

HOLDING TOOL FOR CONVEYOR BELT CONVEYANCE

TECHNICAL FIELD

[0001]

5 The present invention relates to a holding tool for conveyor belt conveyance. More specifically, the present invention relates to a holding tool for conveyor belt conveyance capable of stable holding and conveyance of a conveyor belt while preventing deformation due to gravity and the dead weight of a conveyor belt in a wound-up state.

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BACKGROUND

[0002]

 In general, conveyor belts are stored and conveyed while in a state of being wound up on a winding drum. Such winding drums are known to
15 comprise a winding core member and a pair of flange members formed into disk shapes extending from both ends of the winding core member towards the outer radial sides (See Patent Document 1, for example).

[0003]

 In certain cases when conveyor belts are conveyed while in a state of
20 being wound up on such drums, the winding drums experience deformation or buckling. This particularly occurs when loading or other work employing forklifts is done, placing an excessive load upon sections at the edges of the flange members. Furthermore, if the dead weight of the winding drum is too great, then sometimes the winding drum experiences deformation simply from
25 the winding and holding of the conveyor belt. In addition, the winding drums are roughly cylindrical, and thus are poor in stability since they easily roll when placed on a flat surface and require special means for safe conveyance.

PRIOR ART DOCUMENT

30

Patent Document

[0004]

 Patent Document 1: Japanese Unexamined Patent Application
Publication No. 2005-206265A

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SUMMARY OF THE INVENTION

Problem to be Solved by the Invention

[0005]

An object of the present invention is to provide a holding tool for conveyor belt conveyance that can stably hold and convey a conveyor belt while preventing deformation due to gravity and the dead weight of a conveyor belt in a wound-up state

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Means to Solve the Problem

[0006]

In order to achieve the aforementioned purpose, a holding tool for conveyor belt conveyance of the present invention is a holding tool for
10 conveyor belt conveyance for holding a conveyor belt in a wound-up state on a winding core, which comprises a cradle for placing a conveyor belt in a wound-up state and attaching members for attaching both ends of the cradle to both corresponding ends of the winding core. Furthermore, the cradle has an arc-shaped placement section that matches the outer circumferential surface of a
15 conveyor belt in a wound-up state, and a ground-contacting section for bringing the cradle to an immovable state at a fixed position when the cradle is placed upon a flat surface.

[0007]

Another holding tool for conveyor belt conveyance of the present
20 invention is a holding tool for conveyor belt conveyance for holding a conveyor belt in a wound-up state on a winding core, which comprises a cradle for placing a conveyor belt in a wound-up state, a support shaft passing through the winding core in the direction of the core axis, support shaft attaching members for attaching both ends of the cradle to both corresponding ends of the support
25 shaft, and attaching members for attaching the cradle to the winding core. Furthermore, the cradle has an arc-shaped placement section matching the outer circumferential surface of the conveyor belt in a wound-up state, and a ground-contacting section for bringing the cradle to an immovable state at a fixed position when the cradle is placed upon a flat surface.

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EFFECT OF THE INVENTION

[0008]

As stated above, the cradle of the former holding tool for conveyor belt conveyance of the present invention has an arc-shaped placement section.
35 Therefore, the conveyor belt is brought to a state of being supported on its surface by the arc-shaped placement section, and the localized load burden is reduced. This has the benefit of preventing deformation of the holding tool for conveyor belt conveyance. In addition, a conveyor belt in a wound-up

state may be stably held since its movement in the rolling direction is restricted by the arc-shaped placement section. In addition, the stability of the holding tool for conveyor belt conveyance is ensured by the ground-contacting section since the cradle is in an immovable state at a fixed position when the cradle is placed upon a flat surface. Furthermore, a conveyor belt may be stably held since its movement in the direction of shaft is restricted by the attaching members.

[0009]

Here, as an example, the arc length of the placement section is set to 20% to 45% of the outer circumferential length of the conveyor belt in a wound-up state. By this, the load burden of the conveyor belt is spread out, making it easier to prevent deformation of the holding tool for conveyor belt conveyance. In addition, this makes it easier to restrict the movement of the conveyor belt in the rolling direction.

