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(54) **POLE INSTALLATION METHOD**

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(57) **ABSTRACT**

An object of the present invention is to provide a pole erection method capable of efficiently and safely erecting a utility pole with a small number of operators even in a construction environment in which heavy machines cannot be used.

The pole erection method according to the present invention includes preparing a structure **60** having a cylindrical shape in which, when the structure is erected perpendicularly to the ground with one end **60a** facing down, a part of an edge **61a** at the other end **60b** is higher than the other part of the edge **61b** (step S01), burying one end **60a** of the structure **60** in the ground (step S02), placing a lower end portion **10a-1** of a utility pole **10a** lying on the ground on the other part of the edge **61b** of the structure **60** (step S03), pressing the lower end portion **10a-1** of the utility pole **10a** against an inner wall **62** (step S04), and lifting up an upper end portion **10a-2** of the utility pole **10a** with the other part of the edge **61b** as a fulcrum while pressing the lower end portion **10a-1** of the utility pole **10a** against the inner wall **62**, and sliding down the utility pole **10a** into a cavity **63** of the structure **60** to erect the pole (step S05).

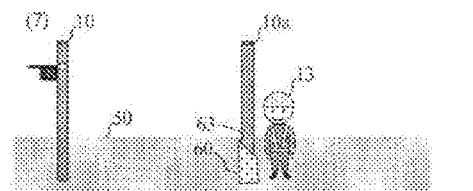
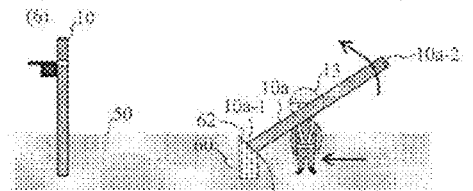
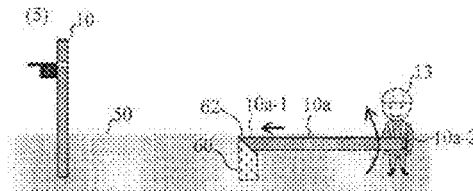
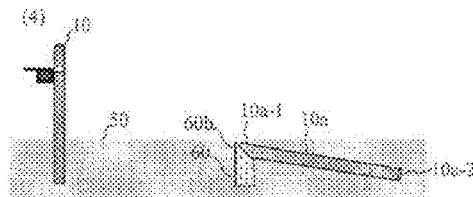
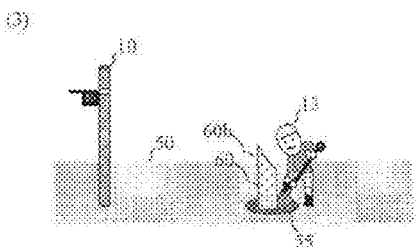
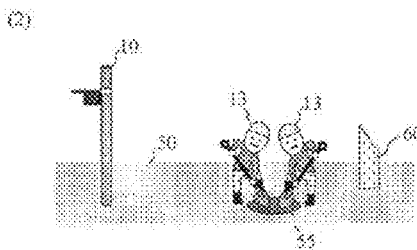
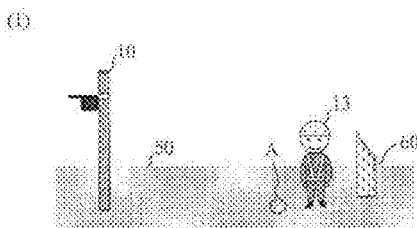


