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CRANE

The present invention relates to a crane which is installed on the rooftop of the building or the like and which is capable of effectively pulling up an object from a narrow road onto a narrow rooftop and setting it up on a rooftop.

The present applicant has previously proposed a solar ray collecting device in which solar rays are focused by a lens or the like and guided into an optical conductor and transmitted through an optical conductor to an optical desired place for use in illumination, etc. The afore-mentioned solar ray collecting device is often installed and used on the rooftop of a building. However, elevator towers, water-supply tanks, etc., are often built on the rooftops of buildings. Some of them have very little space left. Furthermore, in a big city (especially, a megalopolis), many roads are narrow, and therefore it may be very difficult to install such a solar ray collecting device as described above in a predetermined place on the rooftops of buildings.

In accordance with the present invention, there is provided a crane comprising a pair of load arms which are spaced apart side by side and define between them an unobstructed space, hoisting means  
5 carried between said load arms near their distal end and capable of lifting a load in alignment with said unobstructed space, and driving means for rotating said load arms about a horizontal axis near their proximal end, said driving means being capable of rotating said  
10 load arms through a vertical position such that a load suspended from said hoisting means may pass through said unobstructed space, said hoisting means comprising a winding drum extending between the load arms near their distal ends and cable means wound on  
15 said winding drum such that a load suspended from said cable means is generally centrally aligned with said unobstructed space when said cable means is substantially fully wound up on said winding drum.

There follows a description, by way of example,  
20 of a specific embodiment of the present invention, reference being made to the accompanying drawings, in which:

Fig. 1 is a perspective view of the solar ray collecting device as an example of an object carried by  
25 a crane according to the present invention.

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Fig. 2 is a side view of a crane showing the conditions for pulling up an object.

Fig. 3 is a plan view thereof.

Fig. 4 is another side view thereof showing the conditions for letting down an object.

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~~Fig. 6 is a cross-sectional view of the same taken on line VI-VI of Fig. 5.~~

Fig. 1 is a perspective view for explaining an embodiment of the solar ray collecting device proposed by the present applicant previously. In Fig. 1, 1 is a cylindrical foundation, and 2 is a transparent dome-shaped head portion. The foundation and the head portion make up a capsule 3. Under the conditions for employing a solar ray collecting device 10, the device 10 is accommodated in the capsule 3 as shown in Fig. 1.

The solar ray collecting device 10 comprises a large number of (for instance, 19 pieces of) lenses 11 arranged concentrically for focusing the sun's rays, a solar ray direction sensor 12 for sensing the direction of the sun, a supporting frame 13 for unitarily supporting the lenses and the sensor, a first motor 15 for rotating the supporting frame together with the others supported thereby as shown by arrow A, a supporting arm 16 for supporting the lenses 11, the sensor 12, the supporting frame 13, the motor 15, the rotatable shaft 17 set up perpendicularly to the rotatable shaft of the motor 15, and a second motor (not shown in Fig. 1) for rotating the rotatable shaft 17 in the direction as shown by arrow B.

The solar ray direction sensor 12 senses the direction of the sun and generates a detection signal. The first and second motors are so controlled as to always direct the lenses toward the sun. The solar rays focused by the lenses 11 is guided into

a large number of optical conductor cables not shown in Fig. 1 (19 cables in the embodiment of Fig. 1), the light-receiving end of which is arranged at the respective focal positions of the lenses. Then, the solar rays are transmitted through the optical conductor cables to an optional desired place.

On such occasions, the afore-mentioned solar ray collecting device is often installed and used on the rooftop of a building. However, elevator towers, water-supplying tanks, etc. are often built on the rooftops of buildings. Some of them have very little space left. Furthermore, in a big city (especially, a megalopolis), many roads are narrow, and therefore it may be very difficult to instal such a solar ray collecting device as described above in a predetermined place on the rooftops of buildings.

Fig. 2 is a side view describing an embodiment of a crane according to the present invention. Fig. 3 is a plan view. In these figures, 100 is a building, 200 is a solar ray collecting device as previously described, and 300 is a crane. The crane 300 is comprised of a foundation 310, a supporting pole 320 which is set up on a foundation 310, a movable shaft 330, an arm 340 which is rotatably movable around the shaft 330, a winding drum 350 mounted at the tip of the arm 340, a motor 360 for moving the winding drum 350, a balancing weight 370, a gear 380 for rotatably moving the arm 340, and a motor 390 for driving the gear 380.

