

ROPE CLEANING DEVICE

FIELD

Embodiments described herein relate generally to a rope cleaning device which removes grease from a plurality of wire ropes.

BACKGROUND

For example, each of a plurality of wire ropes for suspending the car and counterweight of an elevator comprises a plurality of steel strands helically twisted around a core wire. In this type of wire rope, grease is applied to lubricate the strands and prevent the strands from rusting away.

Grease cannot avoid solidifying or degrading as the operation time of the elevator advances. To remove solidified old grease, maintenance operation should be regularly performed to clean the wire ropes.

JP 5427918 B discloses a conventional cleaning device which automatically cleans a wire rope. The cleaning device comprises a ring-shaped rotary member removably attached to the outer circumferential surface of a wire rope. The rotary member scrapes solidified grease off the outer circumferential surface of twisted strands and the grooves between adjacent strands by rotating so as to follow the moving wire rope.

In an elevator comprising wire ropes adjacent to each other at a narrow pitch, a space for a rotary member which scrapes off grease cannot be defined around each wire rope. Thus, it is difficult to apply the conventional cleaning device to wire ropes arranged at a narrow pitch. Therefore, a worker has to manually remove grease from wire ropes arranged at a narrow pitch with a scraper or brush.

However, manual removal of grease firmly attached to the wire ropes is very troublesome. It takes a lot of time to clean the wire ropes.

SUMMARY

The object of the present invention is to obtain a rope cleaning device which can clean wire ropes efficiently to the inside of a short time.

5 To achieve the above object, a rope cleaning device comprises a housing comprises a rope cleaning chamber into which a plurality of wire ropes arranged at intervals are inserted, and a cleaning element which is provided in the rope cleaning chamber of the
10 housing. The cleaning element cleans the wire ropes by slidably making contact with all the wire ropes passing through the rope cleaning chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view schematically showing a machine room-less elevator according to an
15 embodiment.

FIG. 2 schematically shows the path of main ropes for suspending a car and a counterweight in a hoistway.

FIG. 3A is a side view showing the structure of each main rope used in the embodiment.
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FIG. 3B is a cross-sectional view of each main rope used in the embodiment.

FIG. 4 is a perspective view showing a state in which a rope cleaning device is installed in the
25 hoistway of the machine room-less elevator according to the embodiment.

FIG. 5 is a perspective view in which the rope cleaning device is seen from the side cover side according to the embodiment.

30 FIG. 6 is a perspective view in which the rope cleaning device is seen from the hinge side according to the embodiment.

FIG. 7 is a side view in which the rope cleaning device is seen from the hinge side according to the
35 embodiment.

FIG. 8 is a plan view of the rope cleaning device according to the embodiment.

FIG. 9 is a cross-sectional view of the rope cleaning device according to the embodiment.

5 FIG. 10 is a plan view of the rope cleaning device in a state where a plurality of main ropes arranged in a line are interposed between a plurality of channel brushes.

10 FIG. 11 is a perspective view showing a state in which the rope cleaning device is suspended in the hoistway by brackets.

FIG. 12A is a cross-sectional view of the rope cleaning device in a state where a rope cleaning chamber is open.

15 FIG. 12B is a cross-sectional view in which portion A of FIG. 12A is enlarged.

FIG. 13 is a front view showing the positional relationship between a first supporting plate and a plurality of channel brushes.

20 FIG. 14 is a perspective view of the rope cleaning device in a state where the rope cleaning chamber is open.

FIG. 15 is an exploded perspective view showing the positional relationship between a pair of hinges and a first case of a housing.

DETAILED DESCRIPTION

Various embodiments will be described hereinafter with reference to the accompanying drawings.

30 FIG. 1 discloses a machine room-less elevator 1 which does not require a dedicated machine room. The machine room-less elevator 1 comprises a hoistway 2 provided in a building. A car 3 and a counterweight 4 are supported such that they are capable of moving up and down the hoistway 2. A supporting beam 5 is
35 provided at the upper end of the hoistway 2. A

traction machine 7 comprising a traction sheave 6 is installed onto the supporting beam 5.

5 The car 3 and the counterweight 4 are suspended in the hoistway 2 by a plurality of main ropes 8. The main ropes 8 are examples of wire ropes. As shown in FIG. 4, the main ropes 8 extend in the height direction of the hoistway 2 and are arranged in a line at intervals.

10 In the present embodiment, for each main rope 8, for example, a wire rope having a diameter of 5 mm is used. Further, as shown in FIG. 8, pitch P between adjacent main ropes 8 is set to, for example, 8.5 mm. For example, pitch P is significantly less than the pitch of the main ropes used for an elevator comprising a machine room. Pitch P between the main ropes 8 is not limited to 8.5 mm. Pitch P may be appropriately changed based on, for example, the diameter or the number of wire ropes.

20 As shown in FIG. 2, each main rope 8 comprises an end 8a connected to a first rope hitch 9a at the upper end of the hoistway 2. Similarly, the other end 8b of each main rope 8 is connected to a second rope hitch 9b at the upper end of the hoistway 2.

25 Each main rope 8 comprises an intermediate portion 8c extending between the ends 8a and 8b. The intermediate portion 8c of each main rope 8 is successively rolled over a pair of lower sheaves 11a and 11b provided in the car 3, the traction sheave 6 of the traction machine 7, and a weight sheave 12 provided in the counterweight 4. The traction sheave 6, the lower sheaves 11a and 11b and the weight sheave 12 each rotate around horizontal rotation axis O1 extending in the depth direction of the hoistway 2.

35 As shown in FIG. 1, the moving direction of the intermediate portion 8c of each main rope 8 is guided

via a first deflector sheave 13a and a second deflector sheave 13b in the hoistway 2. The first deflector sheave 13a is supported in the upper part of the hoistway 2 so as to be located immediately under the traction sheave 6. The second deflector sheave 13b is supported in the upper part of the hoistway 2 so as to be located immediately above one of the lower sheaves 11a.

The first deflector sheave 13a and the second deflector sheave 13b rotate around horizontal rotation axis O2 extending in the width direction of the hoistway 2. Thus, the positional relationship between rotation axis O1 of the traction sheave 6 and rotation axis O2 of the first deflector sheave 13a is maintained such that they are perpendicular to each other in the hoistway 2. Similarly, the positional relationship between rotation axis O1 of the lower sheave 11a and rotation axis O2 of the second deflector sheave 13b is maintained such that they are perpendicular to each other in the hoistway 2.

As shown in FIG. 1, in the intermediate portion 8c, the main rope 8 is rolled over the lower sheave 11a of the car 3, and is upwardly routed along the hoistway 2. The main rope 8 is then guided to the first deflector sheave 13a via the second deflector sheave 13b. After the main rope 8 passes the first deflector sheave 13a, the main rope 8 is upwardly routed along the hoistway 2 again. The main rope 8 is then guided to the weight sheave 12 of the counterweight 4 via the traction sheave 6.

