

ELEVATOR ARRANGEMENT FOR SETTING THE STARTING TORQUE OF
THE MOTOR OF AN ELEVATOR MACHINERY

The present invention relates to an arrangement for
5 setting the starting torque of an elevator machinery.

In an elevator arrangement consisting of an elevator
car, a counterweight and an elevator machinery driving
these, there are large variations in the imbalance mo-
10 ment. Generally, every time when the car stops at a
landing, its load changes, causing a change in the im-
balance moment of the elevator arrangement, so the
starting torque of the motor of the elevator machinery
must always be set in accordance with the prevailing
15 load.

At present, the required starting torque is determined
using e.g. a load weighing device in the car. In this
case, a power sensor is placed between the car and the
20 car frame to weigh the load. This structure is diffi-
cult to apply in new elevators having a so-called fra-
meless car structure with an integrated car and car
frame. In addition, long transmission lines are needed
between the car and the control system and they are ex-
25 posed to various disturbances. Likewise, this design
does not take the weight of the ropes and the friction
on the guide rails into account.

Another alternative is to use a brake balance system.
30 In this case, the brake torque of the elevator is meas-
ured and the starting torque is set to the same magni-
tude. After this, the brake is released when the motor
generates a torque that brings the brake torque to
zero. Although this solution works well, it is expen-
35 sive because of the friction at the hinges and the non-
ideality of the brake shoe.

A third alternative is to use a weighing device suspended at the end of a rope. In this case, the force acting on the point of suspension is measured. A drawback is that, in the case of 1:1 suspension, the rope end moves. This drawback is not present in 1:2 suspension, but the friction of the guides gives rise to errors.

10 The object of the present invention is to eliminate the drawbacks described above. A specific object of the present invention is to disclose a new type of elevator arrangement for setting the starting torque of the motor of the an elevator machinery, an arrangement which
15 accurately measures actual forces and which can be implemented in a simple way with few components and short transmission lines.

As for the features characteristic of the invention,
20 reference is made to the claims.

In the elevator arrangement of the invention for setting the starting torque of the motor of an elevator machinery, the elevator machinery is fixed to a guide
25 rail in an elevator shaft. According to the invention, the elevator arrangement comprises at least one power sensor connected to the elevator machinery via a non-switched connection and designed to determine the imbalance moment that the prevailing car load produces in
30 the elevator machinery.

Thus, in the elevator arrangement of the invention, no car load measurements need to be made in the car itself to determine the required starting torque of the motor,
35 but instead the measurements can be performed using appropriate power sensors, which are placed on immobile

points in the framework structures of the elevator machinery and in parts of the elevator arrangement fixedly connected to them.

5 Thus, one or more power sensors may be installed e.g. in places like the following: elevator machinery, guide rail fixture of the elevator machinery, bearing carrier of the elevator machinery and the guide rail in the elevator shaft to which the elevator machinery is
10 fixed.

The elevator arrangement of the invention has significant advantages as compared with prior art. It makes it possible to measure the actual forces acting on the machinery, which are not transmitted via ropes or the like and are not liable to errors e.g. due to friction.
15 Moreover, the sensors can be mounted near the machinery and therefore also near the control equipment, so the transmission lines will be short.

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In the following, the invention will be described in detail with reference to the attached drawings, wherein Fig. 1 presents an elevator arrangement according to the invention,

25 Fig. 2 presents a second elevator arrangement according to the invention,

Fig. 3 presents a third elevator arrangement according to the invention and

30 Fig. 4 presents a fourth elevator arrangement according to the invention.

Fig. 1 presents an elevator arrangement according to the invention in which an elevator machinery 1 is fixed to a guide rail 2 in an elevator shaft by means of rail
35 fixtures 8 holding the machinery by its upper and lower parts. Power sensors 5 according to the invention are

placed in conjunction with the rail fixtures 8. When the car load changes, the magnitude and possibly also the direction of the force acting on the wire ropes 9 is/are changed as well. In Fig. 1, the centre of the elevator machinery functions as a 1st bearing, which carries the vertical forces F_y and 2. The points of attachment of the power sensors 5 also function as bearing carriers, receiving the forces F_x resulting from the torque. Thus, the load acting via the wire ropes produces a torsion on the machinery, and this torsion, i.e. imbalance moment, is measured by means of the power sensors 5.

