

DESCRIPTION

SCREWED TYPE STEEL PIPE PILE

Field

[0001] The present invention relates to a screwed type
5 steel pipe pile.

Background

[0002] As a conventional screwed type steel pipe pile
which is bored into the ground by a screw-effect by
receiving a rotational force, such a screwed type steel
10 pipe pile including a steel pipe 100 and a plurality of
(two in the illustrated example) steel plates 200a and 200b
as illustrated in FIGS. 10(a) and 11(a) is known. The
screwed type steel pipe pile illustrated in FIGS. 10 and 11
will be described with the distal side being the downward
15 side and the pile head side being the upward side.

[0003] The steel pipe 100 has a cylindrical shape and
has a hollow 110 thereinside. A plurality of (two in the
illustrated example) joint portions 120a and 120b is formed
on the distal end portion of the steel pipe 100. Each of
20 the joint portions 120a and 120b is formed along the
circumferential direction on the distal end portion of the
steel pipe 100. Each of the joint portions 120a and 120b
has a distal face which is an inclined face that gradually
slopes to the downward side along the circumferential
25 direction from one side to the other side. The example
joint portions 120a and 120b are the ones in which the
distal faces have an identical extending length and an
identical inclination angle.

[0004] Each of the steel plates 200a and 200b has a
30 shape of a half circle formed by sectioning a circular
steel plate having a larger outer diameter than the steel
pipe 100 into halves. The steel plate 200a is joined along
one of the distal faces, so that the joined steel plate

200a inclines against a direction perpendicular to the axial direction of the steel pipe 100. The outer circumferential portion of the steel plate 200a protrudes in the radially outer side of the steel pipe 100 as illustrated in FIGS. 10(b) and 11(b).

[0005] The steel plate 200b is joined along the other distal face, so that the joined steel plate 200b inclines against a direction perpendicular to the axial direction of the steel pipe 100. The outer circumferential portion of the steel plate 200b protrudes in the radially outer side of the steel pipe 100 as illustrated in FIGS. 10(b) and 11(b).

[0006] Since the distal faces of the two joint portions 120a and 120b have the identical extending length and the identical inclination angle as described above, the steel plates 200a and 200b joined to the joint portions 120a and 120b, respectively, have an identical inclination angle.

[0007] By receiving a rotational force about a central axis L of the steel pipe 100, the screwed type steel pipe pile configured as described above is bored into the ground by the screw-effect of protruding portions of the steel plates 200a and 200b (for example, see Patent Literature 1).

Citation List

Patent Literature

[0008] Patent Literature 1: Japanese Patent Application Laid-open No. 9-324419

Summary

Technical Problem

[0009] A screwed type steel pipe pile proposed in Patent Literature 1 as described above has steel plates 200a and 200b which are joined with inclination against the direction perpendicular to the axial direction of the steel pipe 100. Thus, the steel plate 200a has a bottom slope

end portion 210a and a top slope end portion 220a, and the steel plate 200b has a bottom slope end portion 210b and a top slope end portion 220b. When the screwed type steel pipe pile is rotated about the central axis L of the steel pipe 100 by applying a rotational force, the steel plate 200a intrudes into the ground first by the bottom slope end portion 210a, and the steel plate 200b intrudes into the ground first by the bottom slope end portion 210b. Since the two steel plates 200a and 200b have the identical inclination angle as described above, the bottom slope end portion 210a and the bottom slope end portion 210b are at the downwardmost of the two steel plates 200a and 200b, and therefore serve as leading edge portions, which first intrude into the ground, of the two steel plates 200a and 200b.

[0010] Since the two screwed type steel pipe pile has the steel plates 200a and 200b respectively joined with an inclination against the direction perpendicular to the axial direction of the steel pipe 100, the projection geometry to the ground surface of each of the steel plates 200a and 200b is an ellipse when the screwed type steel pipe pile is positioned so as to have the central axis L of the steel pipe 100 being perpendicular to the ground surface as illustrated in FIGS. 10(c) and 11(c). In this case, a line segment E connecting the bottom slope end portion 210a and the top slope end portion 220a is the short axis of the ellipse, and a line segment F connecting a middle portion 230a and a middle portion 230b is the long axis of the ellipse, where the middle portion 230a is at a location 90 degrees counterclockwise from the bottom slope end portion 210a of the steel plate 200a, and the middle portion 230b is at a location 90 degrees counterclockwise from the bottom slope end portion 210b of the steel plate

200b in FIGS. 10(c) and 11(c).

[0011] When the screwed type steel pipe pile is rotated about the central axis L of the steel pipe 100 to intrude into the ground, the region of the steel plate 200a from the bottom slope end portion 210a to the middle portion 230a and the region of the steel plate 200b from the bottom slope end portion 210b to the middle portion 230b contact the ground, and thereby the entire outer circumferential portion of each of the steel plates 200a and 200b might wear. The increase in the resulting wear amount might cause decrease in the area and thickness of the steel plates 200a and 200b, which might result in the difficulty of maintaining a preferable ground supporting force.

[0012] To solve the aforementioned problem, the shape of each of the steel plates 200a and 200b can be adjusted to have a circular projection geometry to the ground surface when the screwed type steel pipe pile is positioned so as to have the central axis L of the steel pipe 100 being perpendicular to the ground surface. The projection geometry, however, easily changes by the inclination angle of the steel plates 200a and 200b against the direction perpendicular to the axial direction of the steel pipe 100. Therefore, the shapes of the steel plates 200a and 200b should suitably be changed according to the inclination angle by which the steel plates 200a and 200b are joined. This makes manufacturing of the screwed type steel pipe pile complicated and thus unpractical.

[0013] FIGS. 10 and 11 illustrate an example where the two joint portions 120a and 120b have distal faces having the identical extending length and the identical inclination angle. It goes without saying that a similar problem occurs for the joint portions 120a and 120b having different inclination angles, that is, for the steel plates

200a and 200b joined to the joint portions 120a and 120b, respectively, by inclination angles different from each other.

[0014] The present invention is made in view of the
5 aforementioned problem. An object of the present invention is to provide a screwed type steel pipe pile that can reduce a wear amount of steel plates to obtain a favorable ground supporting force.

Solution to Problem

10 [0015] A screwed type steel pipe pile according to the present invention includes a plurality of steel plates joined to a cylindrical steel pipe along a circumferential direction of the steel pipe in a manner plugging a hollow
15 of the steel pipe and inclining against a direction perpendicular to an axial direction of the steel pipe, the steel plates being formed to substantially have fan shapes by sectioning a circular steel plate having a diameter larger than a diameter of the steel pipe, and the screwed
20 type steel pipe pile includes a sacrifice member provided on a distalmost portion of the plurality of steel plates to protrude radially further outward than the steel plate including the distalmost portion.

[0016] In this specification, the term "plugging a
hollow of the steel pipe" means that the hollow is
25 substantially plugged by the plurality of the steel plates when the hollow is viewed from the distal side of the steel plates along an axial direction of the steel pipe, and more specifically means that no opening is formed in the central
region of the steel plates for taking in earth as disclosed
30 in Japanese Patent Application Laid-open No. 2009-209674, etc.