Fig. 1

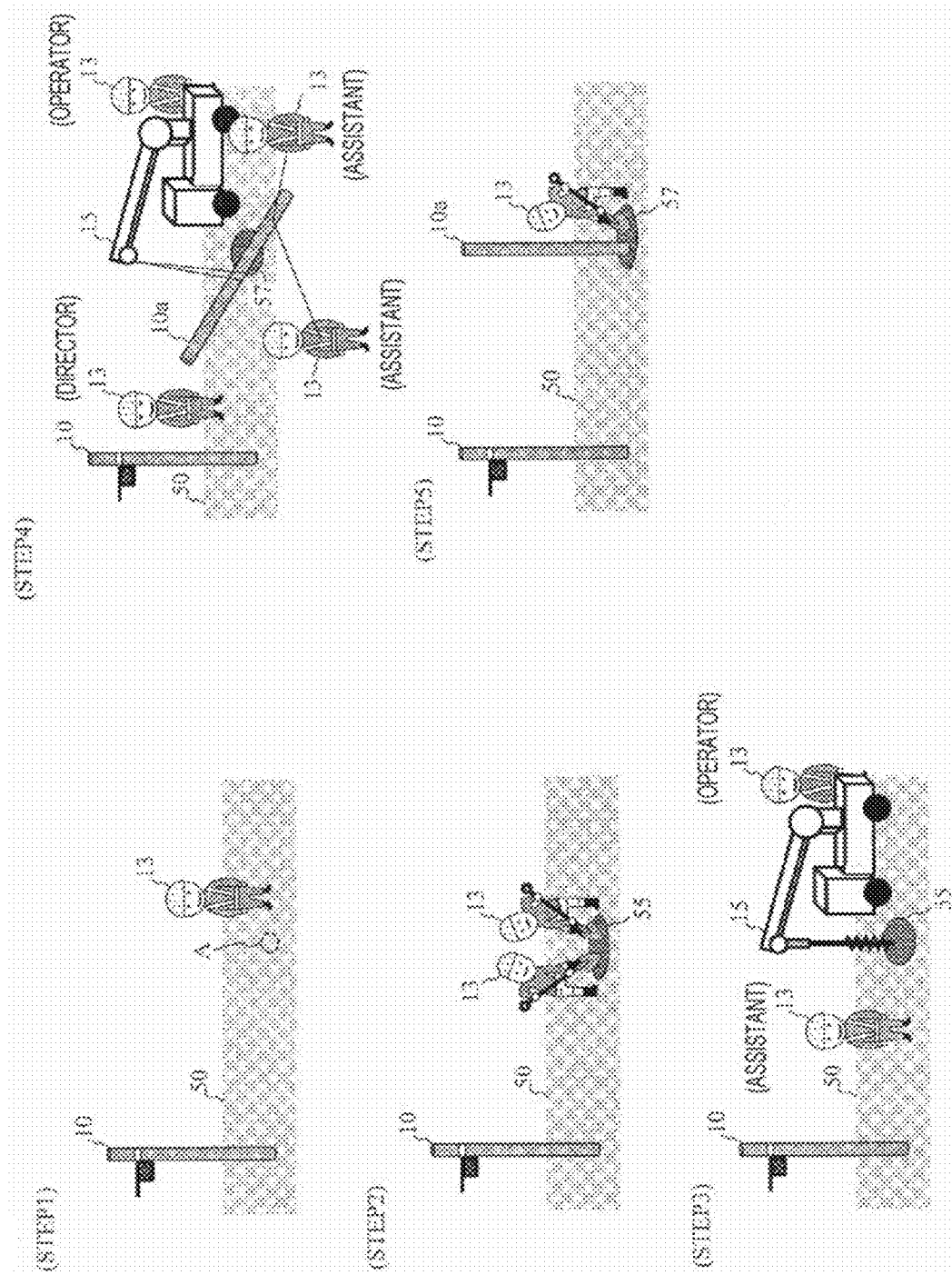


Fig. 2

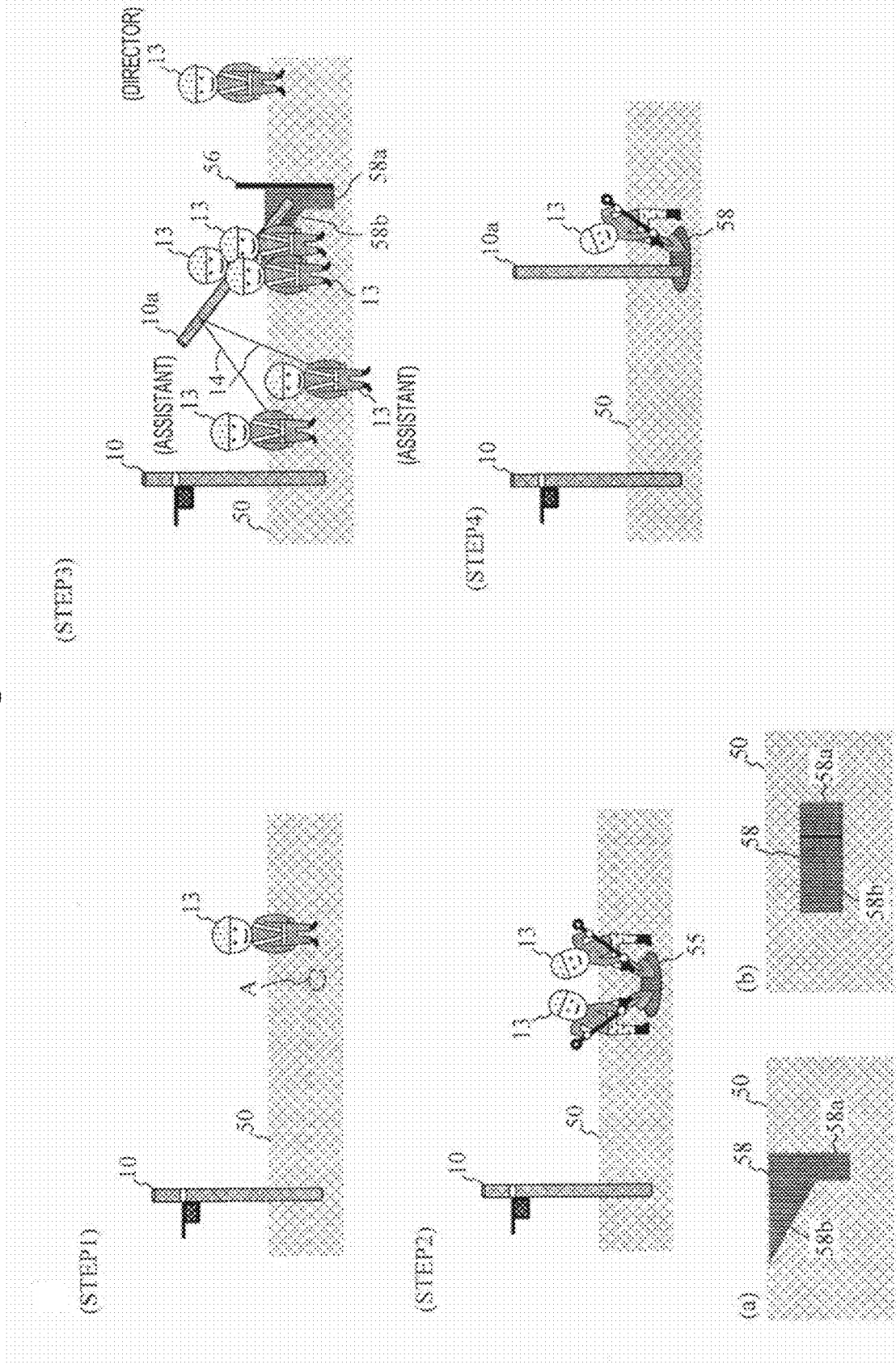


Fig. 3

