July 23, 1968 J. D. BOSWELL 3,393,644

CONCRETE PUMPING STATION WITH A BALLAST TROUGH

Filed Sept. 25, 1967 2 Sheets-Sheet 1

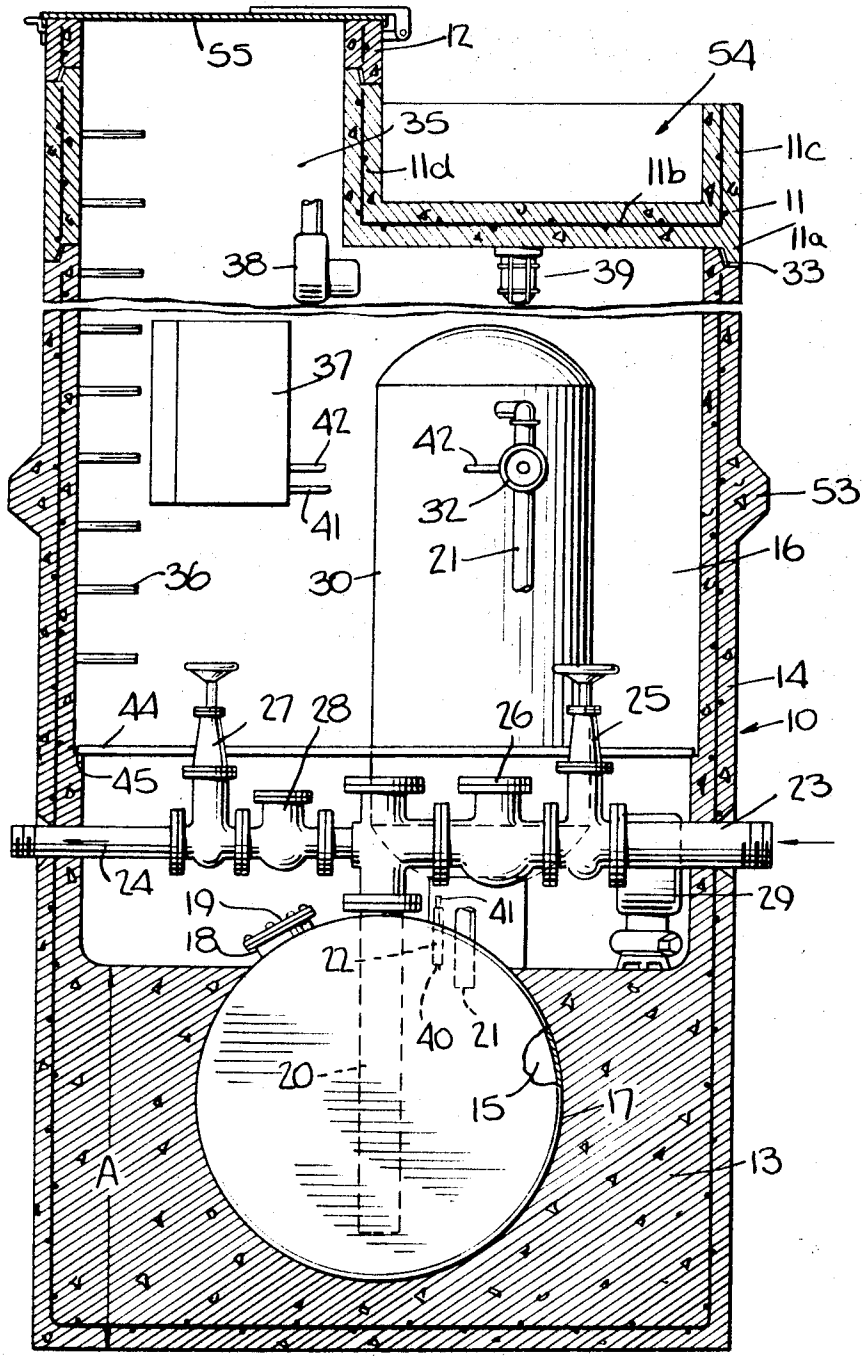


Fig. 1.

