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(54) Titre : APPAREIL DE RACCORDEMENT POUR LE MONTAGE D'UN MAT HAUBANE
(54) Title: OVERHEAD LINE TOWER FOUNDATION CONNECTION METHOD AND CONNECTION APPARATUS

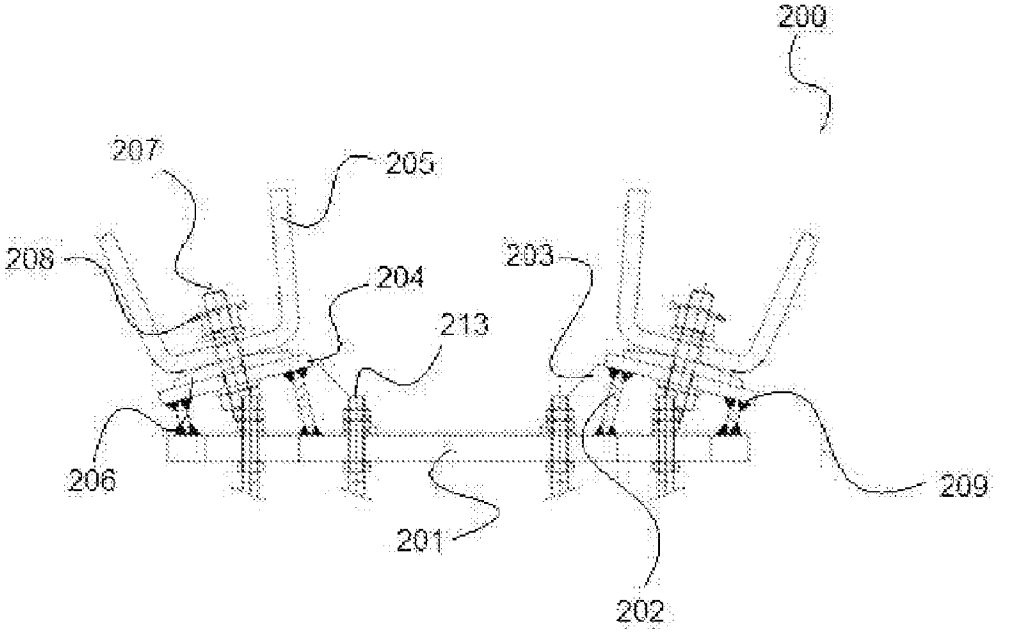

Figure-1

(57) Abrégé/Abstract:
The invention is related to a connection apparatus (200) and foundation connection method developed in order to be used in guyed overhead line towers (100). The foundation connection method and connection apparatus (200) mentioned above, enables all the legs (101) of a tower (100) to be fixed onto a single base plate (201). According to the structure of foundation connection apparatus, the angle determining tubes (202) welded to the base plate (201) are capped with welded treated cap plate (204) which is connected to the bottom cone plate (205) located at the ends of the legs (101) of the towers (100) by means of the pin (207). To provide angular rotation between the connection apparatus (200) and the leg (101) the beveled plate (206) is squeezed between treated cap plate (204) and bottom cone plate (205).

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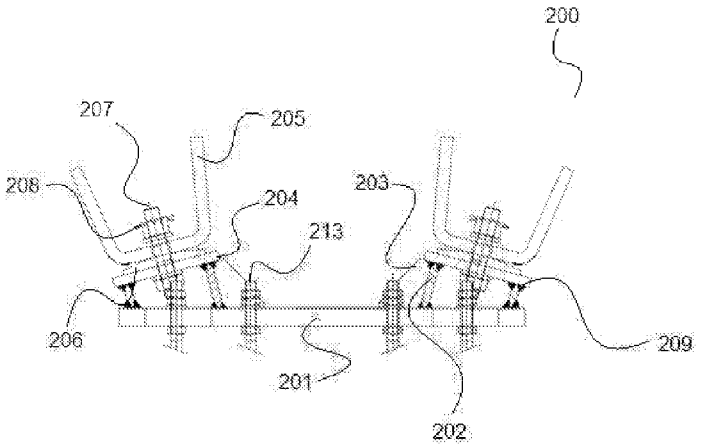

