

CONSTRUCTING IMPLEMENT AND ROPE CLEANING METHOD

FIELD

Embodiments described herein relate generally to a constricting implement used for cleaning of a wire rope and rope cleaning method using this constricting
5 implement.

BACKGROUND

In general, in an elevator, for example, a traction machine around which a main rope coupling a car and counterweight to each other is wound is driven,
10 whereby the car and counterweight are made to carry out a rising operation and falling operation in opposite directions.

As a main rope in such an elevator, a wire rope is used. The wire rope is a rope formed by intertwisting a plurality of strands each of which is formed by twisting fine steel wires called element wires around a central fiber core.
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Incidentally, when a wire roped is used for a long period of time, grease contained in the wire rope separates out, and the separating grease hardens or dust/dirt adheres to the grease, and so on, whereby the service of the elevator is hindered in some cases.
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Accordingly, in order to prevent the grease from hardening or prevent dust/dirt from adhering to the grease, maintenance such as periodical cleaning of the wire rope or the like becomes necessary.
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Cleaning of a wire rope is carried out manually by a worker or workers using a scraper or brush in many cases. However, such cleaning work dependent on human labor requires a large amount of labor and a lot of time. Further, it is difficult to manually chip off grease wedged in a root (between strands) of the wire rope.
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Thus, a rope cleaning jig configured to automatize
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wire rope cleaning is contrived. For example, a rope
cleaning jig configured to chip off grease by attaching
a rotating member having a hole formed into an outer
circumferential shape of the wire rope by die-punching
5 to a wire rope, and making the rotating member rotate
around the axis of the wire rope is developed.

A main rope in an elevator is generally
constituted of a plurality of wire ropes. When such a
main rope is to be cleaned by using the aforementioned
10 rope cleaning jig, the rotating member is attached to
each wire rope around the axis thereof. At this time,
the work of tightly constricting the rotating member in
advance along the outer circumference thereof by using,
for example, a wire, hose band or the like becomes
15 necessary in order that the rotating member may not
come off each wire rope.

However, the work of constricting the rotating
members attached to the wire ropes one by one by using
wires is troublesome and requires a lot of time.
20 Further, a generally known hose band is provided with
metal fittings for fastening such as an operating
lever, fixation bolt or the like and, when attached to
the rotating member to surround the rotating member,
the metal fittings take up a considerable breadth. For
25 this reason, the metal fittings of the hose bands
interfere with each other between adjacent ropes in
some cases and, the hose band cannot be applied to an
elevator in which a pitch between ropes is small.

SUMMARY

30 According to one embodiment, a constricting
implement is configured to fix a rotating member for
cleaning to be attached to a rope around an axis
thereof to the rope. In this implement, at least two
members each of which is formed into an arc-like curved
35 shape are rotatably coupled to each other, are fixed in

a state where the members are closed into a ringed form surrounding an outer circumference of the rotating member, constrict the rotating member from the outer circumference thereof to thereby pressure-attach the rotating member to the rope. The members remain within the limits of a ring outer circumferential diameter when the members are in a ringed state.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view for explaining an example of an installation position of an elevator rope cleaning jig according to a first embodiment.

FIG. 2 is a perspective view showing an example of a structure of the rope cleaning jig in the embodiment.

FIG. 3 is a view for explaining an example of a structure of a rotating member in the embodiment.

FIG. 4 is a view showing a relationship between the rotating member and spatula member in the embodiment.

FIG. 5 is a view showing an attached state of a constricting implement in the embodiment.

FIG. 6 is a perspective view showing an external configuration of the constricting implement in the embodiment.

FIG. 7 is a perspective view of the constricting implement of a case where FIG. 6 is viewed from the direction of an arrow A.

FIG. 8 is a perspective view showing the configuration of a first member of the constricting implement in the embodiment and is a view showing the configuration of the first member on the front surface (ring outer circumferential surface) side thereof.

FIG. 9 is a perspective view showing the configuration of the first member of the constricting implement in the embodiment and is a view showing the configuration of the first member on the rear surface

(ring inner circumferential surface) side thereof.

FIG. 10 is a perspective view showing the configuration of a second member of the constricting implement in the embodiment and is a view showing the configuration of the second member of a case where the second member is viewed from the front surface (ring outer circumferential surface) side thereof.

FIG. 11 is a perspective view showing the configuration of a third member of the constricting implement in the embodiment and is a view showing the configuration of the third member of a case where the third member is viewed from the rear surface (ring inner circumferential surface) side thereof.

FIG. 12 is a perspective view showing the configuration of a fourth member of the constricting implement in the embodiment and is a view showing the configuration of the fourth member of a case where the fourth member is viewed from the rear surface (ring inner circumferential surface) side thereof.

FIG. 13 is a perspective view showing the configuration of a fifth member of the constricting implement in the embodiment and is a view showing the configuration of the fifth member of a case where the fifth member is viewed from the rear surface (ring inner circumferential surface) side thereof.

FIG. 14 is a view showing the configuration of the constricting implement in the embodiment of a case where the constricting implement is not closed into a ringed form.

FIG. 15 is a view for explaining a method of locking a ringed state of the constricting implement in the embodiment.

FIG. 16 is a view for explaining a method of releasing the locking of the ringed state of the constricting implement in the embodiment.

FIG. 17 is a view for explaining a size-adjusting method of the constricting implement in the embodiment and is a view showing a state where the circumferential size thereof is minimized.

5 FIG. 18 is a view for explaining the size-adjusting method of the constricting implement in the embodiment and is a view showing a state where the circumferential size thereof is maximized.

10 FIG. 19 is a view for explaining a procedure for closing the constricting implement into a ringed form in the embodiment.

FIG. 20 is a view for explaining the procedure for closing the constricting implement into the ringed form in the embodiment.

15 FIG. 21 is a view showing a state where a plurality of wire ropes are collectively held between a pair of bases of the rope cleaning jig in the embodiment.

20 FIG. 22 is a view showing a relationship between the size and pitch between ropes of a case where the rotating member is fixed to the wire rope by using the constricting implement in the embodiment.

