A tension sheave device for an elevator governor rope includes: a tension sheave which is suspended by a governor rope; a rotating member which is rotated through vertical displacement of the tension sheave; a regulating member which makes the distance between the regulating member and the rotating member smaller through rotation of the rotating member in a direction in which the tension sheave is upwardly displaced; a wedge which is inserted into a gap between the rotating member and the regulating member; and an urging member urging the wedge so that the wedge enlarges by pushing the distance between the rotating member and the regulating member. A support member is provided inside a hoistway. The rotating member and the regulating member are provided on the support member. The wedge is provided with a first contact surface in contact with the rotating member and a second contact surface sloped with respect to the first contact surface and in contact with the regulating member. By forcing the wedge into the gap between the rotating member and the regulating member, upward displacement of the tension sheave is prevented.
The present invention relates to a tension sheave device for an elevator governor rope for imparting tension to a governor rope moved with a car.

BACKGROUND ART

In some conventional elevators, a tension sheave and a weight are suspended by the governor rope in order to impart tension to the governor rope. The governor rope is looped around the tension sheave, and the weight is mounted to the tension sheave. Further, a fixation member is mounted by rail clips to car guide rails for guiding the ascent and descent of the car. The fixation member is provided with an arm member rotatable around a shaft. The tension sheave is provided at the distal end of the arm member.

A plurality of teeth are formed at the proximal end of the arm close to the shaft. The fixation member is equipped with a pawl to be engaged with the teeth formed on the arm member. Only when the arm member is upwardly rotated, the pawl is engaged with the teeth. With this construction, downward rotation of the arm member is permitted, and upward rotation of the arm member is prevented. In this way, the tension sheave is prevented from rising, and the tension imparted to the governor rope is maintained (see Patent Document 1).


PROBLEMS TO BE SOLVED BY THE INVENTION

However, while it is possible to prevent upward rotation of the arm member when a tooth is engaged with the pawl, when the pawl is situated between teeth, the arm member is allowed to upwardly rotate until a tooth is engaged with the pawl, with the result that the tension sheave is allowed to rise. For example, when the passenger in the car performs an action, such as moving about, the car may vibrate in the vertical direction. If the tension sheave has been allowed to rise when the car is vibrating in the vertical direction, the tension imparted to the governor rope is rather low, so rolling is generated in the governor rope. When rolling is generated in the governor rope, the rotating speed of the governor sheave around which the governor rope is looped also fluctuates. Thus, the speed of the car cannot be detected accurately, with the result that a safety device for forcibly stopping the movement of the car malfunctions. Further, due to the rolling of the governor rope, there is a fear of the governor rope being caught by some other apparatus installed in the hoistway.

The present invention has been made with a view toward solving the above problems in the prior art.

MEANS FOR SOLVING THE PROBLEM

A tension sheave device for an elevator governor rope according to the present invention includes: a tension sheave around which a governor rope moved with a car is looped and which is suspended by the governor rope; a rotating member which is rotatably provided on a support member provided in a hoistway, on which the tension sheave is rotatably provided, and which is rotated with respect to the support member through vertical displacement of the tension sheave; a regulating member which is provided on the support member and which makes the distance between the regulating member and the rotating member smaller through rotation of the rotating member in a direction in which the tension sheave is upwardly displaced; a wedge which is provided with a first contact surface in contact with the rotating member and a second contact surface sloped with respect to the first contact surface and in contact with the regulating member and which is inserted into a gap between the rotating member and the regulating member and is capable of being displaced with respect to the rotating member and the regulating member; and an urging member urging the wedge so that the wedge enlarges by pushing the distance between the rotating member and the regulating member.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic view of an elevator according to Embodiment 1 of the present invention.
Fig. 2 is a front view of the tension sheave device of Fig. 1.
Fig. 3 is a sectional view taken along the line III-III of Fig. 2.
Fig. 4 is a front view of the tension sheave device when the tension sheave of Fig. 2 has been downwardly displaced.
Fig. 5 is a schematic view showing the state of the elevator of Fig. 1 when the vertically vibrating car has been displaced to the lowermost point of the amplitude.
Fig. 6 is a schematic view showing the state of the elevator of Fig. 5 when the vertically vibrating car has been displaced to the uppermost point of the amplitude.

BEST MODE FOR CARRYING OUT THE INVENTION

In the following, a preferred embodiment of the
Fig. 1 is a schematic view of an elevator according to Embodiment 1 of the present invention. In the drawing, installed in a hoistway 1 are a pair of guide rails 2 and a pair of counterweight guide rails (not shown). A car 3 is arranged between the guide rails 2. A counterweight 4 is arranged between the counterweight guide rails.