[0010]

A length adjusting section that adjusts the attachment length of the attaching members may be provided. By this, versatility is increased since it is possible to hold conveyor belts of different outer winding diameters instead of replacing the attaching members.

[0011]

The attaching members are provided in pairs for each end of the cradle. These pairs are attached so that attaching portions with the winding core form a vertical angle. This vertical angle may be specified as being set to 30° to 120°. This specification makes it possible to effectively distribute the load of the conveyor belt to prevent deformation of the holding tool for conveyor belt conveyance, and alleviate the load burden on the attaching members.

[0012]

Conveyance with the holding tool for conveyor belt conveyance is made easier by forklift hook tip insertion sections being provided on the cradle.

[0013]

The latter holding tool for conveyor belt conveyance of the present invention achieves the same effects as the former holding tool for conveyor belt conveyance, and may employ the same arrangements. Furthermore, it has a support shaft that passes through the winding core in the direction of the core axis, and support shaft attaching members. Thus a single holding tool for conveyor belt conveyance may hold a plurality of conveyor belts by passing through the winding cores of a plurality of conveyor belts with the support shaft.

[0014]

In addition, spacers located on the placement section may be provided. By this, relatively small-diameter conveyor belts may be stably held via the spacers when a plurality of conveyor belts of different outer winding diameters are held.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

FIG. 1 is a perspective view depicting a first embodiment of a holding tool for conveyor belt conveyance of the present invention.

FIG. 2 is a front view of the holding tool for conveyor belt conveyance in FIG. 1.

FIG. 3 is a widthwise cross-sectional view (orthogonal to the shaft) of the holding tool for conveyor belt conveyance in FIG. 1.

FIG. 4 is a perspective view depicting a second embodiment.

FIG. 5 is a front view of the holding tool for conveyor belt conveyance in FIG. 4.

FIG. 6 is a perspective view depicting a third embodiment.

FIG. 7 is a front view depicting a fourth embodiment.

FIG. 8 is a front view of a holding tool for conveyor belt conveyance illustrating a Modified Example of attaching members.

FIG. 9 is a front view of a holding tool for conveyor belt conveyance illustrating a Modified Example of attaching members.

FIG. 10 is a widthwise cross-sectional view depicting a fifth embodiment.

FIG. 11 is a front view of the holding tool for conveyor belt conveyance in FIG. 10.

BEST MODE FOR CARRYING OUT THE INVENTION

[0016]

Detailed descriptions will be given below of the present invention with reference to the accompanying drawings.

[0017]

FIG. 1 to FIG. 3 depict a first embodiment of a holding tool for conveyor belt conveyance of the present invention (hereinafter, holding tool 1). This holding tool 1 comprises a cradle 10 for placing a conveyor belt CB in a wound-up state on a winding core C and attaching members 20 for attaching both ends of the cradle 10 to both corresponding ends of the winding core C.

[0018]

The cradle 10 has a placement section 11 on its top surface. This placement section 11 is formed in an arc shape matching the outer circumferential surface of a conveyor belt CB in a wound-up state. On the other hand, the bottom surface of the cradle 10 has a ground-contacting section 12 for bringing the cradle 10 to an immovable state at a fixed position when the cradle 10 is placed upon a flat surface. Furthermore, the outer circumferential surface of a conveyor belt CB in a wound-up state is covered by a polypropylene or other resin film to prevent dirt, corrosion and the like.

[0019]

According to a first embodiment, the cradle 10 has a placement section 11 consisting of concave surface 11a constituted by the machining of the top surface of rectangular steel material into an arc shape matching the outer circumferential surface of a conveyor belt CB in a wound-up state. The ground-contacting section 12 is constituted forming a flat surface 12a on the bottom surface of the cradle 10.

[0020]

The attaching members 20 are constituted by plate material 21. Steel, iron or other metals, hard resins, or timber may be used as material for the attaching members 20. According to this embodiment, two pieces of plate material 21, 21 are suspended between the cradle 10 and the winding core C, and both ends of plate material 21 are fixed by bolts 22 to the cradle 10 and winding core C.