[0017] Moreover, the above-described screwed type steel pipe pile according to the present invention further

includes: a plurality of joint portions formed along a circumferential direction of a distal end portion of the steel pipe, a distal face of each of the joint portions inclining to gradually rise toward a distal side from one end to another end along the circumferential direction, and the steel plate is joined along the distal face of the corresponding joint portion.

[0018] Moreover, in the screwed type steel pipe pile according to the present invention, a ratio of a protruding length in radially outer side of the sacrifice member to an outer diameter of the circular steel plate is 0.05 or below.

Advantageous Effects of Invention

[0019] According to the present invention, a sacrifice member is provided on the distalmost portion of a plurality of steel plates to protrude in the radially outer side of the steel plate on which the sacrifice member is provided. The sacrifice member wears by making contact with the ground, so that the wear-out percentage of the outer circumferential portion of the steel plate can be reduced.

As a result, the screwed type steel pipe pile is bored into the ground with a reduced wear amount of the steel plate, and thus the steel plate maintains a sufficient area and thickness to obtain a large ground supporting force to serve as a support body. In this manner, the wear amount of the steel plate can be reduced to provide an effect of obtaining a preferable ground supporting force.

Brief Description of Drawings

[0020] FIG. 1(a) is a front view of an essential portion of a screwed type steel pipe pile which is a first embodiment of the present invention. FIG. 1(b) is a plan view of the screwed type steel pipe pile illustrated in FIG. 1(a). FIG. 1(c) is an explanatory view illustrating a projection geometry of the screwed type steel pipe pile,

illustrated in FIGS. 1(a) and 1(b), positioned so as to have the central axis of the steel pipe being perpendicular to the ground surface.

FIG. 2(a) is a right side view of an essential portion
5 of the screwed type steel pipe pile which is the first embodiment of the present invention. FIG. 2(b) is a plan view of the screwed type steel pipe pile illustrated in FIG. 2(a). FIG. 2(c) is an explanatory view illustrating a
10 projection geometry of the screwed type steel pipe pile, illustrated in FIGS. 2(a) and 2(b), positioned so as to have the central axis of the steel pipe being perpendicular to the ground surface.

FIG. 3 is a perspective view illustrating a distal end portion of the steel pipe illustrated in FIGS. 1 and 2.

15 FIG. 4 is an explanatory view schematically illustrating an exemplary working of the screwed type steel pipe pile illustrated in FIGS. 1 and 2.

FIG. 5-1(a) is a front view of an essential portion of a screwed type steel pipe pile which is a second embodiment
20 of the present invention. FIG. 5-1(b) is a plan view of the screwed type steel pipe pile illustrated in FIG. 5-1(a). FIG. 5-1(c) is an explanatory view illustrating a projection geometry of the screwed type steel pipe pile, illustrated in FIGS. 5-1(a) and 5-1(b), positioned so as to
25 have the central axis of the steel pipe being perpendicular to the ground surface.

FIG. 5-2 is a plan view of an exemplary modification of the screwed type steel pipe pile which is the second embodiment of the present invention.

30 FIG. 6(a) is a front view of an essential portion of a screwed type steel pipe pile which is a third embodiment of the present invention. FIG. 6(b) is a plan view of the screwed type steel pipe pile illustrated in FIG. 6(a).

FIG. 7(a) is a front view of an essential portion of a screwed type steel pipe pile which is a fourth embodiment of the present invention. FIG. 7(b) is a plan view of the screwed type steel pipe pile illustrated in FIG. 7(a).

5 FIG. 8 is an enlarged side view of an essential portion of an exemplary modification of the screwed type steel pipe pile which is the first embodiment of the present invention.

10 FIG. 9 is an enlarged side view illustrating an essential portion, in an enlarged manner, of another exemplary modification of the screwed type steel pipe pile which is the first embodiment of the present invention.

15 FIG. 10(a) is a front view of an essential portion of a conventional screwed type steel pipe pile. FIG. 10(b) is a plan view of the screwed type steel pipe pile illustrated in FIG. 10(a). FIG. 10(c) is an explanatory view illustrating a projection geometry of the screwed type steel pipe pile, illustrated in FIGS. 10(a) and 10(b), positioned so as to have the central axis of the steel pipe being perpendicular to the ground surface.

20 FIG. 11(a) is a right side view of an essential portion of a conventional screwed type steel pipe pile. FIG. 11(b) is a plan view of the screwed type steel pipe pile illustrated in FIG. 11(a). FIG. 11(c) is an explanatory view illustrating a projection geometry of the screwed type steel pipe pile, illustrated in FIGS. 11(a) and 11(b), positioned so as to have the central axis of the steel pipe being perpendicular to the ground surface.

Description of Embodiments

30 [0021] A preferable embodiment of a screwed type steel pipe pile according to the present invention will now be described in detail with reference to the attached drawings.

[0022] First Embodiment

Each of FIGS. 1 and 2 illustrates an example screwed type steel pipe pile which is a first embodiment of the present invention. FIG. 1(a) is a front view of an essential portion of the screwed type steel pipe pile, and FIG. 1(b) is a plan view of the screwed type steel pipe pile illustrated in FIG. 1(a). FIG. 2(a) is a right side view of an essential portion of the screwed type steel pipe pile, and FIG. 2(b) is a plan view of the screwed type steel pipe pile illustrated in FIG. 2(b). The exemplary screwed type steel pipe pile includes a steel pipe 10 and a plurality of (two in the illustrated example) steel plates 20a and 20b. The screwed type steel pipe pile illustrated in FIGS. 1 and 2 will be described with the distal side being the downward side and the pile head side being the upward side.

[0023] The steel pipe 10 has a cylindrical shape having a hollow 11 thereinside. A plurality of (two in the illustrated example) joint portions 12a and 12b is formed on the distal end portion of the steel pipe 10 as illustrated in FIG. 3. FIG. 3 illustrates the distal end side in the upward side and the pile head side in the downward side for convenience of illustrating the joint portions 12a and 12b.

[0024] The distal end portion of the steel pipe 10 is sectioned into halves along the circumferential direction to form the joint portions 12a and 12b extending along the circumferential direction of the distal end portion. More specifically, the joint portion 12a is adjacent to the joint portion 12b via steps 13a and 13b, and each of distal faces 12a1 and 12b1 inclines from one end to the other end along the circumferential direction to gradually rise upward. That is, the distal face 12a1 of the joint portion 12a inclines and continues from the bottom end of the step

13a to the top end of the step 13b, and the distal face 12b1 of the joint portion 12b inclines and continues from the bottom end of the step 13b to the top end of the step 13a.

5 [0025] A height h of the steps 13a and 13b is determined according to, for example, the condition of the ground G (see FIG. 4) into which the screwed type steel pipe pile is bored, the outer diameter of the steel pipe 10 (hereinafter referred to as a pile diameter), and the number of steel
10 plates 20a and 20b. The height h is desirably approximately 0.1 to 0.5 relative to the pile diameter.

