United States Patent [19]

Sloan

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[45] **Oct. 7, 1975**

[54] **DEWATERING PUMP APPARATUS**

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[52] **U.S. Cl.** **417/390;** 417/405; 417/440

[51] **Int. Cl.²** **F04B 9/08**

[58] **Field of Search** 417/40, 375, 390, 405

[56] **References Cited**

UNITED STATES PATENTS

2,593,729	4/1952	Coberly	417/390
2,927,174	3/1960	Walshin	417/40
2,942,552	6/1960	Wayt	417/390
3,123,007	3/1964	Orr	417/390
3,131,637	5/1964	Jennings	417/40
3,213,871	10/1965	Goering	417/40
3,398,694	8/1968	Lerch	417/375
3,809,505	5/1974	Dobson	417/440

Primary Examiner—William L. Freeh
Assistant Examiner—Gregory LaPointe
Attorney, Agent, or Firm—James E. Nilles

[57] **ABSTRACT**

Water pumping apparatus for pumping water from excavations or other holes in the ground and upwardly to a more or less remote discharge area. The apparatus finds particular utility for use, for example by contractors, utility companies, or the like, and includes a power source, preferably mobile or easily transportable, such as an internal combustion engine or an electric motor or other power sources. A pressure fluid pump forms part of a pressure fluid tank assembly and the pump is connected directly to the power source; the pump and controls are mounted on a mounting plate forming part of the tank and can be left attached to the power source while the rest of the tank is removed, thereby exposing the pump and controls for repair, inspection or replacement. A water pump assembly is located down in the water at the bottom of the hole or excavation so that the pump assembly needs no priming. The pump assembly including a housing in which the impeller, fluid motor, and the connecting drive shaft all are located and the drive shaft and its bearings sealed in a bath of pressurized oil to prevent water from leaking into the housing. The fluid pressure pump which is driven directly by the power source is connected by long flexible conduits to the motor of the pump assembly.

6 Claims, 16 Drawing Figures

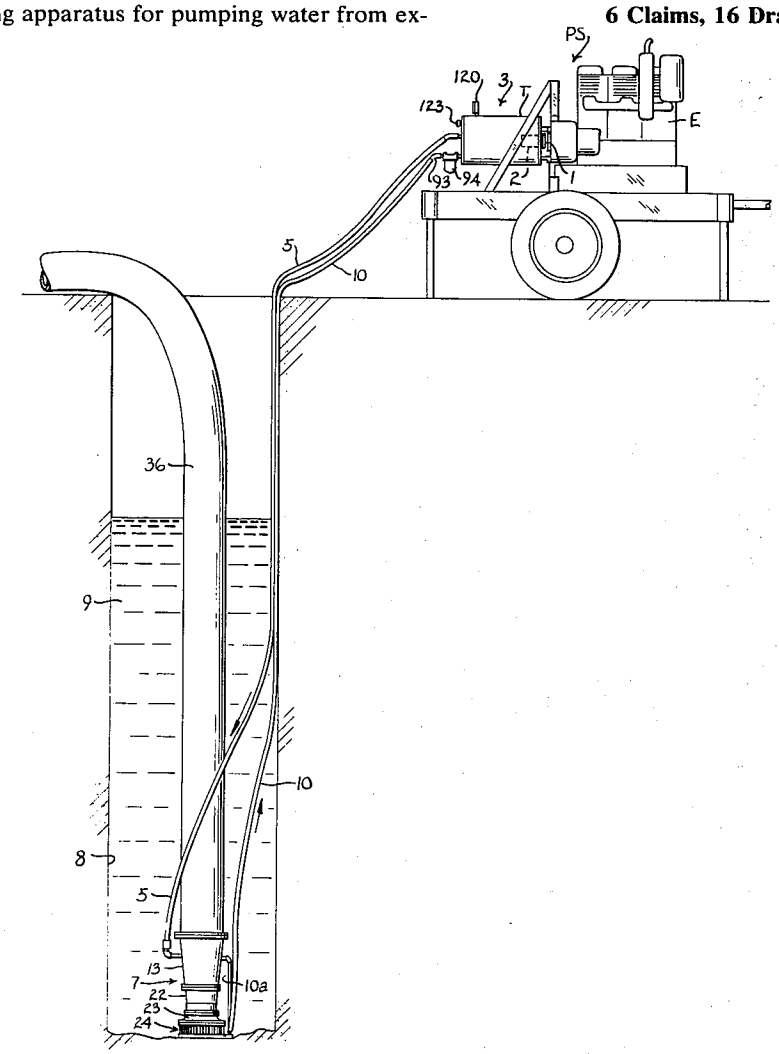


FIG. 1.