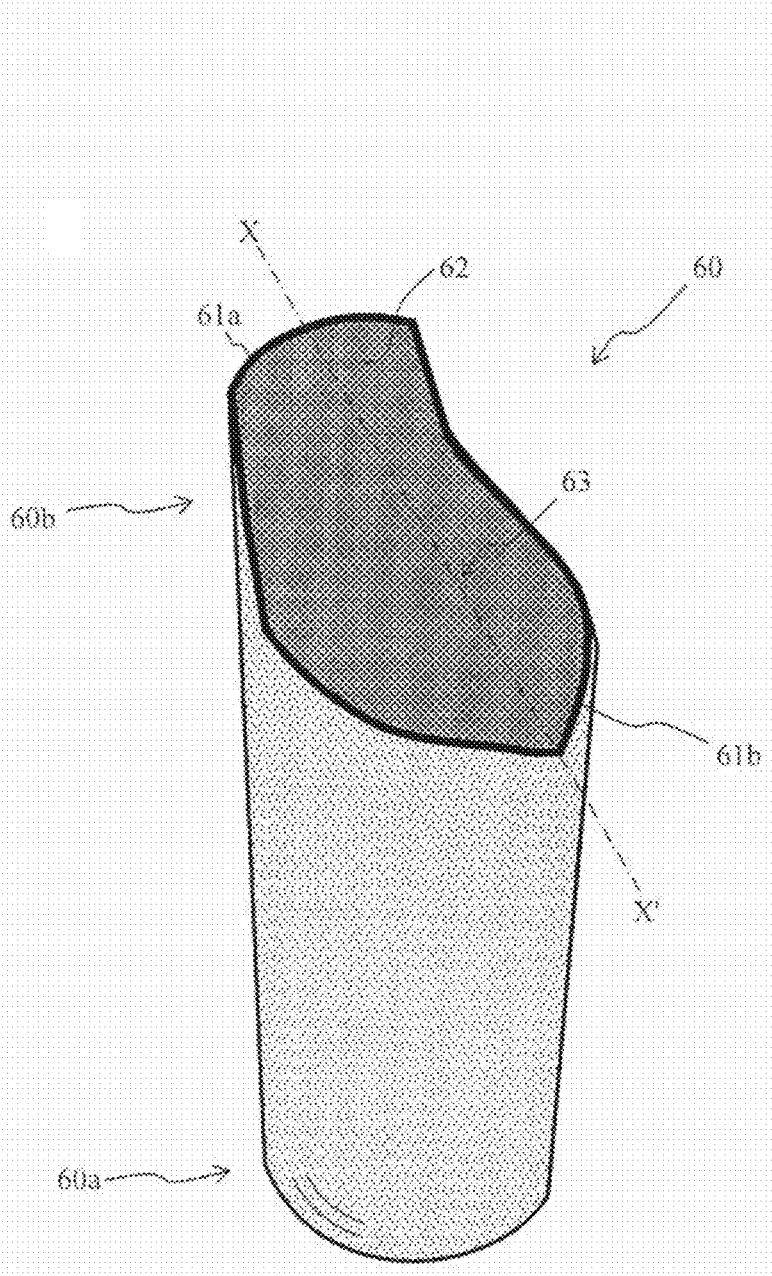


Fig. 4

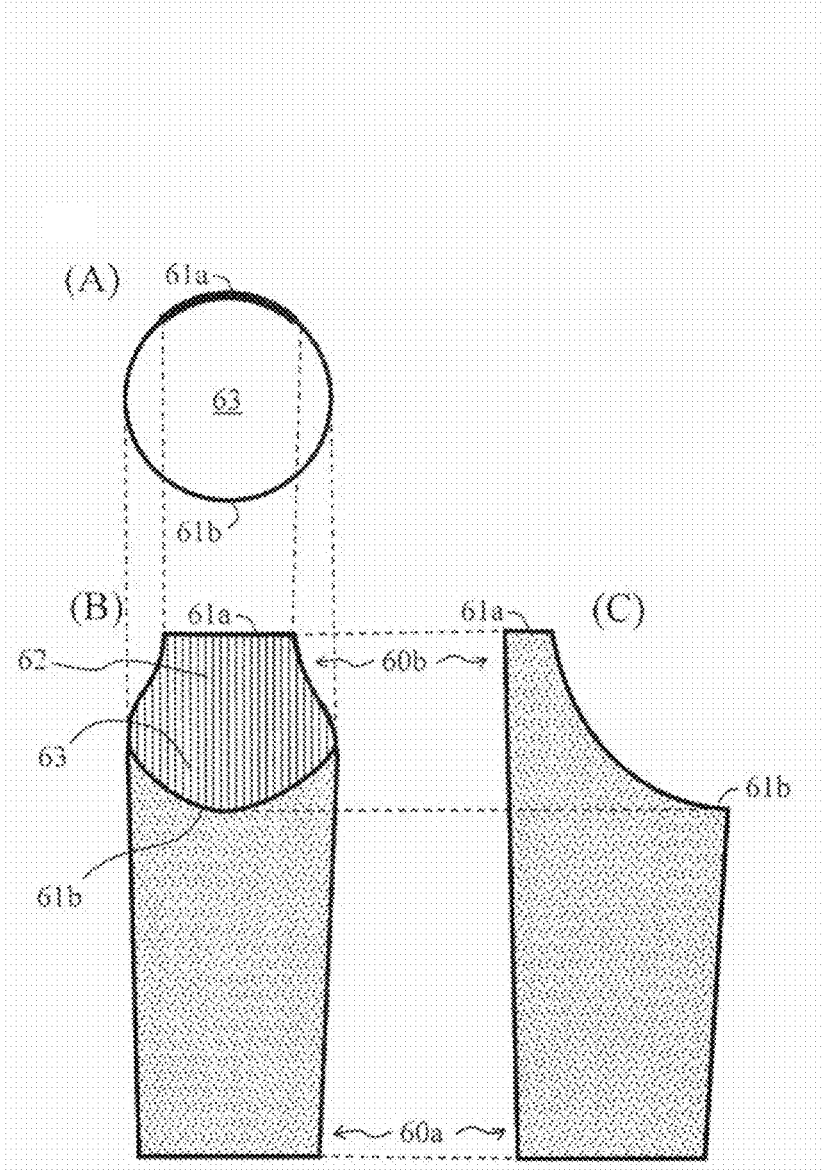


Fig. 5

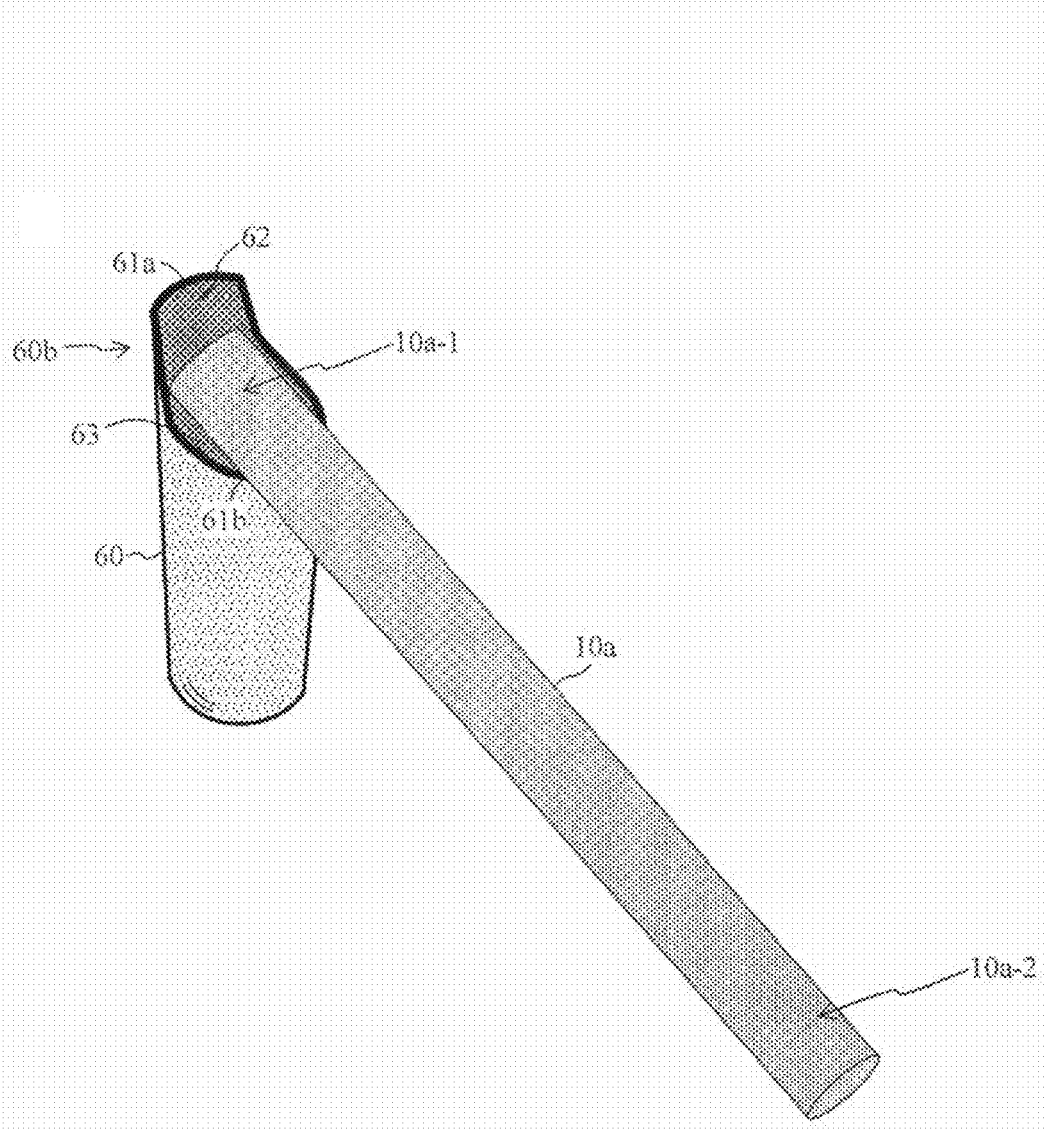