25 FIG. 23 is a view showing a relationship between the size and pitch between ropes of a case where the rotating member is fixed to the wire rope by using a general hose band.

30 FIG. 24 is a view showing an installation position of the rope cleaning jig of a case where the main rope is cleaned at a position between the traction machine and counterweight in the embodiment.

FIG. 25 is a view showing an installation position of the rope cleaning jig of a case where a compensation rope is cleaned at a position between the car and compensation sheave in the embodiment.

35 FIG. 26 is a view showing an installation position

of the rope cleaning jig of a case where the compensation rope is cleaned at a position between the counterweight and compensation sheave in the embodiment.

5 FIG. 27 is a perspective view showing the configuration of a sixth member of a constricting implement in a second embodiment and is a view showing the configuration of the sixth member of a case where the sixth member is viewed from the rear surface (ring
10 inner circumferential surface) side thereof.

 FIG. 28 is a perspective view showing the configuration of a seventh member of the constricting implement in the embodiment and is a view showing the configuration of the seventh member of a case where the
15 seventh member is viewed from the rear surface (ring inner circumferential surface) side thereof.

 FIG. 29 is a view for explaining a procedure for closing the constricting implement into a ringed form in the embodiment.

20 FIG. 30 is a view for explaining the procedure for closing the constricting implement into the ringed form in the embodiment.

 FIG. 31 is a view for explaining the procedure for closing the constricting implement into the ringed form
25 in the embodiment.

DETAILED DESCRIPTION

Hereinafter, embodiments will be described with reference to the accompanying drawings.

(First Embodiment)

30 An elevator rope cleaning jig (hereinafter simply referred to as a rope cleaning jig) according to this embodiment is a jig to be used for cleaning a main rope constituted of, for example, a plurality of wire ropes. It should be noted that each of the wire ropes
35 constituting the main rope is a rope formed by

intertwisting a plurality of strands with a central fiber core around it. Each strand is formed by twisting fine steel wires called element wires together.

5 First, an installation position of the elevator rope cleaning jig according to this embodiment will briefly be described below with reference to FIG. 1.

10 In the elevator, an elevator control device 11 is installed in, for example, a machine room not shown, and carries out operation control of the whole elevator including drive control of a traction machine 12. The traction machine 12 is supported on a machine beam 13, and is installed in the machine room together with the elevator control device 11.

15 A main sheave (traction sheave) 14 is attached to a drive shaft of the traction machine 12, and a main rope 15 is wound around an outer circumferential part of the main sheave 14. One end of the main rope 15 is coupled to a car 16, and the other end thereof is
20 coupled to a counterweight (C/W) 17.

 It should be noted that in FIG. 1, the main rope 15 is shown as if it is a single rope for convenience' sake. However, actually, the main rope 15 is constituted of a plurality of wire ropes as described
25 above. Grease is applied to the plurality of wire ropes for the purpose of lubrication or rust prevention.

 When the traction machine 12 is driven on the basis of the control of the elevator control device 11,
30 the main sheave 14 around which the main rope 15 is wound is rotated, and the car 16 and counterweight 17 carry out a rising operation and falling operation like a well bucket.

 A compensation rope 18 is coupled to a bottom part
35 of each of the car 16 and counterweight 17 through a

compensation sheave 19. The compensation rope 18 is a rope configured to cancel an imbalance caused by the self-weight of the main rope 15.

As shown in FIG. 1, a rope cleaning jig 20
5 according to this embodiment is installed in a position of a machine beam 13 directly below the traction machine 12 to thereby be used. In the example shown in FIG. 1, the rope cleaning jig 20 is installed in a position between the traction machine 12 and car 16.
10 For example, when the elevator is operated in such a manner that the car 16 descends, the rope cleaning jig 20 cleans the main rope 15 passing through the rope cleaning jig 20 from the upper side to the under side.

Next, the structure of the rope cleaning jig 20
15 will be described below with reference to FIG. 2 through FIG. 4.

FIG. 2 is a perspective view showing the structure of the rope cleaning jig 20.

The rope cleaning jig 20 is provided with a pair
20 of bases 201a and 201b arranged in such a manner as to collectively interpose a plurality of wire ropes 15a to 15g between them to thereby pinch the wire ropes 15a to 15g from both sides.

The bases 201a and 201b are coupled to each other,
25 whereby hole parts configured to pass the wire ropes 15a to 15g through the rope cleaning jig 20 from the upper side to the under side thereof are formed. The bases 201a and 201b are coupled to each other by means of clasps 202 provided on the bases 201a and 201b.

On the bases 201a and 201b, a plurality of
30 rotating members 203a to 203g attached to the wire ropes 15a to 15g are arranged. The rotating members 203a to 203g are used as grease removing members configured to remove grease from the wire ropes 15a to
35 15g. Metallic constricting implements 400a to 400g are

detachably attached to the outer circumferences of these rotating members 203a to 203g.

5 The constricting implements 400a to 400g are attached to the outer circumferences of the rotating members 203a to 203g, and are used to pressure-attach/fix the rotating members 203a to 203g to the wire ropes 15a to 15g. It should be noted that the structure of each of the constricting implements 400a to 400g will be described later in detail.

10 Here, the structure of each of the rotating members 203a to 203g will be described below with reference to FIG. 3. It should be noted that in FIG. 3, although the structure of the rotating member 203a will expediently be described, structures of the
15 other rotating members 203b to 203g are similar to the rotating member 203a.

 As shown in FIG. 3, the rotating member 203a has a cylindrical shape and has an engaging hole (hole part) 301 die-punched according to the uneven shape of the
20 outer circumference of the wire rope 15a in the central part thereof. The rotating member 203a is manufactured by using an elastic body such as a urethane resin or the like. A cut 302 is formed between the engaging hole 301 of the rotating member 203a and outer
25 circumference thereof. By widening the part corresponding to the cut 302, the rotating member 203a is rotatably attached to the wire rope 15a.

 Further, a groove 303 used to attach the constricting implement 400a to the rotating member 203a
30 is formed in the outer circumferential direction of the rotating member 203a. A width w of the groove 303 is nearly identical to the width of the constricting implement 400a.