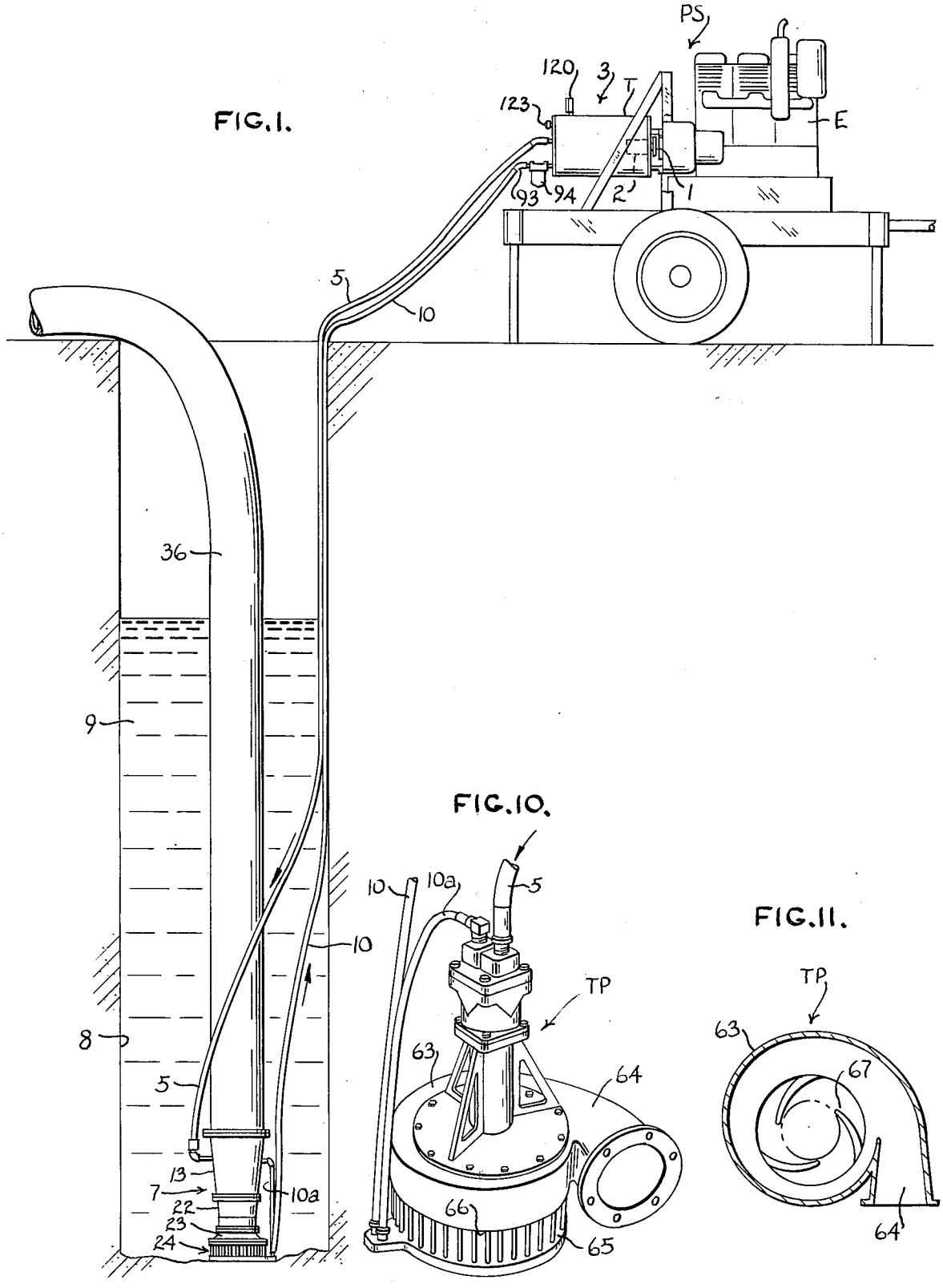


FIG. 10.

FIG. 11.

FIG.2.