Figure-1

(57) Abstract: The invention is related to a connection apparatus (200) and foundation connection method developed in order to be used in guyed overhead line towers (100). The foundation connection method and connection apparatus (200) mentioned above, enables all the legs (101) of a tower (100) to be fixed onto a single base plate (201). According to the structure of foundation connection apparatus, the angle determining tubes (202) welded to the base plate (201) are capped with welded treated cap plate (204) which is connected to the bottom cone plate (205) located at the ends of the legs (101) of the towers (100) by means of the pin (207). To provide angular rotation between the connection apparatus (200) and the leg (101) the beveled plate (206) is squeezed between treated cap plate (204) and bottom cone plate (205).

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DESCRIPTION

OVERHEAD LINE TOWER FOUNDATION CONNECTION METHOD AND CONNECTION APPARATUS

Technical Field

The invention is related to a tower-foundation connection apparatus and a connection method that can be used during tower erection of guyed towers in the electricity transmission line industry.

Prior Art

Nowadays as a result of the increase in electricity requirement, production is being carried out in places where energy sources are located (water, coal, wind, natural gas etc.) but these energy sources are far from the places of energy consumption. Thereby the process of transferring electricity to cities and industries has gained importance. Overhead lines (OHL) are used in order to transfer high voltage electricity to consumption centers from the production facilities. The main role of towers that are usually placed at appropriate intervals and height along the line is to hold the wires of electricity distribution lines at a certain distance above from the ground and from each other. OHL towers are classified according to the material they are produced from and according to their functions in the line.

Nowadays towers made of steel are frequently preferred and they can be used in all kinds of voltage stages. The base or foundations of the steel towers must be filled with concrete only, and gravel, soil or sand must not be used. Steel towers have a longer usage life and are lighter in comparison to concrete towers. Steel towers can be applied to all kinds of arrangements of conductors. It is also easier to repair the tower break downs that may occur due to any reason.

Guyed towers are towers that are fixed by means of several tension cables. The foundations of the guyed towers are generally different from conventional foundations. Since foundation needs to be connected to the base with a 90° angle, sometimes the surface needs to be angular; therefore, this kind of foundation is difficult to obtain as it is difficult to pour the concrete and mount the mould. When that mounting difficulty is combined with land conditions, important problems may arise as a result of faulty placement of the pre-produced foundation or if the foundation is not poured perfectly at a correct angle. Moreover, as the weight of the guyed towers can reach up to 15-20 tons, and as entirely assembled towers are lifted in one piece and mounted with suspensions onto the foundation, even a small error may damage the foundation or connection parts as a result of impact. In such cases, the repair procedures of the foundation and the connection parts lead to great expenses and loss of time. Preparation on the mould of

base for guyed towers is a costly process that necessitates expertise and precise calculation. For each possible size and angle of the tower leg it is necessary to create foundation from scratch

Several studies have been carried out in order to provide easier mounting and reinforcing foundation connections of guyed towers. One of these studies is the invention subject to the patent numbered CN106939614. The invention is related to a highly reliable guyed tower base. The guyed tower foundation comprises a base body, a tower body, a first support mechanism and a second support mechanism. The first support mechanism comprises a main body and several rolling units that have been arranged at equal distances from each other on the main body. Each rolling unit comprises a limitation block, a spring, a grip ring and a sphere. The second support mechanism comprises a support block and reinforcement angled steel on the support block. A support column has been arranged on the base body of the base of the guyed tower with high reliability, and the base body has been filled with concrete; due to this reason, the base body has a very high load carrying capacity, and a hook has been arranged on the base of the base body and as a result it has been prevented for the base body to be lifted upwards by means of an upward force. The second support mechanism has been replaced with a conventional latch connection according to the hinged connection of the base body and the tower body and rolled connection having lower friction forces have been adopted in order to prevent the abrasion of connection part of the tower body and the foundation body. Additionally, by means of the design of the sliding mechanism, the support block can be better connected to the sliding mechanism. Finally, a tension spring that has been arranged between the base body and the support block has been used to prevent the separation of the base body and the support block from each other.

