

METHOD OF CONSTRUCTING FERRIS WHEEL

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The present invention relates to a method of constructing a Ferris wheel.

2. DESCRIPTION OF RELATED ART

There is a known method of constructing a Ferris wheel in which sections of a rim of the Ferris wheel are constructed by rotating the assembled sections of the rim in a first direction (clockwise direction) (for example, refer to Japanese Unexamined Patent Application, Publication No. HEI-11-285585 (Figs. 10 and 11)).

However, according to the method disclosed in Japanese Unexamined Patent Application, Publication No. HEI-11-285585, if a driving mechanism breaks while the load of the assembled sections of the rim is unbalanced, the heavy rim might rotate in a second direction (counterclockwise direction).

BRIEF SUMMARY OF THE INVENTION

The present invention has been conceived in light of the problem described above. Accordingly, an object of the present invention is to provide a method of constructing a Ferris wheel in which the rim can be prevented from rotating

in a second direction (counterclockwise direction) even if the driving mechanism breaks.

To achieve the above-described object, the present invention provides the following solutions. A method of constructing a Ferris wheel according to a first aspect of the present invention includes the steps of: assembling a rim by joining together a plurality of rim sections in order and rotating the joined rim sections in a first direction with at least one propulsion unit having a clamping mechanism for holding rails provided on the rim and a propulsion mechanism for driving the clamping mechanism in the first direction; and preventing the joined rim sections from rotating in a second direction by operating the clamping mechanism, which is capable of operating independently from the propulsion mechanism, while the joined rim sections are rotated in the first direction with the at least one propulsion unit.

According to such a method of constructing a Ferris wheel, since the rim being assembled is constantly supported (or a braking force is applied) by the clamping mechanism of the propulsion unit, the rim is reliably prevented from rotating in the second direction (counterclockwise direction).

A method of constructing a Ferris wheel according to a second aspect of the present invention includes the steps of: assembling a rim by joining together a plurality of rim sections in order and rotating the joined rim sections in a

first direction with at least one propulsion unit having a clamping mechanism for holding rails provided on the rim and a propulsion mechanism for driving the clamping mechanism in the first direction; and moving a receiving unit into contact with the rim, the receiving unit being provided on a brake truss for preventing the joined rim sections from rotating in a second direction when the operation of the clamping mechanism is stopped, the receiving unit being moved by operating the clamping mechanism, which is capable of operating independently from the propulsion mechanism, while the joined rim sections are rotated in the first direction with the at least one propulsion unit.

According to such a method of constructing a Ferris wheel, since the rim being assembled is constantly supported (or a braking force is applied) by the clamping mechanism of the propulsion unit and/or the brake truss, the rim is reliably prevented from rotating in the second direction (counterclockwise direction) even if the propulsion mechanism of the propulsion unit breaks.

A method of constructing a Ferris wheel according to a third aspect of the present invention includes the steps of: assembling a rim by joining together a plurality of rim sections in order and rotating the joined rim sections in a first direction with a propulsion unit having a clamping mechanism for holding rails provided on the rim and a

propulsion mechanism for driving the clamping mechanism in the first direction; and attaching a temporary strut for connecting a spindle unit disposed at the center of the Ferris wheel and the rim or a spoke wire in a substantially vertical orientation.

According to such a method of constructing a Ferris wheel, since the assembly of the temporary struts or the tensing of the spoke wires is always carried out while the temporary strut or spoke wire is hanging vertically downward from the spindle unit provided at the center of the Ferris wheel, assembly error can be minimized, and, thus, work required for correcting such an assembly error does not have to be carried out. Therefore, the construction schedule can be shortened.

A method of constructing a Ferris wheel according to a fourth aspect of the present invention includes the steps of: assembling a rim by joining together a plurality of rim sections in order and rotating the joined rim sections in a first direction with a propulsion unit having a clamping mechanism for holding rails provided on the rim and a propulsion mechanism for driving the clamping mechanism in the first direction; and operating a plurality of jacks for supporting a rim section, the jacks being provided on a work platform disposed on a work carriage movable on the ground and being operated in accordance with the movement of the work

carriage when the joined rim sections are rotated in the first direction in such a manner that joint of the rim sections is positioned on an arc whose radius equals the distance from the center of the Ferris wheel to the joint of the joined rim sections.