 When the traction machine 12 is driven, the wire
35 rope 15a can pass through the engaging hole 301 of the

rotating member 203a. At this time, the constricting implement 400a is attached to the rotating member 203a in advance, whereby it is possible to prevent the cut 302 from widening and allowing the rotating member 203a to come off the wire rope 15a.

The diameter d of the engaging hole 301 is nearly identical to the diameter of the wire rope 15a. That is, the engaging hole 301 is designed in such a manner that, when the rotating member 203a is attached to the wire rope 15a, the inner circumference of the engaging hole 301 comes into close contact with the outer circumference of the wire rope 15a. According to such a structure, when the wire rope 15a passes through the engaging hole 301, the rotating member 203a rotates along the twist of the wire rope 15a. Thereby, it is possible to chip off (remove) grease adhering to the wire rope 15a.

As shown in FIG. 2, the rotating members 203a to 203g are laterally arranged according to the arrangement of the wire ropes 15a to 15g. Accordingly, it is assumed that the diameter D of the outer circumference of the rotating member 203a shown in FIG. 3 is designed in accordance with the intervals between the wire ropes 15a to 15g.

More specifically, the diameter D of the outer circumference of the rotating member 203a is by taking the thickness of the constricting implement 400a to be fitted into the groove 303 into consideration. The diameter D is designed in such a manner that the rotating member 203a can be attached to the wire rope 15a with a gap (for example, several millimeters) held between itself and the adjacent rotating member 203b to such a degree that the rotating member 203a does not come into contact with the adjacent rotating member 203b. The aforementioned adjacent rotating member 203b

is a rotating member to be attached to the wire rope 15b adjacent to the wire rope 15a to which the rotating member 203a is to be attached.

Further, to the positions in the vicinities of the rotating members 203a to 203g on the top surface of the base 201a, spatula members (scrapers) 204a to 204g are fixed by using, for example, fixing bolts or the like. The spatula members (scrapers) 204a to 204g are members configured to take away (remove) the grease chipped off by the rotating members 203a to 203g from the rotating members 203a to 203g.

A grease collecting member 205 having, for example, a U-shaped cross section is fixed to the side face of the base 201a by using fixation bolts or the like. The spatula members 204a to 204g are attached to positions between the rotating members 203a to 203g and grease collecting member 205. Thereby, the spatula members 204a to 204g remove grease from (the top surfaces of) the rotating members 203a to 203g according to the rotation of the rotating members 203a to 203g, and make the removed grease flow into the grease collecting member 205.

FIG. 4 shows a relationship between the rotating members 203a to 203g and spatula members 204a to 204g in the rope cleaning jig 20. In connection with FIG. 4, a relationship between the rotating member 203a and spatula member 204a will be described for convenience' sake. A relationship between each of the other rotating members 203b to 203g and each of the other spatula members 204b to 204g is also similar to the relationship between the rotating member 203a and spatula member 204a.

As shown in FIG. 4, the spatula member 204a intervenes between the rotating member 203a and grease collecting member 205, and removes grease accumulating

on the rotating member 203a to thereby send the removed grease into the grease collecting member 205. The spatula member 204a is fixed with a certain slight gap (several millimeters) held between itself and the rotating member 203a by taking the thickness of the constricting implement 400a into consideration in order that the rotation of the rotating member 203a will not be disturbed.

Further, as shown in FIG. 2, in the rope cleaning jig 20, an enclosure plate 206 is attached to the base 201b in such a manner as to enclose, for example, the rotating members 203a to 203g. Thereby, the grease chipped off by the rotating members 203a to 203g is prevented from spattering around the rope cleaning jig 20.

Next, the structure of each of the constricting implements 400a to 400g will be described below with reference to FIG. 5 through FIG. 22. It should be noted that hereinafter, although the structure of the constricting implement 400a will be described for convenience' sake, each of the other constricting implements 400b to 400g also has a structure similar to the constricting implement 400a.

FIG. 5 is a view showing the attached state of the constricting implement 400a.

When the wire rope 15a is to be cleaned, the rotating member 203a for rope cleaning is attached to the wire rope 15a and, thereafter the constricting implement 400a is attached to the outer circumference of the rotating member 203a. Thereby, the rotating member 203a is pressure-attached/fixed to the wire rope 15a.

FIG. 6 and FIG. 7 are perspective views showing the external configuration of the constricting implement 400a, and FIG. 7 is a perspective view of the

constricting implement 400a of a case where FIG. 6 is viewed from the direction of the arrow A.

5 The constricting implement 400a is constituted of a plurality of members 401 to 405 each of which is formed into an arc-like curved shape. These members 401 to 405 are rotatably coupled to each other in a line through hinges (see FIG. 14) and, an end part of the first member 401 is fitted into the third member 403, whereby these members 401 to 405 enter a ring-like closed state.

10 A diameter D_x of the inner circumference of the constricting implement 400a in the state where (the members 401 to 405 of) the constricting implement is (are) closed into a ringed form is approximately identical to the diameter D of the outer circumference of the rotating member 203a shown in FIG. 3. Alternatively, when the groove 303 is formed in the rotating member 203a, the diameter D_x of the constricting implement 400a is designed to be somewhat smaller than D in consideration of the depth of the groove 303.

20 A width W_x of the constricting implement 400a in the state where the constricting implement 400a is closed into the ringed form is somewhat smaller than the width of the rotating member 203a. Alternatively, when the groove 303 is formed in the rotating member 203a, the width W_x of the constricting implement 400a is approximately identical to the width w of the groove 303.

30 It should be noted that regarding the constricting implement 400a, a plurality of types of constricting implements are prepared according to the size (thickness) of the rope which is an object to be cleaned (more specifically, according to the diameter D of the outer circumference of the rotating member 203a

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of a case where the rotating member 203a is attached to a rope). In the case of an elevator, a plurality of types of the constricting implements 400a are prepared by taking ropes having diameters, for example, greater
5 than or equal to 12 mm as objects. Among the plurality of types of constricting implements 400a, a type of constricting implement 400a appropriate for the size of the rope which is an object to be cleaned is properly and selectively used.