Fig. 2 presents a second embodiment of the invention, in which the elevator machinery 1 is also fixed by two points to a guide rail 2. In this embodiment, the power sensors 6 are mounted on the elevator machinery, close to its points of attachment to the guide rail 2. The sensors 6 are mounted on suitable supporting arms or legs 10 which carry the entire elevator machinery on the guide rail 2. Thus, in a manner corresponding to Fig. 1, the imbalance moment can be measured and used to set the starting torque of the motor as appropriate.

Fig. 3 presents a third embodiment of the invention, in which the elevator machinery 1 is substantially fixedly attached to a guide rail 2 only by its upper part 11. In its lower part 12, the machinery is connected to the guide rail 2 by means of a fulcrum pin 13, allowing a turning motion in a vertical plane. Fig. 4 shows this mounting arrangement in side view.

The embodiment in Fig. 3 has two power sensors 3 mounted between the elevator machinery 1 and the guide rail 2, which is where a path of forces and tensions is located. When an imbalance moment, generated by the im-

balance of the car and counterweight and acting via the ropes passing via the elevator machinery, is applied to the elevator machinery 1, the rigid attachment of the elevator machinery at its upper end 11 and the fulcrum pin attachment at the lower end 12 keep the elevator machinery rigidly in place. However, the fulcrum pin mounting at the lower end allows the elevator machinery to turn about the fulcrum pin 13, which means that, in a plane perpendicular to the fulcrum pin 13, the elevator machinery is rigidly held fast on the guide rail 2 only by its upper end 11. Thus, the imbalance moment acting on the ropes is transmitted from the elevator machinery to the guide rail 2 only via the upper end 11 of the elevator machinery. As the sensors 3 are placed on the guide rail near the point of attachment of the upper end 11 of the elevator machinery, the imbalance moment causes the greatest torsion of the guide rail 2 exactly in the area of the sensors 3, thus allowing the imbalance moment to be determined from them and the starting torque to be adjusted to a suitable level for the motor.

Fig. 4 presents a fourth embodiment, which corresponds to the one in Fig. 3, with a fulcrum pin 13 at the lower end 12 of the elevator machinery 1 as in Fig. 3. However, at the upper end 11 of the elevator machinery, the power sensor 4 is placed on a bearing 7 carrying the elevator machinery, i.e. on a support block supporting the elevator machinery on the guide rail 2.

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In the foregoing, the invention has been described by way of example with reference to the attached drawings while different embodiments of the invention are possible within the scope of the inventive idea defined by the claims.

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CLAIMS

1. Elevator arrangement for setting the starting torque of the motor of an elevator machinery, characterised in that, the elevator machinery (1) being mounted on a guide rail (2) in an elevator shaft, the elevator arrangement comprises at least one power sensor (3, 4, 5, 6) for determining the imbalance moment produced by the car load, said sensor being connected to the elevator machinery (1) via a non-switched connection.
2. Elevator arrangement as defined in claim 1, characterised in that the power sensor (3) is placed between the elevator machinery (1) and the guide rail (2).
3. Elevator arrangement as defined in claim 1, characterised in that the power sensor (4) is placed at a bearing (7) supporting the elevator machinery.
4. Elevator arrangement as defined in claim 1, characterised in that the power sensor (5) is placed on a rail fixture (8) of the elevator machinery.
5. Elevator arrangement as defined in claim 1, characterised in that the power sensor (6) is placed on the elevator machinery.
6. Elevator arrangement as defined in claim 1, characterised in that the elevator arrangement comprises two power sensors.

