



Sheave Array Arrangement For Elevator

The present invention relates to a sheave array arrangement disposed in the upper section of a building.

In a conventional traction-type elevator ropes are suspended, for suspending a car and a counterweight for the elevator, being spaced with relatively large intervals such as, for example, substantially one half of the width of the car, and there is a sheave arrangement in which sheaves are arranged in parallel. In particular, in an elevator using a linear motor, sheaves are disposed, in several instances, in a machine room arranged in the upper section of a building, and has sheaves in a parallel array arrangement as shown in Fig.



However, in a conventional parallel sheave array arrangement for an elevator, a car is suspended by a plurality of ropes at positions which are relatively far away from the vertical line passing through the center of gravity of the car, and therefore, due to deflections of the ropes and differences in tensions of the ropes therebetween caused by dispersion in pay-out speed of the ropes, extra moments are produced around the car, causing damage of guide rollers provided both sides of the car and feelings of uncomfortable oscillation given to the passengers.

A first object of the present invention is to provide a sheave array arrangement for an elevator, which can hold a constant attitude of an elevator car during movement of the car, that is, ascending and descending movement of the car.

A second object of the present invention is to provide a sheave array arrangement for an elevator, which can reduce the installation space of sheaves.

In order to attain the above-mentioned objects, in the first aspect of the present invention, there is provided a sheave array arrangement for an elevator, which is arranged in the upper section of a building and is adapted to suspend a car and a counterweight of the elevator, having such an array arrangement that a plurality of ropes paid out from a sheave section for suspending the car to the car are converged in the vicinity of a vertical line passing through the center of gravity of the car.

In the second aspect of the present invention, there is

provided a sheave array arrangement for an elevator, which is arranged in the upper section of a building and is adapted to suspend a car and a counterweight of the elevator, wherein the maximum horizontal distance between ropes paid out from a sheave section for suspending the car to the car is reduced so as to be less than the maximum horizontal distance between ropes paid out from the sheave section for suspending the counterweight to the counterweight, the ropes from the sheave for suspending the car to the car are converged in the vicinity of the vertical line passing through the center of gravity of the car, thereby a V type array arrangement is formed.

Further, it is preferred to constitute each of the sheaves suspending the car or the counterweight, with the use of a pair of sheaves.

With the sheave array arrangement as mentioned above, the ropes fixed to the car can be converged in the vicinity of the vertical line passing through the center of the gravity of the car, and therefore the car can be elevated and lowered with no extra moments being produced around the center of gravity of the car.

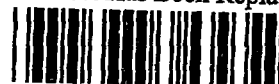
In an embodiment, explanation will be made with reference to the drawings. Referring to Fig. 1 which is a schematic perspective view illustrating an elevator using a linear motor, an elevator car 1 is fixed to one end of ropes 3 by means of rope fixing ends 2. The other end of the ropes 3 are fixed to rope fixing ends 7 which are secured to the upper end of a counterweight 6. the ropes 3 are supported by first and second sheaves 4, 5 which are rotatably supported in the upper section of a building. The first sheave 4 and the second sheave 5 are supported to a sheave shaft support member 9 through the intermediary of a sheave shaft 8 in an elevator machine room. The car 1 has car guide rollers 11 provided on both sides thereof and engaged with car guide rails 10.



Meanwhile, the counterweight 6 has counterweight guide rollers 13 engaged with counterweight guide rails 12. The counterweight 6 is arranged such that it performs rectilinear motion in the vertical direction along a column 8 corresponding to the secondary conductor of a linear induction motor which is supported at both ends by an upper end support section 15 secured to a ceiling beam 14 and a lower end support section 17 secured to a floor frame 16. Reference numeral 19 denotes the primary conductor of the linear motor. In the case of the linear induction motor shown in this embodiment, it is of such a type that the conductor is held at the installation position, and the stator alone performs rectilinear motion. In Fig. 1, the stator 19 is positioned in the center part of the counterweight 6 in consideration of the balance of the counterweight 6. The conventional sheaves have had a parallel array arrangement having a relatively wide interval, as mentioned above.

Referring to Fig. 2 which is a schematic perspective view illustrating the sheave installation for a sheave array arrangement according to the present invention, or a V-type sheave arrangement in particular. The ropes 3 paid out from the sheaves laid in the machine room in the upper section of the building, pass through an opening 20 in the machine room, and are fixed to the rope fixing ends 2 on the car 1. As clearly shown in Fig. 2, a plurality of rope fixing ends 2 fixing a plurality of ropes are concentrated in the vicinity of the vertical line passing through the center of gravity of the car.

Fig. 3 is a plan view illustrating the sheaves arranged in a V-shape as shown in Fig. 2. With this V-shape arrangement, a plurality of car side ropes can be brought to be close together. For example, in the case of the sheaves in the V-type array arrangement in the present embodiment, the minimum space distance L between the centers of the adjacent sheaves as shown Fig. 3 is set to be 100 mm, and on the contrary, the maximum space distance between the centers of



the counterweight side sheaves is set to 650 mm. From these numerical value, it is understandable that the sheaves array arrangement according to the present invention effectively allows a plurality of ropes to approach the vertical line passing through the center of gravity of the car 1.

The present invention has been described in the form of a V-type sheave array arrangement in the above-mentioned embodiment. However, the present invention should not be limited to the above-mentioned V-type array arrangement. For example, with the use of a single sheave having a relatively large size, if the ropes are paid out, equal to the width of the rope grooves of the sheave, the adjacent ropes can be fixed to the car easier than such a case that the ropes are paid out from a plurality of sheaves, and therefore, the ropes can be made to be relatively near to the vertical line passing through the center of gravity of the car. Thus, the present invention can be realized in various arrangements without departing the concept and main feature of the present invention.

Since the present invention is arranged as mentioned above, there can be offered advantages mentioned below:

Since a plurality of ropes are fixed to the car in the elevator, being converged in the vicinity of the vertical line passing through the center of gravity of the car, a constant attitude of the car can be maintained during movement of the car. Accordingly, no extra moments are produced around the center of gravity of the car, thereby it is possible to practically provide an elevator which causes extremely slight oscillation and which is very comfortable.

Further, it is possible to save the installation space of the sheave section arranged in the machine room of the elevator.

Brief Description of Drawings:

Fig. 1 is a schematic perspective view illustrating an

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elevator using linear motor; Fig. 2 is a schematic perspective view illustrating a sheave installation of a sheave array arrangement according to the present invention; and Fig. 3 is a top plan view illustrating the sheaves shown in Fig. 2.

Claims

(1) A sheave array arrangement for an elevator, which is arranged in the upper section of a building and is adapted to suspend a car and a counterweight of the elevator, having such an array arrangement that a plurality of ropes paid out from a sheave section for suspending the car to the car are converged in the vicinity of a vertical line passing through the center of gravity of the car.

(2) A sheave array arrangement for an elevator, which is arranged in the upper section of a building and is wherein the maximum horizontal distance between ropes paid out from a sheave section for suspending the car to the car is reduced so as to be less than the maximum horizontal distance between ropes paid out from the sheave section for suspending the counterweight to the counterweight, the ropes from the sheave for suspending the car to the car are converged in the vicinity of the vertical line passing through the center of gravity of the car, thereby a V type array arrangement is formed.

(3) A sheave array arrangement as set forth in claim 1 or 2, wherein sheaves suspending said car and/or said counterweight are each formed of a pair of sheave.

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