When the traction sheave 6 of the traction machine 7 rolls up and back the main ropes 8, the car 3 and the counterweight 4 move up and down the hoistway 2 in accordance with the traction system.

According to the present embodiment, in the

intermediate portion 8c of each main rope 8, the zone between the traction sheave 6 and the first deflector sheave 13a and the zone between the lower sheave 11a and the second deflector sheave 13b linearly extend in the height direction of the hoistway 2. Further, in these zones, the direction of arrangement of the main ropes 8 is twisted at 90°.

In other words, as rope draw, the main ropes 8 are twisted around the perpendicular axis in the height direction of the hoistway 2 between the traction sheave 6 and the first deflector sheave 13a and between the lower sheave 11a and the second deflector sheave 13b.

As shown in FIG. 3A and FIG. 3B, each main rope 8 comprises, for example, a core wire 15, an internal covering layer 16 and a plurality of strands 17. For example, the core wire 15 is formed by helically twisting a plurality of steel wires 15a. The internal covering layer 16 is cylindrically formed of, for example, polyethylene resin, and entirely covers the outer circumferential surface of the core wire 15.

Each strand 17 is formed by twisting a plurality of steel wires 17a. The strands 17 are helically twisted around the internal covering layer 16 at a predetermined pitch. Thus, a plurality of strand grooves 18 open on the outer circumferential surface of each main rope 8 are formed between adjacent strands 17. The strand grooves 18 are helically twisted, and are inclined with respect to axis O3 of the main rope 8.

Further, in each main rope 8 comprising the core wire 15 formed of steel, grease (not shown) is applied to the strands 17 to lubricate the strands 17 and prevent the strands 17 from rusting away. The grease applied to the strands 17 degrades and solidifies over time. Therefore, there is a need to regularly remove

the grease from the main ropes 8 and newly grease apply to the strands 17.

FIG. 4 to FIG. 9 disclose a rope cleaning device 21 used to remove the solidified grease from the main ropes 8. The rope cleaning device 21 comprises a metal housing 22, a first supporting plate 24 to which a plurality of channel brushes 23 are attached, a second supporting plate 25 to which a plurality of channel brushes 23 are attached in a similar manner, an upper scraper 26, and a lower scraper 27. These elements are provided as the main components of the rope cleaning device 21.

As shown in FIG. 5 to FIG. 9, the housing 22 is a hollow rectangular box. In the present embodiment, the housing 22 is formed by combining a first case 28 and a second case 29. The first case 28 comprises a rectangular outer plate 30 provided upright along the main ropes 8, an upper flange 31 extending from the upper edge of the outer plate 30 to outside at a right angle, a lower flange 32 extending from the lower edge of the outer plate 30 to outside at a right angle, and a flanged hinge support 33 extending from the front edge of the outer plate 30 at a right angle.

The upper flange 31 and the lower flange 32 extend in a horizontal direction, and face each other in the height direction of the outer plate 30. The hinge support 33 extends in a direction opposite to that of the upper and lower flanges 31 and 32, and is provided upright in the height direction of the outer plate 30.

A first top board 35 is stacked on the upper surface of the upper flange 31. The first top board 35 is horizontally provided along the upper flange 31. The two end portions of the first top board 35 in the direction of arrangement of the main ropes 8 are secured to the upper flange 31 through two bolts 36.

The first top board 35 comprises a first scraper supporting portion 37. The first scraper supporting portion 37 horizontally extends to a side opposite to that of the upper flange 31 through the part above the outer plate 30. A rope guide 37a downwardly extends from the distal end of the first scraper supporting portion 37 at a right angle.

A first bottom board 38 is stacked on the lower surface of the lower flange 32. The first bottom board 38 is horizontally provided along the lower flange 32. The two end portions of the first bottom board 38 in the direction of arrangement of the main ropes 8 are secured to the lower flange 32 through two bolts 39.

The first bottom board 38 comprises a second scraper supporting portion 40. The second scraper supporting portion 40 horizontally extends to a side opposite to that of the lower flange 32 through the part under the outer plate 30. A rope guide 40a upwardly extends from the distal end of the second scraper supporting portion 40 at a right angle.

The second case 29 basically comprises the same structure as that of the first case 28. Specifically, as shown in FIG. 6 and FIG. 9, the second case 29 comprises a rectangular outer plate 42 provided upright along the main ropes 8, an upper flange 43 extending from the upper edge of the outer plate 42 to outside at a right angle, a lower flange 44 extending from the lower edge of the outer plate 42 to outside at a right angle, and a flanged hinge support 45 extending from the front edge of the outer plate 42 at a right angle.

The upper flange 43 and the lower flange 44 extend in a horizontal direction, and face each other in the height direction of the outer plate 42. The hinge support 45 extends in a direction opposite to that of the upper and lower flanges 43 and 44, and is provided

upright in the height direction of the outer plate 42.

A second top board 47 is stacked on the upper surface of the upper flange 43. The second top board 47 is horizontally provided along the upper flange 43.
5 The two end portions of the second top board 47 in the direction of arrangement of the main ropes 8 are secured to the upper flange 43 through two bolts 48.

The second top board 47 comprises a third scraper supporting portion 49. The third scraper supporting portion 49 horizontally extends to a side opposite to that of the upper flange 43 through the part above the outer plate 42. A rope guide 49a downwardly extends from the distal end of the third scraper supporting portion 49 at a right angle.
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A second bottom board 50 is stacked on the lower surface of the lower flange 44. The second bottom board 50 is horizontally provided along the lower flange 44. The two end portions of the second bottom board 50 in the direction of arrangement of the main ropes 8 are secured to the lower flange 44 through two bolts 51.
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The second bottom board 50 comprises a fourth scraper supporting portion 52. The fourth scraper supporting portion 52 horizontally extends to a side opposite to that of the lower flange 44 through the part under the outer plate 42. A rope guide 52a upwardly extends from the distal end of the fourth scraper supporting portion 52 at a right angle.
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As shown in FIG. 6 and FIG. 7, the first case 28 and the second case 29 are connected to each other by a pair of hinges 55. A space is left between the hinges 55 in the height direction of the first and second cases 28 and 29.
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Each hinge 55 comprises a first hinge piece 56 and a second hinge piece 57. The first and second hinge
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pieces 56 and 57 are flat plate-like elements, and are connected to each other such that they are relatively rotatable around a hinge shaft 58. The hinge shaft 58 extends in the axial direction of the main ropes 8.