A machine room 5 is provided in the top portion of the hoistway 1. Installed in the machine room 5 are a hoisting machine (driving machine) 6 for causing the car 3 and the counterweight 4 to ascend and descend within the hoistway 1 and a deflector sheave 7 arranged so as to be spaced apart from the hoisting machine 6. The hoisting machine 6 has a driving machine main body 8 including a motor and a brake device, and a driving sheave 9 rotatable with respect to the driving machine main body 8.

A plurality of main ropes 10 are looped around the driving sheave 9 and the deflector sheave 7. The car 3 and the counterweight 4 are suspended within the hoistway 1 by the driving force of the hoisting machine 6 while guided by the guide rails 2. The counterweight 4 is caused to ascend and descend within the hoistway 1 by the driving force of the hoisting machine 6 while guided by the guide rails 2.

Further installed in the machine room 5 is a speed governor 11 for detecting the speed of the car 3. The speed governor 11 has a governor main body 12 and a governor sheave 13 rotatable with respect to the governor main body 12. Further, a control device 14 for controlling the operation of the elevator is electrically connected to the speed governor 11 and the hoisting machine 6. The control device 14 is installed within the machine room 5.

A safety device 15 for forcibly stopping the movement of the car 3 is arranged on the car 3. The safety device 15 is adapted to be operated when the governor rope 16 is grasped by the governor main body 12 and the operating lever 17 is displaced with respect to the car 3. The movement of the car 3 is forcibly stopped through the operation of the safety device 15.

In the lower portion of the hoistway 1, there is provided a tension sheave device for the governor rope (hereinafter, simply referred to as "tension sheave device") 18 for imparting tension to the governor rope 16. The tension sheave device 18 is mounted to one of the car guide rails 2.

A safety device 15 is adapted to be operated when the governor rope 16 is grasped by the governor main body 12, the control device 14 stops the motor of the hoisting machine 6 and operates the brake device. The safety device 15 is adapted to be operated when the governor rope 16 is grasped by the governor main body 12 and the operating lever 17 is displaced with respect to the car 3. The movement of the car 3 is forcibly stopped through the operation of the safety device 15.

Further installed in the machine room 5 is a tension sheave device 18 of Fig. 1. Fig. 3 is a sectional view taken along the line III-III of Fig. 2. In the drawings, a support plate (support member) 19 for supporting the tension sheave device 18 is mounted to the car guide rail 2 by rail clips 20. Provided on the support plate 19 is an arm (rotating member) 22 rotatable around a support shaft 21 extending horizontally. On the support shaft 21, there is provided the proximal end portion of the arm 22. At the distal end of the arm 22, there is provided a tension sheave 23 around which the governor rope 16 is looped. The tension sheave 23 is rotatable around a rotation shaft 24 which is parallel to the support shaft 21.

The arm 22 is rotated around the support shaft 21 through vertical displacement of the tension sheave 23. The tension sheave 23 is rotated around the rotation shaft 24 through movement of the governor rope 16. The rotation shaft 24 is provided with a weight 26 through the intermediation of a suspension member 25. The tension sheave 23 and the weight 26 are suspended by the governor rope 16.

Fixed to the support plate 19 is a protruding pin (regulating member) 27 protruding from the support plate 19. The protruding pin 27 is arranged above the arm 22. Further, the protruding pin 27 is arranged on the tension sheave 23 side of the support shaft 21 with respect to the horizontal direction. That is, the distance between the protruding pin 27 and the arm 22 is reduced through rotation of the arm 22 in the direction of upward displacement of the tension sheave 23.

On the protruding pin 27 side portion of the arm 22, there is provided a sliding surface 28 extending in the longitudinal direction of the arm 22. Between the arm 22 and the protruding pin 27, there is inserted a wedge 29 capable of displacement with respect to the arm 22 and the protruding pin 27. The wedge 29 is provided with a first contact surface 30 in contact with the sliding surface 28 and a second contact surface 31 in contact with the protruding pin 27. The second contact surface 31 is sloped with respect to the first contact surface 30. The wedge 29 is inserted into the gap between the arm 22 and the protruding pin 27, with the first contact surface 30 in contact with the sliding surface 28 and the second contact surface 31 in contact with the protruding pin 27.