10 Here, the constricting implement 400a is disassembled into the members 401 to 405 constituting the constricting implement 400a, and the structure of each of the members 401 to 405 will be described below.

•First Member

15 FIG. 8 and FIG. 9 are perspective views showing the configuration of the first member 401 of the constricting implement 400a. FIG. 8 shows the configuration of the front surface (ring outer circumferential surface) side of the first member 401,
20 and FIG. 9 shows the configuration of the rear surface (ring inner circumferential surface) side of the first member 401.

The first member 401 becomes the leading part at the time when the members 401 to 405 are coupled to each other in a line, and is detachably coupled to the
25 third member 403 serving as the end part. At one end part of the first member 401, a push-fitting section 411 to be used when the first member 401 is fitted into an opening section 432 (see FIG. 11) of the third
30 member 403 is formed.

In the front surface (ring outer circumferential surface) of the other end part of the first member 401, hooking sections 412a and 412b configured to engage with the fixing metal fittings 434 (see FIG. 11) of the

third member 403, and opening section 413 are formed. Further, at the other end part of the first member 401, rod-like fixing metal fittings 414 configured to engage with a hooking section 422 (see FIG. 10) of the second member 402 are provided.

On the rear surface (ring inner circumferential surface) side in the vicinity of the central part of the first member 401, locking metal fittings 415 to be used as a locking mechanism are rotatably provided.

The locking metal fittings 415 include protruding sections 415a and 415b formed by subjecting both short sides of a rectangular plate to curved surface machining. The locking metal fittings 415 are fit in an opening section 432 (see FIG. 11) of the third member 403 when the constricting implement 400a is closed into a ringed form. At this time, the protruding sections 415a and 415b are engaged with the concave sections 433a and 433b of the opening section 432, whereby the ringed state of the constricting implement 400a is locked.

A hexagonal hole 416 formed in the central part of the locking metal fittings 415 penetratingly reaches the outer circumferential surface of the first member 401. When the constricting implement 400a is closed into a ringed form, a long and thin hexagonal wrench 417 is inserted into the hexagonal hole 416 from the outer circumferential surface side of the first member 401 and locking metal fittings 415 are rotated, whereby it is possible to lock/release the ringed state of the constricting implement 400a (see FIG. 15 and FIG. 16).

•Second Member

FIG. 10 is a perspective view showing the configuration of the second member 402 of the constricting implement 400a, and shows the

configuration of the second member 402 of a case where the second member 402 is viewed from the front surface (ring outer circumferential surface) side.

5 The second member 402 is constituted of a long and thin metallic member formed into an arc-like curved shape. The second member 402 is used, together with the fifth member 405, as an adjusting mechanism configured to make fine adjustments to the ring circumferential size (ring diameter).

10 At one end part of the second member 402, a push-fitting section 421 to be used when the second member 402 is fitted into the opening section 413 of the first member 401 is formed. In the rear surface (ring inner circumferential surface) of the one end part, a hooking
15 section 422 configured to engage with the fixing metal fittings 414 of the first member 401 is provided.

 Here, in the front surface (ring outer circumferential surface) of the second member 402, a knurled section 423 for engagement having a
20 predetermined length in the ring circumferential direction is formed. The knurled section 423 is made to partially engage with a knurled section 453 (see FIG. 13) formed in a rear surface (ring inner
25 circumferential surface) of an attaching section 452 of the fifth member 405 at an arbitrary position, whereby it is possible to make fine adjustments to the circumferential size (ring diameter) of the constricting implement 400a. Further, the knurled
30 section 423 of the second member 402 is provided with a screw hole 424 to be used when the size-adjusted state is fixed by using a screw or the like.

•Third Member

FIG. 11 is a perspective view showing the configuration of the third member 403 of the

constricting implement 400a, and shows the configuration of the third member 403 of a case where the third member 403 is viewed from the rear surface (ring inner circumferential surface) side.

5 The third member 403 is constituted of a metallic member formed into an arc-like curved shape, and has a length corresponding to a half of the circumference of the ring. At one end part of the third member 403, a hinge section 431 to be rotatably coupled to fixing
10 metal fittings 441 (see FIG. 12) of the fourth member 404 is provided.

 At the other end part of the third member 403, rod-like fixing metal fittings 434 to be engaged with the hooking sections 412a and 412b of the first member
15 401 are provided, and the third member 403 includes an opening section 432 in which the first member 401 rotatable around the fixing metal fittings 434 serving as the axis of rotation can be fit. Above and below this opening section 432, the concave sections 433a and
20 433b constituting a locking mechanism together with the locking metal fittings 415 provided in the first member 401 are formed.

 In a state where the first member 401 is fit in the opening section 432, the locking metal fittings 415
25 are rotated by 90° and, thus the protruding sections 415a and 415b are engaged with the concave sections 433a and 433b, whereby the ringed state of the constricting implement 400a is locked.

•Fourth Member

30 FIG. 12 is a perspective view showing the configuration of the fourth member 404 of the constricting implement 400a and shows the configuration of the fourth member 404 of a case where the fourth member 404 is viewed from the rear surface (ring inner

circumferential surface) side.

5 The fourth member 404 is constituted of a metallic member formed into an arc-like curved shape, and has a length corresponding to a semi-circumference of the ring. At one end part of the fourth member 404, rod-like fixing metal fittings 441 to be rotatably attached to the hinge section 431 of the third member 403 are provided.

10 At the other end part of the fourth member 404, rod-like fixing metal fittings 442 to be engaged with a hinge section 451 of the fifth member 405 are provided, and the fourth member 404 includes an opening section 443 into which the fifth member 405 rotatable around the fixing metal fittings 442 serving as the axis of rotation is to be fitted.

15 .Fifth Member

FIG. 13 is a perspective view showing the configuration of the fifth member 405 of the constricting implement 400a, and shows the configuration of the fifth member 405 of a case where the fifth member 405 is viewed from the rear surface (ring inner circumferential surface) side.