According to such a method of constructing a Ferris wheel, while a second end of one rim section and a first end of an adjacent rim section are being joined together, the adjacent rim section is disposed on the plurality of jacks on the work carriage so as to prevent a strenuous force from being applied to the rim sections. When the rim sections are joined together and then slightly rotated in the first direction, the work carriage is moved in the propulsion direction in accordance with the rotation, and the heights of the jacks are automatically adjusted so that strenuous forces are not applied to the components.

A rim construction apparatus for a Ferris wheel according to a fifth aspect of the present invention includes: at least two columns vertically mounted on column foundations; a propulsion unit including, a clamping mechanism configured to hold rails provided on a rim being assembled, the clamping mechanism being disposed on an inner edge of the columns, and a propulsion mechanism for driving the clamping mechanism in a first direction; and a brake truss, one end of the brake truss having a receiving unit configured to support a horizontal

member provided on the rim, the other end of the brake truss being installed to the column foundation or a foundation provided independently from the column foundation.

According to such a method of constructing a Ferris wheel, since the rim is always supported (or a braking force is applied) by the propulsion unit with the clamping mechanism and/or the brake truss, even if the propulsion mechanism of the propulsion unit is damaged, the rim is reliably prevented from rotating in the second direction (counterclockwise direction).

For the above-described rim construction apparatus for a Ferris wheel, it is preferable that the brake truss installed on the foundation provided independently from the column foundation be a tower-shaped assembly.

According to such a method of constructing a Ferris wheel, since the brake truss is assembled into a tower and is firmly fixed to a foundation that is buried in the ground and that is independent from the column foundations, an even more stable reaction point can be obtained on the brake truss. Thus, the safety of the construction process can be improved.

It is preferable that the above-described rim construction apparatus for a Ferris wheel further include a work carriage movable on the ground, the work carriage having a plurality of jacks on a work platform, the jacks being configured to support a rim section.

According to such a method of constructing a Ferris wheel, while a second end of one rim section and a first end of an adjacent rim section are being joined together, the adjacent rim section is disposed on the plurality of jacks on the work carriage so as to prevent a strenuous force from being applied to the rim section. When the rim sections are joined together and then slightly rotated in the first direction, the work carriage is moved in the propulsion direction in accordance with the rotation, and the heights of the jacks are automatically adjusted so that strenuous forces are not applied to the components.

The present invention is advantageous in that the assembled rim can be prevented from rotating in the second direction (counterclockwise direction) even if the driving mechanism breaks.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

Fig. 1 is a front view illustrating a method of constructing a Ferris wheel according to an embodiment of the present invention. Fig. 1 illustrates the step of attaching a first section of a temporary strut, which is to be disposed at the innermost position in the radial direction, to a predetermined position on a spindle unit.

Fig. 2 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the

present invention. Fig. 2 illustrates the step of moving a work carriage that carries a section of a rim, which is divided into a plurality of sections, along rails.

Fig. 3 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 3 illustrates the step of jacking up the section of the rim carried to a predetermined position on the work carriage with hydraulic jacks and joining one end of the section with one end of another section at the outermost point in the radial direction of the temporary strut.

Fig. 4 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 4 illustrates the step of tensing a first spoke wire between the spindle unit and the rim.

Fig. 5 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 5 illustrates the step of slightly rotating the temporary strut, the rim, and the spindle unit in a first direction by gradually moving the work carriage after the spoke wire is tensed.

Fig. 6 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 6 illustrates the step of engaging a receiving unit at the tip of a brake truss with a pipe-shaped horizontal member connecting left and right portions of the

rim.

Fig. 7 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 7, which is similar to Fig. 2, illustrates the step of moving the work carriage carrying a second section of the rim.

Fig. 8 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 8 illustrates the step of jacking up the second section of the rim, which has been carried to a predetermined position on a work carriage, with hydraulic jacks and joining a second end of a first section with a first end of the second section.

Fig. 9 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 9 illustrates the step of tensing a second spoke wire between the spindle unit and the rim.

Fig. 10 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 10 illustrates the step of attaching a first section of a second temporary strut, which is disposed at the innermost position in the radial direction, to a predetermined position on the spindle unit.

Fig. 11 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the

present invention. Fig. 11 illustrates the step of tensing a tie wire between the joint of the first temporary strut and the rim and the joint of the second temporary member and the rim after attaching the second temporary strut.