5 The axial direction of the main ropes 8 may be referred to as the height direction of the first and second cases 28 and 29.

10 The first hinge piece 56 of each hinge 55 is connected to the outer surface of the hinge support 33 of the first case 28 by two bolts 60. As shown in FIG. 12A, FIG. 12B and FIG. 15, each pair of bolts 60 penetrates a corresponding first hinge piece 56 and the hinge support 33, and is screwed in a corresponding common nut member 61.

15 In the present embodiment, a plurality of long holes 62 corresponding to the bolts 60, respectively, are formed in the hinge support 33. The long holes 62 horizontally extend in a direction perpendicular to the axis of the main ropes 8. Further, a cylindrical sleeve 63 fits in each long hole 62. The sleeves 63 are slidable in the direction of the long axis of the long holes 62 with respect to the hinge support 33. Each pair of bolts 60 is screwed in a corresponding nut member 61 through a corresponding pair of sleeves 63.

20 As shown in FIG. 12B, the sleeve 63 into which the bolt 60 is inserted is held between the first hinge piece 56 and the nut member 61. In this way, the first hinge piece 56 is supported in the hinge support 33 of the first case 28 so as to be slidable in a horizontal direction, using the sleeve 63 and the long hole 62 as guides.

30 The second hinge piece 57 of each hinge 55 is secured to the outer surface of the hinge support 45 of the second case 29 by two bolts 64. Each pair of bolts 64 penetrates a corresponding second hinge piece 57,

and is screwed in the hinge support 45 of the second case 29.

5 As shown in FIG. 12A and FIG. 12B, the hinge shaft 58 of each hinge 55 is located at the boundary between the hinge support 33 of the first case 28 and the hinge support 45 of the second case 29 in a state where the first case 28 is connected to the second case 29 by each hinge 55.

10 As a result, the first case 28 and the second case 29 are combined with each other so as to be rotatable between a first position at which the outer plates 30 and 42 face each other across an intervening space and a second position at which the outer plates 30 and 42 are distant from each other. FIG. 9 shows a state in which the first case 28 and the second case 29 are located at the first position as a result of rotation. FIG. 12A shows a state in which the first case 28 and the second case 29 are located at the second position as a result of rotation.

20 As shown in FIG. 9, in a state where the first case 28 and the second case 29 are located at the first position as a result of rotation, a rope cleaning chamber 66 surrounded by the outer plates 30 and 42, the hinge supports 33 and 45 and the first to fourth scraper supporting portions 37, 40, 49 and 52 is defined between the first case 28 and the second case 29. The rope cleaning chamber 66 is an element into which the main ropes 38 arranged in a line are inserted, and is located in the housing 22.

30 In a state where the first case 28 and the second case 29 are located at the first position as a result of rotation, the rope guide 37a of the first scraper supporting portion 37 faces the rope guide 49a of the third scraper supporting portion 49 in the upper end portion of the rope cleaning chamber 66 across an

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intervening space. The rope guides 37a and 49a define a first rope insertion hole 67 at the upper end of the housing 22 in cooperation with each other. The first rope insertion hole 67 is open at the upper end of the rope cleaning chamber 66.

Similarly, the rope guide 40a of the second scraper supporting portion 40 faces the rope guide 52a of the fourth scraper supporting portion 52 in the lower end portion of the rope cleaning chamber 66 across an intervening space. The rope guides 40a and 52a define a second rope insertion hole 68 at the lower end of the housing 22 in cooperation with each other. The second rope insertion hole 68 is open at the lower end of the rope cleaning chamber 66.

The first rope insertion hole 67 and the second rope insertion hole 68 have a slit-like opening shape in the direction of arrangement of the main ropes 8 arranged in a line. The main ropes 8 are guided to the rope cleaning chamber 66 through the first rope insertion hole 67 and the second rope insertion hole 68.

In the present embodiment, as shown in FIG. 5, a first side cover 70 is provided at the rear edge of the outer plate 30 on a side opposite to that of the hinge support 33. The first side cover 70 extends from the outer plate 30 so as to face the hinge support 33, and is removably supported in the outer plate 30 through two wing bolts 71.

Similarly, a second side cover 72 is provided at the rear edge of the outer plate 42 on a side opposite to that of the hinge support 45. The second side cover 72 extends from the outer plate 42 so as to face the hinge support 45, and is removably supported in the outer plate 42 through two wing bolts 73.

As shown in FIG. 5, in a state where the first

case 28 and the second case 29 are located at the first position as a result of rotation, the distal end of the first side cover 70 overlaps the distal end of the second side cover 72. Further, they block the opening
5 end of the rope cleaning chamber 66 on a side opposite to that of the hinge supports 33 and 45. Thus, the rope cleaning chamber 66 is substantially an enclosed space.

As shown in FIG. 5, FIG. 6 and FIG. 9, the first
10 case 28 is connected to the second case 29 by, for example, four connecting bolts 75 as fasteners, at the first position. The connecting bolts 75 penetrate the four corners of the rope cleaning chamber 66, and extend between the outer plate 30 of the first case 28
15 and the outer plate 42 of the second case 29. The distal end of each connecting bolt 75 penetrating the outer plate 30 is screwed in a corresponding nut 76.

The outer plate 30 of the first case 28 and the outer plate 42 of the second case 29 are movable in a
20 direction such that they approach or move away from each other in the range of the length of the long holes 62 by adjusting the screw amount of the connecting bolts 75 with respect to the nuts 76.

As shown in FIG. 9 and FIG. 13 to FIG. 15, the
25 first supporting plate 24 is removably housed in the rope cleaning chamber 66 such that the first supporting plate 24 is provided upright along the outer plate 30 of the first case 28. The first supporting plate 24 is a rectangular plate having a predetermined thickness,
30 and is interposed between the first scraper supporting portion 37 of the first top board 35 and the second scraper supporting portion 40 of the first bottom board 38.

The first supporting plate 24 comprises an upper
35 edge 78 facing the first scraper supporting portion 37,

and a lower edge 79 facing the second scraper supporting portion 40. The upper edge 78 is inserted between the rope guide 37a of the first scraper supporting portion 37 and the upper end portion of the outer plate 30. The lower edge 79 is inserted between the rope guide 40a of the second scraper supporting portion 40 and the lower end portion of the outer plate 30.

As shown in FIG. 13, a plurality of first slits 80 and a plurality of second slits 81 are formed in the first supporting plate 24. The first slits 80 are linear cuts from the upper edge 78 toward the lower edge 79 of the first supporting plate 24, and are arranged parallel to each other at intervals in the direction of arrangement of the main ropes 8.

The second slits 81 are linear cuts from the lower edge 79 toward the upper edge 78 of the first supporting plate 24, and are arranged parallel to each other at intervals in the direction of arrangement of the main ropes 8. In the present embodiment, the first slits 80 and the second slits 81 are inclined along the strand grooves 18 of the main ropes 8.