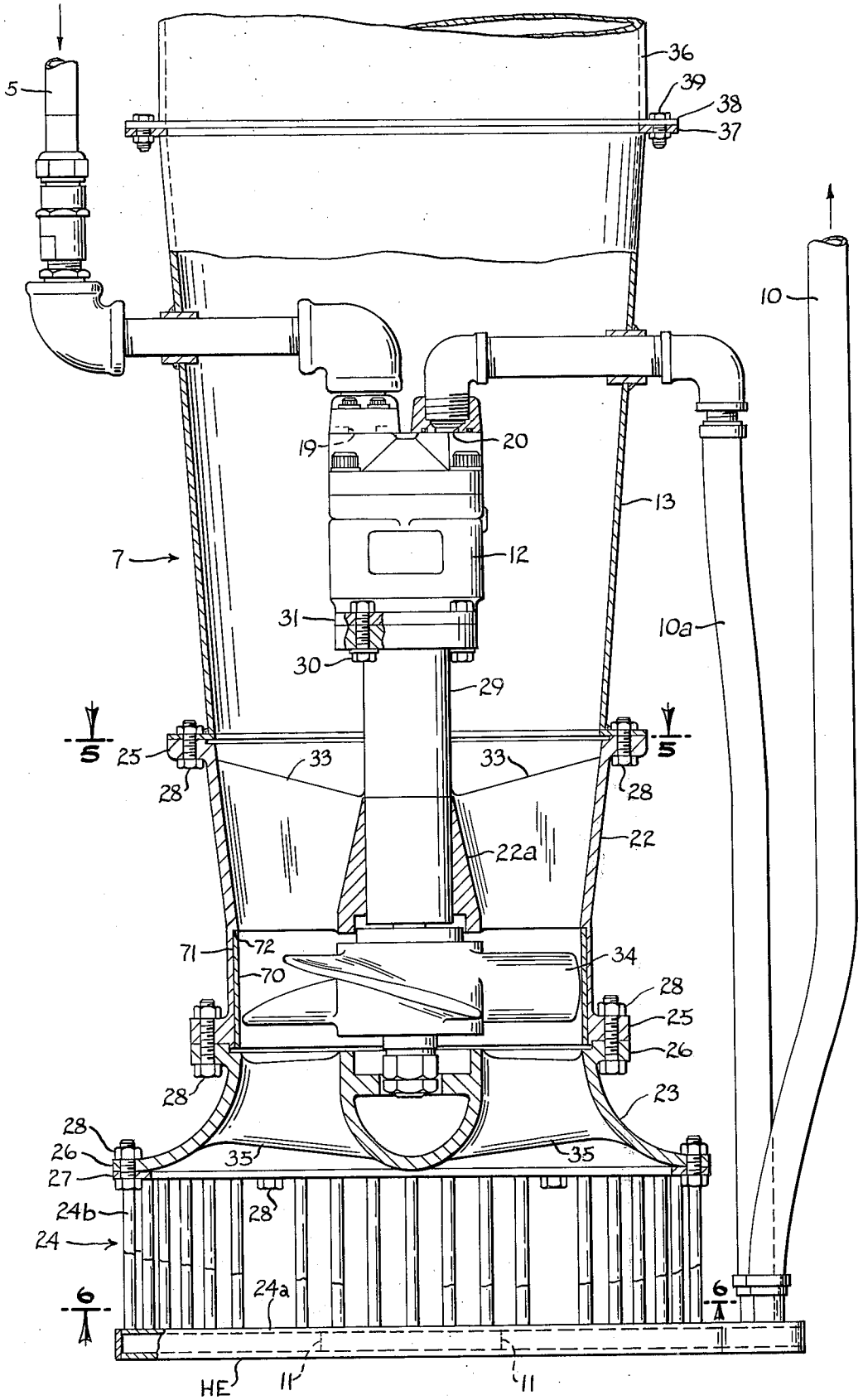

5
36
39
38
37
10
19
20
13
7
12
31
10a
30
29
5
25
33
33
5
28
28
22
22a
71
72
34
70
28
25
26
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23
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26
35
35
27
28
24b
24
6
24a
6
HE
11
11

FIG.4.

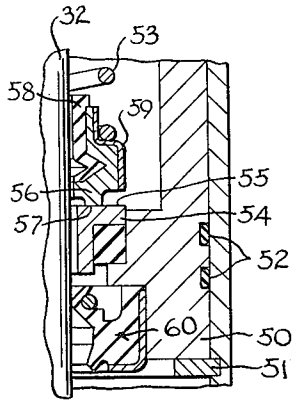

32
53
58
59
56
55
57
54
52
60
50
51

FIG.3.

12
31
30
40
41
42
43
32
29
33
33
46
44
45
48
57
52
60
22a
50
59
54
51
22
32
32a
72
71
70
34
32b
32c
35
35
23

FIG.5.

