

DESCRIPTION

Title of Invention

CONCRETE MEMBER CUTTING DEVICE AND CONCRETE MEMBER
DISMANTLING METHOD

Technical Field

[0001]

The present invention relates to a concrete member cutting device and a
concrete member dismantling method for a reinforced concrete structure (RC
structure) or a steel framed reinforced concrete structure (SRC structure).

Priority is claimed on Japanese Patent Application No. 2016-127726, filed
on June 28, 2016, the content of which is incorporated herein by reference.

Background Art

[0002]

When a concrete member such as a column erected in an
upward-downward direction of a structure such as the RC structure and the SRC
structure is dismantled, a crushing method or a toppling method is frequently
used. For example, as shown in FIG. 2, a concrete on a lower end portion side
of a concrete member 1 is destroyed beforehand by using a rock drill such as a
breaker, and an exposed reinforcing bar or steel frame is cut by carrying out
oxy-fuel cutting.

[0003]

At this time, the reinforcing bar or the steel frame is not completely cut.

The oxy-fuel cutting is carried out so as to leave some of the reinforcing bar or a flange portion of the steel frame. The concrete member 1 is brought into a self-erectable state, and an upper end portion side of the concrete member 1 is gripped and toppled using a heavy machine. Some of the reinforcing bar or the flange portion of the steel frame left at a stage of toppling the concrete member 1 is cut and completely separated.

[0004]

In this case, a toppling direction is set to face inward of the structure while some of the reinforcing bar or the flange portion of the steel frame inside (on a front side of) the structure is left until a final stage, and the concrete member 1 such as a column is dismantled. In this manner, it is possible to prevent the concrete member 1 from falling down outward of the structure having an outer wall 2 or a curing scaffold.

[0005]

However, according to the above-described dismantling method, loud noise, vibration, and a large amount of dust are generated when the concrete is destroyed using a crusher such as the breaker or when the concrete member is toppled. In addition, the oxy-fuel cutting has to be carried out for the reinforcing bar or the steel frame in a narrow place outside the structure surrounded by the column, the outer wall, or the curing scaffold. That is, fire has to be used when the working environment is poor.

[0006]

In contrast, the present applicant of the invention has filed a patent application with regard to the invention of a concrete member cutting device configured to enable a user to use a wire saw by using a thrust cutting method,

and a concrete member dismantling method of using the concrete member cutting device (for example, refer to Patent Document 1 and Patent Document 2).

[0007]

For example, a cutting device used according to the dismantling method
5 is configured to have a wire saw unit (wire saw mechanism). The wire saw unit includes: a guide frame detachably attached to an arm distal end of a construction work machine such as a hydraulic excavator; a plurality of pulleys (sheaves) including a drive pulley supported by the guide frame and rotationally driven by a drive source, a guide pulley, and a propulsion pulley and a tension pulley which
10 are supported by the guide frame so as to be movable forward and rearward in a forward-rearward direction; and an endless loop-shaped wire saw wound around the pulleys.

[0008]

When the concrete member is cut using the cutting device, at a stage
15 where a portion of the wire saw and a reaction force receiving device are brought into contact with the concrete member serving as a cutting target by operating an arm of the construction work machine, the drive pulley is rotationally driven so that the wire saw cyclically pivots while the wire saw is supported by each of the pulleys. Then, the propulsion pulley is moved forward in a thrust cutting
20 direction of the cutting target by using propulsion pulley driving apparatus. Accordingly, the concrete member can be cut while the concrete member is held by the reaction force receiving device. In this manner, without using the fire in the narrow place, the concrete member can be dismantled by significantly preventing the noise, the vibration, and the dust from being generated.

Citation List

Patent Literature

[0009]

[Patent Document 1] Japanese Patent No. 5725346

5 [Patent Document 2] Japanese Unexamined Patent Application, First
Publication No. 2014-69529

Summary of Invention

Technical Problem

10 [0010]

However, in a case of using the wire saw cutting device according to the above-described thrust cutting method, in order to cut the concrete member from a front side, some of the reinforcing bar or the flange portion of the steel frame on the front side cannot be inevitably left. For this reason, the above-described thrust cutting method cannot be adopted for the following case. In the case, the concrete member is cut so as to leave some of the reinforcing bar or the flange portion of the steel frame inside the structure. The concrete member is brought into a self-erectable state in advance. The upper end portion side of the concrete member needs to be gripped and toppled inside the structure by using the heavy machine.