Another study is the invention subject to the patent numbered CN105442906. The invention described a tower anchor structure comprising the main column and a foundation of the guyed tower. The main column and foundation are connected to each other by means of first and second connection parts respectively; the first connection part is a flat plate and the second connection plate is support plate having an arc surface or the first connection part is a support plate shaped like an arc, and the second connection plate is a flat plate; therefore, a point hinge structure forms a plane and an arc surface when they contact each other. For a connection with the arc-surface support plate a fixed plate can be arranged and in order to limit the first and second connection parts base round steel can be arranged. Base round steels comprise nuts and anti-loosening structures at the ends thereof. The danger caused by the temporary wind load can be efficiently prevented and advantages are provided during the processing, mounting and construction of foundation processes.

Another study is the invention subject to the utility model numbered CN204311821. The utility model describes a guyed main tower, and a foundation adjustment part. The guyed tower main leg and the foundation adjustment part comprise a base part, a frame and a connection plate. The base part is fixedly connected to the foundation. The connection plate mentioned, is fixedly coupled with the main leg of the tower, and the relative vertical rotation of the connection plate, is obtained by means of the relative horizontal rotation of the connection plate by turning the support axle horizontally. The support axle is provided by rotating the mechanism. The force subjected to the guyed tower is submitted and maintained by the frame. In order to avoid for the weld on the pan shaped base to have a significant ratio and in order to avoid loss of time during a processing cycle, the usage of a pan shaped base has been abstained. The dosage of concrete and steel has been reduced. The main leg and the base connection have been made safer and more reliable without affecting the contact thereof.

As a result, due to the presence of disadvantages of the prior art and the insufficiency of the solutions to overcome these disadvantages, a necessity to provide developments in the related art has occurred.

Brief Description of the Invention

The present invention is related to a connection apparatus and a foundation connection method developed to be used in the mounting of guyed overhead line tower that meets all of the above-mentioned requirements and eliminates all of the disadvantages and brings about certain additional advantages.

Based on the known prior art, the aim of the invention is to provide fast and easy connection to the foundation via chemical anchors, mechanical drop in anchors, previously mounted cast in place anchors or by means of welding to a steel cap.

The aim of the invention is to ensure a significant reduction in error ratio when adapting the apparatus used for connection to the present foundation by providing a level balancing option with anchorage nuts during the mounting of the aforementioned apparatus.

Another aim of the invention is to ensure that the apparatus can be repaired and changed easily without damaging the base by means of the structure of the connection apparatus used in the base connection method, when aforementioned apparatus breaks down.

Another aim of the invention is to provide mounting and a transportation advantage as the apparatus used in connection and the base connection method is light in weight.

Another aim of the invention is to reduce costs by means of the design of the apparatus used in connection and the base connection method.

Another aim of the invention is to ensure that the tower and foundation calculations are simpler in comparison to the prior art, due to the design of the apparatus used in connection and the base connection method.

Another aim of the invention is to ensure that the foundation can be formed in a single type that is applied for all towers as tubes for each different angle and length of the legs don't have to be cut in different angles and apparatus for various connection angles can be produced in a single shape/type by means of the fast and easy production of the apparatus used in connection and the foundation connection method.

The structural and characteristic features of the invention and all of its advantages shall be understood more clearly by means of the attached figures and the detailed description written by making references to these figures, therefore the evaluation of the invention has to be carried out by taking into consideration these figures and the detailed description.

Brief Description of the Figures

The embodiment of the present invention and additional components must be evaluated together with the figures described below, to further understand the advantages of the invention.

