

TECHNOLOGY OF REINFORCING SOFT GROUNDS

TECHNICAL FIELD

The present invention relates to a technology of reinforcing soft grounds, and more particularly to a pack for molding a sand file to form a drain, a pack guide casing for piling a pack underground, an automatic pack pile driver which is used for piling a pack into a guide casing, and a drain structure and an alignment method thereof.

BACKGROUND ART

A vertical draining method such as a flexible sand drain and/or a paper drain is generally used for reinforcing a soft ground. A conventional vertical draining method piles a cylindrical guide casing underground, inserts a sand pack or a paper drain board into the guide casing, and then removes the guide casing. FIG. 1 is a perspective view of a flexible sand pack and a guide casing which are used for a conventional vertical draining method. As shown in FIG. 1, the conventional vertical draining method is accomplished by burying a cylindrical guide casing 10 underground, and then piling sand pile molding pack 20 into guide casing 10. Pack 20, which is in a matrix-type plain texture, is accomplished by overlapping two sheets of the matrix-type plain textures, in which both ends are formed as reinforcement portions 31 and 32 lengthwise by connecting both ends or thermally melting them to attach to each other. The pack 20 inserted into guide casing 10 are filled with the sands, and then guide casing 10 is removed at the sand-filled state to form a drain.



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However, the conventional sand pile molding pack has problems that the manufacturing method is complicated and the manufacturing cost is high. Also, there are breakage or cut-off of the pack, or some discrepancy between latitude and longitude. Further, the conventional pack has a problem that the reinforcement portion 31 or 32 is folded, through which a fine soil cannot pass, and a film is formed which lowers a draining effect. Also, since a cylindrical pack is used, a draining contact area is small to lower a draining effect.

The conventional guide casing is formed as only a cylindrical shape, to accordingly raise a phenomenon of twisting the pack when the pack is inserted. Moreover, since the paper drain board is a structure of a thin plate when the paper drain is formed, many spaces are formed therein. Thus, removal of the casing causes to raise an excessive ground movement.

DISCLOSURE OF THE INVENTION

Therefore, to solve the above problems, it is an object of the present invention to provide a sand pile molding pack with a simple manufacturing process and a low manufacturing cost.

Another object of the present invention is to provide a rectangular sand pile molding pack.

Yet another object of the present invention is to provide a pack in which a flexible sand drain and a paper drain are simultaneously installed.

Still another object of the present invention is to provide a pack guide member in which a pack is not twisted to each other.

Still yet another object of the present invention is to provide a guide



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casing which can prevent its bending when buried underground.

A further object of the present invention is to provide a casing comprising an internal reinforcement member.

A yet further object of the present invention is to provide an automatic pack pile driver for piling a pack into a guide casing.

A still further object of the present invention is to provide a drain structure and an alignment method thereof in which a draining effect is high.

To accomplish the above objects of the present invention, there is provided a pack which is used for reinforcing a soft ground according to an aspect of the present invention, wherein the pack is fabricated via an injection molding.

A pack guide casing for guiding a pack which is used for reinforcing a soft ground according to another aspect of the present invention comprises a first member which is formed as a hollow vessel having a predetermined length and having at least one guide path formed in the vessel lengthwise; and a second member which is connected in the lower end of the pack and guided by the guide path of the first member, to be movable up and down.

A guide casing for guiding a drain board which is used for reinforcing a soft ground according to yet another aspect of the present invention, comprises a hollow rectangular box body having a predetermined length; and at least one reinforcement member which is protruded in the body.

An automatic pack pile driver which is used for reinforcing a soft ground according to still another aspect of the present invention, comprises



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a pack supply member having a rotatable cylindrical portion around which a pack having a wider locker for every predetermined length is wound on the outer surface thereof; and a pack guide member having a groove for preventing passage of the wider locker of said pack.

A drain structure for reinforcing a soft ground according to still yet another aspect of the present invention, is characterized by that the drain structure is in a rectangular shape.

A drain alignment method for reinforcing a soft ground according to a further aspect of the present invention comprises the steps of maintaining a virtual line which connects a center line of each drain in four rectangular drains adjacent to each other to form a square; and aligning each drain of a length direction perpendicular to an adjacent drain lengthwise at the center.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a flexible pack and a guide casing for explaining a vertical draining method.

FIGs. 2A through 2C are perspective views of a sand pile molding pack according to one embodiment of the present invention.

FIGs. 3A through 3D are plan views of a sand pile molding pack according to another embodiment of the present invention.