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[0011]

Furthermore, in a case of using the wire saw cutting device according to the thrust cutting method, a distal end portion of the cutting device projects outward (rearward) from a rear surface of the concrete member serving as the cutting target. Accordingly, a space having a dimension of approximately 150

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mm or longer needs to be formed outward from the rear surface of the concrete member. For this reason, for example, in a case where there is a wall close to the outside of the column of the concrete member serving as the cutting target, the distal end portion of the cutting device interferes with the wall. Consequently, the column cannot be cut using the wire saw cutting device according to the thrust cutting method.

[0012]

In addition, when the concrete member such as the column is cut using the wire saw cutting device according to the thrust cutting method, basically, the concrete member is completely cut. Accordingly, in advance, it is necessary to attach a bracket for preventing the concrete member from slipping and falling down after being cut.

[0013]

Furthermore, the wire saw cutting device according to the thrust cutting method cannot cope with cutting of a wide concrete member or a deep concrete member which exceeds a distance between a pair of propulsion pulleys moving forward and rearward along the thrust cutting direction.

[0014]

The present invention is made in view of the above-described circumstances, and an object thereof is to provide a concrete member cutting device and a concrete member dismantling method which enables a user to preferably cut/dismantle at least one concrete member of an RC structure and an SRC structure.

25 Solution to Problem

[0015]

In order to achieve the above-described object, this invention proposes the following means.

[0016]

5 According to a first aspect of the present invention, there is provided a concrete member cutting device for cutting/dismantling a concrete member. The device includes an adapter attached to a base machine so as to support the cutting device, a guide frame to be integrally attached to the adapter, and a wire saw mechanism to be supported by the guide frame. The wire saw mechanism
10 includes a plurality of pulleys, and a wire saw which is wound around the plurality of pulleys in an endless loop shape so as to cyclically pivot by rotationally driving a drive pulley among the plurality of pulleys. The plurality of pulleys include the drive pulley which is rotationally driven, a guide pulley for supporting the wire saw so as to be pivotable, a tension pulley which is arranged so as to be movable
15 forward and rearward in a forward-rearward direction so as to adjust a tension of the wire saw, a pair of right and left propulsion pulleys arranged so as to be movable forward and rearward in the forward-rearward direction, and a pair of right and left draw cutting propulsion support pulleys arranged so as to be movable forward and rearward in the forward-rearward direction by being
20 connected to the pair of propulsion pulleys, and arranged so that the wire saw therebetween cuts the concrete member and receives a reaction force.

[0017]

 According to a second aspect of the present invention, there is provided a concrete member dismantling method of dismantling a concrete member of an
25 RC structure or an SRC structure erected in an upward-downward direction.

The method includes using a wire saw cutting device, and cutting the concrete member by causing a wire saw to cyclically pivot and cut the concrete member according to a draw cutting method, leaving a reinforcing bar or a flange portion of a steel frame on a front side of the concrete member, and causing the wire saw cutting device to completely carry out cutting work in a state where the concrete member is in a self-erectable state, and toppling and dismantling the concrete member on the front side by gripping the concrete member.

[0018]

According to a third aspect of the present invention, in the concrete member dismantling method, the concrete member cutting device may be used as the wire saw cutting device.

Advantageous Effects of Invention

[0019]

According to a concrete member cutting device and a concrete member dismantling method of the present invention, fire is not used. In addition, compared to a complete crushing method, noise, vibration, and dust can be prevented from being generated. At least any one concrete member such as a column of an RC structure and an SRC structure can be preferably cut/dismantled.

Brief Description of Drawings

[0020]

FIG. 1 is a view showing a concrete member cutting device and a concrete member dismantling method according to an embodiment of the present

invention.

FIG. 2 is a view showing a concrete member dismantling method (toppling method) in the related art.

5 Description of Embodiments

[0021]

Hereinafter, in FIG. 1 (and FIG. 2), a concrete member cutting device and a concrete member dismantling method according to an embodiment of the present invention will be described.