20 The fifth member 405 is constituted of a metallic member formed into an arc-like curved shape, and is used, together with the second member 402, as an adjusting mechanism configured to make fine adjustments to the ring circumferential size (ring diameter). At one end part of the fifth member 405, the hinge section 451 to be engaged with the fixing metal fittings 442 of the fourth member 404 is provided, and the fifth member 405 is fitted into the opening section 443 of the fourth member 404 through this hinge section 451.

30 On the inner circumferential surface side of the fifth member 405, the attaching section 452 configured

to attach the second member 402 thereto is provided. The knurled section 453 for engagement is formed on the inner side of the attaching section 452. A long hole 454 having a predetermined length in the ring outer circumferential direction is provided in the knurled section 453. The second member 402 shown in FIG. 10 is fixed in a position-adjustable manner by making part of the knurled section 423 thereof engage with the knurled section 453.

As described above, the constricting implement 400a is constituted of the members 401 to 405 each of which is formed into an arc-like curved shape, and which are coupled to each other, and is used in a state where the constricting implement 400a surrounds the rotating member 203a and is closed into a ringed form as shown in FIG. 5. When the constricting implement 400a is in the state where it is closed into the ringed form, the members 401 to 405 remain within the limits of the ring outer circumferential diameter, and do not jut out of the ring outer circumference. Further, the members 401 to 405 do not jut out in the rope axial direction, i.e., in the vertical direction.

FIG. 14 is a view showing the configuration of the constricting implement 400a of a case where the constricting implement 400a is not closed into a ringed form.

In the state (released state) where (the members 401 to 405 of) the constricting implement 400a (are) is closed into a ringed form, the members (401 to 405) are coupled to each other in a line in the order of the first member 401 being at the head, second member 402, fifth member 405, fourth member 404, and third member 403.

Here, the third member 403 and fourth member 404 each have semicircular shapes and, when these two

members 403 and 404 are rotated in a direction (closing direction) in which the members 403 and 404 are to be coupled to each other, a shape of a ring is obtained. Furthermore, the second member 402 is rotated to be fitted into the opening section 443 of the fourth member 404, and the first member 401 is rotated to be fitted into the opening section 432 of the third member 403, whereby the members 401 to 405 remain within the limits of the ring outer circumferential diameter.

FIG. 15 and FIG. 16 are views for explaining the method of locking/releasing the ringed state of the constricting implement 400a.

When the constricting implement 400a is closed into the ringed form, the locking metal fittings 415 rotatably provided on the inner circumferential surface of the first member 401 are fit in the opening section 432 of the third member 403. In this state, as shown in FIG. 15, the hexagonal wrench 417 is inserted into the hexagonal hole 416 from the outer circumferential surface side of the first member 401, then locking metal fittings 415 are rotated by 90°, and protruding sections 415a and 415b of the locking metal fittings 415 are engaged with the concave sections 433a and 433b. Thereby, the members 401 to 405 are fixed in the closed state, and the ringed state of the constricting implement 400a is locked.

In this state, when the hexagonal wrench 417 is used to rotate the locking metal fittings 415 by 90° to thereby separate the protruding sections 415a and 415b from the concave sections 433a and 433b, the locking of the ringed state of the constricting implement 400a is released.

FIG. 17 and FIG. 18 are views for explaining the size-adjusting method of the constricting implement 400a.

When the constricting implement 400a is closed into a ringed form, the knurled section 423 of the second member 402 and knurled section 453 (FIG. 13) of the fifth member 405 are made to partially overlap each other at an arbitrary position. Thereby, it is possible to make fine adjustments to the circumferential size of the constricting implement 400a, i.e., the ring diameter in a stepwise manner in steps of several millimeters.

The larger the overlap between the knurled section 423 of the second member 402 and knurled section 453 of the fifth member 405, the smaller the circumferential size (ring diameter) of the constricting implement 400a becomes and, conversely, the smaller the aforementioned overlap, the larger the circumferential size (ring diameter) of the constricting implement 400a becomes.

FIG. 17 is a view showing the state where the circumferential size is minimized. The overlap between the knurled section 423 of the second member 402 and knurled section 453 of the fifth member 405 is increased, whereby the gap between the third member 403 and fourth member 404 is made small.

FIG. 18 is a view showing the state where the circumferential size is maximized. The overlap between the knurled section 423 of the second member 402 and knurled section 453 of the fifth member 405 is decreased, whereby the gap between the third member 403 and fourth member is made larger.

A fastener 425 such as a set screw or the like is inserted into the screw hole 424 (see FIG. 10) of the second member 402 from the ring outer circumferential surface side of the fifth member 405 through the long hole 454, whereby the state after the size adjustment can be fixed.

Here, a procedure for closing the constricting

implement 400a into a ringed form in the first embodiment will be described with reference to FIG. 19 and FIG. 20.

5 First, as shown in FIG. 19, the first member 401, second member 402, and fifth member 405 which are coupled to each other are rotated toward the inner side of the ring around the fixing metal fittings 441 provided at one end part of the fourth member 404, the fixing metal fittings being used as the axis of
10 rotation. Then, the hooking sections 412a and 412b for engagement formed in the first member 401 are hooked on the fixing metal fittings 434 provided on the third member 403.

Then, as shown in FIG. 20, the push-fitting
15 section 411 of the first member 401 is rotated toward the opening section 432 of the third member 403, and first member 401 is fit in the opening section 432, whereby the constricting implement 400a is closed into the ringed form. As described above, at this time,
20 when the hexagonal wrench 417 is used to rotate the locking metal fittings 415 by 90°, the ringed state of the constricting implement 400a is locked (see FIG. 15).

Next, an operation to be carried out when the main
25 rope 15 is cleaned by using the rope cleaning jig 20 according to this embodiment will be described below.

When (the plurality of wire ropes 15a to 15g constituting) the main rope 15 (are) is to be cleaned, the car 16 is moved to the uppermost floor in advance,
30 and the rope cleaning jig 20 is set on the machine beam 13.

