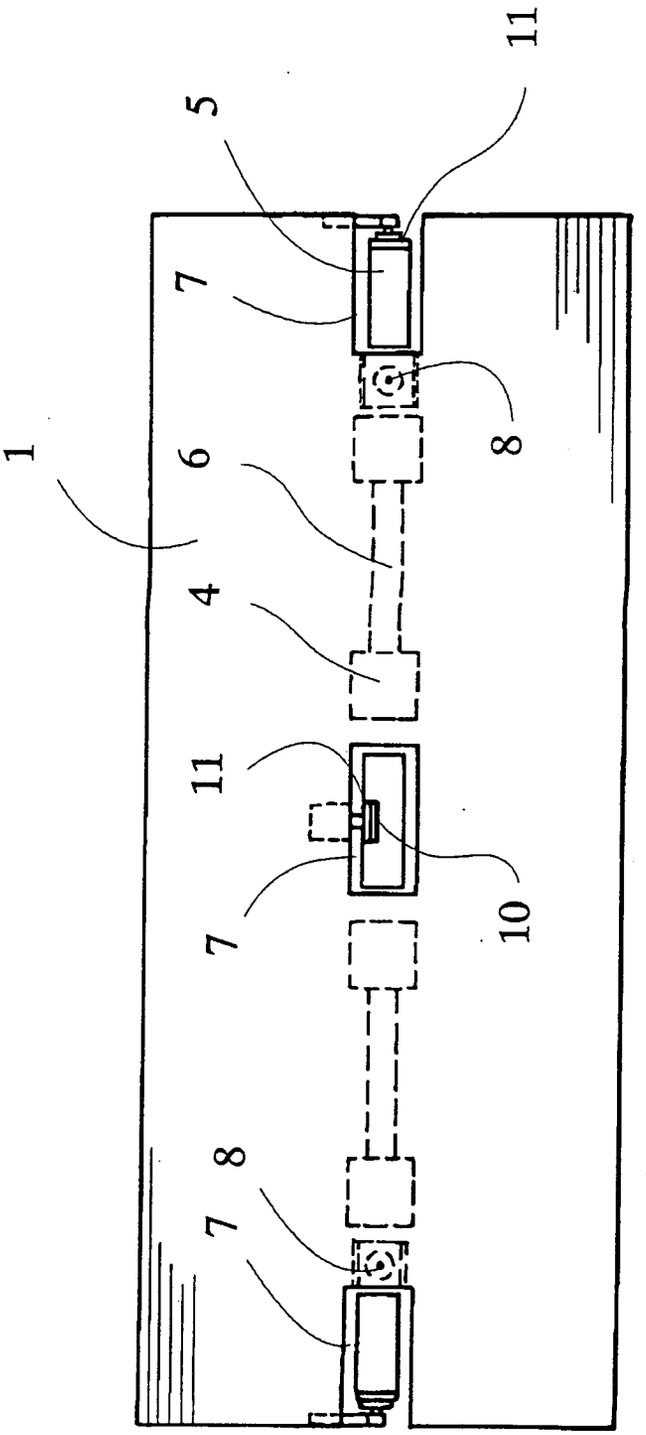

Fig. 4