10 [0022]

Here, the present embodiment relates to a preferable concrete member cutting device and dismantling method which are used when cutting/dismantling a concrete member 1 such as a column erected in an upward-downward direction in an RC structure or an SRC structure as shown in FIG. 2.

15 [0023]

First, as shown in FIG. 1, a concrete member cutting device A according to the present embodiment is a cutting device (wire saw cutting device) including a wire saw, and is configured to cut the concrete member 1 by using a draw cutting method.

20 [0024]

Specifically, the concrete member cutting device A according to the present embodiment is configured to include a tilt mechanism-attached adapter 3 for supporting the cutting device A by being attached to a base machine such as a hydraulic excavator, a guide frame 4 to be integrally attached to the adapter 3, a
25 wire saw mechanism 5 to be supported by the guide frame 4, and a reaction force

receiving device 13.

[0025]

The guide frame 4 is formed in a substantially C shape while including a base portion 4a extending in a width direction of a rightward-leftward direction T1 and arranged so that the adapter 3 is connected to substantially the center in the width direction, and a pair of right and left guide portions 4b linearly extending forward from both side portions of the base portion 4a.

[0026]

The wire saw mechanism 5 is configured to include a plurality of pulleys (sheaves) 6 to 10, and a wire saw 11 which is wound around the plurality of pulleys 6 to 10 in an endless loop shape so as to cyclically pivot.

[0027]

In addition, as the plurality of pulleys 6 to 10, there are provided a drive pulley 6 arranged on and supported by the base portion 4a of the guide frame 4, a plurality of the guide pulley 7, a pair of propulsion pulleys 8 supported so as to be respectively movable forward to and rearward from the pair of guide portions 4b of the guide frame 4 in a forward-rearward direction T2 (extending direction of the guide portion 4b), a pair of draw cutting propulsion support pulleys 9 driven by each of the pair of propulsion pulleys 8 and respectively moving forward and rearward in the forward-rearward direction T2 together with each of the pair of propulsion pulleys 8, and a tension pulley 10 supported by the guide frame 4 so as to be movable forward and rearward in the forward-rearward direction T2.

[0028]

According to the present embodiment, mutual shaft portions (pivot portions) of the pair of right and left propulsion pulleys 8 and the pair of right and

left draw cutting propulsion support pulleys 9 are connected to each other. In this manner, the pair of right and left propulsion pulleys 8 and the pair of draw cutting propulsion support pulleys 9 are connected to each other so as to be rotatable.

5 [0029]

In each of the pair of draw cutting propulsion support pulleys 9, an inner end portion 9a in the rightward-leftward direction T1 is arranged inside an inner end portion 8a in the rightward-leftward direction T1 of the propulsion pulleys 8 connected to the pulley 9, and a rear end portion 9b in the forward-rearward direction T2 is arranged behind a front end portion 8b of the propulsion pulley 8 connected to the pulley 9.

[0030]

In addition, the wire saw mechanism 5 includes drive pulley rotationally driving apparatus (not shown) for rotationally driving the drive pulley 6 around a rotation axis, tension pulley forward and rearward driving apparatus (not shown) for moving the tension pulley 10 forward and rearward, for example, in the forward-rearward direction T2 so that tension of the wire saw 11 having the endless loop shape is held in a predetermined state, and propulsion pulley forward and rearward driving apparatus (not shown) for moving each of the propulsion pulleys 8 and the draw cutting propulsion support pulley 9 in the forward-rearward direction T2.

[0031]

Then, the concrete member cutting device A according to the present embodiment is configured as follows. The drive pulley 6 is rotationally driven around the rotation axis extending in an upward-downward direction

perpendicular to an extending direction of the guide portion 4b by the drive pulley rotationally driving apparatus. The endless loop-shaped wire saw 11 cyclically pivots which is wound around the plurality of pulleys 6 to 10 and which is arranged in a horizontal plane perpendicular to the upward-downward direction.