Fig. 6

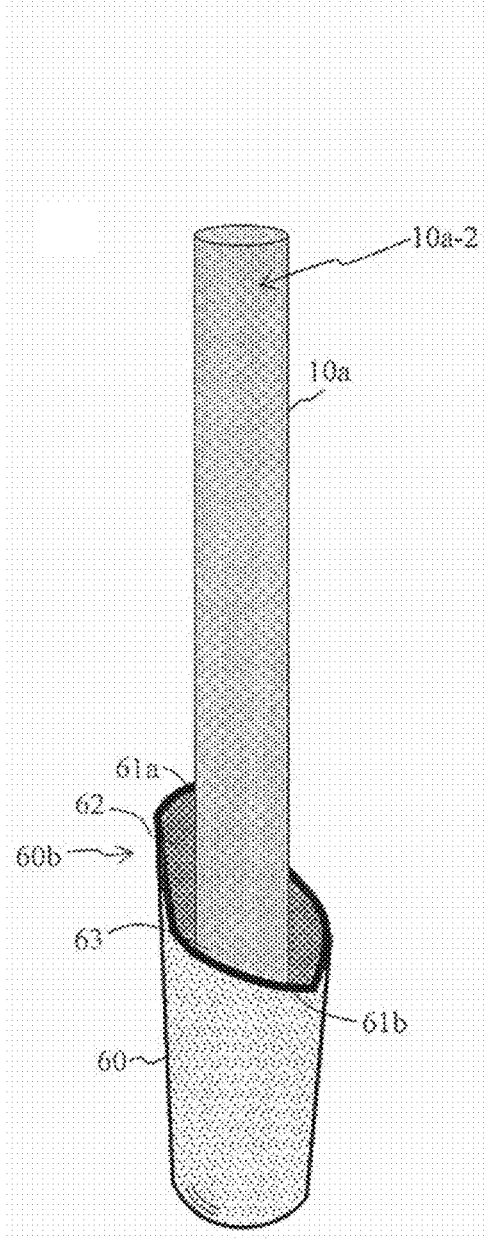


Fig. 7

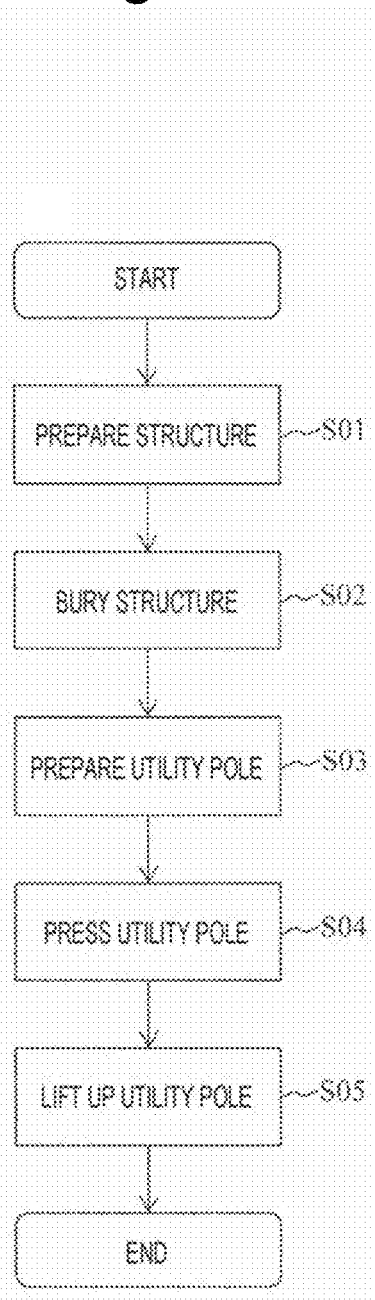


Fig. 8

