Nov. 27, 1951 B. C. GERWICK, JR 2,576,507

HOLLOW MANDREL FOR PLACEMENT OF DISCRETE MATERIAL

Filed Feb. 14, 1949

FIG_1_

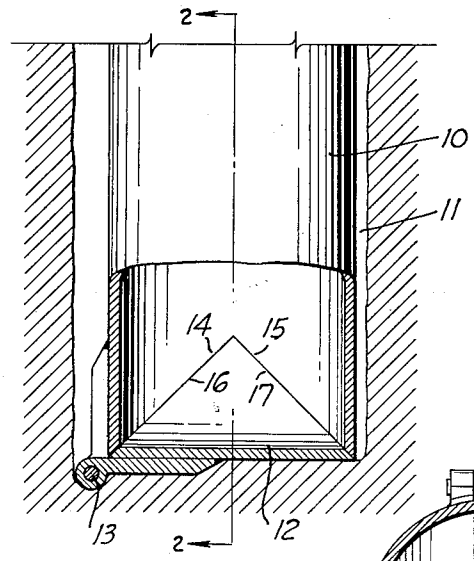


FIG_2_

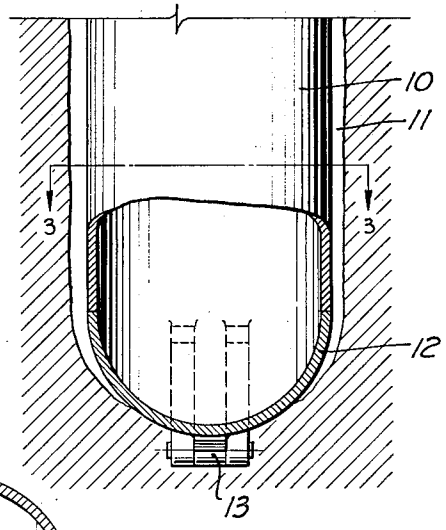


FIG_3_

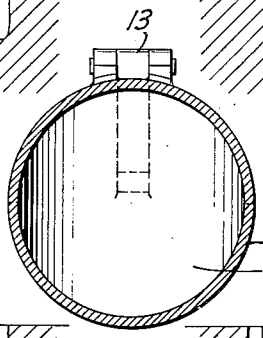


FIG_4_

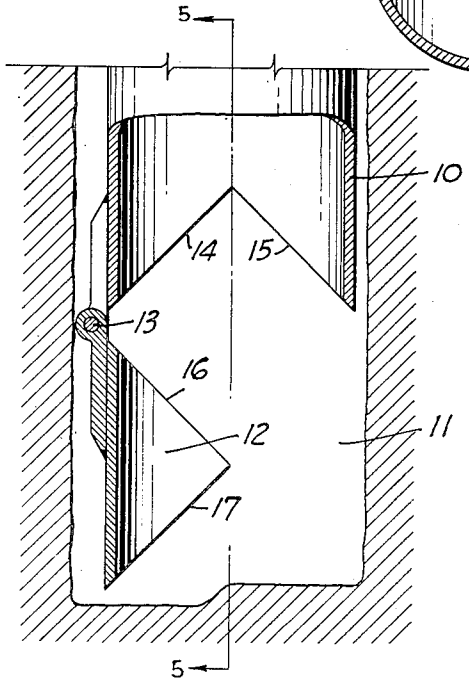
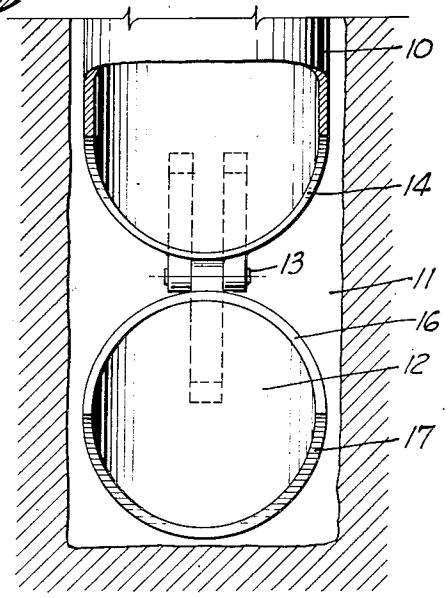