As shown in Fig. 3, the supporting pole 320 consists of two parts 320a and 320b which are set up on a foundation 310 at a predetermined interval, and the arm 340 which also consists

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of two parts 340a and 340b which are mounted parallel to each other at a predetermined interval. Components 340a and 340b consist of 340a<sub>1</sub>, 340a<sub>2</sub>; and 340b<sub>1</sub>, 340b<sub>2</sub>; respectively. The component arms 340a<sub>2</sub> and 340b<sub>2</sub> are so constructed that they can extend and contract freely against the component arms 340a<sub>1</sub> and 340b<sub>1</sub>, respectively under the application of a force provided by e.g. a motor driving them back and forth as desired. The winding drum 350 is mounted between the arms 340a<sub>2</sub> and 340b<sub>2</sub> at the tip of the main arm 340.

When the winding drum 350 terminates winding the wire for suspending the solar ray collecting device 200, the wire is located at approximately the central position of the drum 350. At the time of lifting up the solar ray collecting device 200, the device 200 is located approximately at a center point between the component arms 340a<sub>2</sub> and 340b<sub>2</sub>. At that point the motor 390 is driven so as to rotate the arms 340a and 340b around the rotatable shaft 330 in a direction shown by arrow C, and then the solar ray collecting device 200 passes between the initial horizontal positions of the arms 340a and 340b (340a<sub>2</sub> and 340b<sub>2</sub>) and is transported as shown in Fig. 4.

In Fig. 4, 400 is an entraining base for entraining a plurality of solar ray collecting devices 200. The present applicant has already proposed an entraining base 400. In the case of using a plurality of solar ray collecting devices, the entraining base 400 is installed on the rooftop of a building and the respective solar ray collecting devices are arranged at designated positions. In such a manner, a large number of solar ray collecting devices can be effectively arranged in a narrow space.

On such an occasion, the location for installing the entraining base 400 is predetermined and the parking position for the truck transporting the solar ray collecting device is decided at the same time. If the crane according to the present invention is installed in a straight line connecting the entraining base 400 with the transporting truck, the solar ray collecting device can be installed at the desired portion only by rotating the arm 340 in a vertical plane. Subsequently, it may even be possible to install a solar ray collecting device effectively on a narrow rooftop.

Furthermore, the foundation 310 is capable of rotating in a horizontal plane on such occasions. In such a manner, it may be possible to install the solar ray collecting device much more effectively thereon. A block represented by 500 is an auxiliary apparatus (carrying tool) for lifting up and carrying the solar ray collecting device 200. The detailed structure of the auxiliary apparatus is described in the specification of JAP 56-140942 (Japanese Patent Application) in more detail.

An embodiment for installing a solar ray collecting device on a rooftop of a building by the use of a crane, according to the present invention, is described heretofore. However, the present invention  
5 is not limited to the above-mentioned embodiments. That is to say, it may be possible to lift up and carry any optional object other than a solar ray collecting device. In the embodiment, the arm is capable of extending and contracting freely (as shown in Figs. 2,  
10 3 and 4), but it is not always necessary to make the arm capable of extending and contracting freely. Furthermore, it may be easily understood that, in respect to the rotatably movable mechanism of the arm assembly, various kinds of modifications, other than  
15 the embodiment described above, can be realized.

As is apparent from the foregoing description, according to the present invention, it may be possible to provide a crane capable of effectively lifting up an object onto a narrow rooftop of a building from a narrow  
20 road and installing it in a desired position thereof, that is, a crane capable of moving within a small area on a horizontal plane.



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CLAIMS:

1. A crane comprising a pair of load arms which are spaced apart side by side and define between them an unobstructed space, hoisting means carried between said  
5 load arms near their distal end and capable of lifting a load in alignment with said unobstructed space, and driving means for rotating said load arms about a horizontal axis near their proximal end, said driving means being capable of rotating said load arms through a  
10 vertical position such that a load suspended from said hoisting means may pass through said unobstructed space, said hoisting means comprising a winding drum extending between the load arms near their distal ends and cable means wound on said winding drum such that a load  
15 suspended from said cable means is generally centrally aligned with said unobstructed space when said cable means is substantially fully wound up on said winding drum.

20 2. A crane as claimed in claim 1, wherein said load arms can be extended and contracted in use.



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3. A crane as claimed in any preceding claim, wherein said horizontal axis is defined by a support which is rotatable about a vertical axis.

4. A crane as claimed in any preceding claim,  
5 adapted to be mounted on a roof of a building near the edge thereof so as to carry loads between ground level in front of said edge to roof level behind the crane.

5. A crane substantially as described hereinabove  
10 with reference to Figures 2 to 4 of the accompanying drawings.

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