[0026] The two example joint portions 12a and 12b are the ones in which the distal faces 12a1 and 12b1 have an identical extending length and an identical inclination
15 angle.

[0027] Each of the steel plates 20a and 20b has a shape of a half circle formed by sectioning a circular steel plate having a larger outer diameter than the steel pipe 10 into halves. The outer diameter of the circular steel
20 plate (hereinafter referred to as a blade diameter) is determined according to, for example, the condition of the ground G into which the screwed type steel pipe pile is bored, the outer diameter of the steel pipe 10, and the number of the steel plates 20a and 20b. A material having
25 a strength equivalent to that of SM490 and SM570 is used as the material of the circular steel plate, and the thickness (plate thickness) of the circular steel plate is approximately 10 to 100 mm.

[0028] The steel plate 20a is joined along the distal
30 face 12a1 of the joint portion 12a, for example, by welding so that the joined steel plate 20a inclines against a direction perpendicular to the axial direction of the steel pipe 10. The outer circumferential portion of the steel

plate 20a protrudes in the radially outer side of the steel pipe 10 as illustrated in FIGS. 1(b) and 2(b). The joint of the steel plate 20a with inclination against the direction perpendicular to the axial direction of the steel pipe 10 creates a bottom slope end portion 21a and a top slope end portion 22a.

[0029] The steel plate 20b is joined along the distal face 12b1 of the joint portion 12b, for example, by welding so that the joined steel plate 20b inclines against a direction perpendicular to the axial direction of the steel pipe 10. The outer circumferential portion of the steel plate 20b protrudes in the radially outer side of the steel pipe 10 as illustrated in FIGS. 1(b) and 2(b). The joint of the steel plate 20b with inclination against the direction perpendicular to the axial direction of the steel pipe 10 creates a bottom slope end portion 21b and a top slope end portion 22b.

[0030] Since the distal faces 12a1 and 12b1 of the two joint portions 12a and 12b have the identical extending length and the identical inclination angle as described above, the steel plates 20a and 20b joined to the joint portions 12a and 12b, respectively, have an identical inclination angle. Therefore, the bottom slope end portion 21a and the bottom slope end portion 21b are positioned at the downwardmost of the two steel plates 20a and 20b, and the top slope end portion 22a and the top slope end portion 22b are positioned at the upwardmost of the two steel plates 20a and 20b.

[0031] Such a screwed type steel pipe pile has a blade diameter of, for example, 1.5 to 3 relative to the pile diameter.

[0032] The reference numeral 14 in FIG. 1 denotes a plugging member. The plugging member 14 is, for example, a

triangular plate body that plugs a side opening on the distal end portion of the steel pipe 10 resulting from the steps 13a and 13b. Although the plugging member 14 is provided for plugging in the first embodiment, the opening need not be plugged in the present invention. This is because the opening area of the opening is small, and thus earth does not come into the inside of the steel pipe. Plugging of the opening by the plugging member 14 as in the first embodiment, however, improves the strength of the screwed type steel pipe pile.

[0033] Such a screwed type steel pipe pile has the steel plates 20a and 20b that are formed by sectioning a circular steel plate and substantially plug the distal end opening of the steel pipe 10 as illustrated in FIGS. 1(b) and 2(b). Therefore, the screwed type steel pipe pile has a closed end structure, which is substantially closed by the steel plates 20a and 20b and has no opening in the central region of the steel plates 20a and 20b for taking in earth.

[0034] Since the screwed type steel pipe pile has the steel plates 20a and 20b each joined with an inclination against the direction perpendicular to the axial direction of the steel pipe 10, the projection geometry to the ground surface of each of the steel plates 20a and 20b is an ellipse when the screwed type steel pipe pile is positioned so as to have the central axis L of the steel pipe 10 being perpendicular to the ground surface as illustrated in FIGS. 1(c) and 2(c). In this case, a line segment A connecting the bottom slope end portions 21a and 21b and the top slope end portions 22a and 22b is the short axis of the ellipse, and a line segment B connecting a middle portion 23a and a middle portion 23b is the long axis of the ellipse, where the middle portion 23a is at a location 90 degrees counterclockwise from the bottom slope end portion 21a of

the steel plate 20a, and the middle portion 23b is at a location 90 degrees counterclockwise from the bottom slope end portion 21b of the steel plate 20b in FIGS. 1(c) and 2(c).

5 [0035] A sacrifice member 25 is attached, for example, by welding to the bottom face of each of the bottom slope end portions 21a and 21b at the downwardmost of the steel plates 20a and 20b. The sacrifice member 25, which is a digging blade, for example, has a form of a rectangular
10 solid which has a rectangular shape in a top view or in a front view as illustrated in FIG. 1 and a parallelogram shape in a right side view as illustrated in FIG. 2. The material of the sacrifice member 25 is not particularly limited and suitably selected according to the strength of
15 the ground that is to be bored.

[0036] The sacrifice members 25 are attached to the corresponding bottom slope end portions 21a and 21b to protrude in the radially outer side of the steel plates 20a and 20b that include the bottom slope end portions 21a and
20 21b. The protruding length (extending length) of the sacrifice member 25 from the steel plates 20a and 20b is such a length that the ratio of the length by which the sacrifice member 25 protrudes in the radially outer side to the blade diameter is preferably 0.05 or below. With the
25 ratio of the protruding length of the sacrifice member 25 in the radially outer side to the blade diameter set within such a range, the path that the sacrifice member 25 follows created by the screwed type steel pipe pile rotating about the central axis of the steel pipe 10 comes close to the
30 path that the middle portion 23a constituting the long axis follows.

[0037] For a specific example of dimensions where the outer diameter of the steel pipe 10 is 1000 mm, the

inclination of the steel plates 20a and 20b is 14.4 degrees, the length of the long axis of the projection geometry (ellipse) is 2000 mm, and the length of the short axis of the projection geometry is 1937 mm, the protruding length of the sacrifice member 25 in the radially outer side is desirably adjusted to be 31.5 mm.

[0038] An example working using the screwed type steel pipe pile configured as described above will now be described with reference to FIG. 4. As illustrated in FIG. 4(a), the screwed type steel pipe pile is rotated about the central axis L of the steel pipe 10 by applying a rotational force and contacts the ground surface g. In this case, the steel plate 20a intrudes into the ground G first by the bottom slope end portion 21a and the steel plate 20b intrudes into the ground G first by the bottom slope end portion 21b. The two bottom slope end portions 21a and 21b are at the downwardmost of the two steel plates 20a and 20b, and therefore serve as leading edge portions of the two steel plates 20a and 20b which first intrude into the ground G.

[0039] As illustrated in FIG. 4(b), the screwed type steel pipe pile is screwed into the ground G by the screw-effect of the protruding portions of the two steel plates 20a and 20b. In this case, the path that the sacrifice members 25 follow with the rotation about the central axis L of the steel pipe 10 is approximately identical to the path that the middle portions 23a and 23b follow. The sacrifice member 25, wearing by making contact with the ground G, reduces the wear-out percentage of outer circumferential portions of the steel plates 20a and 20b, thereby reducing the wear amount of the steel plates 20a and 20b.