FIG. 4 is an exploded perspective view of a guide casing of a sand pile molding pack according to one embodiment of the present invention.

FIG. 5 is a cross-sectional view of a combined state cut along a direction of I-I of FIG. 4.

FIG. 6 is perspective view of a second member of FIG. 4 according to



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another embodiment of the present invention.

FIGs. 7A through 7F are plan views of a second member of FIG. 4 according to various embodiments of the present invention.

FIG. 8 is a plan view of a guide casing according to another embodiment of the present invention.

FIGs. 9A through 9D are plan views of guide casings according to different embodiments of the present invention.

FIGs. 10A and 10B are perspective views of an automatic pack pile driver according to the present invention.

FIG. 11 is a plan view of a plurality of integrally constructed guide casings to embody a drain aligning method according to the present invention.

FIG. 12 is a conceptual view for explaining a drain aligning method according to the present invention.

FIG. 13A is a perspective view of a conventional drain structure.

FIG. 13B is a perspective view of a drain structure according to the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

Hereinbelow, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

FIGs. 2A through 2C are perspective views of a sand pile molding pack according to one embodiment of the present invention. The pack of the present invention is fabricated by a metal injection molding method. FIG. 2A is a perspective view of a sand pile molding pack 40 which is obtained by



the injection molding method without any reinforcement portions. FIG. 2B shows a sand pile molding pack material 50 having a reinforcement 51 at a constant interval which is obtained by the injection molding. A sand pile molding pack 60 shown in FIG. 2C is obtained by cutting pack material 50 of FIG. 2B to include at least one reinforcement portion 51 and combining the cut pack materials with each other.

FIGs. 3A through 3D are plan views of sand pile molding packs according to other embodiments of the present invention. It can be seen that the packs of the present embodiments are extended lengthwise and in the same pattern even without showing perspective views.

FIGs. 3A and 3B show rectangular packs and FIGs. 3C and 3D show cylindrical packs. In these embodiments, the pack includes net portions 71 and a plurality of reinforcement portions 72. The reinforcement portion 72 can be attached with a sub-texture. Thus, the packs according to these embodiments have a merit that a flexible sand drain and a paper drain can be simultaneously formed.

Further, since the pack is in a rectangular shape, a draining area increases more than 30% compared with a cylindrical pack which consumes the same amount of the sands as that of the rectangular pack. That is, the rectangular pack has circumferential length of more than 30% at the same area compared with the cylindrical pack. Thus, a draining effect of more than 30% can be obtained, even though the same amount of the sands is used.

Furthermore, the conventional flexible pack is continuously produced without any marking in the same shape and color, and then is measured



and cut by necessary lengths in use. The drain which is constructed by using such a pack has an exposed portion of the same shape and color. Thus, to ascertain whether the underground drain has been constructed up to a target depth, construction drawings or records should be checked or it should be measured using other equipment.

Thus, the pack of the present invention has markings which can identify the length of the pack. That is, when the pack is produced, various colors or figures are marked on the pack. Alternatively, reinforcement portions having the identified patterns are made and attached to the pack, and then it is more preferable that the identification of the length is made by human vision. Thus, after construction, identification of the markings of the exposed drain can make a judgement whether such a construction was properly done. Accordingly, poor construction can be prevented, and easy construction or effective construction control can be performed.

FIG. 4 is an exploded perspective view of a guide casing of a sand pile molding pack according to one embodiment of the present invention. As shown in FIG. 4, the casing of the present invention is buried by a predetermined depth into a soft ground. The casing has a first member 80 having lengthy guiding paths 81 which are formed along the whole lengthwise surface, and a second member 90 which is integrally combined with sand pile molding pack P, and are moved up and down at the state which is engaged with guide paths 81 in first member 80. Therefore, when sand pile molding pack P is driven into first member 80, variation such as twisting or distortion does not occur. In this embodiment, guide paths 81 are located at four positions. However, it is possible to use more than or



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less than four guide paths 81. Even though guide paths 81 are shown as protruded shapes, the guide paths can be formed in grooves if second member 90 is modified to have the grooves therein.

Second member 90 has a predetermined width and thickness and is formed to have a semicircular surface 92 at the area contacting the inner circumferential surface of first member 80. By forming semicircular surface 92, second member 90 moves smoothly along the inner circumferential surface of first member 80.

FIG. 5 is a cross-sectional view of a combined state cut along a direction of I-I of FIG. 4. Referring to FIG. 5, one embodiment of the installation of the present invention will be described below.