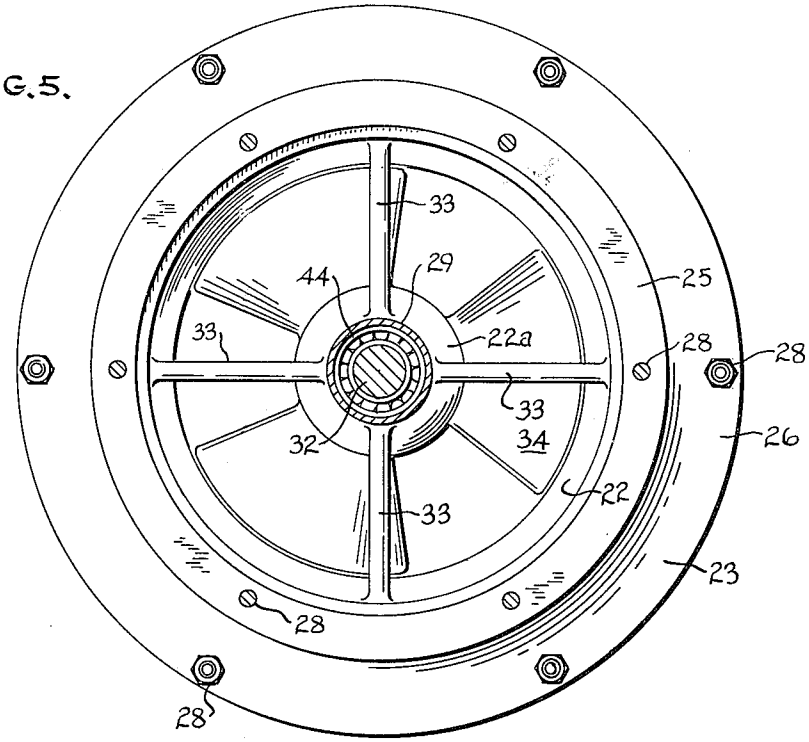
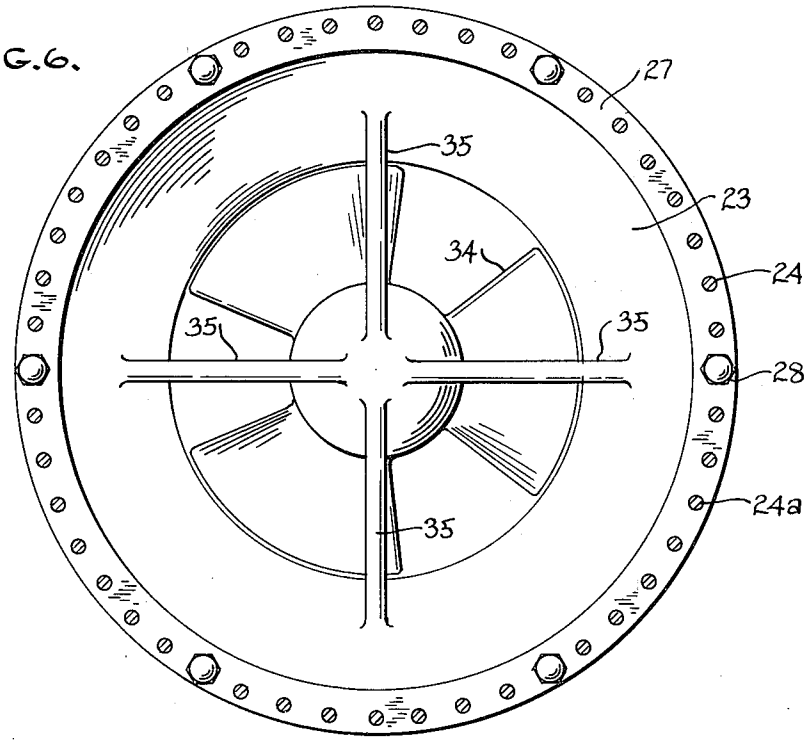

33
44
29
25
33
22a
28
28
33
34
26
32
33
22
23
28
28

FIG.6.