[0021]

The cradle 10 in holding tool 1 of the present invention has an arc-shaped placement section 11, bringing the conveyor belt CB to a state of being supported on its surface by the arc-shaped placement section 11. Thus, it is possible to avoid an excessive load being applied to specific areas, such as during conveyance of a conveyor belt CB wound around a conventional winding drum, and to reduce the localized load burden. This is useful in preventing deformation of the holding tool 1. In addition, since the arc-shaped placement section 11 can catch a conveyor belt CB in a wound-up state, and restrict its movement in the rolling direction, the conveyor belt CB is stably held.

[0022]

The ground-contacting section 12 ensures the stability of this holding tool 1, since the cradle 10 is in an immovable state at a fixed position when the cradle 10 is placed upon a flat surface. This further benefits stable holding of

the conveyor belt CB since the movement of the conveyor belt CB, which is prone to slippage in the direction of the shaft during conveyance, is restricted by the attaching members 20. In addition, since the conveyor belt CB is in surface contact with the placement section 11, the conveyor belt CB may be damaged by friction between the conveyor belt CB and the placement section 11 when the conveyor belt CB moves in the direction of the shaft. However, since the conveyor belt CB integrated with the winding core C is restricted in moving in the direction of the shaft by the attaching members 20, this damage can also be avoided.

[0023]

The arc length L of the placement section 11 may be set, for example, to 20% to 45% of the outer circumferential length of the conveyor belt CB in a wound-up state. Thus, the load burden of the conveyor belt CB is spread out, making it easier to prevent deformation of the holding tool 1. In addition, this makes it easier to restrict the movement of the conveyor belt CB in the rolling direction. If the arc length L of the placement section 11 is less than 20% of the outer circumferential length of a conveyor belt CB in a wound-up state, the load burden of the conveyor belt CB is narrower, and the effect of preventing deformation of the holding tool 1 is reduced. In addition, the placement depth of the conveyor belt CB on the placement section 11 becomes shallower, lessening the restricting effect upon the movement of the conveyor belt CB in the rolling direction. If the arc length L of the placement section 11 is greater than 45% of the outer circumferential length of a conveyor belt CB in a wound-up state, the size and weight of the holding tool 1 will be too greater.

[0024]

The outer circumferential length of the conveyor belt CB may vary, but is, for example, about 4700 mm to 11,300 mm with outer winding diameters of about 1500 mm to 3600 mm. The width of the conveyor belt CB is, for example, about 300 mm to 3200 mm. The weight of a conveyor belt CB in a wound-up state is, for example, about 1000 kg to 32,000 kg.

[0025]

In the first embodiment, the attaching members 20 are provided in pairs, each pair corresponding to an end of the cradle 10. In this case, as illustrated in FIG. 2, the pair of attaching members 20, 20 are attached so that the attaching portions with the winding core C form a vertical angle; this vertical angle θ preferably being set to 30° to 120° . Thus, the load of the conveyor belt CB is effectively distributed, allowing deformation of the holding tool 1 to be prevented. Furthermore, this helps to alleviate the load burden on the

attaching members 20. If the angle θ is less than 30° , then the pair of attaching members 20, 20 may become too close, and the conveyor belt CB is substantially fixed by a single attaching member 20, making it difficult to effectively distribute its load. If the angle θ is greater than 120° , then the
5 fixing points where the attaching members 20 are fixed to the cradle 10 begin to reach the ends of the cradle 10, resulting in an increased load burden upon the ends of the cradle 10 and making deformation more likely.

[0026]

The cradle 10, as depicted in FIG. 1 and 2, is preferably provided with
10 forklift hook tip insertion sections 13. These make it easy to convey the holding tool 1.

[0027]

The holding tool 1 of the present invention is not limited to the first embodiment, and may be any one of the second to fifth embodiments described
15 below. Furthermore, configurations not specifically referred to in the descriptions of the second to fifth embodiments share the same configuration as the first embodiment. In addition, the various described arrangements according to the first embodiment may be similarly implemented in the second to fifth embodiments.