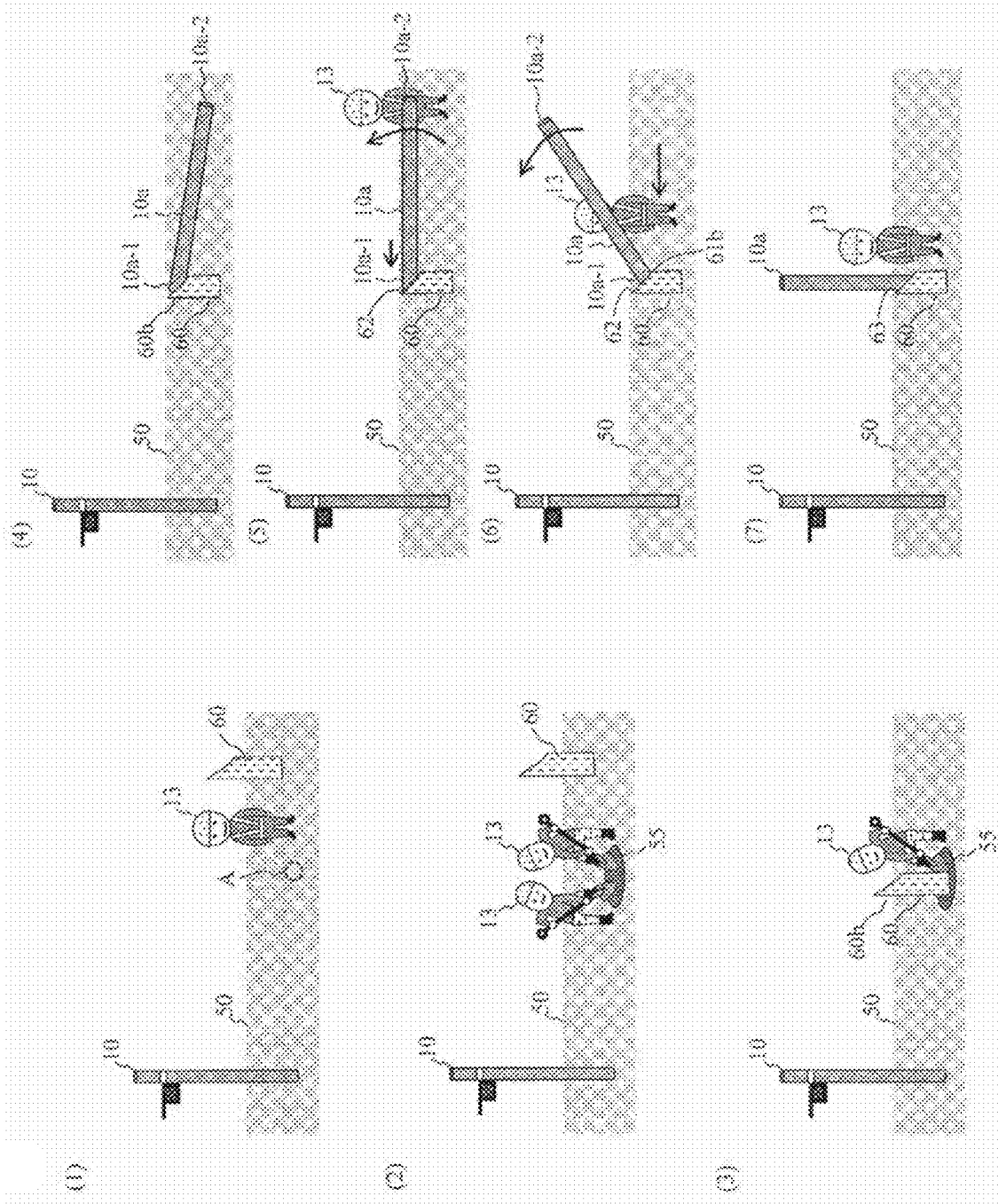




Fig. 10

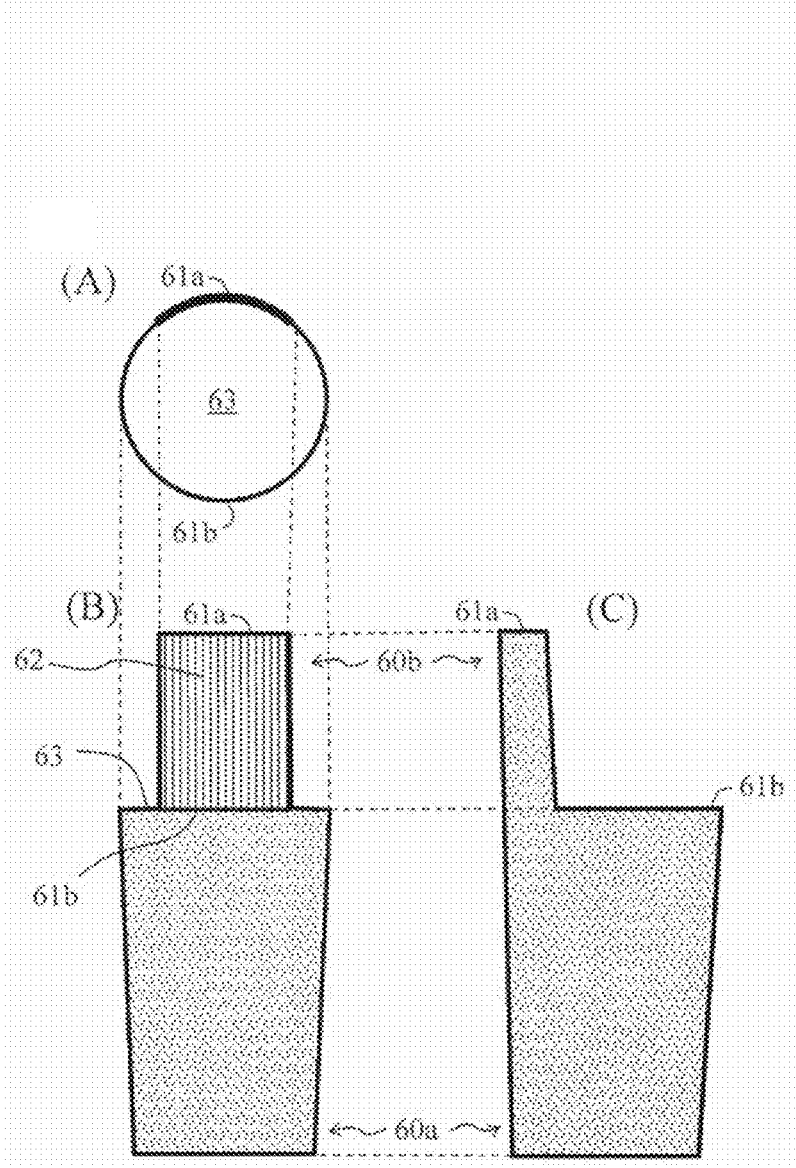
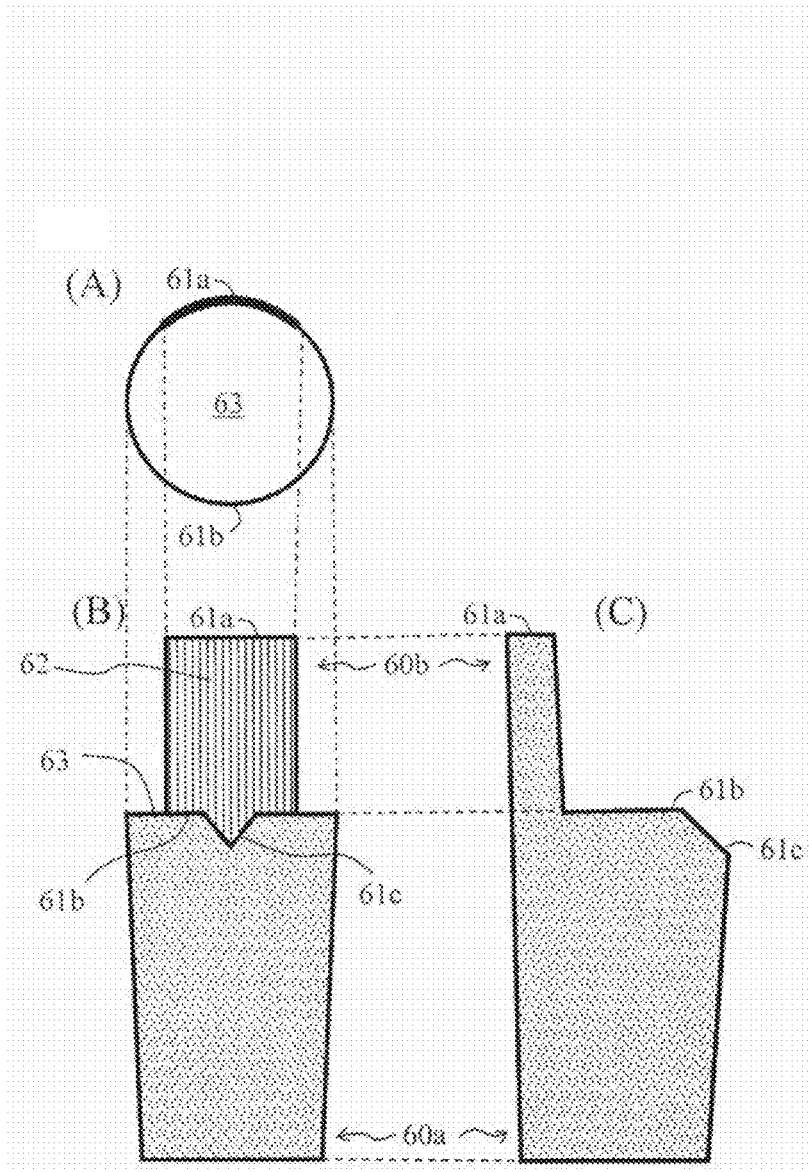