27
35
23
34
24
35
35
28
35
24a

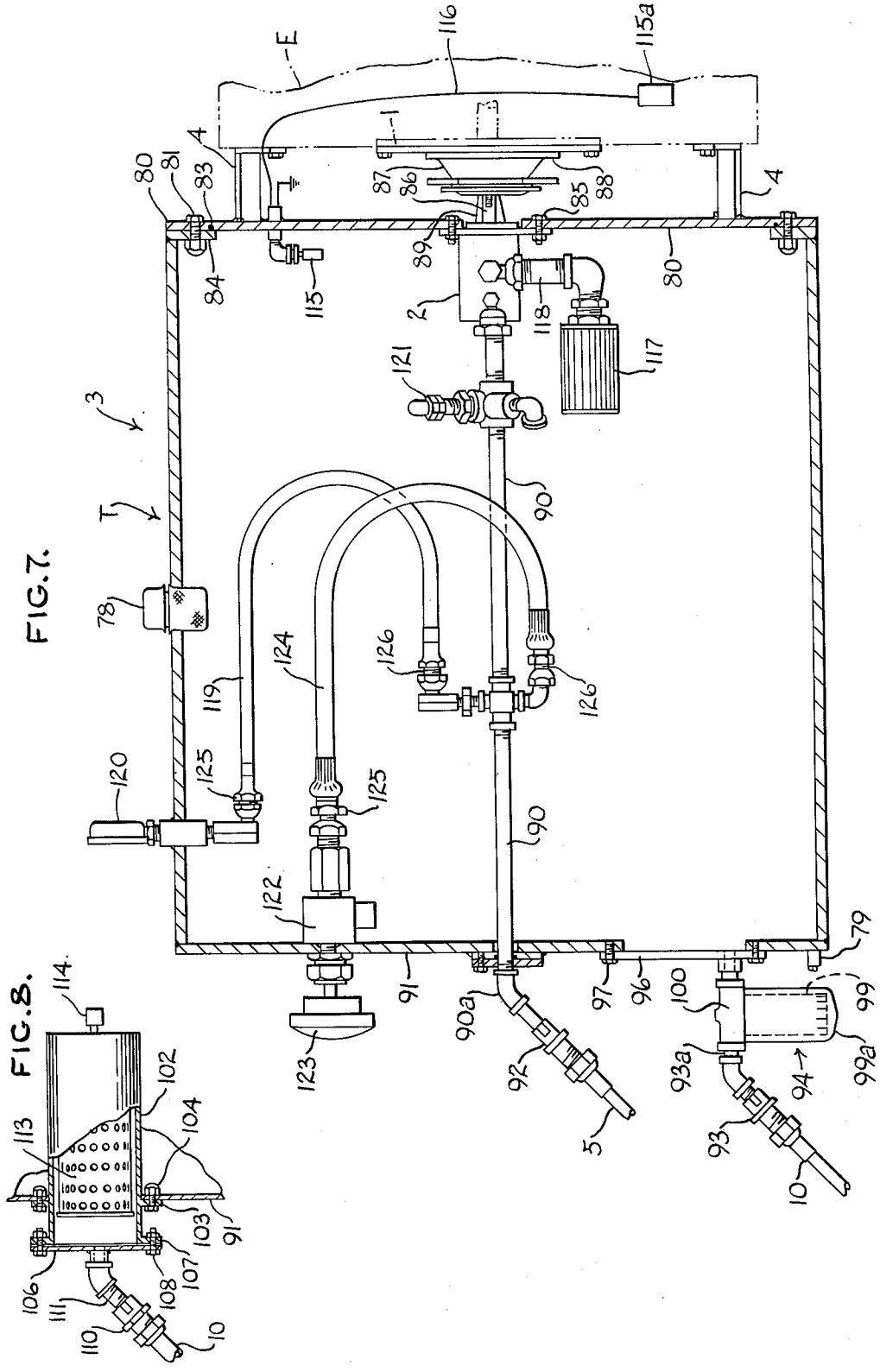

E
116
115a
1
87
86
85
88
4
80
81
83
84
89
115
2
118
117
121
3
T
90
78
119
124
126
125
120
122
123
91
90a
92
5
97
96
100
99
99a
93a
94
93
10
79

FIG. 7.

114
102
104
113
103
91
106
107
108
111
110
10

FIG. 8.

FIG. 9.