In this case, as shown in, for example, FIG. 21, the wire ropes 15a to 15g are pinched between the bases 201a and 201b from both sides in such a manner that the
35 wire ropes 15a to 15g are respectively positioned at

the hole parts formed by the bases 201a and 201b. These bases 201a and 201b are placed on the machine beam 13, and are coupled to each other by means of clasps 202.

5 Here, the rotating members 203a to 203g are attached to the wire ropes 15a to 15g respectively. Then, the constricting implements 400a to 400g are attached to these rotating members 203a to 203g respectively.

10 The method of attaching the constricting implements 400a to 400g will be described below by taking the constricting implement 400a as an example.

 The constricting implement 400a is brought into the opened state (see FIG. 14), and is then wound
15 around the outer circumference of the rotating member 203a like a watch wristband. Then, as previously described in connection with FIG. 19 and FIG. 20, the hooking sections 412a and 412b for engagement formed in the first member 401 are hooked on the fixing metal
20 fittings 434 provided on the third member 403. The push-fitting section 411 of the first member 401 is rotated toward the opening section 432 of the third member 403, and the first member 401 is fit in the opening section 432, whereby the constricting implement
25 400a is closed into the ringed form.

 After the constricting implement 400a is closed into the ringed form, when the hexagonal wrench 417 is used to rotate the locking metal fittings 415 by 90°, and engage the protruding sections 415a and 415b with
30 the concave sections 433a and 433b as shown in FIG. 15, the ringed state of the constricting implement 400a is locked. Thereby, the rotating member 203a is constricted by the constricting implement 400a from the outer circumference thereof, and is pressure-
35 attached/fixed to the wire rope 15a.

It should be noted that regarding the constricting implement 400a, although the one appropriate for the size (thickness) of the wire rope 15a is used, the thickness thereof somewhat changes due to secular changes or the like. Accordingly, it is desirable that fine adjustments be made to the circumferential size of the constricting implement 400a in advance in order that the rotating member 203a can be constricted by appropriate force in accordance with the current rope size by using the adjusting mechanism described in connection with FIG. 17 and FIG. 18.

The same applies to the other wire ropes 15b to 15g. That is, the constricting implements 400b to 400g are attached respectively to the rotating members 203b to 203g attached to the wire ropes 15b to 15n around their axes, the rotating members 203b to 203g are constricted from their outer circumferences, and are respectively pressure-attached/fixed to the wire ropes 15b to 15g.

It should be noted that there is sometimes a case where it is difficult to attach the rotating members 203a to 203g to the wire ropes 15a to 15g by the interference of, for example, the spatula members 204a to 204g. In such a case, it is also sufficient if the rotating members 203a to 203g are attached to the wire ropes 15a to 15g and are fixed by the constricting implements 400a to 400g in advance before the bases 201a and 201b are coupled to each other.

Attaching of the constricting implements 400a to 400g is very simple or easy and takes less time as compared with the method of constricting the rotating members 203a to 203g by using wires or the like. Furthermore, when each of the constricting implements 400a to 400g is closed into the ringed form, the members 401 to 405 remain within the limits of the ring

outer circumferential diameter, and hence each of the constricting implements 400a to 400g does not interfere with adjacent ropes or rotating members.

The above state is shown in FIG. 22 and FIG. 23.

5 It should be noted that here descriptions will be given by taking four wire ropes 15a to 15d as an example.

FIG. 22 is a view showing a relationship between the size and pitch between ropes of a case where the constricting implements 400a to 400d are used. FIG. 23
10 is a view showing a relationship between the size and pitch between ropes of a case where general hose bands 500a to 500d are used.

The rotating members 203a to 203d are attached to the wire ropes 15a to 15d respectively. Here, assuming
15 that the pitch between ropes is L as shown in FIG. 22, it is possible to attach the constricting implements 400a to 400d to the outer circumferences of the rotating members 203a to 203d at intervals of less than or equal to $L/2$. On the other hand, as shown in
20 FIG. 23, regarding the hose bands 500a to 500d, fixing metal fittings 501a to 501d such as bolts exist on the outer circumferences of the bands. For this reason, the work for tightening the fixing metal fittings 501a to 501d after attaching the hose bands 500a to 500d to the rotating members 203a to 203d is troublesome.
25 Furthermore, as indicated by the dotted lines, there is sometimes a case where the traffic lines 502a to 502d of the fixing metal fittings 501a to 501d interfere with each other beyond $L/2$.

30 As described above, when the constricting implements 400a to 400d are employed, it is possible to apply the constricting implements 400a to 400d even to an elevator having ropes with small pitches between the ropes to which the hose bands 500a to 500d cannot be
35 applied.

The state where the rotating members 203a to 203g and constricting implements 400a to 400g are attached to the seven wire ropes 15a to 15g is shown in FIG. 2, and thus installation of the rope cleaning jig 20 is
5 completed.

After the rope cleaning jig 20 is installed, the elevator car 16 is operated. More specifically, the car 16 is moved in a direction in which the rotating members 203a to 203g attached to the wire ropes 15a to
10 15g are pressed against the bases 201a and 201b of the rope cleaning jig 20 (i.e., in a direction from the uppermost floor to the lowermost floor).

The rope cleaning jig 20 is installed in a position of the machine beam 13. Accordingly, in
15 accordance with the movement of the car 16 from the uppermost floor to the lowermost floor, each of the wire ropes 15a to 15g passes through the engaging hole 301 formed in each of the rotating members 203a to 203g attached to the wire ropes 15a to 15g. At this time,
20 the rotating members 203a to 203g rotate in a state where the rotating members 203a to 203g are in contact with (pressed against) the bases 201a and 201b of the rope cleaning jig 20.

Each of the rotating members 203a to 203g rotates,
25 as described above, in a state where each of the rotating members 203a to 203g is in tight contact with the outer circumference of each of the wire ropes 15a to 15g. Accordingly, it is possible for the rotating members 203a to 203g to scrape (chip) the grease
30 adhering to the wire ropes 15a to 15g off the wire ropes 15a to 15g.