Fig. 11



## POLE INSTALLATION METHOD

### TECHNICAL FIELD

[0001] The present disclosure relates to a pole erection method for erecting a pole such as a utility pole installed outdoors on the ground.

### BACKGROUND ART

[0002] Utility poles installed outdoors are used to support communication cables of communication companies and to support cables for power transmission and power distribution of power companies. It is said that the number of utility poles installed in Japan is 33 million or more when communication companies, power companies, railway companies, traffic signals, and the like are combined. Further, about 50,000 to 100, 000 are being newly erected and increased every year.

[0003] Since a utility pole may be long and heavy and is often erected in an environment where there are obstacles such as houses and through which people and vehicles pass, construction requires many operators for safe work. Under such circumstances, considering that utility poles will be erected and numbers thereof increase every year and that a large number of already erected utility poles will need to be renewed in the future due to deterioration with age or the like, it is required to efficiently erect utility poles with a small number of operators.

### CITATION LIST

#### Non Patent Literature

Non Patent Literature 1: Kansai Electric Power Group Facebook (Jinriki ni yoru denchu no shinsetsu kouji moyo (in Japanese) (a new construction pattern of utility poles by human power)), <https://www.facebook.com/kanden.jp/posts/1057205184308814/?form=MY01SV&OCID=MY01SV> (retrieved on Jun. 10, 2021)

Non Patent Literature 2: (Limited Company) IMAKEN Homepage Dakase pole sekou houhou (in Japanese) (DAKASE POLE CONSTRUCTION METHOD), <http://www.nichiden-group.co.jp/imaken/dakase/dakase0002.htm> (retrieved on Jun. 10, 2021)

### SUMMARY OF INVENTION

#### Technical Problem

[0004] Construction work may involve a construction environment in which a work space for a heavy machine such as a digging and pole erection vehicle can be secured in the vicinity of a construction site without restriction due to a road width and obstacles, or a construction environment in which a work space of a heavy machine cannot be secured in the vicinity of a construction site due to restriction of a road width and an obstacle and construction must be performed by human power.

[0005] FIG. 1 is a diagram illustrating a work procedure of utility pole erection work in a construction environment in which a heavy machine can be used.

[0006] STEP 1 in FIG. 1 is a process of determining a position A where a new utility pole 10a is to be built. After positioning, an operator 13 may break up the pavement as

necessary to expose the ground 50. A reference numeral 10 denotes an existing utility pole.

[0007] STEP 2 in FIG. 1 is a process in which operators 13 carefully manually drill at the position A on the ground 50 to a depth of about 1.5 m (prospecting) in order to avoid damaging buried objects such as electricity, gas, or water pipes by mistake during the pole erection work. A reference numeral 55 denotes a prospected hole.

[0008] STEP 3 in FIG. 1 is a process of drilling a hole 55 to a depth necessary to erect the new utility pole 10a with a heavy machine 15 such as a digging and pole erection vehicle when there is no risk of buried object damage in the previous process.

[0009] STEP 4 in FIG. 1 is a process of lifting up the utility pole 10a with a heavy machine 15 such as a crane in order to insert the utility pole 10a into a hole 57 drilled in the previous process. In consideration of safety, an operator 13 puts the utility pole 10a into the hole 57 and erects the utility pole 10a while supporting the utility pole 10a with a rope such that the hanging utility pole 10a does not swing.

[0010] STEP 5 in FIG. 1 is a process in which the operator 13 compacts the soil while filling the hole 57 and fixes the erected utility pole 10a to the ground 50.

[0011] As described above, when a utility pole is erected by using a heavy machine, a part of the work is performed by a machine, and thus labor-saving work can be performed.

[0012] On the other hand, FIG. 2 is a diagram for describing a procedure of construction for erecting a utility pole by human power without using a heavy machine.

[0013] STEP 1 in FIG. 2 is the same process as STEP 1 in FIG. 1.

[0014] STEP 2 in FIG. 2 is a process in which the operator 13 manually drills the hole 55 prospected in the exposed ground 50 in the same manner as STEP 2 in FIG. 1 to a depth necessary to erect the utility pole 10a. A reference numeral 58 denotes a hole formed by drilling the hole 55. (a) and (b) of STEP 2 are a cross-sectional view of the shape of the hole 58 perpendicular to the ground surface and a top view seen from the ground surface, respectively. In order to safely erect the utility pole 10a by human power, the hole 58 is drilled obliquely with respect to a main hole 58a drilled vertically to provide a sliding slope 58b. Further, since a backing plate 56 to be used in the next step is erected, the hole 58 needs to be excavated to be wider than in the case of using the heavy machine described in FIG. 1.

[0015] STEP 3 in FIG. 2 is a process of putting a utility pole 10a into the drilled hole 58 and erecting the utility pole. In this process, first, the backing plate 56 is placed in the hole 58. Then, in consideration of safety, the operator 13 supports the utility pole 10a with a rope 14 as an assistant such that the utility pole 10a does not swing, and a plurality of operators 13 lift the utility pole 10a with their hands and gradually raise the utility pole 10a while bracing against the sliding slope 58b and pressing the utility pole 10a against the backing plate 56. Note that the number of necessary operators 13 varies depending on the length and weight of the utility pole 10a to be erected, and a longer and heavier one requires a larger number of operators 13.

[0016] STEP 4 in FIG. 2 is the same process as STEP 5 in FIG. 1.