Fig. 12 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 12 illustrates the step of tensing a tie wire between the joint of the second temporary member and the rim and the joint of a third temporary member and the rim after attaching the third temporary strut.

Fig. 13 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 13 illustrates the step of assembling a fourteenth section of the rim, which is divided into 28 sections.

Fig. 14 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 14 illustrates the step of assembling a sixteenth section of the rim, which is divided into 28 sections.

Fig. 15 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 15 illustrates the step of assembling a twentieth section of the rim, which is divided into 28 sections.

Fig. 16 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 16 illustrates the step of assembling a twenty-fourth section of the rim, which is divided into 28 sections.

Fig. 17 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 17 illustrates the step of assembling a twenty-eighth section of the rim, which is divided into 28 sections.

Fig. 18 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 18 illustrates the step of removing a section of a temporary strut, which is disposed at the innermost position in the radial direction, from a predetermined position on the spindle unit and placing it on the work carriage.

Fig. 19 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 19 illustrates the step of removing a section of a fourth temporary strut, which is disposed at the innermost position in the radial direction, from a predetermined position on the spindle unit, while three other temporary struts are still assembled, and placing it on the work carriage.

Fig. 20 is a front view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 20 illustrates the step of completing the removal of all temporary struts and all tie wires, thus completing the assembly process of the rim.

Fig. 21 is a plan view illustrating the method of constructing a Ferris wheel according to the embodiment of the present invention. Fig. 21 illustrates the step of burying a column foundations and stay-wire securing foundations in the ground, vertically mounting columns on the column foundations, tensing a plurality of stay wires from the tips of the columns to the stay-wire securing foundations, and mounting a brake truss on the column foundations.

Fig. 22 is a side view of the columns.

Fig. 23A is a plan view of the propulsion unit with a clamping mechanism.

Fig. 23B is a front view of the propulsion unit with the clamping mechanism.

Fig. 24A is a front view of the work carriage carrying a section of the rim.

Fig. 24B is a side view of the work carriage carrying a section of the rim.

Fig. 25 is a plan view illustrating a method of constructing a Ferris wheel according to another embodiment of the present invention.

Fig. 26 is a front view of a propulsion unit with a clamping mechanism according to the other embodiment.

DETAILED DESCRIPTION OF THE INVENTION

A method of constructing a Ferris wheel according to an embodiment of the present invention will be described with reference to the drawings.

As shown in Figs. 1 and 21, first, column foundations 1 and stay-wire securing foundations 2 are buried in the ground G. Columns 3 are vertically arranged on the column foundations 1. A plurality of stay wires 4 (four stay wires in this embodiment) are tensed from the tips of the columns 3 to the stay-wire securing foundations 2.

As shown in Fig. 21, rails 5 are laid on the ground G between the column 3 at one side and the column 3 at the other side. Depending on the assembly process, a work carriage 6 or a work carriage 7 is moved along the rails 5. The work carriage 6 includes only a carriage 22, whereas the work carriage 7 includes, in addition to the carriage 22, a spoke wire drum 23, a work platform 24, and hydraulic jacks 25.

As shown in Fig. 22, a shaft unit 8 and a spindle unit 9 are provided at the top of the columns 3. A rotating platform 10 is provided on the spindle unit 9.

Middle platforms 11 are provided at positions higher than the midpoints of the columns 3. Lower platforms 12 are

provided at positions lower than the midpoints of the columns 3. The middle platforms 11 and the lower platforms 12 are provided at heights that are suitable for assembling (joining) or disassembling temporary struts 13 into a plurality of sections (in this embodiment the temporary struts 13 are disassembled into three sections). In other words, the middle platforms 11 and the lower platforms 12 are provided at heights where the joints of the temporary struts 13 are provided.

Propulsion units 15 with clamping mechanisms are attached to the inner edges of fixed beams 12a that support the lower platforms 12. The propulsion units 15 tightly hold rails 14a that are provided on both sides of a rim 14 being assembled and drive the rim 14, along with the rails 14a, in a first direction.

Tilted columns 30 for receiving horizontal reaction force are provided on the propulsion units 15 to smoothly transmit the horizontal reaction force applied to the propulsion units 15.