In FIG. 5, first member 80 is driven at a predetermined position into soft ground E. Here, the lower end of first member 80 is driven in an opening state, but the lower end thereof is actually driven in a closed state. Also, a plurality of first members 80 are mutually connected and used according to a target depth to install first member 80. Here, it is preferable that guide paths 81 are linearly driven without discrepancy. Sand plie molding pack P, which is made of a net of a flexible material and is integrally combined with second member 90, is driven into the inside of first member 80 which is driven underground.

It is preferable that a predetermined amount of the sands is filled into the end of pack P prior to driving pack P into first member 80, and then the pack P is driven into first member 80. The reason why the sands are filled into the end of the pack P is for swiftly and accurately driving pack P up to a target depth of first member 80 due to the weight of the sands.



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Other weight materials can be used as weight balance instead of the sands. In this state, if sand pile molding pack P is driven into first member 80, second member 90 is located swiftly at a predetermined position along guide paths 81 in first member 80. Thus, sand pile molding pack P is linearly located in first member 80 while maintaining the original state without twisting sand pile molding pack P. A reference numeral 100 designates a sand driver for filling the sands into pack P.

FIG. 6 is a perspective view of the second member of FIG. 4 according to another embodiment of the present invention. In this embodiment, second member 90 is formed of a plate member in which a curved portion 97 is wholly bent downwards and an engagement hole 94 for engaging pack P is formed thereon. The reason why curved portion 97 is formed in the plate member is for making the smoothly concave portion due to the curved portion 97 more naturally adapting to a convex portion of the pack, because the lower end of pack P forms the convex spherical body when filling the sands into pack P.

FIGs. 7A through 7F are plan views of second members 90 of FIG. 4 according to various embodiments of the present invention. The same elements are assigned with the same reference numerals as those of FIG. 4. FIG. 7A shows that a single guide path 81 is formed in first member 80 and second member 90 is formed as a circular plate having a single recess 98. FIGs. 7B and 7C show second members 90 having recesses as many as the number of guide paths 81 in first member 80, respectively. FIGs. 7D through 7F show that second members 90 can rotate to some extent in first member 80. The detailed description thereof will be omitted since it will be



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appreciated through the drawings without further descriptions.

FIG. 8 is a plan view of the guide casing according to another embodiment of the present invention. As shown in FIG. 8, guide casing 100 in this embodiment is integrated with at least one reinforcement member 101. The reinforcement member 101 is for bending a paper drain board 102 and guiding it into casing 100. It is more preferable that paper drain board 102 is made of an easily bendable material at the portions which are shown as dotted lines. As described above, since paper drain board 102 is bent and installed by reinforcement member 101, a wider drain board can be driven as a smaller cross-sectional area than in the linearly installed case. Accordingly, a draining effect is largely enhanced and the ground movement is reduced when driven.

FIGs. 9A through 9D are plan views of guide casings according to different embodiments of the present invention. As shown in FIGs. 9A through 9D, guide casings 110 in these embodiments have at least one outer protrusion 111, respectively. Such protrusions 111 are to prevent bending of guide casings 110 when guide casings 110 are driven underground, respectively.

FIGs. 10A through 10B are perspective views of an automatic pack pile driver according to the present invention. The automatic pack pile driver according to the present invention includes a pack supply member 120 and a pack guide member 130. FIG. 10A is a perspective view of pack supply member 120 and pack guide member 130. Pack supply member 120 includes a cylindrical body 121 which winds the pack therearound and a support 122 which supports the pack in both ends of cylindrical body 121. One support



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122 and cylindrical body 121 forms a first groove 123 which is lengthwisely formed. Pack guide member 130 includes a circular plate member 132 in which a second groove 131 is formed downwards in parallel with first groove 123 and a support 133 which is integrally with circular plate member 132. A reference numeral 140 is a hanger member 120 for rotatably hanging pack supply member 120.

FIG. 10B is a perspective view for explaining an operation when pack P is driven into the automatic pack pile driver. As shown in FIG. 10B, pack P wound in pack supply member 120 is driven into second groove 131 in pack guide member 130. A stopper edge 150 is formed in pack P every predetermined length. Thus, if pack P is inserted into a guide casing (not shown) by a predetermined length, the stopper edge 150 is stopped by second groove 131 and the driving operation is interrupted. Here, it can be seen that second groove 131 is made so that pack P passes therethrough but the stopper edge 150 of pack P cannot pass therethrough. Moreover, first groove 123 fixes pack P in the inside of cylindrical body 121 after inserting one end of pack P thereinto.