FIG_5_



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HOLLOW MANDREL FOR PLACEMENT OF DISCRETE MATERIAL

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4 Claims. (Cl. 61—78)

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This invention relates generally to hollow mandrels such as are useful for the placement of sand, gravel, concrete mixes, or other discrete material. For example it can be used in the construction of so-called sand drains, or for the formation of subterranean concrete columns.

In the past it has been common to construct sand drains by the use of a hollow mandrel which is driven into the ground formation where the drain is desired, after which it is filled with sand or gravel, and then withdrawn whereby the sand is deposited in the opening formed by the mandrel to permit water to drain from the clay and mud into which the sand is placed. In a typical instance the mandrel may be about 2 feet in diameter, and provided with a flat door or gate at its lower end, which is hinged whereby the gate closes against the lower end of the mandrel body in a plane at right angles to the longitudinal axis, and swings downwardly to open position. The outer diameter of the gate corresponds to the exterior diameter of the mandrel. The mandrel is formed of suitable steel tubing of sufficient strength and length to enable it to be driven into the ground formation, with the lower gate closed. After being driven to a suitable depth, sand or gravel is introduced into the mandrel, and then the mandrel is retracted. When upward or lifting movement is commenced, the gate swings to open position to permit the sand or gravel to be deposited.

I have observed that mandrels of the type described above are subject to certain difficulties and disadvantages. When the bottom gate swings to open position as the mandrel is lifted, it seriously interferes with lifting of the mandrel, and it causes considerable tearing away of the side walls of the opening with undesirable intermixing of the clay and sand. In addition the gate forms a substantially flat end for the mandrel, which cannot be readily driven into ground formations.

It is an object of the present invention to provide a mandrel which will overcome the difficulties and disadvantages outlined above, and which will have gate means at its lower end which greatly facilitates withdrawal of the mandrel, and which also facilitates driving the mandrel into the ground.

It is a more specific object of the invention to provide a mandrel construction having one or more lower closure gates so formed that when moved to open position, as the mandrel is lifted, it conforms to the same cylindrical wall contour as that of the mandrel.

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Additional objects of the invention will appear from the following description in which the preferred embodiments have been set forth in detail in conjunction with the accompanying drawing.

Referring to the drawing:

Figure 1 is a side elevational view, partly in section, illustrating a mandrel body incorporating the present invention, and with the bottom gate in closed position.

Figure 2 is a cross-sectional view taken along the lines 2—2 of Figure 1.

Figure 3 is a cross-sectional view taken along the line 3—3 of Figure 2.

Figure 4 is a view similar to Figure 1, but illustrating the body of the mandrel in an elevated position, and the bottom gate in open position.

Figure 5 is a cross-sectional view taken along the line 5—5 of Figure 4.

Referring first to Figures 1 to 5 inclusive of the drawing, I have shown a cylindrical hollow mandrel body 10, and it is shown as having been driven into the ground to provide the opening 11. At the lower end of the mandrel there is a bottom gate 12, which is secured to one side of the mandrel by the hinge 13.

In place of using a flat gate, closing upon the end of the mandrel, I provide a gate which is curved to the contour of the mandrel body 10. This contouring (see Figure 2) presents a curved surface to the formation to facilitate driving the mandrel.