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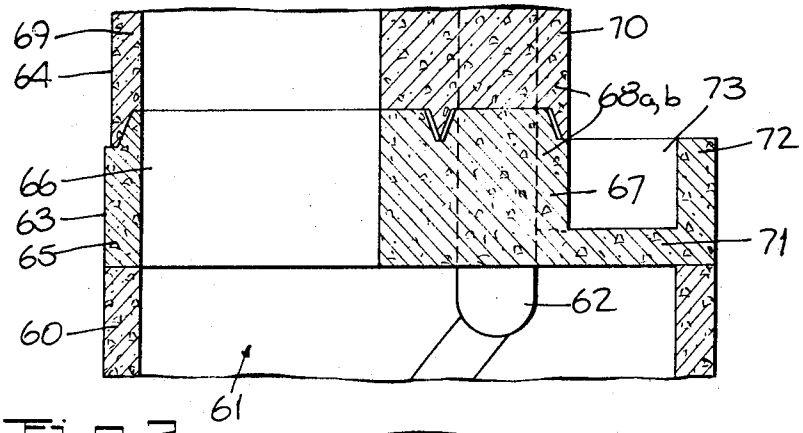


Fig. 2.

Fig. 3.

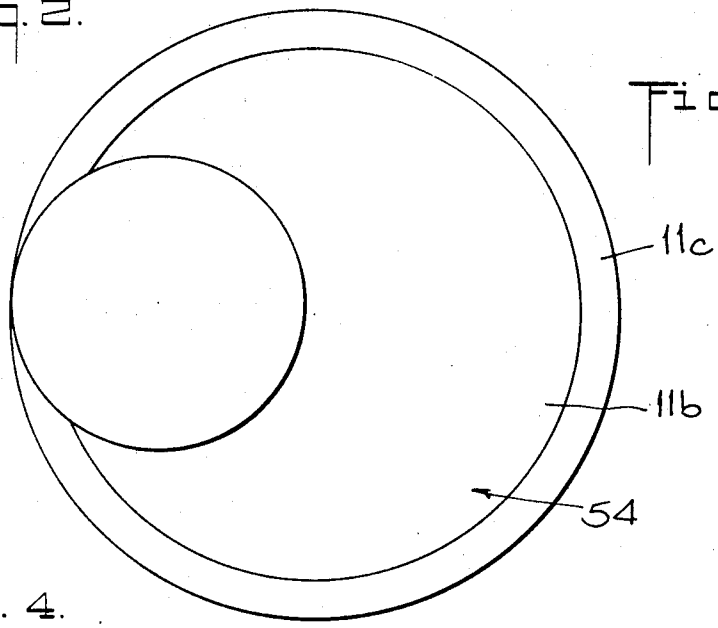
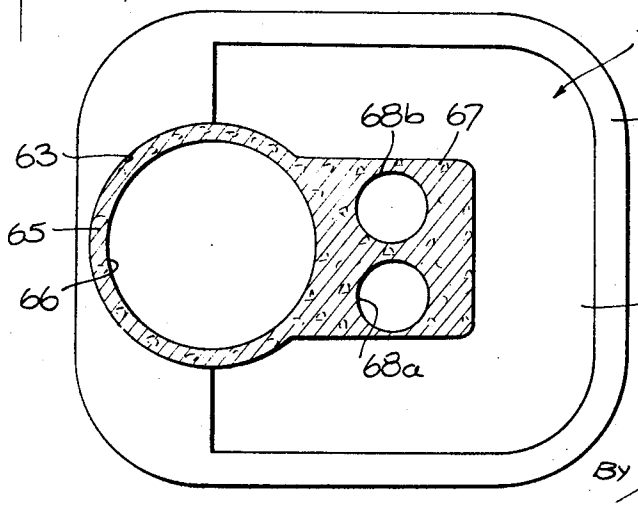


Fig. 4.



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CONCRETE PUMPING STATION WITH A BALLAST TROUGH

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Continuation-in-part of application Ser. No. 407,377, Oct. 29, 1964. This application Sept. 25, 1967, Ser. No. 670,157

3 Claims. (Cl. 103—87)

ABSTRACT OF THE DISCLOSURE

An underground pump station has a concrete casing for housing tanks, pipes, pumps and associated equipment for transference of fluids, and has a ballast trough for receiving ballast at the installation site to add weight to the pump station.

Related application

This is a continuation-in-part of my copending application Ser. No. 407,377 filed Oct. 29, 1964, and entitled "Concrete Pumping Station," now abandoned.

Background of invention

In systems for conveying fluids which are embedded in the ground, it is desirable to have the pumping stations at approximately the same level as the conveying system. This necessitates the embedment of the pumping system below ground. This places the station in adverse conditions where it is subjected to the corrosive action of soil and water.