As shown in the plan view in Fig. 23A and the front view in Fig. 23B, each propulsion unit 15 includes a clamping mechanism 16 for tightly holding the upper and lower surfaces of one of the rails 14a provided on each side of the rim 14 being assembled and a propulsion mechanism 17 for driving the entire clamping mechanism 16 in the first direction. The

clamping mechanisms 16 and the propulsion mechanisms 17 are, for example, hydraulic jacks that can be operated independently. Therefore, by operating the propulsion mechanisms 17 while the clamping mechanisms 16 are holding the upper and lower surfaces of the rails 14a on both sides of the rim 14 being assembled (i.e., by extending arms 17a in the first direction (i.e., propulsion direction)), the rim 14 being assembled is rotated in the first direction. One of the ends of the propulsion mechanisms 17 of the propulsion unit 15 and the fixed beams 12a are connected to each other with pins (not shown in the drawings) so that the propulsion units 15 can freely rotate with respect to the fixed beams 12a.

After the columns 3 having the above-described structure are vertically provided on the column foundations 1 and the four stay wires 4 are tensed from the tips of the columns 3 to the stay-wire securing foundations 2, a first section of a first temporary strut 13 is attached to a predetermined position on the spindle unit 9. Since the temporary strut 13 is divided into three sections, according to this embodiment, first, a first section is attached to a predetermined position on the spindle unit 9. The first section of the temporary strut 13 is the innermost section of the three sections in the radial direction (i.e., closest to the spindle unit 9). The first section of the first temporary strut 13 is placed on the work carriage 6 and is carried along the rails 5. A first end

of a winch wire 21 is attached to a first end of the first section of the first temporary strut 13 that is carried to a predetermined position, whereas a second end of the winch wire 21 is attached to a winch 19. The winch wire 21 extending from the winch 19 is passed through a pulley 20 disposed on the ground G and then through a pulley (not shown in the drawing) mounted on the rotating platform 10. From the rotating platform 10, the winch 19 extends downward to the first section of the first temporary strut 13. The winch 19 winches up the winch wire 21 so that the first section of the first temporary strut 13 is lifted (refer to Fig. 1). As the winch 19 further winches up the winch wire 21, the first section of the first temporary strut 13 is lifted to the predetermined position on the spindle unit 9. The first section of the first temporary strut 13 and the spindle unit 9 are joined together with, for example, bolts, at the rotating platform 10. During the period between the moment the first end of the first section of the first temporary strut 13 is separated from the work carriage 6 and the moment a second end of the first section of the first temporary strut 13 is separated from the work carriage 6, the work carriage 6 moves along the rails 5 further in the propulsion direction. As a result, the first section of the temporary strut 13 is prevented from swinging back when the second end of the first section of the temporary strut 13 is separated from the work

carriage 6.

In the same manner, a second section, that is, the middle section 11, of the three sections of the first temporary strut 13 is lifted, and the second end of the first section and a first end of the second section are joined together with, for example, bolts. Then, a third section that is to be disposed at the outermost position of the three sections in the radial direction is lifted, and a second end of the second section that is already connected to the lower platforms 12 and a first end of the third section are joined together with, for example, bolts. In this way, the attachment of the first temporary strut 13 to the spindle unit 9 is completed (refer to Fig. 2). At this point, a brake truss B is installed on the column foundations 1.

Next, as shown in Fig. 2, a first section of the rim 14, which is divided into a plurality of sections (separated into 28 sections in this embodiment), is placed on the work carriage 7 and is carried along the rails 5.

As shown in the front view in Fig. 24A and the side view in Fig. 24B, the work carriage 7 is constructed by mounting the spoke wire drum 23 on the carriage 22 and mounting a plurality of hydraulic jacks 25 (12 hydraulic jacks 25 are provided in this embodiment) on the work platform 24 that is mounted on the carriage 22. The spoke wire drum 23 accommodates a spoke wire 26 (refer to Fig. 4) that is tensed

between the spindle unit 9 and the first section of the rim 14. The hydraulic jacks 25 can be operated independently. The hydraulic jacks 25 are controlled so they each receive a specific (constant) load that has been calculated in advance.

As shown in Fig. 3, the first section of the rim 14 on the work carriage 7 that has been transported to a predetermined position is jacked up by the hydraulic jacks 25. The second end of the third section of the temporary strut 13, which is the outermost section in the radial direction, and a first end of the first section of the rim 14 are joined together with, for example, bolts.