[0017] As described above, in a pole erection method for manually erecting a utility pole, there are a first problem that a wider range of excavation is required than in the case of using a heavy machine, and many operators are required, a

second problem that the efficiency is very low because physical burdens on operators are large and the work time is long, and a third problem that there is a risk that the utility pole will collide with surroundings such as a house and a passerby or the operators themselves because the long and heavy utility pole is handled.

**[0018]** Therefore, in order to solve the above three problems, an object of the present invention is to provide a pole erection method capable of efficiently and safely erecting a utility pole with a small number of operators even in a construction environment in which heavy machines cannot be used.

#### Solution to Problem

**[0019]** In order to achieve the above object, a pole erection method according to the present invention inserts a structure having a specific shape into a drilled hole to erect a pole.

**[0020]** A pole erection method according to the present invention including:

**[0021]** preparing a structure having a cylindrical shape in which, when the structure is erected perpendicularly to a ground with one end facing down, a part of an edge at the other end is higher than another part of the edge;

**[0022]** burying the one end of the structure in the ground;

**[0023]** placing a lower end portion of a utility pole lying on the ground on the other part of the edge facing the part of the edge at the other end of the structure;

**[0024]** pressing the lower end portion of the utility pole against an inner wall on the side of the part of the edge of the structure; and

**[0025]** lifting up an upper end portion of the utility pole with the other part of the edge as a fulcrum while pressing the lower end portion of the utility pole against the inner wall, and sliding down the utility pole into a cavity of the structure to erect the pole.

**[0026]** The structure has functions corresponding to a conventional backing plate and sliding slope. Therefore, the size of a hole to be excavated can be set to about the diameter of the structure, and the utility pole is erected using the weight of the utility pole with the other part of the edge as a fulcrum, and thus pole erection work can be efficiently performed with a small number of people. Furthermore, since the utility pole settles on the other part of the edge due to the shape of the structure, the amount of shaking of the utility pole is small, and there is little risk that the utility pole will collide with the surroundings such as a house, a passerby, and the like, or operators themselves.

**[0027]** Therefore, the present invention can provide a pole erection method capable of efficiently and safely erecting a utility pole with a small number of operators even in a construction environment in which heavy machines cannot be used.

**[0028]** Examples of the structure include the following shapes.

**[0029]** An edge of the other end of the structure has a shape including a cut surface obtained by linearly and obliquely cutting the structure with respect to a central axis.

**[0030]** An edge of the other end of the structure has a shape including a cut surface obtained by obliquely cutting the structure in a curved shape with respect to a central axis.

**[0031]** The edge of the other end of the structure has a stepped shape including the part of the edge and the other part of the edge.

**[0032]** The other part of the edge has a wedge-shaped notch in the central portion.

**[0033]** The part of the edge has a constant height.

**[0034]** Note that the above-described inventions can be combined as far as possible.

#### Advantageous Effects of Invention

**[0035]** The present invention can provide a pole erection method capable of efficiently and safely erecting a utility pole with a small number of operators even in a construction environment in which heavy machines cannot be used.

#### BRIEF DESCRIPTION OF DRAWINGS

**[0036]** FIG. 1 is a diagram illustrating a pole erection method using a heavy machine.

**[0037]** FIG. 2 is a diagram illustrating a pole erection method using human power.

**[0038]** FIG. 3 is a diagram illustrating a structure used in a pole erection method according to the present invention.

**[0039]** FIG. 4 is a diagram illustrating a structure used in the pole erection method according to the present invention.

**[0040]** FIG. 5 is a diagram illustrating the pole erection method according to the present invention.

**[0041]** FIG. 6 is a diagram illustrating the pole erection method according to the present invention.

**[0042]** FIG. 7 is a diagram illustrating the pole erection method according to the present invention.

**[0043]** FIG. 8 is a diagram illustrating the pole erection method according to the present invention.

**[0044]** FIG. 9 is a diagram illustrating a structure used in the pole erection method according to the present invention.

**[0045]** FIG. 10 is a diagram illustrating a structure used in the pole erection method according to the present invention.

**[0046]** FIG. 11 is a diagram illustrating a structure used in the pole erection method according to the present invention.

#### DESCRIPTION OF EMBODIMENTS

**[0047]** Embodiments of the present invention will be described with reference to the accompanying drawings. The embodiments described below are examples of the present invention, and the present invention is not limited to the following embodiments. Note that components having the same reference numerals in the present specification and the drawings indicate the same components.

#### First Embodiment

**[0048]** FIG. 7 is a flowchart illustrating a pole erection method of the present embodiment. The pole erection method of the present embodiment includes:

**[0049]** preparing a structure **60** having a cylindrical shape in which, when the structure is erected perpendicularly to the ground with one end **60a** facing down, a part of an edge **61a** at the other end **60b** is higher than the other part of the edge **61b** (step **S01**);

**[0050]** burying one end **60a** of the structure **60** in the ground (step **S02**);

**[0051]** placing a lower end portion **10a-1** of a utility pole **10a** lying on the ground on the other part of the edge **61b** facing the part of the edge **61a** at the other end **60b** of the structure **60** (step **S03**);

[0052] pressing the lower end portion 10a-1 of the utility pole 10a against an inner wall 62 on the side of the part of the edge 61a of the structure 60 (step S04); and

[0053] lifting up an upper end portion 10a-2 of the utility pole 10a with the other part of the edge 61b as a fulcrum while pressing the lower end portion 10a-1 of the utility pole 10a against the inner wall 62, and sliding down the utility pole 10a into a cavity 63 of the structure 60 to erect the pole (step S05).

[0054] FIGS. 3 and 4 are diagrams illustrating an example of the structure 60. FIG. 3 is a perspective view of structure 60, and FIG. 4 is a three-face view of the structure 60. (A) is a top view, (B) is a front view, and (C) is a side view. The structure 60 is a cylindrical object having a hollow center. The structure 60 has a height difference such that, when it is erected perpendicularly to the ground with one end 60a facing down, the part of the edge 61a at the other end 60b is higher than the other part of the edge 61b. Here, the part of the edge 61a and the other part of the edge 61b are at diagonal positions.

[0055] The edge of the other end 60b of the structure 60 of the present embodiment has a shape including a cut surface obtained by obliquely cutting the structure 60 in a curved shape with respect to a central axis. As shown in FIG. 4 (C), in the case of the structure 60 of the present embodiment, the part of the edge 61a and the other part of the edge 61b are connected by a gentle curve. This has an effect that when a utility pole which will be described later is placed on the other end 60b, the utility pole slides and settles on the other part of the edge 61b by the weight thereof. Note that, as illustrated in FIG. 3, it is desirable that the structure 60 be bilaterally symmetrical with respect to a plane defined by the central axis of the structure 60 and a straight line X-X'. The one having a higher height difference has a constant surface for replacement of a backing plate.