A wedge side spring peg 32 is fixed to the wedge
29. A support plate side spring peg 33 is fixed to the support plate 19. Between the wedge side spring peg 32 and the support plate side spring peg 33, there is provided a tension spring (urging member) 34 biased in the contracting direction. The wedge 29 is urged by the tension spring 34 so as to enlarge by pushing the distance between the arm 22 and the protruding pin 27. As a result, the arm 22 is urged so as to be rotated in the direction of downward displacement of the tension sheave 23. A predetermined frictional force is generated between the first contact surface 30 and the sliding surface 28 and between the second contact surface 31 and the protruding pin 27.

[0023] Fig. 4 is a front view of the tension sheave device 18 when the tension sheave 23 of Fig. 2 has been downwardly displaced. As shown in the drawing, when the tension sheave 23 is downwardly displaced as a result, for example, of expansion of the governor rope 16, the arm 22 is rotated, and the distance between the arm 22 and the protruding pin 27 is enlarged. The wedge 29 is displaced so as to be forced into the gap between the arm 22 and the protruding pin 27 while being held in contact with the arm 22 and the protruding pin 27 due to the urging by the tension spring 34. Since a predetermined frictional force is generated between the first contact surface 30 and the sliding surface 28 and between the second contact surface 31 and the protruding pin 27, the wedge 29 is prevented from being pushed back, thus preventing upward displacement of the tension sheave 23.

[0024] Next, the operation of this embodiment will be described. The wedge 29 is constantly urged by the tension spring 34 so as to enlarge the distance between the arm 22 and the protruding pin 27. In this state, tension is imparted to the governor rope 16.

[0025] When, for example, the governor rope 16 is expanded and the tension sheave 23 is downwardly displaced, the arm 22 is rotated so as to be moved away from the protruding pin 27 (that is, downwards). At this time, the wedge 29 is displaced by the urging force of the tension spring 34 so as to be forced into the gap between the protruding pin 27 and the arm 22 while being held in contact with the protruding pin 27 and the arm 22. As a result, upward displacement of the tension sheave 23 is prevented.

[0026] When the car 3 is moved within the hoistway 1, the governor rope 16 is moved together with the car 3. As a result, the governor sheave 13 and the tension sheave 23 are rotated.

[0027] When the rotating speed of the governor sheave 13 attains the first set overspeed, a stop signal is supplied from the governor main body 12 to the control device 14. As a result, the brake device of the hoisting machine 6 is operated through control by the control device 14, and the rotation of the driving sheave 9 is braked.

[0028] When, for example, due to breakage of the main ropes 10, the speed of the car 3 further increases, and the rotating speed of the governor sheave 13 attains the second set overspeed, the governor rope 16 is grasped by the governor main body 12. As a result, the movement of the governor rope 16 is stopped, and the safety device 15 is operated, whereby the movement of the car 3 is forcibly stopped.

[0029] Next, the operation when the car 3 vibrates in the vertical direction will be described. Fig. 5 is a schematic view showing the state of the elevator of Fig. 1 when the vertically vibrating car 3 has been displaced to the lowermost point of the amplitude. Fig. 6 is a schematic view showing the state of the elevator of Fig. 5 when the vertically vibrating car 3 has been displaced to the uppermost point of the amplitude. As shown in the drawings, when as a result, for example, of a passenger 35 in the car 3 moving about, the car 3 is vibrating in the vertical direction, the governor rope 16 is repeatedly moved in the vertical direction in conformity with the vibration of the car 3. At this time, the respective rotating directions of the governor sheave 13 and the tension sheave 23 are also repeatedly reversed in conformity with the vertical movement of the governor rope 16.

[0030] When the car 3 is displaced toward the lowermost point of the amplitude, the magnitude of the tension imparted to the portions of the main ropes 10 between the car 3 and the driving sheave 9 increases. At this time, the operating lever 17 is displaced downwardly together with the car 3, so the tension imparted to the portion of the governor rope 16 between the lower portion of the operating lever 17 and the tension sheave 23 decreases. However, since the tension sheave 23 is downwardly urged by the tension sheave device 18, it is possible to prevent an abrupt reduction in the magnitude of the tension imparted to the governor rope 16.

[0031] When the car 3 is displaced toward the uppermost point of the amplitude, the magnitude of the tension imparted to the portions of the main ropes 10 between the car 3 and the driving sheave 9 decreases. As a result, rolling is generated in the main ropes 10. At this time, the operating lever 17 is displaced upwardly together with the car 3, so the tension imparted to the portion of the governor rope 16 between the upper portion of the operating lever 17 and the governor sheave 13 decreases. However, since upward displacement of the tension sheave 23 is prevented because of the wedge 29 being forced into the gap between the protruding pin 27 and the arm 22, there is no fear of the tension sheave 23 rising upwards, and it is possible to prevent an abrupt reduction in the magnitude of the tension imparted to the governor rope 16.