Moreover, four through-holes 82 into which the connecting bolts 75 are inserted are formed at positions off the first slits 80 and the second slits 81 in the outer circumferential portion of the first supporting plate 24. Thus, the first supporting plate 24 is supported in the first case 28, using the connecting bolts 75 extending between the first case 28 and the second case 29.

The second supporting plate 25 basically comprises the same structure as that of the first supporting plate 24. The same structural elements are denoted by the same reference numbers, detailed description thereof being omitted. The second supporting plate 25

is removably housed in the rope cleaning chamber 66 such that the second supporting plate 25 is provided upright along the outer plate 42 of the second case 29. The second supporting plate 25 is interposed between
5 the third scraper supporting portion 49 of the second top board 47 and the fourth scraper supporting portion 52 of the second bottom board 50.

The upper edge 78 of the second supporting plate 25 is inserted between the rope guide 49a of the third
10 scraper supporting portion 49 and the upper end portion of the outer plate 42. The lower edge 79 of the second supporting plate 25 is inserted between the rope guide 52a of the fourth scraper supporting portion 52 and the lower end portion of the outer plate 42.

Further, the second supporting plate 25 is
15 supported in the second case 29, using the connecting bolts 75 extending between the first case 28 and the second case 29. In a state where the first case 28 is connected to the second case 29 by the connecting bolts
20 75, the first supporting plate 24 faces the second supporting plate 25 across the intervening main ropes 8 in the rope cleaning chamber 66.

The first and second slits 80 and 81 formed in the second supporting plate 25 are inclined in a direction
25 opposite to that of the first and second slits 80 and 81 formed in the first supporting plate 24.

The channel brushes 23 attached to the first supporting plate 24 and the second supporting plate 25 are examples of cleaning elements, and have the common
30 structure. As shown in FIG. 9 and FIG. 12A, each channel brush 23 comprises a linear channel portion 85, and a large number of metal brush members 86 supported in the channel portion 85, as the main components.

Each channel portion 85 is formed of, for example,
35 channel shaped steel. The channel portions 85

removably fit in the first and second slits 80 and 81. When the channel portions 85 fit in the first and second slits 80 and 81, the metal brush members 86 protrude from the first and second supporting plates 24 and 25, and further, the ends of bristles of the metal brush members 86 are slidably in contact with the main ropes 8 in the rope cleaning chamber 66.

Specifically, as shown in FIG. 9, FIG. 10 and FIG. 14, the metal brush members 86 of the channel brushes 23 attached to the first supporting plate 24 protrude from the first supporting plate 24 to the main ropes 8 in the rope cleaning chamber 66. Further, the channel brushes 23 are arranged at intervals in the direction of arrangement of and the axial direction of the main ropes 8, and are inclined along the twisted strand grooves 18.

The metal brush members 86 of the channel brushes 23 attached to the second supporting plate 25 protrude from the second supporting plate 25 to the main ropes 8 in the rope cleaning chamber 66. Further, the channel brushes 23 are arranged at intervals in the direction of arrangement of and the axial direction of the main ropes 8, and are inclined along the twisted strand grooves 18.

In this way, all the main ropes 8 inserted into the rope cleaning chamber 66 are interposed between the channel brushes 23 of the first supporting plate 24 and the channel brushes 23 of the second supporting plate 25 in a radial direction.

The metal brush members 86 are evenly pressed onto all the main ropes 8 by tightening the four connecting bolts 75 extending between the first case 28 and the second case 29 such that the dimension L between the first supporting plate 24 and the second supporting plate 25 is a predetermined right value. The pressure

for pressing the metal brush members 86 onto the main ropes 8 may be freely adjusted by changing the screw amount of the connecting bolts 75.

5 As shown in FIG. 10, FIG. 14 and FIG. 15, the first supporting plate 24 of the present embodiment comprises a stopper portion 87. The stopper portion 87 is formed by, for example, bending the side edge portion of the first supporting plate 24 adjacent to the first and second side covers 70 and 72 toward the
10 second supporting plate 25 at a right angle. The distal end of the stopper portion 87 is in contact with a side edge portion of the second supporting plate 25 when the dimension L between the first supporting plate 24 and the second supporting plate 25 falls below the
15 right value L by excessively tightening the connecting bolts 75. As a result, the excessive tightening of the connecting bolts 75 is restricted. In this manner, the metal brush members 86 of the channel brushes 23 are not excessively pressed onto the main ropes 8.

20 When the metal brush members 86 are in contact with the main ropes 8 with an appropriate pressure, the end portions of the channel portions 85 protruding from the first and second slits 80 and 81 are in contact with the outer plate 30 of the first case 28 and the
25 outer plate 42 of the second case 29. Thus, the channel brushes 23 are firmly retained in the first and second supporting plates 24 and 25 such that backlash is prevented.

30 As shown in FIG. 5, FIG. 6, FIG. 9 and FIG. 14, the upper scraper 26 is provided above the first rope insertion hole 67 of the housing 22. The upper scraper 26 comprises a pair of blocks 90a and 90b formed of synthetic resin. The blocks 90a and 90b are elements having the shape of a rectangular column and extending
35 in the direction of arrangement of the main ropes 8,

and comprise flat matching surfaces 91a and 91b caused to face each other.

5 A plurality of arc-like recessed portions 92 are formed in the matching surfaces 91a and 91b. The recessed portions 92 are arranged at intervals in the longitudinal direction of the blocks 90a and 90b so as to correspond to pitch P of the main ropes 8 arranged in a line. When the matching surfaces 91a and 91b of the blocks 90a and 90b are caused to face each other, 10 the recessed portions 92 fit in each other such that the main ropes 8 are interposed between the recessed portions 92.

As a result, as shown in FIG. 8, circular through-holes 93 through which the main ropes 8 are inserted 15 are defined. The through-holes 93 have a diameter greater than that of the main ropes 8 by, for example, approximately 0.1 to 0.2 mm, and are arranged in a line in the direction of arrangement of the main ropes 8.

As shown in FIG. 5 to FIG. 9, the block 90a is 20 supported on the first scraper supporting portion 37 by a first scraper cover 95 which is a sheet metal. The first scraper cover 95 comprises a side plate portion 96 provided upright from the first top board 35 of the first case 28, and a flange portion 97 prepared by 25 bending the upper edge of the side plate portion 96 at a right angle so as to extend above the first scraper supporting portion 37.