The grease scraped off by the rotating members 203a to 203g is accumulated on the top surfaces of the rotating members 203a to 203g. As described
35 previously, the spatula members 204a to 204g are

attached to the positions in the vicinities of the rotating members 203a to 203g. Accordingly, the grease accumulated on the top surfaces of the rotating members 203a to 203g is removed by the spatula members 204a to 204g according to the rotation of the rotating members 203a to 203g. The grease removed by the spatula members 204a to 204g is collected by the grease collecting member 205.

As described above, according to the first embodiment, by using the constricting implements 400a to 400g when the rotating members 203a to 203g for cleaning attached to the wire ropes 15a to 15g are to be fixed, it is possible to constrict the rotating members 203a to 203g from their outer circumferences to thereby fix the rotating members 203a to 203g to the wire ropes 15a to 15g without causing any interference between adjacent ropes.

Here, each of the constricting implements 400a to 400g is formed by rotatably coupling a plurality of members 401 to 405 to each other, and has a simple structure requiring merely closing it into a ringed form like a watch wristband to fix it when used. Accordingly, it is possible to easily attach the constricting implements 400a to 400g to the rotating members 203a to 203g without the need for troublesome work or power unlike the case where wires, hose bands or the like are used. As a result, it is possible to significantly shorten the working hours and reduce the burdens of the workers.

It should be noted that in this embodiment, although the descriptions have been given assuming that the rope cleaning jig 20 cleans the main rope 15 between the traction machine 12 and car 16 as shown in FIG. 1, the rope cleaning jig 20 may also be installed in such a manner as to clean the main rope 15 between

the traction machine 12 and counterweight 17 as shown in, for example, FIG. 24. In this case, by making the car 16 move from the lowermost floor to the uppermost floor, the main rope 15 can be cleaned in the same manner.

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Furthermore, as shown in, for example, FIG. 25 and FIG. 26, it is also possible to install the rope cleaning jig 20 in a position in the vicinity of the compensation sheave 19 to thereby clean the compensation rope 18.

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Further, in the rope cleaning jig 20 according to this embodiment, a rotation assisting mechanism (not shown) configured to assist the rotation of the plurality of rotating members 203a to 203g may also be provided. The rotation assisting mechanism is constituted of, for example, balls and supporting members configured to rotatably support the balls. Such a rotation assisting mechanism is provided on the bases 201a and 201b in such a manner as to support each of the rotating members 203a to 203g respectively attached to the wire ropes 15a to 15g, whereby it becomes possible to smoothly rotate the rotating members 203a to 203g on the balls of the rotation assisting mechanism.

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(Second Embodiment)

Next, a second embodiment will be described below.

In the first embodiment described above, the first member 401 is provided with the locking metal fittings 415. The first embodiment is configured in such a manner that the protruding sections 415a and 415b of the locking metal fittings 415 are engaged with the concave sections 433a and 433b formed at the opening section 432 of the third member 403, whereby the ringed state of the constricting implement 400a is locked (see FIG. 15). Conversely, in the second embodiment, a

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structure in which the ringed state of the constricting implement 400a is locked without using the locking metal fittings 415 will be described.

5 It should be noted that the configuration of the rope cleaning jig 20 is similar to the first embodiment described above. Hereinafter, although a description will be given by taking a constricting implement 400a as an example, the other constricting implements 400b to 400g are also similar thereto.

10 In the constricting implement 400a in the second embodiment, a sixth member 406 (see FIG. 27) is used in place of the first member 401 (see FIG. 9). Further, in place of the third member 403 (see FIG. 11), a seventh member 407 (see FIG. 28) is used. The other
15 members (second member 402, fourth member 404, and fifth member 405) constituting the constricting implement 400a are similar to the first embodiment described above.

•Sixth Member

20 FIG. 27 is a perspective view showing the configuration of the sixth member 406 of the constricting implement 400a in the second embodiment, and shows the configuration of the sixth member 406 of a case where the sixth member 406 is viewed from the
25 rear surface (ring inner circumferential surface) side.

When the members 402, and 404 to 407 are coupled to each other in a line, the sixth member 406 serves as the leading part, and is detachably coupled to the seventh member 407 serving as the end part. One end
30 part of the sixth member 406 includes a push-fitting section 461 to be used when the sixth member 406 is fitted into an opening section 473 (see FIG. 28) of the seventh member 407. Furthermore, in the rear surface (ring inner circumferential surface) of the one end

part, a hooking section 462 configured to engage with the fixing metal fittings 472 (see FIG. 28) of the seventh member 407 is formed.

5 In the front surface (ring outer circumferential surface) of the other end part of the sixth member 406, hooking sections 463a and 463b each configured to engage with the fixing metal fittings 474 (see FIG. 28) of the seventh member 407, and opening section 464 are formed. Further, at the other end part, rod-like
10 fixing metal fittings 465 configured to engage with the hooking section 422 (see FIG. 10) of the second member 402 are provided.

Here, on the rear surface (ring inner circumferential surface) side of the sixth member 406
15 near the central part thereof, no locking metal fittings 415 provided on the first member 401 are provided. The hooking section 462 formed at the one end part of the sixth member 406 is used as a locking mechanism together with the fixing metal fittings 472
20 of the seventh member 407.

•Seventh Member

FIG. 28 is a perspective view showing the configuration of the seventh member 407 of the constricting implement 400a in the second embodiment,
25 and shows the configuration of the seventh member 407 of a case where the seventh member 407 is viewed from the rear surface (ring inner circumferential surface) side.

The seventh member 407 is constituted of a
30 metallic member formed into an arc-like curved shape, and has a length corresponding to a semi-circumference of the ring. At one end part of the seventh member 407, a hinge section 471 to be rotatably coupled to the fixing metal fittings 441 (see FIG. 12) of the fourth

member 404 is provided. Further, at the one end part, rod-like fixing metal fittings 472 configured to engage with the hooking section 462 of the sixth member 406 are provided. When the constricting implement 400a is closed into a ringed form, the hooking section 462 of the sixth member 406 is fitted on the fixing metal fittings 472, whereby the ringed state of the constricting implement 400a is locked.