The lower end of the mandrel 10, instead of terminating in a plane, is notched as shown in Figure 4. This serves to form the contour lines 14 and 15, which extend in this instance at an angle of about 45° with respect to each other. The edges 16 and 17 of the gate 12 are contoured to be complementary to the edges 14 and 15 of the mandrel. Thus the gate completely closes against the mandrel as shown in Figure 1, but may readily swing to the full open position shown in Figure 4. When in full open position the gate 12 is coincident with the extended cylindrical contour of the mandrel. In other words the curvature of the gate 12 conforms to a cylinder having the same internal and external diameter as that of the mandrel, and the axis of the gate curvature is likewise in alignment with the longitudinal axis of the mandrel.

Use of the mandrel described above is as follows: The body of the mandrel is of a length adequate for forming openings in the ground of the depth desired. The gate 12 is closed, and then the mandrel is driven into the ground formation by means of a power pile driver, or other

suitable means. After being driven to the depth desired the lower end of the mandrel appears substantially as shown in Fig. 1. Sand or gravel is introduced into the mandrel, and then the mandrel is lifted free of the hole. As the lifting movement commences the gate 12 swings to open position as shown in Figure 4, thus permitting the sand or other discrete material to freely discharge from the lower end of the mandrel into the opening. Because of the contouring of the gate 12, it causes a minimum of resistance to upward movement, particularly because it follows the general path of the mandrel wall. Likewise it does not tear the side walls of the opening 11, as with the flat gates of conventional constructions, and therefore undersirable intermixing of clay with the sand is reduced to a minimum.

In the foregoing particular reference has been made to using the device for forming sand drains. It is apparent that the device can likewise be used for placement of other discrete material, such as concrete mixes. Thus in the construction of foundations, it is possible to drive the mandrel into the ground formation, introduce a concrete mix, and then withdraw the mandrel, leaving the concrete mix to form a column.

I claim:

1. In a mandrel adapted to be driven into the ground and subsequently retracted, a cylindrical mandrel body, and a closure gate means for the lower end of the body, said means comprising a single gate hinged to the lower end of the body and having a closed position against the lower end of the body and a lowered open position, said gate being contoured to conform to the cylindrical contouring of the mandrel body when in open position and to substantially close the lower end of the mandrel body when in closed position.

2. In a mandrel adapted to be driven into the ground and subsequently retracted, a cylindrically shaped mandrel body, and a closure gate means for the lower end of the body, said means comprising a single gate hinged to the lower end of the body at one side of the same and having a closed position against the lower end of the body and a lowered full open position, said gate being formed as a section of a cylinder of the same diameter as that of the mandrel body and having a circular contour when in closed position and viewed in plan.

3. In a mandrel adapted to be driven into the ground and subsequently retracted, a cylindrical mandrel body, a single closure gate at the lower

end of the body, a hinge serving to form a hinged connection between one edge of the gate and the lower end of the body for swinging movement of the gate through substantially 180° from closed to depending open positions, said gate having a circular outer contour corresponding to that of the mandrel body when closed and viewed in plan, said gate being curved to present a convex surface to the ground when in closed position, the curvature of the gate being such that it conforms to a section of a cylinder of the same diameter as the mandrel body whereby when the gate is swung to depending open position it conforms to the cylindrical contouring of the mandrel body.

4. In a mandrel adapted to be driven into the ground and subsequently retracted, a cylindrical mandrel body, a single closure gate at the lower end of the body, a hinge serving to form a hinged connection between one edge of the gate and the lower end of the body for swinging movement of the gate about a horizontal axis through substantially 180° from closed to depending open positions, said gate when in closed position and viewed in plan having a circular outer contour corresponding to that of the mandrel body, said gate being curved to conform to the section of a cylinder to present a convex surface to the ground when in closed position and to conform to the cylindrical contouring of the mandrel body when in depending open position, said gate when viewed from one side of the mandrel and in a direction corresponding to the axis of the hinged connection having an inverted V-shaped contour, the lower edge of the mandrel body having inverted V-shaped notches formed on opposite sides of the same to accommodate the V-shaped contouring of the gate.

BEN C. GERWICK, JR.

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