The side plate portion 96 of the first scraper cover 95 extends in the direction of arrangement of the 30 main ropes 8. Further, a pair of supporting pieces 98a and 98b is formed by bending the lower edge of the side plate portion 96 at a right angle so as to extend on the first top board 35. The supporting pieces 98a and 98b are attached to the first top board 35, using the 35 bolts 36 securing the first top board 35 to the upper

flange 31.

In the present embodiment, the bolts 36 penetrate through long holes (not shown) formed in the supporting pieces 98a and 98b. The longitudinal axis of each long
5 hole horizontally extends in a direction perpendicular to the direction of arrangement of the main ropes 8.

Further, the outer surface of the block 90a on a side opposite to the matching surface 91a is secured to the inner surface of the side plate portion 96 by a
10 plurality of screws 99. Thus, when the bolts 36 are loosened, the block 90a is movable in a direction so as to approach or move away from the main ropes 8 together with the first scraper cover 95.

The block 90b is supported on the third scraper
15 supporting portion 49 by a second scraper cover 101 which is a sheet metal. The second scraper cover 101 comprises a side plate portion 102 provided upright from the second top board 47 of the second case 29, and a flange portion 103 prepared by bending the upper edge
20 of the second scraper cover 102 at a right angle so as to extend above the third scraper supporting portion 49.

The side plate portion 102 of the second scraper cover 101 extends in the direction of arrangement of
25 the main ropes 8. Further, a pair of supporting pieces 104a and 104b is formed by bending the lower edge of the side plate portion 102 at a right angle so as to extend on the second top board 47. The supporting pieces 104a and 104b are attached to the second top
30 board 47, using the bolts 48 securing the second top board 47 to the upper flange 43.

In the present embodiment, the bolts 48 penetrate through long holes (not shown) formed in the supporting pieces 104a and 104b. The longitudinal axis of each
35 long hole horizontally extends in a direction

perpendicular to the direction of arrangement of the main ropes 8. Further, the outer surface of the block 90b on a side opposite to the matching surface 91b is secured to the inner surface of the side plate portion 102 by a plurality of screws 105. Thus, when the bolts 48 are loosened, the block 90b is movable in a direction so as to approach or move away from the main ropes 8 together with the second scraper cover 101.

As shown in FIG. 8 and FIG. 9, the flange portion 97 of the first scraper cover 95 faces the flange portion 103 of the second scraper cover 101 across an intervening gap. Gap G1 extends in the direction of arrangement of the main ropes 8 between the flange portions 97 and 103. The main ropes 8 are guided to the part above the rope cleaning device 21 through gap G1.

As shown in FIG. 6 to FIG. 8, the blocks 90a and 90b of the upper scraper 26 are connected to each other by two scraper bolts 106 as fasteners. The scraper bolts 106 extend between the end portions of the blocks 90a and 90b in the longitudinal direction of the blocks 90a and 90b. The distal end of each scraper bolt 106 penetrating the block 90a is screwed in a corresponding nut 107. In this way, the blocks 90a and 90b are integrated such that all the main ropes 8 are interposed therebetween.

As shown in FIG. 5, FIG. 6, FIG. 9 and FIG. 14, the lower scraper 27 is provided under the second rope insertion hole 68 of the housing 22. The lower scraper 27 is a common element having the same structure as that of the upper scraper 26. The elements of the lower scraper 27 are denoted by the same reference numbers as those of the upper scraper 26, detailed description thereof being omitted.

As shown in FIG. 5 to FIG. 9, the block 90a of the

lower scraper 27 is supported under the second scraper supporting portion 40 by a third scraper cover 110 which is a sheet metal. The third scraper cover 110 comprises a side plate portion 111 downwardly extending from the first bottom board 38 of the first case 28, and a flange portion 112 prepared by bending the lower edge of the side plate portion 111 at a right angle so as to extend under the second scraper supporting portion 40.

The side plate portion 111 of the third scraper cover 110 extends in the direction of arrangement of the main ropes 8. Further, a pair of supporting pieces 113a and 113b is formed by bending the upper edge of the side plate portion 111 at a right angle so as to extend under the first bottom board 38. The supporting pieces 113a and 113b are attached to the first bottom board 38, using the bolts 39 securing the first bottom board 38 to the lower flange 32.

In the present embodiment, the bolts 39 penetrate through long holes (not shown) formed in the supporting pieces 113a and 113b. The longitudinal axis of each long hole horizontally extends in a direction perpendicular to the direction of arrangement of the main ropes 8.

Further, the outer surface of the block 90a on a side opposite to the matching surface 91a is secured to the inner surface of the side plate portion 111 by a plurality of screws 114. Thus, when the bolts 39 are loosened, the block 90a is movable in a direction so as to approach or move away from the main ropes 8 together with the third scraper cover 110.

The block 90b is supported under the fourth scraper supporting portion 52 by a fourth scraper cover 116 which is a sheet metal. The fourth scraper cover 116 comprises a side plate portion 117 downwardly

extending from the second bottom board 50 of the second case 29, and a flange portion 118 prepared by bending the lower edge of the side plate portion 117 at a right angle so as to extend under the fourth scraper supporting portion 52.

As shown in FIG. 6, the side plate portion 117 of the fourth scraper cover 116 extends in the direction of arrangement of the main ropes 8. Further, a pair of supporting pieces 119a and 119b is formed by bending the upper edge of the side plate portion 117 at a right angle so as to extend under the second bottom board 50. The supporting pieces 119a and 119b are attached to the second bottom board 50, using the bolts 51 securing the second bottom board 50 to the lower flange 44.

In the present embodiment, the bolts 51 penetrate through long holes (not shown) formed in the supporting pieces 119a and 119b. The longitudinal axis of each long hole horizontally extends in a direction perpendicular to the direction of arrangement of the main ropes 8.

Further, the outer surface of the block 90b on a side opposite to the matching surface 91b is secured to the inner surface of the side plate portion 117 by a plurality of screws 120. Thus, when the bolts 51 are loosened, the block 90b is movable in a direction so as to approach or move away from the main ropes 8 together with the fourth scraper cover 116.

As shown in FIG. 5 to FIG. 7, the flange portion 112 of the third scraper cover 110 faces the flange portion 118 of the fourth scraper cover 116 across an intervening gap. Gap G2 extends in the direction of arrangement of the main ropes 8 between the flange portions 112 and 118. The main ropes 8 are guided to the part under the rope cleaning device 21 through gap G2.

In the present embodiment, the blocks 90a and 90b of the lower scraper 27 are integrated such that all the main ropes 9 are interposed therebetween by the two scraper bolts 106 and the two nuts 107 in a manner
5 similar to that of the upper scraper 26.

As shown in FIG. 5, a long hole 122 is formed in the lower flange 32 of the first case 28 and the first bottom board 38 overlapping the lower flange 32. The long hole 112 is an element into which a worker inserts
10 his/her fingers. Thus, the lower flange 32 and the first bottom board 38 comprising the long hole 112 also function as a handle when the rope cleaning device 21 is carried.