Further, it is desirable to reduce the assembling of the system at the construction site to a minimum so as to avoid extensive time being spent in assembling apparatus underground where excavation is required and consequent complications are encountered greatly increasing the cost of installation, as well as increasing the time for completing the system. Thus the pumping stations are assembled at a factory and shipped to the installation site where a footing is provided in the ground and the station lowered into the excavation and the conduit and electrical connections completed.

Heretofore the pumping stations have been encased in steel tanks which meet the requirements of factory assembled installation but are subject to corrosion and deterioration over a period of time. Various efforts have been made to protect the tank against this corrosive action, but the results have been only partially successful. Further, the steel tanks in areas having a high water level are faced with a buoyancy problem which requires extensive anchorage systems to hold the tank in place. Such anchorage systems are contrary to the concept of a quick and simple installation, since it requires the pouring of concrete, embedment of anchoring means and the like. This increases the expense and installation time.

In addition to manufacturing the casing at a factory, it is desirable to keep the shipping weight of the pump station at a minimum. It is thus desirable to provide means for increasing the total weight of the pump station at the site to offset any buoyant effect of ground water. This is particularly true where fluid conveying systems are installed in swampy areas.

Summary of invention

An object of this invention is to provide a unitized pumping station that can be manufactured in a plant and shipped to the installation site, and simple means are provided to increase the weight of the pump station at the site. In the present invention troughlike means are provided on the exterior of the pump station which is

accessible from ground level for adding ballast after the pump station is lowered into the ground.

Brief description of the drawings

FIG. 1 is a vertical section view of the pumping station.

FIG. 2 is another fragmentary vertical sectional view of another pump station.

FIG. 3 is a fragmentary view of the embodiment of FIG. 1 with the pump station below ground level and the ballast trough filled with ballast.

FIG. 4 is a top view of the pump station shown in FIG. 1.

Detailed description

Referring to FIG. 1, the pumping station comprises a main section **10**, a top section **11** and a grating or cover section **12**. Each of the sections is made of a water-impervious reinforced concrete having a circular or cylindrical shape. The main section **10** has a base **13** and an outer cylindrical wall **14** extending upwardly from the base to form a chamber **16**. A spherical steel tank **17** is partially embedded in the base forming a chamber **15** for receiving and discharging fluids under pressure. The tank **17** has a manhole **18** rendering the chamber **15** accessible from the chamber **16**. The manhole **18** has a cover **19** to close and seal the manhole **18** when not in use. Also extending through the wall of the tank is an inlet and discharge pipe **20** for the fluids and an air inlet pipe **21** for delivering air under pressure to the chamber **15** for forcing fluids out through the pipe **20**.

A sensor **40** is housed in a pipe **22** extending through the wall of the tank. The sensor is located at the top of the tank to determine the level of the liquid when the chamber **15** is filled and actuates the discharge apparatus. The fluid inlet and discharge apparatus has in the cylindrical wall **14** an inlet pipe **23** and an outlet pipe **24** which may be on opposite sides of the wall **14**. The inlet **23** is connected to the pipe **20** through a mechanically operated valve **25** and check valve **26**. The outlet pipe **24** is connected to the pipe **20** through a manually operated valve **27** and a valve **28**. Mounted on the base **13** is a sump pump **29** for removing water that may collect in the chamber **16**, an air storage tank **30** and a centrifugal air compressor and motor **31** for supplying the storage tank **30** with compressed air. The pipe **21** is connected to the top of the air storage tank through an electrically operated valve **32**. When the liquid in the tank **17** reaches the sensor **40**, the valve **32** is actuated and air under pressure is forced into the tank through the pipe **21**.

The top section **11** has a flange **11***a* setting on top of the main section **10** with sealing means **33** therebetween. The section **11** is formed with a circular horizontal roof or deck **11***b* with a circular opening **35** to permit ingress and egress to the chamber **16**. A cylindrical wall portion **11***d* extends upwardly from around the opening for supporting the grating or cover section **12** and to form with a second upwardly extending cylindrical wall **11***c* a crescent shaped trough **54** above the deck portion **11***b*. Ballast, such as concrete, may be poured into the trough after the station is in place to overcome any buoyancy effect due to excessive ground water. The grating or cover section **12** is circular in shape and rests on and is in sealing relation with the cylindrical wall portion **11***d* of the top section. A cover **55** is hingedly mounted on the section. Further concrete sections may be mounted between the top section and grating section to extend to ground level or a manhole set thereon to close the top of the pumping station in a conventional manner. A ring **53** is at the upper end of the wall **14** for lifting the main section and providing support for bracing the section in a vertical position.