[0040] As a result, as illustrated in FIG. 4(c), the

screwed type steel pipe pile is bored into the ground G with a reduced wear amount of the steel plates 20a and 20b, and thus each of the steel plates 20a and 20b maintains a sufficient area and thickness to obtain a large ground supporting force to serve as a support body.

[0041] For the screwed type steel pipe pile, which is the first embodiment of the present invention, the wear amount of the steel plates 20a and 20b is reduced, and thus a preferable ground supporting force can be obtained.

[0042] Furthermore, the screwed type steel pipe pile has the sacrifice members 25 attached to the bottom slope end portions 21a and 21b, which are at the downwardmost (distal end) of the two steel plates 20a and 20b, to protrude in the radially outer side of the steel plates 20a and 20b.

Thus, in a work process for a hard ground G such that the screwed type steel pipe pile is screwed into the ground G by a normal rotation about the central axis L of the steel pipe 10, pulled out by a reverse rotation, and then screwed again into the ground G by the normal rotation, the sacrifice members 25 minimize the gap created between the bottom slope end portions 21a and 21b of the steel plates 20a and 20b and the ground G, so that the working can be performed in a highly rectilinear and stable manner.

[0043] Furthermore, the screwed type steel pipe pile is simply provided with the sacrifice members 25 on the bottom slope end portions 21a and 21b, so that manufacturing of the screwed type steel pipe pile is easier compared to a screwed type steel pipe pile that requires adjustment of the shape of the steel plate to have a circular projection geometry.

[0044] Second Embodiment

FIG. 5-1 illustrates an example screwed type steel pipe pile which is a second embodiment of the present

invention. FIG. 5-1(a) is a front view of an essential portion of the screwed type steel pipe pile, and FIG. 5-1(b) is a plan view of the screwed type steel pipe pile. The screwed type steel pipe pile illustrated in FIG. 5-1 will be described with the distal side being the downward side and the pile head side being the upward side.

[0045] The exemplary screwed type steel pipe pile includes a steel pipe 30 and a plurality of (two in the illustrated example) steel plates 40a and 40b.

10 [0046] The steel pipe 30 has a cylindrical shape having a hollow 31 thereinside. A plurality of (two in the illustrated example) joint portions 32a and 32b is formed on the distal end portion of the steel pipe 30. The distal end portion of the steel pipe 30 is sectioned into halves along the circumferential direction to form the joint portions 32a and 32b extending along the circumferential direction of the distal end portion.

[0047] More specifically, the joint portion 32a is formed such that a distal face 32a1 inclines gradually
20 upward from one end on one side to another end on the other side along the circumferential direction. The joint portion 32b is formed such that the distal face (not shown) inclines gradually upward from one end on one side to another end on the other side along the circumferential
25 direction. The other end of the joint portion 32a continues to the one end of the joint portion 32b, and the one end of the joint portion 32a continues to the other end of the joint portion 32b via a step 33a. That is, the joint portion 32a and the joint portion 32b are integrated in an external appearance. The distal face 32a1 of the joint portion 32a inclines and continues from the bottom end of the step 33a to the one end of the joint portion 32b, and the distal face of the joint portion 32b inclines and

continues from the other end of the joint portion 32a to the top end of the step 33a. Although the inclination angle of the distal face 32a1 of the joint portion 32a is approximately identical to the inclination angle of the distal face of the joint portion 32b in the second embodiment, the inclination angles may be different from each other in the present invention.

[0048] Each of the steel plates 40a and 40b has a shape of a half circle formed by sectioning a circular steel plate having a larger outer diameter than the steel pipe 30 into halves. The outer diameter of the circular steel plate (hereinafter referred to as a blade diameter) is determined according to, for example, the condition of the ground into which the screwed type steel pipe pile is bored, the outer diameter of the steel pipe 30 (hereinafter referred to as a pile diameter), and the number of the steel plates 40a and 40b. A material having a strength equivalent to that of SM490 and SM570 is used as the material of the circular steel plate, and the thickness (plate thickness) of the circular steel plate is approximately 10 to 100 mm.

[0049] The steel plate 40a is joined along the distal face 32a1 of the joint portion 32a, for example, by welding so that the joined steel plate 40a inclines against a direction perpendicular to the axial direction of the steel pipe 30. The outer circumferential portion of the steel plate 40a protrudes in the radially outer side of the steel pipe 30 as illustrated in FIG. 5-1(b). The joint of the steel plate 40a with inclination against the direction perpendicular to the axial direction of the steel pipe 30 creates a bottom slope end portion 41a and a top slope end portion 42a.

[0050] The steel plate 40b is joined along the distal

face of the joint portion 32b, for example, by welding so that the joined steel plate 40b inclines against a direction perpendicular to the axial direction of the steel pipe 30. The outer circumferential portion of the steel plate 40b protrudes in the radially outer side of the steel pipe 30 as illustrated in FIG. 5-1(b). The joint of the steel plate 40b with inclination against the direction perpendicular to the axial direction of the steel pipe 30 creates a bottom slope end portion 41b and a top slope end portion 42b.

[0051] Since the other end of the joint portion 32a continues to the one end of the joint portion 32b and the one end of the joint portion 32a continues to the other end of the joint portion 32b via the step 33a as described above, the two steel plates 40a and 40b are arranged to intersect each other partially below the outer circumferential portion of the steel pipe 30, namely, at a portion where the other end of the joint portion 32a continues to the one end of the joint portion 32b. With the two steel plates 40a and 40b intersecting each other partially below the outer circumferential portion of the steel pipe 30, the bottom slope end portion 41a is separated from the intersection by a distance greater than the distance from the intersection to the bottom slope end portion 41b. The bottom slope end portion 41a of the steel plate 40a is thus positioned lower than the bottom slope end portion 41b, so that the bottom slope end portion 41a of the steel plate 40a is at the downwardmost of the two steel plates 40a and 40b.

[0052] Such a screwed type steel pipe pile has a blade diameter of, for example, 1.5 to 3 relative to the pile diameter.

[0053] Similar to the first embodiment, the screwed type

steel pipe pile has a side opening (not shown) on the distal end portion of the steel pipe 30 resulting from the step 33a, and the side opening is plugged by a plugging member (not shown). Although, in the second embodiment, the side opening on the distal end portion of the steel pipe 30 is plugged by the plugging member (not shown), the opening need not be plugged in the present invention. This is because the opening area of the opening is small, and thus earth does not come into the inside of the steel pipe. Plugging of the opening by the plugging member as in the second embodiment, however, improves the strength of the screwed type steel pipe pile.

[0054] Such a screwed type steel pipe pile has the steel plates 40a and 40b that are formed by sectioning a circular steel plate and substantially plug the distal end opening of the steel pipe 30 as illustrated in FIG. 5-1(b).

Therefore, the screwed type steel pipe pile has a closed end structure, which is substantially closed by the steel plates 40a and 40b and has no opening in the central region of the steel plates 40a and 40b for taking in earth.