As shown in FIG. 5, FIG. 7 and FIG. 9, an
15 attachment 125 is provided on the first top board 35 of the first case 28. The attachment 125 is an element used when the rope cleaning device 21 is installed in the hoistway 2. The attachment 125 comprises a columnar rubber bush 126. The rubber bush 126 is
20 retained in the central portion of the first top board 35 by a single bolt 127. The bolt 127 penetrates the rubber bush 126, and is perpendicularly provided in the height direction of the hoistway 2.

FIG. 4, FIG. 8 and FIG. 9 show a state in which
25 the rope cleaning device 21 is installed in the hoistway 2. The rope cleaning device 21 is provided at the upper end of the hoistway 2 by a first bracket 130 and a second bracket 131.

The first bracket 130 is secured to the supporting
30 beam 5 in which the traction machine 7 is provided. The second bracket 131 is connected to the first bracket 130. The second bracket 131 extends from the first bracket 130 to the lower side of the supporting beam 5.

35 A flange portion 132 horizontally extends from the

lower end of the second bracket 131. The flange portion 132 is stacked on the upper surface of the rubber bush 126 of the attachment 125. The upper end of the bolt 127 penetrates the flange portion 132. A pair of nuts 133 is screwed at the upper end of the bolt 127.

Thus, the rope cleaning device 21 is suspended in the hoistway 2 such that the rubber bush 126 of the attachment 125 is interposed between the first top board 35 of the rope cleaning device 21 and the flange portion 132 of the second bracket 131.

In a state where the rope cleaning device 21 is suspended in the hoistway 2, the rope cleaning device 21 is located immediately under the traction machine 7, and is capable of rotating around axis O4 of the bolt 127 perpendicularly provided.

Now, this specification explains a procedure for installing the rope cleaning device 21 in the hoistway 2.

A rope lubricator (not shown) is removed from the hoistway 2. The first bracket 130 and the second bracket 131 are installed in the hoistway 2. Subsequently, the rope cleaning device 21 is connected to the flange portion 132 provided at the lower end of the second bracket 131 through the attachment 125. In this way, the rope cleaning device 21 is installed in the hoistway 2. A worker climbs on the car 3, and manually removes the rope lubricator and installs the first bracket 130 and the second bracket 131 in the hoistway 2.

At the time of the connection of the rope cleaning device 21 to the second bracket 131, the four connecting bolts 75 are removed from the housing 22. Thus, the first and second cases 28 and 29 of the housing 22 are maintained so as to be rotatable to the

second position shown in FIG. 11 and FIG. 14.

Further, the connection between the blocks 90a and 90b by the scraper bolts 106 and the nuts 107 is released in the upper and lower scrapers 26 and 27.

5 Thus, the blocks 90a and 90b are maintained so as to be separated from each other.

After the rope cleaning device 21 is installed in the hoistway 2, the first and second cases 28 and 29 of the housing 22 are rotated to the second position.

10 Thus, the rope cleaning chamber 66 is open in the hoistway 2. In this way, the channel brushes 23 attached to the first supporting plate 24 are moved away from the channel brushes 23 attached to the second supporting plate 25. Further, the blocks 90a and 90b
15 of the upper and lower scrapers 26 and 27 are moved away from each other.

Subsequently, as shown in FIG. 14, the first case 28 is retained such that, in the zone from the traction sheave 6 to the first deflector sheave 13a, the main
20 ropes 8 pass through the first case 28 perpendicularly to the blocks 90a of the upper and lower scrapers 26 and 27 supported on the first case 28 side. In this state, the main ropes 8 fit in the recessed portions 92 of the blocks 90a.

25 Subsequently, the second case 29 is rotated toward the first case 28 such that the main ropes 8 are interposed between the first and second cases 28 and 29. Further, the four connecting bolts 75 are inserted between the first case 28 and the second case 29. The
30 first and second cases 28 and 29 are temporarily fixed to prevent the first and second cases 28 and 29 from rotating toward the second position. The connecting bolts 75 penetrate through the through-holes 82 of the first supporting plate 24 and the second supporting
35 plate 25. In this way, the first supporting plate 24

and the second supporting plate 25 are retained in the rope cleaning chamber 66.

5 In the present embodiment, the first hinge pieces 56 of the hinges 55 supported in the first case 28 are movable in a horizontal direction perpendicular to the main ropes 8, using the long holes 62 as guides. Thus, the first case 28 and the second case 29 are movable parallel to each other in a direction such that the first and second supporting plates 24 and 25 approach and move away from each other in a state where the first and second supporting plates 24 and 25 face each other.

10 Subsequently, the first case 28 and the second case 29 are secured by screwing the connecting bolts 75 into the nuts 76 such that the dimension L between the first supporting plate 24 and the second supporting plate 25 is a predetermined right value. In this way, the main ropes 8 are inserted into the rope cleaning chamber 66. Further, all the main ropes 8 are retained so as to be evenly interposed between the channel brushes 23.

15 Subsequently, the bolts 36 and 48 are loosened. As shown in FIG. 8 with arrows, the blocks 90a and 90b of the upper scraper 26 are slid in a direction so as to approach each other together with the first scraper cover 95 and the second scraper cover 101.

25 In this way, the matching surfaces 91a and 91b of the blocks 90a and 90b face each other. The recessed portions 92 formed in the matching surfaces 91a and 91b are combined with each other such that the main ropes 8 are interposed therebetween. Thus, the main ropes 8 are retained in a state where the main ropes 8 slidably penetrate through the through-holes 93 defined by the recessed portions 92.

30 After the main ropes 8 are interposed between the

blocks 90a and 90b, the upper scraper 26 is secured to the housing 22 by tightening the bolts 36 and 48. Moreover, the blocks 90a and 90b are integrally connected to each other by the scraper bolts 106 and the nuts 107 so as to maintain the state where the recessed portions 92 of the blocks 90a and 90b are combined with each other.

After the position of the upper scraper 26 is adjusted, the bolts 39 and 51 are loosened. The blocks 90a and 90b of the lower scraper 27 are slid in a direction so as to approach each other together with the third scraper cover 110 and the fourth scraper cover 116. In this way, an adjustment process similar to that of the upper scraper 26 is performed.

After the main ropes 8 are interposed between the blocks 90a and 90b of the lower scraper 27, the lower scraper 27 is secured to the housing 22 by tightening the bolts 39 and 51. Further, the blocks 90a and 90b are integrally connected to each other by the scraper bolts 106 and the nuts 107. By the above procedure, the rope cleaning device 21 is attached to the main ropes 8.