20 [0028]

In the second embodiment depicted in FIG. 4 and 5, a cradle 10 (placement section 11) is constituted by a plate-like body having a concave surface 11b curving in an arc shape matching the outer circumferential surface of a conveyor belt CB in a wound-up state. A ground-contacting section 11 is
25 constituted provided with, a pair of a plurality of supports 12b extending downward from the bottom surface of the curved plate-like body and ground plates 12c extending so as to be joined with the bottom ends of the plurality of supports 12b.

[0029]

30 Thus, the same effects as the first embodiment can be achieved. The ground-contacting section 11 is constituted by the supports 12b and the ground plates 12c, so the gap between the adjacent supports 12b may be utilized as forklift hook tip insertion sections 13.

[0030]

35 The volume of this cradle 10 may be reduced, which is useful for miniaturization and compactness. Multiple cradles 10 may be formed side-by-side in the widthwise direction of the cradle 10 (in the direction of the shaft of the winding core C) from thin plate material curved into an arc shape.

[0031]

In the third embodiment depicted in FIG. 6, a placement section 11 is constituted by lining up a plurality of strips of plate material 11c extending in the widthwise direction of a cradle 10 so that the long sides of the plate material 11c are in contact with one another. This placement section 11 has a polygonal shape matching the outer circumferential surface of a conveyor belt CB in a wound-up state, and is substantially an arc shape made up of multiple pieces of plate material 11c. In the present invention, such polygonal shapes are also referred to as arc shapes. Consequently, the same effects as the first embodiment can be achieved. The forklift hook tip insertion sections 13 may be provided on either the widthwise side sections of the cradle 10, side sections orthogonal to them, or both.

[0032]

The fourth embodiment depicted in FIG. 7 illustrates a modification of the ground-contacting section 12 of the second embodiment. Here a ground-contacting section 12 is projecting downward from the bottom surface of a curved plate-like cradle 10, and is constituted from a pair of leg sections 12d disposed that is spaced circumferentially. These leg sections 12d are both formed to have a length such that both of the leg sections and the outer circumferential surface of the cradle 10 makes contact with the ground. Thus, the cradle 10 is in an immovable state at a fixed position when the cradle 10 is placed upon a flat surface

[0033]

FIG. 8 and 9 illustrate a Modified Example of the attaching members 20. These attaching members 20 are provided with a length adjusting section that adjusts the attachment length.

[0034]

The attaching members 20 depicted in FIG. 8 have plate material 21 having a plurality of bolt holes 23 in the lengthwise direction and bolts 22. These pieces of plate material 21 are suspended between the cradle 10 and the winding core C. Bolts 22 are passed through the bolt holes 23 to fix the attaching members 20 to the cradle 10, and the attaching members 20 to the winding core C, respectively. The attachment length may be adjusted by properly selecting the bolt holes 23 through which the bolts 22 will be passed through from the plurality of bolt holes 23 provided.

[0035]

The attaching members 20 depicted in FIG. 9 have plate material 21 having long and narrow bolt holes 23 extending in the lengthwise direction and

bolts 22. These pieces of plate material 21 are suspended between the cradle 10 and the winding core C. Bolts 22 are passed through the long and narrow bolt holes 23 to fix the attaching members 20 to the cradle 10, and the attaching members 20 to the winding core C, respectively. The attachment length may be adjusted by selecting the fixing positions for the bolts 22 passed through these long and narrow bolt holes 23 at any position along the bolt holes 23 in the lengthwise direction.

[0036]

In the attaching members 20 depicted in Fig. 8 and 9, versatility is increased since it is possible to hold conveyor belts CB of different outer winding diameters without replacing the attaching members 20.