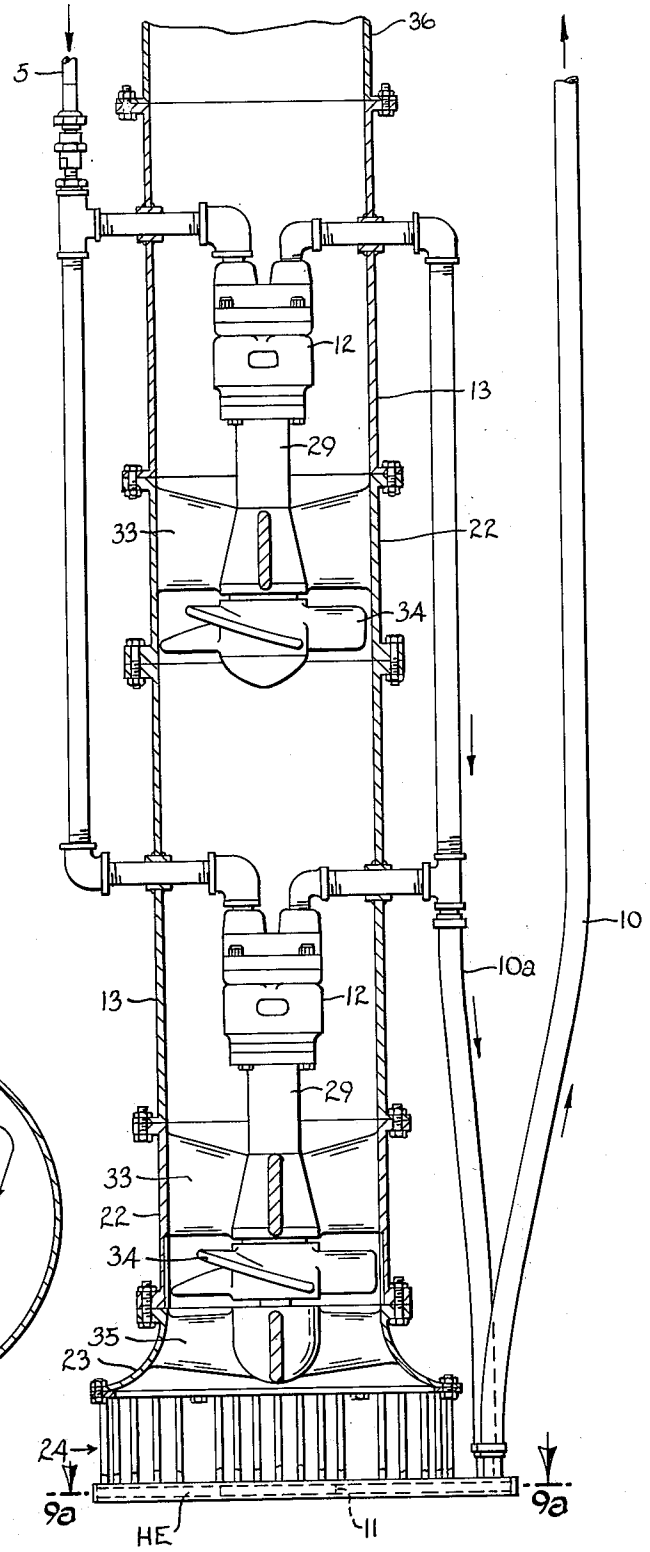

36
5
12
13
29
33
22
34
10
10a
13
12
29
33
22
34
35
23
24
9a
HE
11
9a

FIG. 9a.

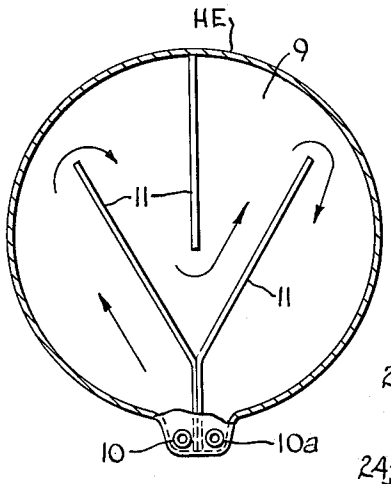

HE
9
11
11
10
10a

FIG. 12.