[0032] In the tension sheave device 18 described above, the wedge 29 is inserted into the gap between the arm 22, which is rotated with respect to the support plate 19 through vertical displacement of the tension sheave 23 suspended by the governor rope 16, and the protruding pin 27 provided on the support plate 19 and making the distance between itself and the arm 22 smaller through upward displacement of the tension sheave 23, and the wedge 29 is urged by the tension spring 34.
so as to enlarge the distance between the arm 22 and the protruding pin 27, so it is possible to constantly urge the tension sheave 23 downwards. Further, when the wedge 29 is forced into the gap between the arm 22 and the protruding pin 27, it is possible to prevent the arm 22 from rotating toward the protruding pin 27. As a result, it is possible to prevent upward displacement of the tension sheave 23, making it possible to prevent an abrupt reduction in the magnitude of the tension imparted to the governor rope 16. Thus, even when the car 3 vibrates in the vertical direction, it is possible to prevent generation of rolling in the governor rope 16, and to accurately detect the ascent/descent speed of the car 3 from the rotating speed of the governor sheave 13. Further, it is also possible to prevent, for example, a malfunction of the safety device 15 and the governor rope 16 from being caught by some other apparatus.

[0033] Further, since the protruding pin 27 is arranged above the arm 22, it is possible to arrange the protruding pin 27 between the support shaft 21 and the tension sheave 23 with respect to the horizontal direction, making it possible to reduce the length of the arm 22. As a result, it is possible to achieve a reduction in material cost and space saving.

[0034] While in the above example the protruding pin 27 is arranged above the arm 22, it is also possible to arrange the protruding pin 27 below the arm 22. In this case, the protruding pin 27 is arranged so as to be more spaced apart from the tension sheave 23 than the support shaft 21. In this arrangement also, it is possible for the gap between the protruding pin 27 and the arm 22 to be reduced when the arm 22 is rotated so as to upwardly displace the tension sheave 23, and it is possible to prevent upward displacement of the tension sheave 23 by forcing the wedge 29 into the gap between the protruding pin 27 and the arm 22.

[0035] The larger the horizontal distance between the protruding pin 27 and the support shaft 21, the larger the displacement amount of the wedge 29, and therefore, the larger the size of the wedge 29 and the tension spring 34. Thus, to achieve a reduction in size, it is desirable to diminish the horizontal distance between the protruding pin 27 and the support shaft 21.

Claims

1. A tension sheave device for an elevator governor rope, comprising:

   a tension sheave around which a governor rope moved with a car is looped and which is suspended by the governor rope;
   a rotating member which is rotatably provided on a support member provided in a hoistway, on which the tension sheave is rotatably provided, and which is rotated with respect to the support member through vertical displacement of the tension sheave;
   a regulating member which is provided on the support member and which makes the distance between the regulating member and the rotating member smaller through rotation of the rotating member in a direction in which the tension sheave is upwardly displaced:
   a wedge which is provided with a first contact surface in contact with the rotating member and a second contact surface sloped with respect to the first contact surface and in contact with the regulating member and which is inserted into a gap between the rotating member and the regulating member and is capable of being displaced with respect to the rotating member and the regulating member; and
   an urging member urging the wedge so that the wedge enlarges by pushing the distance between the rotating member and the regulating member.

2. The tension sheave device for an elevator governor rope according to Claim 1, characterized in that the regulating member is arranged above the rotating member.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

B66B7/06 (2006.01), B66B5/04 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B66B7/06 (2006.01), B66B5/04 (2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched


Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<th>Category &amp;</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tbody>
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<td>AJP 2002-179361 A (Toshiba Elevator and Building Systems Corp.), 26 June, 2002 (26.06.02), Abstract, Fig. 5</td>
<td>1-2</td>
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<tr>
<td>AJP 50-19139 A (Hiromichi ITO), 28 February, 1975 (28.02.75), Page 2, upper left column, line 20 to page 3, upper right column, line 14; Figs. 1 to 7</td>
<td>1-2</td>
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Date of the actual completion of the international search
04 April, 2006 (04.04.06)

Date of mailing of the international search report
11 April, 2006 (11.04.06)

Name and mailing address of the ISA/Authorized officer
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

• JP 2002179361 A [0004]