After the second end of the third section of the temporary strut 13 and the first end of the first section of the rim 14 are joined together, the work carriage 7 is gradually moved from the position shown in Fig. 3 to the position shown in Fig. 4. In this way, the temporary strut 13, the rim 14, and the spindle unit 9 are slightly rotated in the first direction (i.e., clockwise direction in Fig. 4). At this time, the heights of the hydraulic jacks 25 are automatically adjusted so that the joint of the temporary strut 13 and the rim 14 travels along an arc whose radius equals the distance from the rotation center of the spindle unit 9 to the joint of the temporary strut 13 and the rim 14.

As shown in Fig. 4, when a first spoke wire 26 can be fully extended, the work carriage 7 is temporarily stopped to

tense the first spoke wire 26 tightly between the spindle unit 9 and the rim 14.

After the first spoke wire 26 is tensed, the work carriage 7 is gradually moved from the position in Fig. 4 to the position in Fig. 5. In this way, the temporary strut 13, the rim 14, and the spindle unit 9 are slightly rotated in the first direction (i.e., clockwise direction in Fig. 5). At this time, the heights of the hydraulic jacks 25 are automatically adjusted so that the joint of the temporary strut 13 and the rim 14 travels along an arc whose radius equals the distance from the rotation center of the spindle unit 9 to the joint of the temporary strut 13 and the rim 14. When the work carriage 7 reaches the position shown in Fig. 5 (i.e., when the second end of the first section of the rim 14 is disposed between the two columns 3), the work carriage 7 is stopped, and a pipe-shaped horizontal member 14b (refer to Fig. 23A) connecting the left and right portions of the rim 14 is engaged with a receiving unit that is provided at the tip of the brake truss B (refer to Fig. 6). In this way, the temporary strut 13, the rim 14, and the spindle unit 9 are prevented from rotating in a second direction (i.e., counterclockwise direction in Fig. 5). At the same time, a second mechanism for preventing the temporary strut 13, the rim 14, and the spindle unit 9 from rotating in the second direction is provided by operating the clamping mechanisms 16

of the propulsion units 15. The work carriage 7 retracts to the outside (right in Fig. 6) of a work station disposed directly below the spindle unit 9.

A second section of the rim 14 divided into 28 sections is placed on the retracted work carriage 7. The work carriage 7 carrying the second section of the rim 14 travels along the rails 5 in the same manner as shown in Fig. 2 (refer to Fig. 7). At this time, the horizontal members 14b and the receiving unit provided at the tip of the brake truss B are disengaged.

As shown in Fig. 8, the second section of the rim 14 on the work carriage 7 that has traveled to a predetermined position is jacked up by the hydraulic jacks 25. The second end of the first section of the rim 14 and a first end of the second section of the rim 14 are joined together with, for example, bolts.

After the second end of the first section of the rim 14 and the first end of the second section of the rim 14 are joined together, the work carriage 7 is gradually moved from the position in Fig. 8 to the position in Fig. 9. In this way, the temporary strut 13, the rim 14, and the spindle unit 9 are slightly rotated in a first direction (i.e., clockwise direction in Fig. 9). At this time, the heights of the hydraulic jacks 25 are automatically adjusted so that the joint of the second end of the first section of the rim 14 and

the first end of the second section of the rim 14 travels along an arc whose radius equals the distance from the rotation center of the spindle unit 9 to the joint of the second end of the first section of the rim 14 and the first end of the second section of the rim 14.

As shown in Fig. 9, when a second spoke wire 26 can be fully extended, the work carriage 7 is temporarily stopped to tense the second spoke wire 26 tightly between the spindle unit 9 and the rim 14. At this time, the brake truss B is changed to a brake truss Be whose length is about twice as long as the brake truss B.