Figure-1; is the front schematic view of the connection apparatus,
Figure-2; is the general top schematic view of the connection apparatus,
Figure-3a; is the general schematic view of the minimum tower height leg angle configuration,
Figure-3b; is the general schematic view of the maximum tower height leg angle configuration,
Figure-3c; is the schematic display of connection apparatus location on tower and detailed view of tower legs mounted to the connection apparatus,
Figure-4a; is the schematic display of the angle of the lower conical plate at the minimum tower height.
Figure-4b; is the schematic display of the angle of the lower conical plate at the maximum tower height.

Reference Numbers

100. Overhead line tower
101. Leg
200. Connection apparatus
201. Base plate
202. Angle determining tube
203. Stiffener plate
204. Treated cap plate
205. Bottom cone plate
206. Beveled plate
207. Pin
208. Nut
209. Welded connection
210. Drainage hole
211. Anchorage holes
212. Central dimple
213. Anchorage rods and leveling nut system

Detailed Description of the Invention

In this detailed description the connection apparatus (200) and foundation connection method during the mounting of a tower (100) that has been developed in order to be used in guyed overhead line tower (100) subject to the invention has been described only for illustration purposes to further explain the invention and without any intention of limitation of the invention.

The connection apparatus (200) shown in Figure 1, comprises at the lowermost section, a base plate (201) which has an anchorage hole (211) and a drainage hole (210) thereon, onto which all of the components are connected to. The connection to base plate (201) mentioned above is preferably carried out by means of welding. On the mentioned base plate (201) an angle determining tube (202) is provided which is connected by means of a weld connection (209) and onto which a leg (101) has been engaged for easy and safe connection. Angle determining tube (202) that has a certain calculated average angle that does not vary depending on the leg angle that may change depending on the shape and height of the tower (100), has treated cap plate (204) on top to which the tower leg (101) is connected. In order to increase rigidity of above-mentioned base plate (201) and to provide a strong connection between the angle determining tube (202) and the base plate (201) a stiffener plate (203) has been positioned. The bottom

cone plate (205) onto which the leaf springs are engaged to at the end of the leg (101) is made of a hot rolled plate. The beveled plate (206) placed between the treated cap plate (204) and the bottom cone plate (205), has a semi spherical shape and it allows an angular rotation movement when the bottom cone plate (205) is being safely and strongly engaged to the treated cap plate (204). In the mid section of the mentioned bottom cone plate (205) a pin (207) has been positioned such that it allows the rotation and inclination of the leg (101) when necessary but prevents the linear movement of the bottom cone plate (205) to the treated cap plate (204). Nut (208) and pin (207) have a cavity inside for mounting Split/Cotter Pin to keep them in place.

The drainage hole (210) that has been formed on the base plate (201) of the connection apparatus (200) shown in Figure 2, allows excess zinc mixture to be released during hot dipping galvanization process. The anchorage holes (211) that have been formed on the base plate (201) enable the engagement of the anchorage rods and leveling nut system (213). Central dimple (212) positioned at the mid section of the base plate (201) enables to determine the center of the base plate (201) in order to measure adjustment alignment for base plate (201) to be fixed at its position, the apparatus comprises anchorage rods and leveling nut system (213) comprising a leveling nut in order position the plate at a desired position.

The angle determining tubes (202) that are positioned angularly are welded onto the base plate (201) in order to fix both legs (101) of the tower (100) shown in Figure 3, to a single base plate (201) and a treated cap plate (204) is welded to the opening section of the angle determining tubes (202). The bottom cone plate (205) at the ends of the legs (101) of the towers (100) are sealed by placing a beveled plate (206) there-between, via pin (207). As the surface of beveled plate (206) is circular, the leg at the top section (101) operates such that it is connected with a rotating support. As the forces received from the legs (101) are different and differ continuously according to load, large stiffener plate (203) have been welded to the base plate (201) and angle determining tubes (202) in order to balance the load distribution and to prevent deformation due to the difference of tension formed on the left and right side of the base plate (201). Moreover, as the connections are designed as rotating supports, special joiner nut (208) has been used during the mounting of the pin (207). The angle of the angle determining tubes (202) provided in the connection apparatus (200) shown in Figure 3a and Figure 3b, varies depending on the height of the utility tower (100), in other words depending on the leg length (101). In Figure 3a the angle between the tower leg (101) and the vertical (X) is shown by δ for the minimum tower (100) height, while in Figure 3b the angle between the tower leg (101) and the vertical (X) is shown by α for the maximum tower (100) height. As it is shown in the Figure 4a, the angle δ - the angle between the bottom cone plate (205) axis and the vertical (X),