Rungs 36 are provided on the side of the sections 10, 11 and 12 to form a ladder for access to the chamber 16. A deck grating 44 rests on ledge 45 on the wall 14 to provide a floor above the conduits. An electrical control box 37 provides the electrical power connections to the electrical compressor and the blower 38 and the light 39. The sensor 40 in the pipe 22 is connected by cable 41 to the control box 37 and the electrical control valve 32 is connected by cable 42 to release the supply of air to the chamber 15 on the liquid reaching a given level.

The base 13 is cylindrical in shape and has a substantial depth A to embed and reinforce the steel tank 17 against the pulsating pressures of the periodic filling of the tank and discharge under pressure. An upper portion of the tank extends above the base and into the chamber 16. The manhole 18, pipes 20, 21 and 22 are mounted in this upper exposed portion for ready access in case of repair or replacement. The substantial thickness provides additional concrete and weight to the pump station to assist in overcoming the buoyancy due to ground water.

The concrete sections 10, 11 and 12 are sturdy and have sufficient weight so as not to be buoyant in the underground water. Thus no anchoring means are required. Further, the concrete is highly resistant to any corrosive action of the soil or water and thus does not require any extensive protection means. Further, the sections 10, 11 and 12 are not subjected to physical changes in size or to the vibrations of the mechanical equipment mounted on the base. Thus the structure is easy to install and once installed does not require any further attention, nor is it subjected to any corrosive or buoyant action. Any attention that is required of the mechanical operating equipment would be that which would normally occur in any other pumping station.

It is further seen that the main section also supports all of the main components of the pumping station. The main section 10 is manufactured at a plant under careful supervision and is shipped to the site and lowered in place. All that is required is the connection of the conduit system to the inlet 23 and outlet 24 and the lowering and sealing of the top section 11 and the grating or cover section 12. The auxiliary electrical connections to the control box 37 may be made.

In FIG. 2 a vertical fragmentary sectional view of another pump station is shown. The concrete wall 60 is part of a concrete section of the pump station forming a chamber 61 housing equipment of the pump station, including drive means for operating the intake and exhaust fans 62. The sections 63 and 64 sit on top of the wall 60. The section 63 has a concrete wall 65 forming the passage 66 for permitting ingress and egress to the chamber 61. A second concrete wall or extension 67 merging with the wall 65 defines air ducts 68*a*, *b* for conducting air to and discharging air from the fans 62 (FIGS. 2 and 4). Similarly, the section 64 has walls 69 and 70 to form the passage 66 and air ducts 68*a*, *b*. The section 63 also has a horizontal wall or roof 71 and a vertical enclosing wall 72 defining a ballast trough 73 with the walls 65 and 67. The pump station has a generally rectangular shape and the trough 73 has a generally U shape (FIG. 4).

The ballast troughs are open at the top and when the pump station is in place the troughs are below ground. A mixture of concrete and stone or concrete may be easily poured into the ballast trough after the pump station is lowered and assembled in the ground. The walls 11*c* and 72 retain the fluid concrete while it is solidifying. Since the walls are formed as part of the pump station, no forms or the like are required in the excavation, thus saving considerable time and cost of installation. The concrete walls 11*d* and 11*b*, 65 and 67 and 71 hold and isolate the fluid concrete from the equipment housed by the pump station. Thus added weight may be easily and conveniently provided at the installation site.

The invention is set forth in the appended claims.

I claim:

1. An underground pumping station comprising a concrete base portion having vertical concrete side wall means forming interior chamber means, pumping and auxiliary equipment in said interior chamber means and isolated from the exterior by said concrete base portion and said side wall means, a top portion made substantially solely of concrete mounted on said side wall means at the upper end thereof and covering said chamber means, said top portion having a horizontal concrete roof wall, a first wall extending vertically therefrom defining vertical passage means through said top portion and positioned peripherally within said roof wall, and a second concrete wall extending vertically from said roof wall and spaced from said first wall with the horizontal roof wall therebetween and forming with said first wall an exterior trough with an upwardly facing opening for passing to said trough vertically delivered ballast, said roof, first and second walls being liquidtight for exteriorly isolating ballast in said trough from said interior pumping and auxiliary equipment.

2. An underground pumping station as set forth in claim 1 wherein said top portion is separable from said vertical concrete side wall means.

3. An underground pumping station as set forth in claim 1 wherein said trough is formed peripherally around said first wall.

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