After the second spoke wire 26 is tensed, the work carriage 7 is gradually moved from the position in Fig. 9 to the position described above with reference to Fig. 5. In this way, the temporary strut 13, the rim 14, and the spindle unit 9 are slightly rotated in the first direction (i.e., clockwise direction in Fig. 9). At this time, the heights of the hydraulic jacks 25 are automatically adjusted so that the joint of the temporary strut 13 and the rim 14 travels along an arc whose radius equals the distance from the rotation center of the spindle unit 9 to the joint of the temporary strut 13 and the rim 14. When the work carriage 7 reaches the position shown in Fig. 5 (i.e., when the second end of the second section of the rim 14 is disposed between the two columns 3), the work carriage 7 is stopped, and a pipe-shaped

horizontal member 14b (refer to Fig. 23A) connecting the left and right portions of the rim 14 is engaged with a receiving unit provided at the tip of the brake truss Be (refer to Fig. 10). In this way, the temporary strut 13, the rim 14, and the spindle unit 9 are prevented from rotating in the second direction (i.e., counterclockwise direction in Fig. 9). At the same time, a second mechanism for preventing the temporary strut 13, the rim 14, and the spindle unit 9 from rotating in the second direction is provided, by operating the clamping mechanisms 16 of the propulsion units 15. The work carriage 7 retracts to the outside (right side in Fig. 9) of the work station disposed directly below the spindle unit 9.

After a second end of the second section of the rim 14 and a first end of a third section of the rim 14 are joined together, in the same manner as shown in Figs. 7 to 9, a third spoke wire 26 is tensed, a second end of the third section of the rim 14 and a first end of a fourth section of the rim 14 are joined together, a fourth spoke wire 26 is tensed; and a second temporary strut 13 is attached to a predetermined position on the spindle unit 9, as shown in Fig. 10. Since the process for attaching the temporary strut 13 to the spindle unit 9 has already been described above with reference to Fig. 1, a description thereof is not repeated here.

As shown in Fig. 11, after the second temporary strut 13 is attached to the spindle unit 9, a tie wire 27 is tensed

tightly between the joint of the first temporary strut 13 and the rim 14 and the joint of the second temporary strut 13 and the rim 14.

Subsequently, after joining a second end of the fourth section of the rim 14 and a first end of a fifth section of the rim 14, in the same manner as shown in Figs. 2 to 11, a fifth spoke wire 26 is tensed, a second end of the fifth section of the rim 14 and a first end of a sixth section of the rim 14 are joined together, a sixth spoke wire 26 is tensed, a second end of the sixth section of the rim 14 and a first end of a seventh section of the rim 14 are joined together, a seventh spoke wire 26 is tensed, a second end of the seventh section of the rim 14 and a first end of an eighth section of the rim 14 are joined together, an eighth spoke wire 26 is tensed, and a third temporary strut 13 is attached to a predetermined position on the spindle unit 9, as shown in Fig. 12. Since the process for attaching the temporary strut 13 to the spindle unit 9 has already been described above with reference to Fig. 1, a description thereof is not repeated here.

As shown in Fig. 12, after the third temporary strut 13 is attached to the spindle unit 9, a tie wire 27 is tensed tightly between the joint of the second temporary strut 13 and the rim 14 and the joint of the third temporary strut 13 and the rim 14.

Fig. 13 is a front view of the Ferris wheel after assembling a fourteenth section of the rim 14. At this time, the load applied to the brake truss Be is maximum.

Fig. 14 is a front view of the Ferris wheel after assembling a sixteenth section of the rim 14. Fig. 15 is a front view of the Ferris wheel after assembling a twentieth section of the rim 14. Fig. 16 is a front view of the Ferris wheel after assembling a twenty-fourth section of the rim 14. Fig. 17 is a front view of the Ferris wheel after assembling a twenty-eighth section of the rim 14.

As shown in Fig. 17, a second end of the twenty-seventh section of the rim 14 and a first end of the twenty-eighth section of the rim 14, and a second end of the twenty-eighth section of the rim 14 and the first end of the first section of the rim 14 are joined together on the work carriage 7. In this way, the process of joining a second end of one section of the rim 14 and a first end of a second section of the rim 14 adjacent to the first section is carried out on the work carriage 7.

After all sections of the rim 14 are attached, the seven temporary struts 13 are disassembled according to a process opposite to that for assembling the temporary struts 13. Fig. 18 illustrates a section of one of the temporary struts 13 that was disposed at the innermost position in the radial direction (i.e., the section disposed closest to the spindle

unit 9) being placed on the work carriage 6 after being removed from a predetermined position on the spindle unit 9.

Fig. 19 illustrates a section of a fourth temporary strut 13 that was disposed at the innermost position in the radial direction being placed on the work carriage 6 after being removed from a predetermined position on the spindle unit 9, while three other temporary struts 13 remain assembled.