corresponding to minimum tower (100) height is greater in magnitude than the angle α - the angle between the bottom cone plate (205) axis and the vertical (X), corresponding to maximum tower (100) height that is shown in Figure 4b.

The base plate (201) dimensions of connection apparatus (200) may vary according to the angle determining tubes (202) angle, length, anchorage hole (211) placement and number of holes and tower type. The foundation connection method during the mounting of above mentioned tower (100), has been developed to connect legs (101) of the tower (100) to a single connection apparatus (200) and it has been developed to ensure that the concrete foundation design application and the tower (100) is suitable with each other.

CLAIMS

1. A connection apparatus (200) developed for the mounting of a tower (100) to be used in guyed overhead line towers (100), is characterized in that it comprises;
   - having at the lowermost section a base plate (201) with anchorage holes (211), which holds all the components together,
   - having attached to its base plate (201) an angle determining tube (202), that has treated cap plate (204) attached on the top of it which holds beveled plate (206) that transfers forces from tower leg (101) to the angle determining tube (202) and thus to the base plate (201).
2. The connection apparatus (200) according to claim 1, characterized in that it comprises a welded connection (209) between the base plate (201) and aforementioned angle determining tube (202)
3. The connection apparatus (200) according to claim 1, characterized in that it comprises a reinforcement plate (203) which enhances rigidity of aforementioned base plate (201), provides a strong connection between the angle determining tube (202) and the base plate (201), prevents deformation due to the difference in tensions created on the left and right side of the base plate (201), engaged with the base plate (201) and the angle determining tubes (202) in order to balance load distribution.
4. The connection apparatus (200) according to claim 1, characterized in that it comprises a treated cap plate (204) which is directly coupled to the leg (101) below the beveled plate (206).
5. The connection apparatus (200) according to claim 1, characterized in that it comprises a beveled plate (206) positioned between treated cap plate (204) and bottom cone plate (205) which allows rotation via angular movement between leg (101) and the connection apparatus (200) while the treated cap plate (204) is engaged reliably and strongly to the cone plate (205).
6. The connection apparatus (200) according to claim 1, characterized in that it comprises a pin (207) located at the mid section of the bottom cone plate (205), which only limits the linear movement of the bottom cone plate (205) to the end cover (204) but is engaged such that it allows the rotation and inclination of the leg (101) if necessary.
7. The connection apparatus (200) according to claim 1, characterized in that it comprises a nut (208) which is the main structural part of the pin (207).
8. The connection apparatus (200) according to claim 1, characterized in that it comprises a drainage hole (210) formed on aforementioned base plate (201), which allows to release excess zinc mixture during hot dipping-galvanizing process.

9. The connection apparatus (200) according to claim 1, characterized in that it comprises an anchorage hole (211) formed on aforementioned base plate (201), which enables to engage the anchorage rods and leveling nut system (213).

10. The connection apparatus (200) according to claim 1, characterized in that it comprises a central dimple (212) which enables to determine the center of the base plate (201) in order to measure the adjustment alignment, positioned at the mid section of the base plate (201).

11. The connection apparatus (200) according to claim 1, characterized in that it comprises anchorage rods and leveling nut system (213) in order to fix aforementioned base plate (201) in its place.

12. The connection apparatus (200) according to claim 1, characterized in that the angle of the angle determining tube (202) which is a part of the connection apparatus (200) doesn't change depending on the height of the tower (100) or in other words depending on the leg (101) angle.