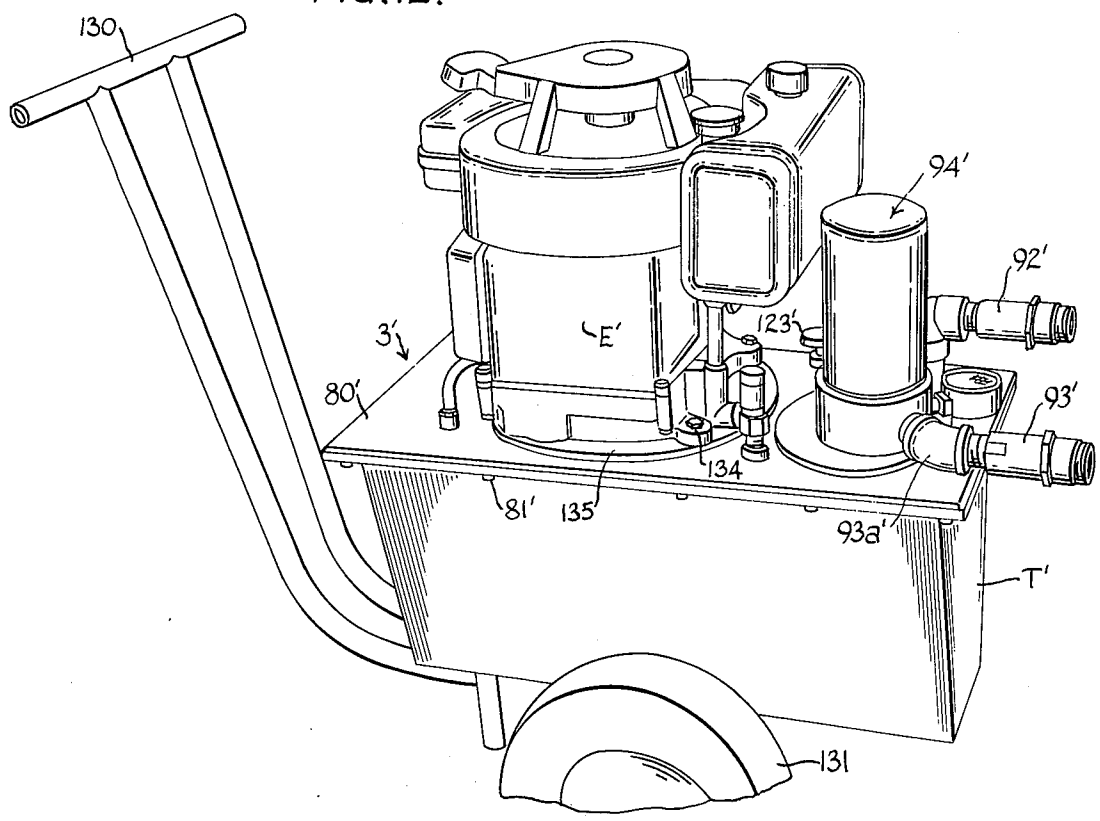
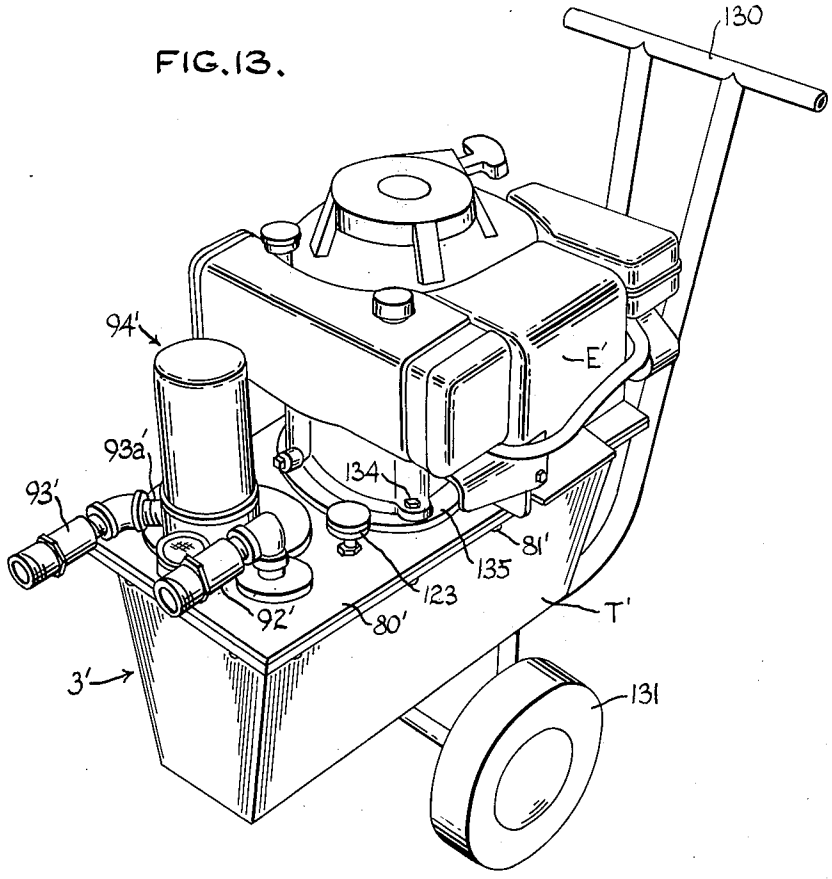

130
94'
92'
3'
E'
123'
80'
93'
134
81'
135
93a'
T'
131

FIG. 13.