At the other end part of the seventh member 407, rod-like fixing metal fittings 474 configured to engage with the hooking sections 463a and 463b of the sixth member 406 are provided, and an opening section 473 capable of accommodating therein the sixth member 406 rotatable around the fixing metal fittings 474 serving as the axis of rotation is also provided. Above and beneath this opening section 473, the concave sections 433a and 433b (see FIG. 11) which have been necessary for the locking mechanism of the first embodiment are not formed.

Here, with reference to FIG. 29 through FIG. 31, the procedure for closing the constricting implement 400a into the ringed form in the second embodiment will be described below.

First, as shown in FIG. 29, the sixth member 406, second member 402, and fifth member 405 which are in the state where they are coupled to each other are rotated toward the inside of the ring around the fixing metal fittings 441 provided at the one end part of the fourth member 404 and serving as the axis of rotation. Then, the hooking sections 463a and 463b for engagement formed in the sixth member 406 are hooked on the fixing metal fittings 474 provided on the seventh member 407.

Next, as shown in FIG. 30, when the push-fitting section 461 of the sixth member 406 is rotated toward the opening section 473 of the seventh member 407 and

the sixth member 406 is fit in the opening section 473, the constricting implement 400a is brought into the ringed state.

5 Here, when the sixth member 406 is fit in the opening section 473, the hooking section 462 of the sixth member 406 is engaged with the fixing metal fittings 472 as shown in FIG. 31, whereby the ringed state of the constricting implement 400a is locked. When the ringed state is to be released, it is
10 sufficient if the push-fitting section 461 of the sixth member 406 is raised and thereby the hooking section 462 is disengaged from the fixing metal fittings 472.

It should be noted that the circumferential size (diameter) of the constricting implement 400a is
15 approximately identical to the first embodiment described above. The constricting implement 400a does not cause any interference with the adjacent rope as shown in FIG. 22.

As described above, according to the second
20 embodiment, by only engaging the hooking section 462 formed in the sixth member 406 with the fixing metal fittings 472 provided on the seventh member 407, it is possible to easily lock the ringed state of the constricting implement 400a, and further shorten the
25 working hours. Further, there is no need for the locking metal fittings 415 employed in the first embodiment, and hence it is possible to reduce the number of components and thereby achieve weight reduction and downsizing.

30 According to at least one of the embodiments described above, it is possible to provide a constricting implement capable of, when a rotating member for cleaning is to be attached to a rope and the rope is to be cleaned, constricting the rotating member
35 from the outer circumference thereof to thereby fix the

rotating member to the rope without causing any interference between adjacent ropes.

5 It should be noted that in each of the first and second embodiments described above, although the structure of a constricting implement in which five members are rotatably coupled to each other has been described, it is sufficient if the constricting implement has a structure in which at least two arc-like members are rotatably coupled to each other, and
10 which is closed into a ringed form surrounding a rotating member that is an object to be constricted. More specifically, in, for example, FIG. 14, a structure which includes a member formed by integrating the first member 401, second member 402, fifth member
15 405, and fourth member 404 into one body, and the third member, and in which these members are rotatably coupled to each other may also be employed.

While certain embodiments have been described, these embodiments have been presented by way of example
20 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
25 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.

WHAT IS CLAIMED IS:

1. A constricting implement configured to fix a rotating member for cleaning to be attached to a rope around an axis thereof to the rope, the constricting
5 implement comprising:
at least two members each of which is formed into an arc-like curved shape are rotatably coupled to each other, are fixed in a state where the members are closed into a ringed form surrounding an outer
10 circumference of the rotating member, constrict the rotating member from the outer circumference thereof to thereby pressure-attach the rotating member to the rope, and the members remain within the limits of a ring outer circumferential diameter when the members
15 are in a ringed state.
2. The constricting implement of Claim 1, further comprising a locking mechanism configured to lock the ringed state.
3. The constricting implement of Claim 1, further
20 comprising an adjusting mechanism configured to make fine adjustments to a circumferential size in the ringed state.
4. The constricting implement of Claim 2, wherein
the locking mechanism comprises a locking metal
25 fittings rotatably provided on one of the members and including a protruding section, and an opening section formed in the other of the members and configured to accommodate therein the locking metal fittings, and
when the members are closed into a ringed form,
30 the locking metal fittings are fit in the opening section, and the locking metal fittings are rotated and the protruding section is engaged with part of the opening section, whereby the ringed state is locked.
5. The constricting implement of Claim 2, wherein
35 the locking mechanism comprises a hooking section

formed in one of members and a fixing section formed in the other of the members and to be engaged with the hooking section, and

5 when the members are closed into a ringed form,
the hooking section is engaged with the fixing section,
whereby the ringed state is locked.

6. The constricting implement of Claim 3, wherein
the adjusting mechanism comprises a knurled
section for engagement formed in an inner
10 circumferential surface of one of members, and a
knurled section for engagement formed in an outer
circumferential surface of the other of the members,
and

15 when the members are closed into a ringed form,
the knurled section of the one of the members and the
knurled section of the other of the members are made to
partially overlap each other at an arbitrary position,
whereby fine adjustments are made to the
circumferential size.

20 7. A rope cleaning method comprising:
attaching each of rotating members for cleaning to
each of a plurality of ropes which are objects to be
cleaned around an axis thereof;

25 surrounding an outer circumference of each of the
rotating members by means of each of a plurality of
constricting implements each of which is configured in
such a manner that when at least two members
constituting each of the constricting implements and
each formed into arc-like curved shapes are rotatably
30 coupled to each other to be in a ringed state, the
members remain within the limits of the ring outer
circumferential diameter, and fixing each of the
constricting implements to each of the rotating members
in a state where each of the constricting implements is
35 closed into a ringed form to thereby constrict each of

the rotating members from the outer circumference thereof and pressure-attach each of the rotating members to each of the ropes; and

5 making each of the rotating members rotate around an axis of each of the ropes concomitantly with a movement of each of the ropes to thereby clean each of the ropes.