Now, this specification explains how the main ropes 8 are cleaned using the rope cleaning device 21.

As shown in FIG. 4, after the rope cleaning device 21 is provided immediately under the traction machine 7, the car 3 is caused to move down from the highest stop position of the hoistway 2 and make at least one round trip between the highest stop position and the pit of the hoistway 2. In the present embodiment, the rope cleaning device 21 is located in the zone of the main ropes 8 from the traction sheave 6 to the first deflector sheave 13a. Thus, when the car 3 moves down, the main ropes 8 pass through the rope cleaning chamber 66 of the rope cleaning device 21 from the upper side

to the lower side.

5 The main ropes 8 firstly pass through the through-
holes 93 of the upper scraper 26. At this time, the
grease attached to the outer circumferential surface of
the main ropes 8 is scraped by the upper scraper 26.
The scraped grease is partially accumulated on the
upper surface of the upper scraper 26. The other
grease goes off the upper scraper 26 and is accumulated
between the first scraper cover 95 and the second
10 scraper cover 101.

 The main ropes 8 pass through the upper scraper 26
and enter the rope cleaning chamber 66 through the
first rope insertion hole 67. Subsequently, all the
main ropes 8 pass between the metal brush members 86 of
15 the channel brushes 23 attached to the first supporting
plate 24 and the metal brush members 86 of the channel
brushes 23 attached to the second supporting plate 25.
In other words, all the main ropes 8 pass through the
rope cleaning chamber 66 in a state where the main
20 ropes 8 are interposed between the metal brush members
86 of the channel brushes 23 in a radial direction.

 In the present embodiment, the metal brush members
86 are inclined along the strand grooves 18 helically
twisted in the main ropes 8. In this structure, when
25 the main ropes 8 pass through the rope cleaning chamber
66, most of the metal brush members 86 get into the
strand grooves 18, and scrape solidified grease off the
strand grooves 18.

 The grease scraped off the strand grooves 18 is
30 partially accumulated in the rope cleaning chamber 66.
The other grease follows the movement of the main ropes
8 and is guided to the lower scraper 27. The grease
having reached the lower scraper 27 is scraped by the
lower scraper 27 when the main ropes 8 pass through the
35 through-holes 93 of the lower scraper 27. The grease

is accumulated on the upper surface of the lower scraper 27 and in the second rope insertion hole 68.

After the car 3 reaches the pit of the hoistway 2 and shifts to moving up, the main ropes 8 pass through the rope cleaning chamber 66 of the rope cleaning device 21 from the lower side to the upper side. Thus, the grease remaining on the outer circumferential surface of the main ropes 8 is firstly scraped by the lower scraper 27. The scraped grease is partially accumulated on the lower surface of the lower scraper 27. The other grease goes off the lower scraper 27 and is accumulated between the third scraper cover 110 and the fourth scraper cover 116.

The main ropes 8 pass through the lower scraper 27 and enter the rope cleaning chamber 66 through the second rope insertion hole 68. Subsequently, all the main ropes 8 pass through the rope cleaning chamber 66 again between the metal brush members 86 of the channel brushes 23 in a radial direction. In this way, the grease remaining in the strand grooves 18 is scraped off again by the metal brush members 86.

The grease scraped off the strand grooves 18 is partially accumulated in the rope cleaning chamber 66. The other grease follows the movement of the main ropes 8 and is guided to the upper scraper 26. The grease having reached the upper scraper 26 is scraped by the upper scraper 26 when the main ropes 8 pass through the through-holes 93 of the upper scraper 26. The grease is accumulated on the lower surface of the upper scraper 26 and in the first rope insertion hole 67. As a result, solidified grease is removed from the main ropes 8 while the car 3 makes at least one round trip between the highest stop position and the pit in the hoistway 2.

If a large amount of grease is firmly attached to

the metal brush members 86 of the channel brushes 23 before completion of cleaning of the main ropes 8, the cleaning performance is impaired. In this case, all the connecting bolts 75 and all the scraper bolts 106 are removed, and further, the first side cover 70 and the second side cover 72 are removed from the housing 22 by loosening the wing bolts 71 and 73.

Moreover, the first cover 28 and the second cover 29 are rotated from the first position to the second position. The first and second supporting plates 24 and 25 to which the channel brushes 23 are attached are replaced by new ones.

In the above rope cleaning device 21, the channel brushes 23 for interposing all the main ropes 8 therebetween in a radial direction are provided in the rope cleaning chamber 66 of the housing 22 through which all the main ropes 8 pass. Thus, solidified grease can be simultaneously removed from all the main ropes 8 regardless of pitch P of the main ropes 8.

In this way, the main ropes 8 can be effectively cleaned in a short time. Specifically, it takes a worker a couple of days to manually clean the main ropes. However, when the rope cleaning device 21 of the present embodiment is applied, cleaning can be finished in an hour or a couple of hours. Thus, the maintenance of the machine room-less elevator 1 can be easily performed. In this way, the time for stopping the operation of the machine room-less elevator 1 can be reduced, thereby improving convenience.

In the present embodiment, the grease scraped by the channel brushes 23 is kept in substantially the enclosed rope cleaning chamber 66. Similarly, the grease scraped by the upper scraper 26 is accumulated between the first scraper cover 95 and the second scraper cover 101. The grease scraped by the lower

scraper 27 is accumulated between the third scraper cover 110 and the fourth scraper cover 116. In this way, it is possible to surely prevent the grease removed from the main ropes 8 from being spread to the hoistway 2 or attached to the main ropes 8 again.

In addition, in the present embodiment, the upper scraper 26 provided on the rope cleaning chamber 66 and the lower scraper 27 provided under the rope cleaning chamber 66 comprise the through-holes 93 into which the respective main ropes 8 are inserted. Thus, the paths of the main ropes 8 are corrected when the main ropes 8 pass through the through-holes 93 of the upper and lower scrapers 26 and 27.

The main ropes 8 are always inserted through the rope cleaning chamber 66 such that the main ropes 8 are perpendicularly provided. In this way, it is possible to prevent the main ropes 8 from being tangled up in the rope cleaning chamber 66. Further, all the main ropes 8 can be evenly brought into contact with the channel brushes 23.

The first and second supporting plates 24 and 25 to which the channel brushes 23 are attached can be easily removed from the first and second cases 28 and 29 by releasing the connection between the first case 28 and the second case 29 by the connecting bolts 75 and removing the connecting bolts 75 from the first and second cases 28 and 29.

Spare supporting plates to which new channel brushes are attached may be prepared in advance. For example, even when the channel brushes 23 become unclean with grease or degrade, the cleaning work of the main ropes 8 can be continued by replacing the supporting plates by the spare supporting plates.