FIG. 11 is a plan view of the pack guide casings in which a plurality of the pack guide casings are simultaneously buried underground. As can be seen from the drawing, a plurality of the pack guide casings 160 are mutually connected by first connectors 161. Thus, bending of the casing can be prevented when a plurality of the guide casings are simultaneously driven underground. The dotted lines in the drawing represent second connectors 162 for effectively preventing the bending of the casing.

FIG. 12 is a conceptual view for explaining a drain aligning method



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according to the present invention. As shown in the drawing, the draining method according to the present invention has processes of maintaining a virtual line which connects a center line of each drain in four rectangular drains adjacent to each other to form a square, and of aligning each drain of a length direction to be perpendicular to an adjacent drain lengthwise at the center. Thus, an effective draining radius is balanced and a ground sink is also expedited since a draining interval is compact.

FIG. 13A is a perspective view of the conventional flexible drain structure. The conventional flexible drain is in a cylindrical shape and the diameter of the cylindrical body is limited to a range between 5cm and 25cm. The reason why the size of the diameter is limited resides in a fact that a normal draining is not performed if the diameter is less than 5cm, and the pack used in the draining or the flexibility of the drain is broken in case of the diameter of more than 25cm.

FIG. 13B is a perspective view of a drain structure according to the present invention. The drain structure of the present invention is a rectangular shape. The rectangular shape should have a length between 5cm and 25cm in both sides, respectively. Thus, the draining becomes smooth and solves the breakage of flexibility of the drain. When compared with the conventional art, the present invention provides effects that the same amounts of the sands are consumed and the draining contact surface area is widened. That is, referring to FIGs. 13A and 13B, under the assumption of the same height, the drains of FIGs. 13A and 13B have the nearly same areas, but the FIG. 13B drain has much larger surface areas in view of the circumferential length.

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INDUSTRIAL APPLICABILITY

The present invention can be used for reinforcing a soft ground, and also employed in an earth work, foundation work and pile driving work which requires for reinforcing a soft ground.

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**WHAT IS CLAIMED IS:**

1. A pack which is used for reinforcing a soft ground, wherein said pack (40 or 60) is fabricated via an injection molding.
2. The pack according to claim 1, wherein said pack comprises a net portion (71) and at least one reinforcement portion (72).
3. The pack according to claim 2, wherein said reinforcement portion (72) is attached with a sub-texture.
4. The pack according to one of claims 1 through 3, wherein said pack is in a rectangular shape.
5. The pack according to one of claims 1 through 4, wherein said pack has a marking which can be identified with a length.
6. A pack guide casing for guiding a pack which is used for reinforcing a soft ground comprising:
 - a first member (80) which is formed as a hollow vessel having a predetermined length and having at least one guide path (81) formed in the vessel lengthwise; and
 - a second member (90) which is connected in the lower end of the pack and guided by the guide path (81) of the first member (80), to be movable up and down.
7. The pack guide casing according to claim 6, wherein said second member comprises at least one engagement hole (94) for engaging the packs.
8. The pack guide casing according to claim 6, wherein said guide path (81) is protruded from the inner wall of the vessel.
9. The pack guide casing according to claim 6, wherein said guide





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path (81) is a groove formed in the inner wall of the vessel.

10. A guide casing for guiding a drain board which is used for reinforcing a soft ground comprising:

a hollow rectangular box body having a predetermined length; and
at least one reinforcement member which is protruded in the inside of said body.

11. The guide casing according to claim 10, wherein said body further comprises at least one protrusion which is protruded outwards.

12. An automatic pack pile driver which is used for reinforcing a soft ground comprising:

a pack supply member (120) having a rotatable cylindrical portion around which a pack having a wider locker for every predetermined length is wound on the outer surface thereof; and

a pack guide member (130) having a groove for preventing passage of the wider locker of said pack.

13. A drain structure for reinforcing a soft ground characterized by that said drain structure is in a rectangular shape.

14. The drain structure according to claim 13, wherein the length of both sides in said rectangular shape is at a range between 5cm and 25cm.

15. A drain alignment method for reinforcing a soft ground comprising the steps of maintaining a virtual line which connects a center line of each drain in four rectangular drains adjacent to each other to form a square; and aligning each drain of a length direction perpendicular to an adjacent drain lengthwise at the center.

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