[0055] Since the screwed type steel pipe pile has the steel plates 40a and 40b each joined with an inclination against the direction perpendicular to the axial direction of the steel pipe 30, the projection geometry to the ground surface of each of the steel plates 40a and 40b is an ellipse when the screwed type steel pipe pile is positioned so as to have the central axis L of the steel pipe 30 being perpendicular to the ground surface as illustrated in FIG. 5-1(c). In this projection geometry, a line segment C passing through the bottom slope end portion 41a of the steel plate 40a and the central axis L of the steel pipe 30 is the shortest diameter (hereinafter referred to as a short diameter), and a line segment D connecting a middle

portion 44a and a middle portion 44b is the longest diameter (hereinafter referred to as a long diameter), where the middle portion 44a is at a location 90 degrees clockwise from the top slope end portion 42a of the steel plate 40a, and the middle portion 44b is at a location 90 degrees counterclockwise from the bottom slope end portion 41b of the steel plate 40b in FIG. 5-1(c).

[0056] A sacrifice member 45 is attached, for example, by welding to the bottom face of the bottom slope end portion 41a at the downwardmost of the steel plates 40a and 40b. The sacrifice members 45 are, for example, a digging blades. The material of the sacrifice member 45 is not particularly limited and suitably selected according to the strength of the ground that is to be bored.

[0057] The sacrifice member 45 is attached to the bottom slope end portion 41a to protrude in the radially outer side of the steel plate 40a that includes the bottom slope end portion 41a. The protruding length (extending length) of the sacrifice member 45 from the steel plate 40a is such a length that the ratio of the length by which the sacrifice member 45 protrudes in the radially outer side to the blade diameter is preferably 0.05 or below. With the ratio of the protruding length of the sacrifice member 45 in the radially outer side to the blade diameter set within such a range, the path that the sacrifice member 45 follows created by the screwed type steel pipe pile rotating about the central axis L of the steel pipe 30 comes close to the path that the middle portions 44a and 44b constituting the long diameter follow.

[0058] When the screwed type steel pipe pile is rotated about the central axis L of the steel pipe 30 by applying a rotational force and contacts the ground surface, the steel plate 40a intrudes into the ground first by the bottom

slope end portion 41a, and the steel plate 40b intrudes into the ground first by the bottom slope end portion 41b. Since the bottom slope end portion 41a of the steel plate 40a is at the downwardmost of the two steel plates 40a and 40b, the bottom slope end portion 41a serves as the leading edge portion which first intrudes into the ground.

[0059] While the screwed type steel pipe pile is screwed into the ground by the screw-effect of the protruding portions of the two steel plates 40a and 40b, the path that the sacrifice members 45 follows along with the rotation about the central axis L of the steel pipe 30 is approximately identical to the path that the middle portions 44a and 44b follow. The sacrifice member 45 wears by making contact with the ground to reduce the wear-out percentage of outer circumferential portions of the steel plates 40a and 40b, thereby reducing the wear amount of the steel plates 40a and 40b.

[0060] As a result, the screwed type steel pipe pile is bored into the ground with a reduced wear amount of the steel plates 40a and 40b, and thus each of the steel plates 40a and 40b maintains a sufficient area and thickness to obtain a large ground supporting force to serve as a support body.

[0061] For the screwed type steel pipe pile, which is the second embodiment of the present invention, the wear amount of the steel plates 40a and 40b is reduced, and thus a preferable ground supporting force can be obtained.

[0062] Furthermore, the screwed type steel pipe pile has the sacrifice member 45 attached to the bottom slope end portion 41a, which is at the downwardmost (distal end) of the two steel plates 40a and 40b, to protrude in the radially outer side of the steel plate 40a. Thus, in a work process for a hard ground in which the screwed type

steel pipe pile is screwed into the ground by a normal rotation about the central axis L of the steel pipe 30, pulled out by a reverse rotation, and then screwed again into the ground by the normal rotation, the sacrifice members 45 minimizes the gap created between the bottom slope end portion 41a of the steel plate 40a and the ground, so that the working can be performed in a highly rectilinear and stable manner.

[0063] Furthermore, the screwed type steel pipe pile is simply provided with the sacrifice member 45 on the bottom slope end portion 41a, so that manufacturing of the screwed type steel pipe pile is easier compared to a screwed type steel pipe pile that requires adjustment of the shape of the steel plate to have a circular projection geometry.

[0064] FIG. 5-2 is a plan view of an exemplary modification of the screwed type steel pipe pile, which is the second embodiment of the present invention. Although the screwed type steel pipe pile has the steel plate 40a having a shape of a half-circle in the second embodiment, the present invention may include a steel plate 40a' that has a shape having a notch in the portion in the radially outer side of the steel pipe 30 as illustrated in FIG. 5-2. For the steel plate 40a', the sacrifice member 45 is also attached to a bottom slope end portion 41a' to protrude in the radially outer side of the steel plate 40a'.

[0065] Although, in the first and second embodiments described above, the screwed type steel pipe pile has two steel plates 20a and 20b or 40a and 40b, the number of steel plates is not limited to two. The screwed type steel pipe pile according to the present invention may be a screwed type steel pipe pile including three steel plates or four steel plates. Such a screwed type steel pipe pile will now be described below.

[0066] Third Embodiment

FIG. 6 illustrates an example screwed type steel pipe pile which is a third embodiment of the present invention. FIG. 6(a) is a front view of an essential portion of the screwed type steel pipe pile, and FIG. 6(b) is a plan view of the screwed type steel pipe pile. The exemplary screwed type steel pipe pile includes a steel pipe 50 and three steel plates 60a, 60b, and 60c. The screwed type steel pipe pile illustrated in FIG. 6 will be described with the distal side being the downward side and the pile head side being the upward side.

[0067] The steel pipe 50 has a cylindrical shape having a hollow 51 thereinside. Three joint portions 52a, 52b, and 52c are formed on the distal end portion of the steel pipe 50.

[0068] The distal end portion of the steel pipe 50 is sectioned into thirds along the circumferential direction to form the joint portions 52a, 52b, and 52c extending along the circumferential direction of the distal end portion. More specifically, each of the joint portions 52a, 52b, and 52c are adjacent to the other two of the joint portions 52a, 52b, and 52c via a step 53, and the distal face of each of the joint portions 52a, 52b, and 52c inclines from one end to the other end along the circumferential direction to gradually rise upward. All the steps 53 have an identical height. The three example joint portions 52a, 52b, and 52c are the ones in which the distal faces have an identical extending length and an identical inclination angle.

[0069] Each of the steel plates 60a, 60b, and 60c has a fan shape formed by sectioning a circular steel plate having a larger outer diameter than the steel pipe 50 into thirds. The outer diameter of the circular steel plate

(hereinafter referred to as a blade diameter) is determined according to, for example, the condition of the ground into which the screwed type steel pipe pile is bored, the outer diameter of the steel pipe 50 (hereinafter referred to as a pile diameter), and the number of the steel plates 60a, 60b, and 60c. A material having a strength equivalent to that of SM490 and SM570 is used as the material of the circular steel plate, and the thickness (plate thickness) of the circular steel plate is approximately 10 to 100 mm.