In the present embodiment, as rope draw, the main ropes 8 are twisted at 90° around the perpendicular

axis in the height direction of the hoistway 2 in the zone of the main ropes 8 from the traction sheave 6 to the first deflector sheave 13a. Thus, the rope draw of the main ropes 8 which pass through the rope cleaning chamber 66 of the rope cleaning device 21 is changed in connection with the moving operation of the car 3.

Thus, the housing 22 of the rope cleaning device 21 is suspended in the hoistway 2 so as to rotate around axis 04 of the bolt 127 perpendicularly provided. When the rope draw of the main ropes 8 which pass through the rope cleaning chamber 66 is changed, the housing 22 of the rope cleaning device 21 rotates around axis 04 of the bolt 127 so as to follow the rope draw.

In this way, the channel brushes 23 are not excessively pressed onto the main ropes 8. The resistance generated when the main ropes 8 pass through the rope cleaning chamber 66 can be reduced. As a result, the aggression of the channel brushes 23 against the main ropes 8 can be reduced. The metal brush members 86 of the channel brushes 23 are difficult to degrade. The life of the channel brushes 23 can be long.

While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

For example, the channel brushes may not be inclined along the helically twisted strand grooves. Channel brushes horizontally extending in a direction perpendicular to the main ropes may be provided
5 parallel to each other at intervals in the axial direction of the main ropes.

Further, the cleaning elements are not limited to channel brushes. For example, the cleaning elements may be a resinous belt comprising a plurality of
10 projections on the contact surface with the main ropes.

In the present embodiment, the first case of the housing is connected to the first hinge pieces of the hinges so as to be movable in a horizontal direction. The second case may be also connected to the second
15 hinge pieces of the hinges so as to be movable in a horizontal direction.

WHAT IS CLAIMED IS:

1. A rope cleaning device comprising:
 - a housing comprising a rope cleaning chamber into which a plurality of wire ropes arranged at intervals are inserted; and
 - a cleaning element which is provided in the rope cleaning chamber of the housing, and cleans the wire ropes by slidably making contact with all the wire ropes passing through the rope cleaning chamber.
2. The rope cleaning device of Claim 1, wherein the cleaning element includes a plurality of cleaning brushes, and the cleaning brushes are arranged at intervals in a direction of arrangement of the wire ropes and an axial direction of the wire ropes.
3. The rope cleaning device of Claim 2, wherein the cleaning brushes are provided such that the wire ropes are interposed between the cleaning brushes in a radial direction in the rope cleaning chamber.
4. The rope cleaning device of Claim 1, wherein each of the wire ropes comprises a core wire, a plurality of strands twisted at a predetermined pitch around the core wire, and a plurality of strand grooves helically twisted between the adjacent stands, and the cleaning element is provided in the rope cleaning chamber in accordance with an inclination angle of the strand grooves.
5. The rope cleaning device of Claim 2, further comprising a supporting plate in which the cleaning brushes are removably supported, wherein the supporting plate is removably housed in the rope cleaning chamber of the housing.
6. The rope cleaning device of Claim 1, wherein the housing comprises a first rope insertion hole open in the rope cleaning chamber, and a second rope

insertion hole open in the rope cleaning chamber on a side opposite to the first rope insertion hole, and

5 a scraper which scrapes grease scraped off the wire ropes by the cleaning element is provided in each of the first rope insertion hole and the second rope insertion hole.

7. The rope cleaning device of Claim 6, wherein the scraper includes a pair of blocks facing each other such that the wire ropes are interposed between the blocks, and

10 the blocks are connected to each other by a fastener such that the wire ropes are interposed between the blocks.

8. The rope cleaning device of Claim 7, wherein the blocks of the scraper comprise a recessed portion in which each of the wire ropes slidably fits, and are supported in the housing so as to be movable in a direction in which the blocks approach or move away from each other.

20 9. A rope cleaning device comprising:

a housing comprising first and second cases combined so as to face each other, and a rope cleaning chamber into which a plurality of wire ropes are inserted, the wire ropes being arranged at intervals between the cases; and

25 a cleaning element which is provided in each of the first and second cases so as to face the rope cleaning chamber, wherein

30 the cleaning elements clean the wire ropes by sandwiching all the wire ropes passing through the rope cleaning chamber in a radial direction.

10. The rope cleaning device of Claim 9, wherein the first case and the second case are connected to each other by a hinge so as to be rotatable between a first position at which the first and second cases

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face each other so as to define the rope cleaning chamber and a second position at which the first and second cases are separated from each other so as to open the rope cleaning chamber.

5 11. The rope cleaning device of Claim 9 or 10, further comprising:

 a first supporting plate removably supported in the first case so as to face the rope cleaning chamber; and

10 a second supporting plate removably supported in the second case so as to face the rope cleaning chamber, wherein

 the cleaning elements are removably supported in the first supporting plate and the second supporting plate.

15 12. The rope cleaning device of Claim 10, wherein the first case and the second case are secured to the first position by a plurality of fasteners extending between the cases, and

20 a pressure for pressing the cleaning elements onto the wire ropes is determined based on tightening of the fasteners.

 13. The rope cleaning device of Claim 12, wherein one of the first and second supporting plates comprises a stopper portion protruding toward the other one of the first and second supporting plates, and

25 the stopper portion prevents the cleaning elements from being excessively pressed onto the wire ropes by making contact with the other one in a state where the first case and the second case are secured by the fasteners.

30 14. The rope cleaning device of Claim 10, wherein the hinge is connected to at least one of the first and second cases so as to be movable in a direction perpendicular to an axial direction of the

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wire ropes.

15. The rope cleaning device of Claim 11, wherein the cleaning elements include a plurality of cleaning brushes, and

5 the cleaning brushes are arranged at intervals in a direction of arrangement of the wire ropes and an axial direction of the wire ropes.

16. The rope cleaning device of Claim 15, wherein each of the wire ropes comprises a core wire, a
10 plurality of strands twisted at a predetermined pitch around the core wire, and a plurality of strand grooves helically twisted between the adjacent strands, and the cleaning brushes are supported in the first supporting plate and the second supporting plate in
15 accordance with an inclination angle of the strand grooves.

17. A rope cleaning device comprising:

a housing comprising a rope cleaning chamber into which a plurality of wire ropes are inserted, the wire
20 ropes being arranged at intervals so as to extend along a hoistway of an elevator, a direction of arrangement of the wire ropes being changed in the hoistway; and

a cleaning element which is provided in the rope cleaning chamber of the housing, and cleans the wire
25 ropes by slidably making contact with all the wire ropes passing through the rope cleaning chamber, wherein

the housing is supported in the hoistway such that the housing is rotatable around a perpendicular axis so
30 as to follow a rope draw of the wire ropes, the rope draw changing in the hoistway.