13. A foundation connection method developed for mounting a tower (100) in order to be used in guyed towers (100) characterized in that; it comprises the process steps of engaging angle determining tubes (202) that are angularly positioned on the base plate (201) in order to fix the legs (101) of a tower (100) onto a single base plate (201), engaging treated cap plates (204) to the opening section of the angle determining tube (202), and sealing the bottom cone plate (205) at the end of the legs (101) of the towers (100) via the pin (207) by placing a beveled plate (206) there-between.

14. The base connection method according to claim 13, characterized in that it comprises the step of welding angle determining tubes (202) to the base plate (201).

15. The base connection method according to claim 13, characterized in that it comprises the step of welding a treated cap plate (204) to the opening section of the angle determining tubes (202).

16. The base connection method according to claim 13, characterized in that in order to prevent deformation due to the differences of tension created on the left and right sides of the base plate (201) and to balance the load distribution, it comprises the process step of welding stiffener plates (203) to the angle determining tubes (202) and base plate (201).

17. The base connection method according to claim 13, characterized in that it comprises the step of using a special nut (208) during the mounting of the pin (207).

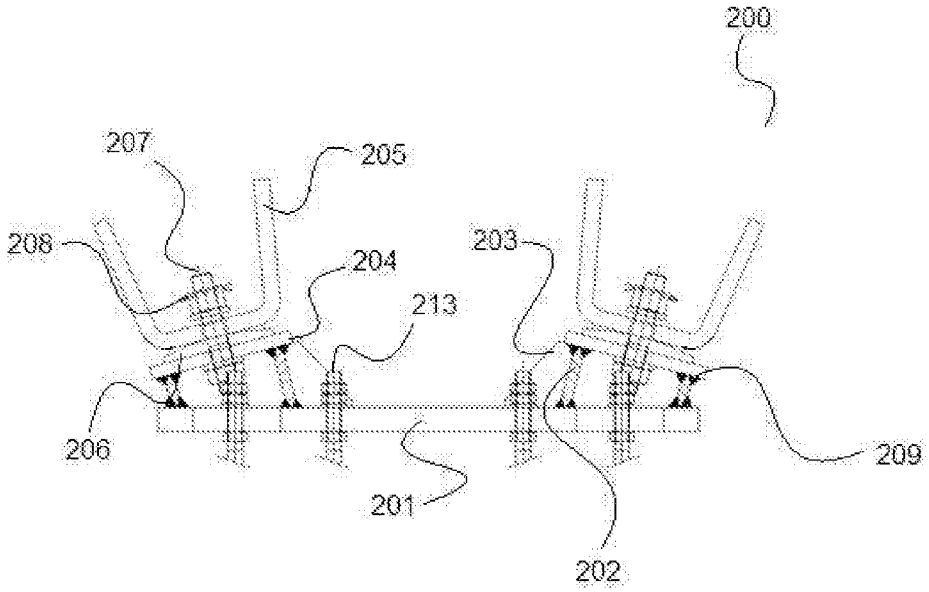

Figure-1

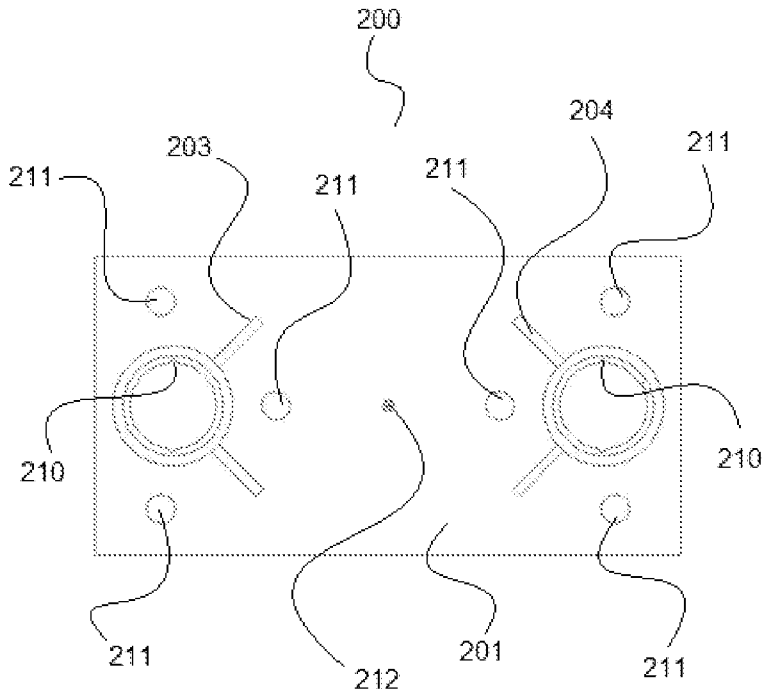

Figure-2

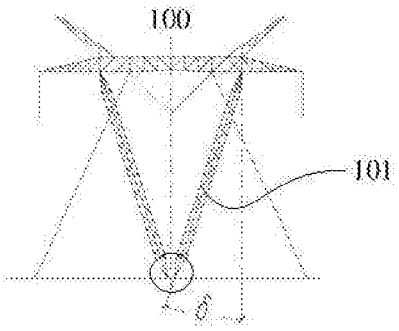

Figure 3a

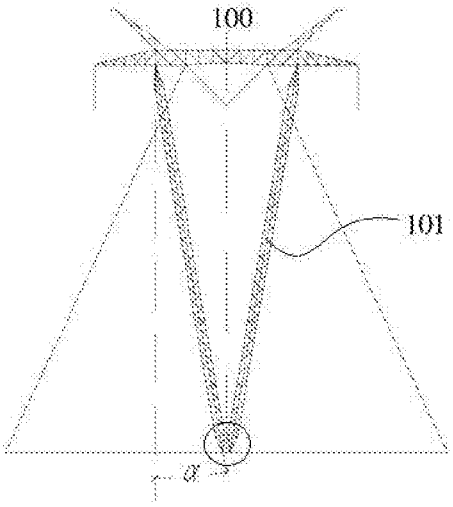

Figure 3b

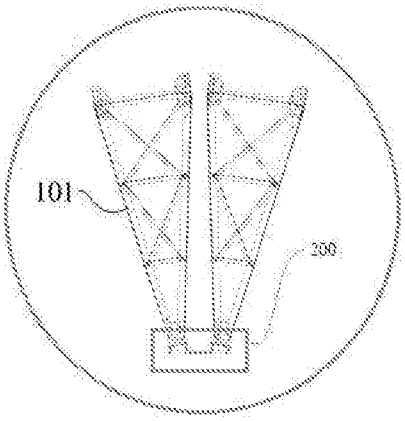

Figure 3c

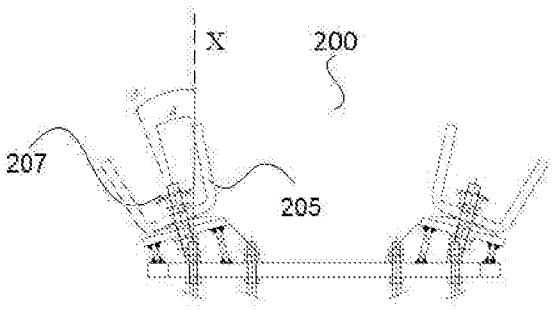

Figure 4a

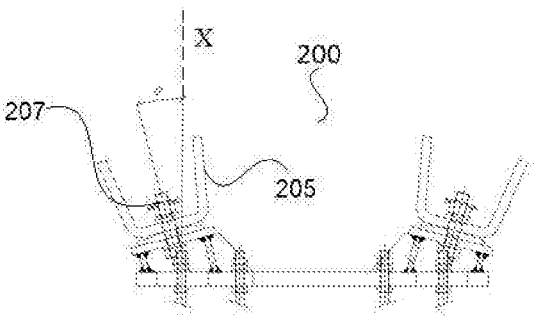

Figure 4b

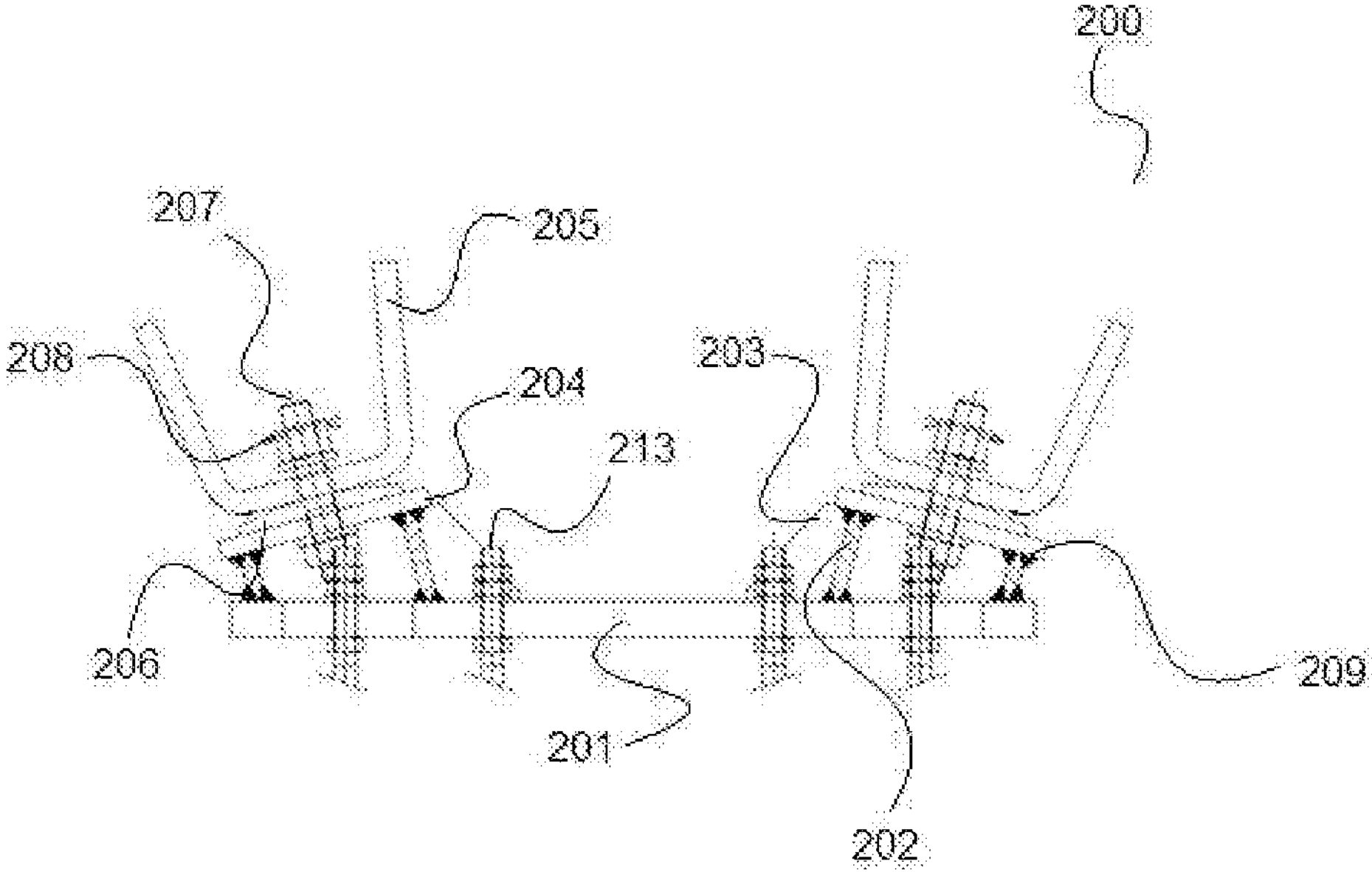

Figure-1