10 [0070] The first steel plate 60a is joined along the distal face of the first joint portion 52a, for example, by welding so that the joined first steel plate 60a inclines against a direction perpendicular to the axial direction of the steel pipe 50. The outer circumferential portion of
15 the first steel plate 60a protrudes in the radially outer side of the steel pipe 50 as illustrated in FIG. 6(b). The joint of the first steel plate 60a with inclination against the direction perpendicular to the axial direction of the steel pipe 50 creates a bottom slope end portion 61a and a
20 top slope end portion 62a.

[0071] The second steel plate 60b is joined along the distal face of the second joint portion 52b, for example, by welding so that the joined second steel plate 60b inclines against a direction perpendicular to the axial direction of the steel pipe 50. The outer circumferential portion of the second steel plate 60b protrudes in the radially outer side of the steel pipe 50 as illustrated in FIG. 6(b). The joint of the second steel plate 60b with inclination against the direction perpendicular to the
30 axial direction of the steel pipe 50 creates a bottom slope end portion 61b and a top slope end portion 62b.

[0072] The third steel plate 60c is joined along the distal face of the third joint portion 52c, for example, by

welding so that the joined third steel plate 60c inclines against a direction perpendicular to the axial direction of the steel pipe 50. The outer circumferential portion of the third steel plate 60c protrudes in the radially outer side of the steel pipe 50 as illustrated in FIG. 6(b). The joint of the third steel plate 60c with inclination against the direction perpendicular to the axial direction of the steel pipe 50 creates a bottom slope end portion 61c and a top slope end portion 62c.

10 [0073] Since the distal faces of the three joint portions 52a, 52b, and 52c have the identical extending length and the identical inclination angle as described above, the steel plates 60a, 60b, and 60c joined to the joint portions 52a, 52b, and 52c, respectively, have an identical inclination angle. Therefore, the bottom slope end portions 61a, 61b, and 61c are at the downwardmost of the three steel plates 60a, 60b, and 60c.

15 [0074] Such a screwed type steel pipe pile has a blade diameter of, for example, 1.5 to 3 relative to the pile diameter.

20 [0075] The reference numeral 64 in FIG. 6 denotes a plugging member. The plugging member 64 is, for example, a triangular plate body that plugs a side opening on the distal end portion of the steel pipe 50 resulting from the step 53. Although the plugging member 64 is provided for plugging in the third embodiment, the opening need not be plugged in the present invention. This is because the opening area of the opening is small, and thus earth does not come into the inside of the steel pipe. Plugging of the opening by the plugging member 64 as in the third embodiment; however, improves the strength of the screwed type steel pipe pile.

30 [0076] Such a screwed type steel pipe pile has the steel

plates 60a, 60b, and 60c that are formed by sectioning a circular steel plate and substantially plug the distal end opening of the steel pipe 50 as illustrated in FIG. 6(b). Therefore, the screwed type steel pipe pile has a closed end structure, which is substantially closed by the steel plates 60a, 60b, and 60c and has no opening in the central region of the steel plates 60a, 60b, and 60c for taking in earth.

[0077] As illustrated in FIG. 6(b), there is a small gap between adjacent two of the steel plates 60a, 60b, and 60c. Such a gap may be kept as it is. Alternatively, for example, the sum of internal angles of a plurality of steel plates, such as the steel plate 60a, may be greater than 360 degrees, so that the gap is not apparent in a view from
15 upward (the pile head side) or from downward (the distal end side).

[0078] A sacrifice member 65 is attached, for example, by welding to the bottom face of each of the bottom slope end portions 61a, 61b, and 61c at the downwardmost of the
20 steel plates 60a, 60b, and 60c. The sacrifice member 65 is, for example, a digging blade. The material of the sacrifice member 65 is not particularly limited and suitably selected according to the strength of the ground that is to be bored.

25 [0079] The sacrifice member 65 is attached to the corresponding bottom slope end portions 61a, 61b, and 61c to protrude in the radially outer side of the steel plates 60a, 60b, and 60c that include the bottom slope end portions 61a, 61b, and 61c. The protruding length (extending length) of the sacrifice member 65 from the steel plates 60a, 60b, and 60c is such a length that the length by which the sacrifice member 65 protrudes in the radially outer side to the blade diameter is preferably

0.05 or below.

[0080] Since the screwed type steel pipe pile has the steel plates 60a, 60b, and 60c each joined with an inclination against the direction perpendicular to the axial direction of the steel pipe 50, the projection geometry to the ground surface of each of the steel plates 60a, 60b, and 60c has the shortest radius along the line segment passing through one of the bottom slope end portion 61a, 61b, and 61c and the central axis L of the steel pipe 50 when the screwed type steel pipe pile is positioned so as to have the central axis LL of the steel pipe 50 being perpendicular to the ground surface.

[0081] When the screwed type steel pipe pile is rotated about the central axis L of the steel pipe 50 by applying a rotational force and contacts the ground surface, the first steel plate 60a intrudes into the ground first by the bottom slope end portion 61a, the second steel plate 60b intrudes into the ground first by the bottom slope end portion 61b, and the third steel plate 60c intrudes into the ground first by the bottom slope end portion 61c. The three bottom slope end portions 61a, 61b, and 61c are at the downwardmost of the three steel plates 60a, 60b, and 60c and therefore serve as leading edge portions, which first intrude into the ground, of the three steel plates 60a, 60b, and 60c.

[0082] While the screwed type steel pipe pile is screwed into the ground by the screw-effect of the protruding portions of the three steel plates 60a, 60b, and 60c, the sacrifice members 65 rotate about the central axis L of the steel pipe 50, making contact with the ground to wear, and thereby reduce the wear-out percentage of the outer circumferential portion of the steel plates 60a, 60b, and 60c. In this manner, the wear amount of the steel plates

60a, 60b, and 60c is reduced.

[0083] As a result, the screwed type steel pipe pile is bored into the ground with a reduced wear amount of the steel plates 60a, 60b, and 60c, and thus each of the steel plates 60a, 60b, and 60c maintains a sufficient area and thickness to obtain a large ground supporting force to serve as a support body.

[0084] For the screwed type steel pipe pile, which is the third embodiment of the present invention, the wear
10 amount of the steel plates 60a, 60b, and 60c is reduced, and thus a preferable ground supporting force can be obtained.

[0085] Furthermore, the screwed type steel pipe pile has the sacrifice members 65 attached to the bottom slope end
15 portions 61a, 61b, and 61c, which are at the downwardmost (distal end) of the three steel plates 60a, 60b, and 60c, to protrude in the radially outer side of the steel plates 60a, 60b, and 60c. Thus, in a work process for a hard
20 ground in which the screwed type steel pipe pile is screwed into the ground by a normal rotation about the central axis L of the steel pipe 50, pulled out by a reverse rotation, and then screwed again into the ground by the normal rotation, the sacrifice members 65 minimize the gap created
25 between the bottom slope end portions 61a, 61b, and 61c of the steel plates 60a, 60b, and 60c and the ground, so that the working can be performed in a highly rectilinear and stable manner.