[0037]

In the fifth embodiment depicted in FIG. 10 and 11, a cradle 10 for placing a conveyor belt CB in a wound-up state, a support shaft 30 passing through a winding core C in the direction of the core axis, support shaft attaching members 40 for attaching both ends of the cradle 10 to both corresponding ends of the support shaft 30, and attaching members 20 for attaching the cradle 10 and the winding core C are provided. In this embodiment, a support shaft 30 passing through the winding core C in the direction of the core axis and support shaft attaching members 40 are provided. Thus a single holding tool 1 may hold a plurality of conveyor belts CB1, CB2 by causing the support shaft 30 to pass through and hold winding cores C1, C2 of the plurality of conveyor belts CB1, CB2. The winding cores C1, C2 of the respective conveyor belts CB1, CB2 are each attached to the cradle 10 by respective attaching members 20, so the plurality of conveyor belts CB1, CB2 may be stably held since the movement of each of the conveyor belts CB1, CB2 in the rolling direction is restricted by the attaching members 20.

[0038]

As depicted in FIG. 10 and 11, not only a plurality of conveyor belts CB with the same outer winding diameter, but conveyor belts CB1, CB2 with different outer winding diameters may be held. In this case, the placement section 11 is formed into an arc shape matching the outer circumferential surface of the conveyor belt CB1 with the greatest outer diameter. Spacer 50 located on top of the placement section 11 may be provided. By interposing these spacers 50 into the gap between a relatively small diameter conveyor belt CB2 and the placement section 11, a relatively small diameter conveyor belt CB2 may be stably held by the placement section 11 via the spacers 50 when a

plurality of conveyor belts CB1, CB2 with different outer winding diameters are held.

[0039]

5 In the embodiment depicted in FIG. 10 and 11, one support shaft
attaching member 40 is provided for each end of the cradle 10, but similar to
the attaching members 20, a pair may be provided on each end of the cradle 10.
When this happens, similar to the attaching members 20, the pair of support
shaft attaching members 40, 40 are attached so that the attaching portions with
the support shaft 30 form a vertical angle, in order to alleviate the load burden
10 on the attaching members. This vertical angle preferably is set to 30° to 120°.

REFERENCE NUMERALS

[0040]

1 Holding tool for conveyor belt conveyance
15 10 Cradle
11 Placement section
12 Ground-contacting section
13 Forklift hook tip insertion section
20 Attaching member
20 21 Plate material
22 Bolt
23 Bolt hole
30 Support shaft
40 Support shaft attaching member
25 50 Spacer
CB Conveyor belt
C Winding core

CLAIMS

1. A holding tool for conveyor belt conveyance for holding a conveyor belt in a wound-up state on a winding core, comprising:
 - a cradle for placing a conveyor belt in a wound-up state; and
 - attaching members for attaching both ends of the cradle to both corresponding ends of a winding core;
 - the cradle having an arc-shaped placement section that matches an outer circumferential surface of the conveyor belt in a wound-up state; and
 - the cradle having a ground-contacting section for bringing the cradle to an immovable state at a fixed position upon the cradle being placed upon a flat surface.
2. The holding tool for conveyor belt conveyance according to claim 1, wherein an arc length of the placement section is set to 20% to 45% of an outer circumferential length of the conveyor belt in a wound-up state.
3. The holding tool for conveyor belt conveyance according to claim 1 or 2, further comprising a length adjusting section for adjusting an attachment length of the attaching members.
4. The holding tool for conveyor belt conveyance according to claim 1, 2 or 3, wherein the attaching members are provided in pairs for each end of the cradle, the pairs of attaching members are attached so that attaching portions with the winding core form a vertical angle, and the vertical angle is set to 30° to 120°.
5. The holding tool for conveyor belt conveyance according to any one of claims 1 to 4, further comprising forklift hook tip insertion sections provided on the cradle.
6. A holding tool for conveyor belt conveyance for holding a conveyor belt in a wound-up state on a winding core, comprising:
 - a cradle for placing a conveyor belt in a wound-up state;
 - a support shaft passing through a winding core in a direction of core axis;
 - support shaft attaching members for attaching both ends of the cradle to both corresponding ends of the support shaft; and

attaching members for attaching the cradle to the winding core;
the cradle having an arc-shaped placement section matching an outer peripheral surface of the conveyor belt in a wound-up state; and
the cradle having a ground-contacting section for bringing the cradle to an immovable state at a fixed position upon the cradle being placed upon a flat surface.

7. The holding tool for conveyor belt conveyance according to claim 6, further comprising spacers located on the placement section.