[0056] Further, the part of the edge 61a has a constant height in the circumferential direction, and maintains the area of the inner wall 62 to some extent. This is for the purpose of providing a function of a backing plate for pressing the lower end portion 10a-1 against the inner wall 62.

[0057] A pole erection method of the present embodiment will be described in detail with reference to FIG. 8.

[0058] FIGS. 8 (1) and 8 (2) illustrate the same processes as STEP 1 and STEP 2 in FIG. 1. Note that a reference numeral 59 denotes a hole drilled by an operator 13 in a prospected hole 55. Unlike the hole 58 described with reference to FIG. 2, the structure 60 has functions of a backing plate 56 and a sliding slope 8b, and thus the amount of excavation of the hole 59 corresponds to only the cylindrical structure 60.

[0059] FIG. 8 (3) corresponds to steps S01 and S02 in FIG. 7 and is a process of preparing the structure 60 and burying the structure in the hole 59. Here, instead of burying the entire structure 60 in the ground 50, a part of the structure 60 on the side of one end 60a is buried. That is, the other end 60b of the structure 60 protrudes to the ground surface. The structure 60 serves as a base of the utility pole 10a.

[0060] FIG. 8 (4) corresponds to step S03 in FIG. 7 and is a process of placing the lower end portion 10a-1 of the utility pole 10a on the other part of the edge 60b of the structure 60. FIG. 5 is a diagram illustrating this state in detail. Since the other end 60b of the structure 60 is

constituted by the part of the edge 61a and the other part of the edge 61b having different heights, and the edges are connected by a gentle curve, when the lower end portion 10a-1 of the utility pole 10a is placed on the structure 60, the utility pole 10a slides and settles on the other part of the edge 61b by the weight thereof.

[0061] FIG. 8 (5) corresponds to step S04 in FIG. 7, in which the operator 13 lifts up the upper end portion 10a-2 of the utility pole 10 and presses the lower end portion 10a-1 against the inner wall 62 on the side of the part of the edge 61a of the structure 60.

[0062] FIGS. 8 (6) and 8 (7) correspond to step S05 in FIG. 7. As shown in FIG. 8 (6), the operator 13 approaches the structure 60 while pressing the lower end portion 10a-1 of the utility pole 10a against the inner wall 62, and raises the upper end portion 10a-2 of the utility pole 10a with the other part of the edge 61b as a fulcrum. When the utility pole 10a rises up to a certain angle with respect to the ground 50, the lower end portion 10a-1 slides down into the cavity 63 of the structure 60 by the weight thereof and thus the utility pole 10a can be erected (refer to FIGS. 8 (7) and FIG. 6).

[0063] In this way, by using the structure 60, it is not necessary to excavate the hole 58 having a large area for installing the sliding slope or the backing plate described with reference to FIG. 2 when the utility pole 10a is erected by human power. That is, efficient pole erection can be performed by using the structure 60. Furthermore, since the structure 60 supports the utility pole 10a and supports construction, labor of the operator 13 can be reduced and safe work can be realized with a small number of people. When the material of the utility pole is lightweight such as plastic, even one operator can erect the pole.

#### Variation in Shape of Structure

[0064] Although an example of the shape of the structure 60 has been described with reference to FIGS. 3 and 4, the structure 60 may have other shapes. FIGS. 9 to 11 are three-face views illustrating shapes of the structure 60. In any of the figures, (A) is a top view, (B) is a front view, and (C) is a side view.

[0065] The edge of the other end 60b of the structure 60 in FIG. 9 has a shape including a cut surface obtained by linearly and obliquely cutting the structure 60 with respect to the central axis. The structure 60 in this figure has a shape like a bamboo cut at an angle. In the case of such a shape, the positions of the part of the edge 61a, the other part of the edge 61b, and the inner wall 62 are not clear, but when the structure 60 is erected on the ground with one end 60a facing down, a region including the highest portion of the other end 60b is the part of the edge 61a, and a region including the lowest portion of the other end 60b is the other part of the edge 61b. When viewed from the front, an inner wall portion under the part of the edge 61a viewed from the front is the inner wall 62.

[0066] The edge of the other end 60b of the structure 60 in FIG. 10 has a stepped shape including the part of the edge 61a and the other part of the edge 61b. In other words, when the structure 60 is erected on the ground with the one end 60a facing down, the part of the edge 61a and the other part of the edge 61b having a height difference therebetween are horizontal with respect to the ground, and the edge between the part of the edge 61a and the other part of the edge 61b is vertical with respect to the ground.

[0067] As illustrated in FIG. 11, the structure 60 in FIG. 10 may have a wedge-shaped notch 61c at the central portion of the other part of the edge 61b.

[0068] The structure 60 of any of the three types of shapes described herein may be used in the same procedure as in FIG. 8 as an efficient pole erection method.

REFERENCE SIGNS LIST

- [0069] 10, 10a Utility pole
- [0070] 10a-1 Lower end portion
- [0071] 10a-2 Upper end portion
- [0072] 13 Operator
- [0073] 15 Heavy machine
- [0074] 50 Ground
- [0075] 55 Prospected hole
- [0076] 56 Backing plate
- [0077] 58 Hole
- [0078] 58a Main hole
- [0079] 58b Sliding slope
- [0080] 60 Structure
- [0081] 60a One end
- [0082] 60b Other end
- [0083] 61a Part of edge
- [0084] 61b Other part of edge
- [0085] 61c Notch
- [0086] 62 Inner wall
- [0087] 63 Cavity

1. A pole erection method comprising:  
 preparing a structure having a cylindrical shape in which,  
 when the structure is erected perpendicularly to a

ground with one end facing down, a part of an edge at another end is higher than another part of the edge;  
 burying the one end of the structure in the ground;  
 placing a lower end portion of a utility pole lying on the ground on the other part of the edge facing the part of the edge at the other end of the structure;  
 pressing the lower end portion of the utility pole against an inner wall on a side of the part of the edge of the structure; and  
 lifting up an upper end portion of the utility pole with the other part of the edge as a fulcrum while pressing the lower end portion of the utility pole against the inner wall, and sliding down the utility pole into a cavity of the structure to erect the utility pole.

2. The pole erection method according to claim 1, wherein the edge of the other end of the structure has a shape including a cut surface obtained by linearly and obliquely cutting the structure with respect to a central axis.

3. The pole erection method according to claim 1, wherein the edge of the other end of the structure has a shape including a cut surface obtained by obliquely cutting the structure in a curved shape with respect to the central axis.

4. The pole erection method according to claim 1, wherein the edge of the other end of the structure has a stepped shape including the part of the edge and the other part of the edge.

5. The pole erection method according to claim 4, wherein the other part of the edge has a wedge-shaped notch in a central portion.

6. The pole erection method according to claim 1, wherein the part of the edge has a constant height.

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