Fig. 20 illustrates the Ferris wheel after the assembly of the rim 14 is completed and after all temporary struts 13 and all tie wires 27 are removed.

Subsequently, cabins (or gondolas), not shown in the drawings, are attached to predetermined positions on the rim 14, and a driving mechanism for driving the rim 14 is installed, thus completing the construction of the Ferris wheel.

In the method of constructing a Ferris wheel according to this embodiment, the entire process is carried out only on the rotating platform 10 provided on the spindle unit 9, the middle platforms 11 and the lower platforms 12 provided on the columns 3, and the work platform 24 provided on the work carriage 7. Therefore, the safety of the workers can be ensured, work efficiency can be increased, and the construction schedule can be shortened. Furthermore, since a large crane does not have to be used, a Ferris wheel having any diameter can be assembled.

When a second end of a first section of the rim 14 is joined together with a first end of a second adjacent section of the rim 14, the second section of the rim 14 is placed on the hydraulic jacks 25 on the work carriage 7. In this way, strenuous force is not applied to either section of the rim 14. When the temporary strut 13, the rim 14, and the spindle unit 9 are slightly rotated in the first direction after the sections of the rim 14 are joined together, the work carriage 7 travels in the same direction as the rotational direction, and the heights of the hydraulic jacks 25 are automatically adjusted so that strenuous forces are not applied to the components.

Since the middle platforms 11 and the lower platforms 12 mounted on the columns 3 are provided at heights that are suitable for assembling (joining) or disassembling the three sections of the temporary struts 13, i.e., where the joints of the temporary struts 13 are provided, the long temporary struts 13 can be assembled and disassembled easily and safely. Each temporary strut 13 divided into sections is assembled and disassembled while the temporary strut 13 is attached to a first end of the winch wire 21 extending from the winch 19, being passed through a pulley 20 disposed on the ground G, and then being passed through a pulley (not shown in the drawing) mounted on the rotating platform 10. Therefore, the assembly and disassembly processes can be carried out efficiently, and

the construction schedule can be shortened.

Since the assembly of the temporary struts 13 and the tensing of the spoke wires 26 are carried out with each of the temporary struts 13 and the spoke wires 26 hanging vertically downward from the columns 3, error in the assembly can be minimized. Moreover, work required for correcting such error does not have to be carried out, and, as a result, the construction schedule can be shortened even more.

By using the work carriage 7 on which the work platform 24 and the hydraulic jacks 25 are mounted, axial force generated when removing the temporary struts 13 can be easily dissipated. Therefore, the temporary struts 13 can be easily disassembled. Even after all sections of the rim 14 are assembled, the spoke wires 26 can be easily adjusted.

By using the brake trusses B and Be, the temporary struts 13 and rim 14 being assembled and the spindle unit 9 are reliably prevented from rotating in the opposite direction. Since second ends (i.e., ends opposite to the ends where receiving units are provided) of the brake trusses B and Be are attached to the column foundations 1, a force that causes the temporary strut 13, the rim 14, and the spindle unit 9 to rotate in the opposite direction is efficiently transmitted to the column foundations 1.

The scope of the present invention is not limited to the above-described embodiments; instead of the brake trusses B

and Be, a brake truss Bs, such as that shown in Fig. 25, may be employed.

The brake truss Bs is a tower-shaped assembly that includes a receiving unit (not shown in the drawing) at its tip. Similar to the above-described brake trusses B and Be, the receiving unit is engaged to prevent the temporary struts 13, the rim 14, and the spindle unit 9 from rotating in the second direction (for example, the counterclockwise direction in Fig. 5). The brake truss Bs is vertically mounted on foundations F1 and F2 that are buried in the ground G and that are provided independently from the column foundations 1.

If such a brake truss Bs is used, the brake truss B does not have to be changed to a brake truss Be, which is about twice as long as the brake truss B, midway through the assembly process (for example, when tensing a second spoke wire 26 between the spindle unit 9 and the rim 14, as shown in Fig. 9). Therefore, the work efficiency of the assembly process can be increased, and the construction schedule can be shortened even more.

Since the brake truss Bs is firmly fixed to the foundations F1 and F2 that are buried in the ground G and that are provided independently from the column foundations 1, a more stable reaction point is obtained on the brake truss Bs. Therefore, the safety of the assembly process can be improved.