5 [0032]

In addition, in the concrete member cutting device A according to the present embodiment, when a draw cutting method is used, the wire saw 11 is attached so as to be wound around the rear end portion 9b side of the draw cutting propulsion support pulley 9 from the front end portion 8b side of the pair of
10 right and left propulsion pulleys 8, and so that the concrete member 1 is arranged inside the wire saw 11 (so that the concrete member 1 is surrounded by the wire saw 11). In this manner, when the draw cutting method is used, a portion laid between the pair of right and left draw cutting propulsion support pulleys 9 of the wire saw 11 serves as a cutter 11a for cutting the concrete member 1.

15 [0033]

Next, in FIG. 1 (and FIG. 2), a method will be described in which the concrete member cutting device A according to the present embodiment is used so as to dismantle the concrete member 1 such as the column of the RC structure or the SRC structure by using the draw cutting method.

20 [0034]

First, in the concrete member dismantling method according to the present embodiment, a base machine such as a construction work machine is operated, and the guide frame 4 of the cutting device A is located at a predetermined position. In this case, according to the present embodiment, the
25 guide frame 4 is brought into a horizontal state, and the center of the concrete

member 1 and the center of the guide frame 4 are approximately aligned with each other, and the pair of guide portions 4b are equally arranged on the respective right and left sides of the concrete member 1.

[0035]

- 5 In this state, the pair of right and left propulsion pulleys 8 and the pair of right and left draw cutting propulsion support pulleys 9 are arranged on a front end side of the guide portion 4b. The wire saw 11 is set to have the endless loop shape so as to surround the concrete member 1 while the wire saw 11 is wound around the propulsion pulleys 8 and the draw cutting propulsion support pulley 9.
- 10 In addition, the reaction force receiving device 13 is brought into contact with a front surface 1a (side surface on the front side: a surface facing inward of the guide frame 4) of the concrete member 1.

[0036]

- At a stage where the wire saw 11 is set, the drive pulley 6 is rotationally
- 15 driven so that the wire saw 11 cyclically pivots, and the propulsion pulley 8 and the draw cutting propulsion support pulley 9 are moved rearward along with the guide portion 4b. In this manner, the cutter 11a of the wire saw 11 between the pair of the draw cutting propulsion support pulleys 9 is caused to cut into the rear surface side of the concrete member 1.

20 [0037]

 The propulsion pulley 8 and the draw cutting propulsion support pulley 9 are sequentially moved rearward along the guide portion 4b. In addition, if necessary, the base machine is operated so that the wire saw 11 cuts the concrete member 1 while the cutting device A is moved rearward.

25 [0038]

According to the present embodiment, in a state where some of the reinforcing bar or the flange portion 12a of the steel frame 12 on the front side (inside the structure) of the concrete member 1 is left, the draw cutting work using the wire saw cutting device A is completely carried out.

5 [0039]

Then, the upper end portion side of the concrete member 1 is pressed (gripped) inside the structure by using the heavy machine, and the concrete member 1 is toppled inside the structure. At a stage where the concrete member 1 is toppled, some of the reinforcing bar or the flange portion 12a of the steel frame 12 which is left is cut, and is completely separated therefrom.

[0040]

Therefore, in the concrete member cutting device A and the concrete member dismantling method according to the present embodiment, fire is not used. In addition, compared to a complete crushing method, noise, vibration, and dust can be prevented from being generated. In this manner, the concrete member 1 such as the column can be dismantled.

[0041]

In addition, in order to cut/machine the concrete member 1 by using the wire saw cutting device A according to the draw cutting method, some of the reinforcing bar or the flange portion 12a of the steel frame 12 is left inside the structure, and the concrete member 1 is brought into a self-erectable state in advance. The upper end portion side of the concrete member 1 can be pressed (gripped) and toppled inside the structure by using the heavy machine. In this manner, the wire saw cutting device A is applicable to the toppling method.

25 [0042]

Furthermore, the concrete member 1 is cut/machined using the wire saw cutting device A according to the draw cutting method. In this manner, it is possible to cope with the cutting of the wide concrete member 1 or the deep concrete member 1 which exceeds the distance between the pair of propulsion
5 pulleys 8.