[0086] Furthermore, the screwed type steel pipe pile is simply provided with the sacrifice members 65 on the bottom
30 slope end portions 61a, 61b, and 61c, so that manufacturing of the screwed type steel pipe pile is easier compared to a screwed type steel pipe pile that requires adjustment of the shape of the steel plate to have a circular projection

geometry.

[0087] Fourth Embodiment

FIG. 7 illustrates an example screwed type steel pipe pile which is a fourth embodiment of the present invention.

5 FIG. 7(a) is a front view of an essential portion of the screwed type steel pipe pile, and FIG. 7(b) is a plan view of the screwed type steel pipe pile. The exemplary screwed type steel pipe pile includes a steel pipe 70 and four steel plates 80a, 80b, 80c, and 80d. The screwed type
10 steel pipe pile illustrated in FIG. 7 will be described with the distal side being the downward side and the pile head side being the upward side.

[0088] The steel pipe 70 has a cylindrical shape having a hollow 71 thereinside. Four joint portions 72a, 72b, 72c,
15 and 72d are formed on the distal end portion of the steel pipe 70.

[0089] The distal end portion of the steel pipe 70 is sectioned into fourths along the circumferential direction to form the joint portions 72a, 72b, 72c, and 72d extending
20 along the circumferential direction of the distal end portion. More specifically, each of the joint portions 72a, 72b, 72c, and 72d is adjacent to two of the joint portions 72a, 72b, 72c, and 72d via a step 73, and the distal face of each of the joint portions 72a, 72b, 72c, and 72d
25 inclines from one end to the other end along the circumferential direction to gradually rise upward. All the steps 73 have an identical height. The four example joint portions 72a, 72b, 72c, and 72d are the ones in which the distal faces have an identical extending length and an
30 identical inclination angle.

[0090] Each of the steel plates 80a, 80b, 80c, and 80d has a fan shape formed by sectioning a circular steel plate having a larger outer diameter than the steel pipe 70 into

fourths. The outer diameter of the circular steel plate (hereinafter referred to as a blade diameter) is determined according to, for example, the condition of the ground into which the screwed type steel pipe pile is bored, the outer diameter of the steel pipe 70 (hereinafter referred to as a pile diameter), and the number of the steel plates 80a, 80b, 80c, and 80d. A material having a strength equivalent to that of SM490 and SM570 is used as the material of the circular steel plate, and the thickness (plate thickness) of the circular steel plate is approximately 10 to 100 mm.

[0091] The first steel plate 80a is joined along the distal face of the first joint portion 72a, for example, by welding so that the joined first steel plate 80a inclines against a direction perpendicular to the axial direction of the steel pipe 70. The outer circumferential portion of the first steel plate 80a protrudes in the radially outer side of the steel pipe 70 as illustrated in FIG. 7(b). The joint of the first steel plate 80a with inclination against the direction perpendicular to the axial direction of the steel pipe 70 creates a bottom slope end portion 81a and a top slope end portion 82a.

[0092] The second steel plate 80b is joined along the distal face of the second joint portion 72b, for example, by welding so that the joined second steel plate 80b inclines against a direction perpendicular to the axial direction of the steel pipe 70. The outer circumferential portion of the second steel plate 80b protrudes in the radially outer side of the steel pipe 70 as illustrated in FIG. 7(b). The joint of the second steel plate 80b with inclination against the direction perpendicular to the axial direction of the steel pipe 70 creates a bottom slope end portion 81b and a top slope end portion 82b.

[0093] The third steel plate 80c is joined along the

distal face of the third joint portion 72c, for example, by welding so that the joined third steel plate 80c inclines against a direction perpendicular to the axial direction of the steel pipe 70. The outer circumferential portion of the third steel plate 80c protrudes in the radially outer side of the steel pipe 70 as illustrated in FIG. 7(b). The joint of the third steel plate 80c with inclination against the direction perpendicular to the axial direction of the steel pipe 70 creates a bottom slope end portion 81c and a top slope end portion 82c.

[0094] The fourth steel plate 80d is joined along the distal face of the fourth joint portion 72d, for example, by welding so that the joined fourth steel plate 80d inclines against a direction perpendicular to the axial direction of the steel pipe 70. The outer circumferential portion of the fourth steel plate 80d protrudes in the radially outer side of the steel pipe 70 as illustrated in FIG. 7(b). The joint of the fourth steel plate 80d with inclination against the direction perpendicular to the axial direction of the steel pipe 70 creates a bottom slope end portion 81d and a top slope end portion 82d.

[0095] Since the distal faces of the four joint portions 72a, 72b, 72c, and 72d have the identical extending length and the identical inclination angle as described above, the steel plates 80a, 80b, 80c, and 80d joined to the joint portions 72a, 72b, 72c, and 72d, respectively, have an identical inclination angle. Therefore, the bottom slope end portions 81a, 81b, 81c, and 81d are at the downwardmost of the four steel plates 80a, 80b, 80c, and 80d.

[0096] Such a screwed type steel pipe pile has a blade diameter of, for example, 1.5 to 3 relative to the pile diameter.

[0097] Although not shown in the drawing, the screwed

type steel pipe pile has a side opening (not shown) on the distal end portion of the steel pipe 70 resulting from the step 73, and the side opening is plugged by a plugging member (not shown). Although the side opening on the
5 distal end portion of the steel pipe 70 is plugged by the plugging member (not shown) in the fourth embodiment, the opening need not be plugged in the present invention. This is because the opening area of the opening is small, and thus earth does not come into the inside of the steel pipe.
10 Plugging of the opening by the plugging member as in the fourth embodiment, however, improves the strength of the screwed type steel pipe pile.

[0098] Such a screwed type steel pipe pile has the steel plates 80a, 80b, 80c, and 80d that are formed by sectioning
15 a circular steel plate and substantially plug the distal end opening of the steel pipe 70 as illustrated in FIG. 7(b). Therefore, the screwed type steel pipe pile has a closed end structure, which is substantially closed by the steel plates 80a, 80b, 80c, and 80d and has no opening in
20 the central region of the steel plates 80a, 80b, 80c, and 80d for taking in earth.

[0099] As illustrated in FIG. 7(b), there is a small gap between adjacent two of the steel plates 80a, 80b, 80c, and 80d. Such a gap may be kept as it is. Alternatively, for
25 example, the sum of internal angles of a plurality of steel plates, such as the steel plate 80a, may be greater than 360 degrees, so that the gap is not apparent in a view from upward (the pile head side) or from downward (the distal end side).

30 [0100] A sacrifice member 85 is attached, for example, by welding to the bottom face of each of the bottom slope end portions 81a, 81b, 81c, and 81d at the downwardmost of the steel plates 80a, 80b, 80c, and 80d. The sacrifice

member 85 is, for example, a digging blade. The material of the sacrifice member 85 is not particularly limited and suitably selected according to the strength of the ground that is to be bored.