As shown in Fig. 26, it is even more preferable to

provide a plurality of propulsion units 15 (two in this embodiment) along the rotational direction (circumferential direction) of the rim 14.

In this way, the rails 14a of the rim 14 being assembled will be supported (or clamped) by the clamping mechanisms 16 of a plurality of propulsion units 15 (a total of four in this embodiment). Therefore, even if some of the clamping mechanisms 16 of the propulsion units 15 fail or are damaged, the other clamping mechanisms 16 of the propulsion units 15 that have not failed or have not been damaged can still support (or clamp) the rails 14a of the rim 14. Accordingly, the safety of the assembly operation can be improved even more, and the rim 14 can be reliably prevented from rotating in the second direction (i.e., counterclockwise direction).

Since braking forces can be applied to the rim 14 with only the clamping mechanisms 16 of the propulsion units 15 (i.e., since the rim 14 can be prevented from rotating in the second direction (i.e., counterclockwise direction)), the brake trusses B, Be, and Bs can be provided as secondary safety mechanisms.

What is claimed is:

1. A method of constructing a Ferris wheel comprising the steps of:

assembling a rim by joining together a plurality of the rim sections in order and rotating the joined rim sections in a first direction with at least one propulsion unit having a clamping mechanism for holding rails provided on the rim and a propulsion mechanism for driving the clamping mechanism in the first direction; and

preventing the joined rim sections from rotating in a second direction by operating the clamping mechanism, which is capable of operating independently from the propulsion mechanism, while the joined rim sections are rotated in the first direction with the at least one propulsion unit.

2. A method of constructing a Ferris wheel comprising the steps of:

assembling a rim by joining together a plurality of rim sections in order and rotating the joined rim sections in a first direction with at least one propulsion unit having a clamping mechanism for holding rails provided on the rim and a propulsion mechanism for driving the clamping mechanism in the first direction; and

moving a receiving unit into contact with the rim, the

receiving unit being provided on a brake truss for preventing the joined rim sections from rotating in a second direction when the operation of the clamping mechanism is stopped, the receiving unit being moved by operating the clamping mechanism, which is capable of operating independently from the propulsion mechanism, while the joined rim sections are rotated in the first direction with the at least one propulsion unit.

3. A method of constructing a Ferris wheel comprising the steps of:

assembling a rim by joining together a plurality of rim sections in order and rotating the joined rim sections in a first direction with a propulsion unit having a clamping mechanism for holding rails provided on the rim and a propulsion mechanism for driving the clamping mechanism in the first direction; and

attaching a temporary strut for connecting a spindle unit disposed at the center of the Ferris wheel and the rim or a spoke wire in a substantially vertical orientation.

4. A method of constructing a Ferris wheel comprising the steps of:

assembling a rim by joining together a plurality of rim sections in order and rotating the joined rim sections in a

first direction with a propulsion unit having a clamping mechanism for holding rails provided on the rim and a propulsion mechanism for driving the clamping mechanism in the first direction; and

operating a plurality of jacks for supporting a rim section, the jacks being provided on a work platform disposed on a work carriage movable on the ground and being operated in accordance with the movement of the work carriage when the joined rim sections are rotated in the first direction in such a manner that a joint of the rim sections is positioned on an arc whose radius equals the distance from the center of the Ferris wheel to the joint of the joined rim sections.

5. A rim construction apparatus for a Ferris wheel comprising:

at least two columns vertically mounted on column foundations;

a propulsion unit including,

a clamping mechanism configured to hold rails provided on a rim being assembled, the clamping mechanism being disposed on an inner edge of the columns, and

a propulsion mechanism for driving the clamping mechanism in a first direction; and

a brake truss, one end of the brake truss having a receiving unit configured to support a horizontal member

provided on the rim, the other end of the brake truss being installed to the column foundation or a foundation provided independently from the column foundation.

6. The rim construction apparatus for a Ferris wheel according to Claim 5, wherein the brake truss installed on the foundation provided independently from the column foundation is a tower-shaped assembly.

7. The rim construction apparatus for a Ferris wheel according to Claim 5 or 6, further comprising:

a work carriage movable on the ground, the work carriage having a plurality of jacks on a work platform, the jacks being configured to support a rim section.