[0043]

In addition, the concrete member 1 is cut/machined using the wire saw cutting device A according to the draw cutting method. Accordingly, unlike a case of using the wire saw cutting device A according to the thrust cutting method,
10 the distal end portion of the cutting device A does not project outward from the rear surface of the concrete member 1 serving as the cutting target. In this manner, for example, in a case where there is a wall close to the outside of the column serving as the cutting target, the distal end portion of the cutting device A does not interfere with the wall. Therefore, the applicable range of the wire saw
15 cutting device A can be significantly enlarged.

[0044]

In addition, it is not necessary to completely cut the concrete member 1, unlike a case where the concrete member 1 such as the column is cut using the wire saw cutting device according to the thrust cutting method. The concrete
20 member 1 can be cut so as to leave some of the reinforcing bar or the flange portion 12a of the steel frame 12 inside the structure. Therefore, it can be no longer necessary to attach a bracket for preventing the concrete member 1 from slipping and falling down after being cut. In this manner, it is possible to reduce labor in attaching the bracket and cost required for attaching the bracket.

25 [0045]

Hitherto, an embodiment of the concrete member cutting device and the concrete member dismantling method according to the present invention has been described. However, the present invention is not limited to the above-described embodiment, and may be appropriately modified within the scope not departing from the gist of the present invention.

Industrial Applicability

[0046]

According to the concrete member cutting device and the concrete member dismantling method of the present embodiment, fire is not used. In addition, compared to the complete crushing method, noise, vibration, and dust can be prevented from being generated. In this manner, at least any one concrete member such as the column of the RC structure and the SRC structure can be preferably cut/dismantled.

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Reference Signs List

[0047]

- 1: concrete member (column)
- 2: outer wall
- 20 3: adapter
- 4: guide frame
- 4a: base portion
- 4b: guide portion
- 5: wire saw mechanism (wire saw unit)
- 25 6: drive pulley

- 7: guide pulley
- 8: propulsion pulley
- 8a: inner end portion
- 8b: front end portion
- 5 9: draw cutting propulsion support pulley
- 9a: inner end portion
- 9b: rear end portion
- 10: tension pulley
- 11: wire saw
- 10 11a: cutter
- 12: steel frame
- 12a: flange portion inside structure
- 13: reaction force receiving device
- A: concrete member cutting device (wire saw cutting device)
- 15 T1: rightward-leftward direction (width direction)
- T2: forward-rearward direction

CLAIMS

1. A concrete member cutting device for cutting/dismantling a concrete member, the device comprising:

an adapter which is attached to a base machine so as to support the cutting device;

a guide frame which includes a base portion that is integrally attached to the adapter and a pair of guide portions that linearly extend forward from both side portions of the base portion, the guide frame being formed in a substantially C shape by the base portion and the pair of guide portions; and

a wire saw which is wound around the plurality of pulleys in an endless loop shape so as to cyclically pivot by rotationally driving a drive pulley among the plurality of pulleys, and

wherein the plurality of pulleys include

the drive pulley which is rotationally driven,

a guide pulley for supporting the wire saw so as to be pivotable,

a tension pulley which is arranged so as to be movable forward and rearward in a forward-rearward direction so as to adjust a tension of the wire saw,

a pair of right and left propulsion pulleys arranged inside the guide portions so as to be movable forward and rearward in the forward-rearward direction, and

a pair of right and left draw cutting propulsion support pulleys arranged so as to be movable forward and rearward in the forward-rearward direction by being connected to the pair of propulsion pulleys, and arranged so that the wire saw therebetween cuts the concrete member and receives a reaction force.

2. A concrete member dismantling method of dismantling a concrete member of an RC structure or an SRC structure erected in an upward-downward direction, the method comprising:

using a wire saw cutting device, and cutting the concrete member by causing a wire saw to cyclically pivot and cut the concrete member according to a draw cutting method;

cutting by the wire saw cutting device so as to leave a reinforcing bar or a flange portion of a steel frame on a front side of the concrete member, and causing the wire saw cutting device to

completely carry out cutting work in a state where the concrete member is in a self-erectable state;
and

toppling and dismantling the concrete member on the front side by gripping the concrete member.

3. The concrete member dismantling method according to claim 2,
wherein the concrete member cutting device according to claim 1 is used as the wire saw cutting device.