- 5 [0101] The sacrifice members 85 are attached to the corresponding bottom slope end portions 81a, 81b, 81c, and 81d to protrude in the radially outer side of the steel plates 80a, 80b, 80c, and 80d that include the bottom slope end portions 81a, 81b, 81c, and 81d. The protruding length
10 (extending length) of the sacrifice member 85 from the steel plates 80a, 80b, 80c, and 80d is such a length that the length by which the sacrifice member 85 protrudes in the radially outer side to the blade diameter is preferably 0.05 or below.
- 15 [0102] Since the screwed type steel pipe pile has the steel plates 80a, 80b, 80c, and 80d each joined with an inclination against the direction perpendicular to the axial direction of the steel pipe 70, the projection geometry to the ground of each of the steel plates 80a, 80b,
20 80c, and 80d has the shortest radius on the line segment passing through one of the bottom slope end portion 81a, 81b, 81c, and 81d and the central axis L of the steel pipe 70 when the screwed type steel pipe pile is positioned so as to have the central axis L of the steel pipe 70 being
25 perpendicular to the ground surface.
- [0103] When the screwed type steel pipe pile is rotated about the central axis L of the steel pipe 70 by applying a rotational force and contacts the ground surface, the first steel plate 80a intrudes into the ground first by the
30 bottom slope end portion 81a, the second steel plate 80b intrudes into the ground first by the bottom slope end portion 81b, the third steel plate 80c intrudes into the ground first by the bottom slope end portion 81c, and the

fourth steel plate 80d intrudes into the ground first by the bottom slope end portion 81d. The four bottom slope end portions 81a, 81b, 81c, and 81d are at the downwardmost of the four steel plates 80a, 80b, 80c, and 80d and therefore serve as leading edge portions, which first intrude into the ground, of the four steel plates 80a, 80b, 80c, and 80d.

[0104] While the screwed type steel pipe pile is screwed into the ground by the screw-effect of the protruding portions of the four steel plates 80a, 80b, 80c, and 80d, the sacrifice members 85 rotate about the central axis L of the steel pipe 70, making contact with the ground to wear, and thereby reduce the wear-out percentage of the outer circumferential portion of the steel plates 80a, 80b, 80c, and 80d. In this manner, the wear amount of the steel plates 80a, 80b, 80c, and 80d is reduced.

[0105] As a result, the screwed type steel pipe pile is bored into the ground with a reduced wear amount of the steel plates 80a, 80b, 80c, and 80d, and thus each of the steel plates 80a, 80b, 80c, and 80d maintains a sufficient area and thickness to obtain a large ground supporting force to serve as a support body.

[0106] For the screwed type steel pipe pile, which is the fourth embodiment of the present invention, the wear amount of the steel plates 80a, 80b, 80c, and 80d is reduced, and thus a preferable ground supporting force can be obtained.

[0107] Furthermore, the screwed type steel pipe pile has the sacrifice members 85 attached to the bottom slope end portions 81a, 81b, 81c, and 81d, which are at the downwardmost (distal end) of the four steel plates 80a, 80b, 80c, and 80d, to protrude in the radially outer side of the steel plates 80a, 80b, 80c, and 80d. Thus, in a work

process for a hard ground in which the screwed type steel pipe pile is screwed into the ground by a normal rotation about the central axis L of the steel pipe 70, pulled out by a reverse rotation, and then screwed again into the ground by the normal rotation, the sacrifice members 85 minimize the gap created between the bottom slope end portions 81a, 81b, 81c, and 81d of the steel plates 80a, 80b, 80c, and 80d and the ground, so that the working can be performed in a highly rectilinear and stable manner.

[0108] Furthermore, the screwed type steel pipe pile is simply provided with the sacrifice members 85 on the bottom slope end portions 81a, 81b, 81c, and 81d, so that manufacturing of the screwed type steel pipe pile is easier compared to a screwed type steel pipe pile that requires adjustment of the shape of the steel plate to have a circular projection geometry.

[0109] The preferable first to fourth embodiments are described above, not by way of limiting the scope of the present invention, and various modifications can be made.

[0110] Although the first embodiment described above includes the sacrifice members 25 that are attached, for example, by welding to the bottom face of the bottom slope end portions 21a and 21b, a sacrifice member 25' may be attached, for example, by welding to the side face of the bottom slope end portion 21a as illustrated in FIG. 8 or a sacrifice member 25'' may be attached, for example, by welding to the top face of the bottom slope end portion 21a as illustrated in FIG. 9 in the present invention.

[0111] Although the first to fourth embodiments described above include the joint portion 12a or the like with the distal face 12a1 or the like having an identical inclination angle by which the steel plate 20a or the like is joined to the joint portion 12a or the like with an

identical inclination angle, the steel plates may be provided with inclination angles different from each other in the present invention. In this case, a sacrifice member may be provided on the bottom slope end portion at the
 5 distalmost end of a plurality of steel plates.

[0112] Although, in the first to fourth embodiments of the present invention, the sacrifice member 25 or the like is attached to the bottom slope end portion 21a or the like at the distalmost end of a plurality of steel plates, for
 10 example, 20a, a sacrifice member may suitably be provided on a portion other than the bottom slope end portion at the distalmost end in the present invention.

[0113] Although, in the first to fourth embodiments, a plurality of steel plates, for example, 20a, is joined to
 15 the distal end portion of the steel pipe 10 or the like, the steel plate may be provided not only to the distal end portion of the steel pipe but to the side face of the steel pipe.

Reference Signs List

20 [0114] 10 STEEL PIPE
 11 HOLLOW
 12a JOINT PORTION
 12b JOINT PORTION
 13a STEP
 25 13b STEP
 20a STEEL PLATE
 21a BOTTOM SLOPE END PORTION
 22a TOP SLOPE END PORTION
 23a MIDDLE PORTION
 30 20b STEEL PLATE
 21b BOTTOM SLOPE END PORTION
 22b TOP SLOPE END PORTION
 23b MIDDLE PORTION

25 SACRIFICE MEMBER

g GROUND SURFACE

G GROUND

L CENTRAL AXIS

CLAIMS

1. A screwed type steel pipe pile comprising a plurality of steel plates joined to a cylindrical steel pipe along a circumferential direction of the steel pipe in a manner plugging a hollow of the steel pipe and inclining against a direction perpendicular to an axial direction of the steel pipe, the steel plates being formed to substantially have fan shapes by sectioning a circular steel plate having a diameter larger than a diameter of the steel pipe, wherein

10 the screwed type steel pipe pile includes a sacrifice member provided on a distalmost portion of the plurality of steel plates to protrude radially further outward than the steel plate including the distalmost portion.

2. The screwed type steel pipe pile according to claim 1, further comprising:

a plurality of joint portions formed along a circumferential direction of a distal end portion of the steel pipe, a distal face of each of the joint portions
20 inclining to gradually rise toward a distal side from one end to another end along the circumferential direction, wherein

the steel plate is joined along the distal face of the corresponding joint portion.

25 3. The screwed type steel
or 2, wherein

a ratio of a protruding length in radially outer side of the sacrifice member to an outer diameter of the
30 circular steel plate is 0.05 or below.