130
94'
E'
93a'
134
93'
81'
135
123
92'
80'
T'
3'
131

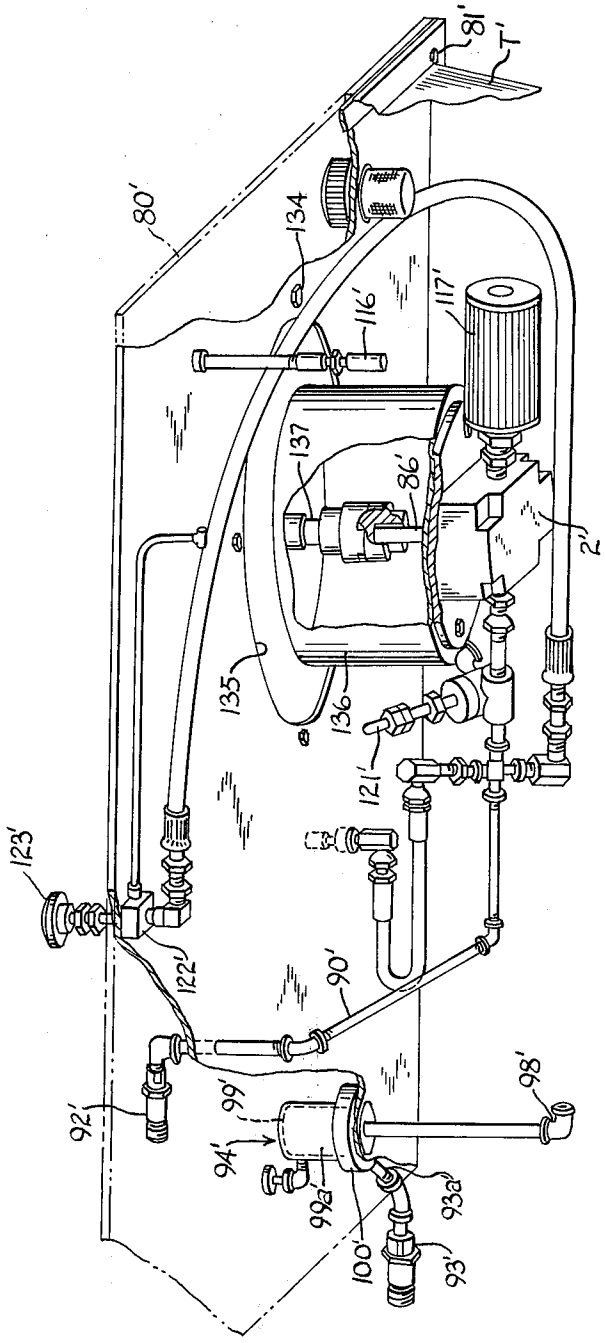

81'
T'
80'
134
116'
117'
137
86'
2'
135
136
121'
123'
122'
90'
98'
99'
92'
94'
99a
93a
100'
93'

FIG. 14.

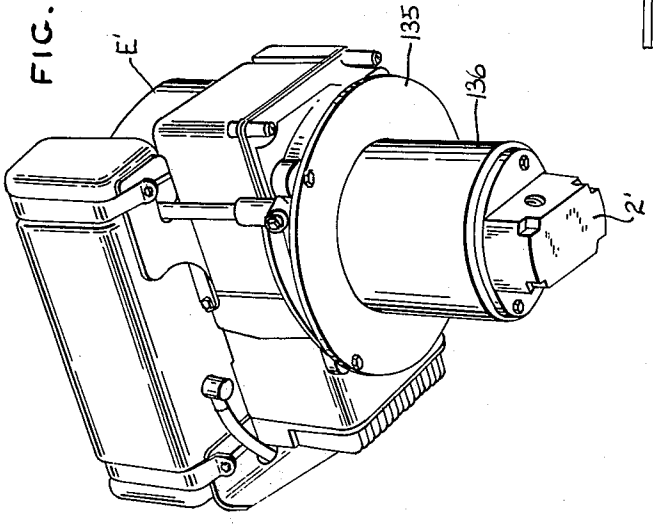

E'
135
136
2'

FIG. 15.

DEWATERING PUMP APPARATUS

BACKGROUND OF THE INVENTION

This invention pertains to dewatering pumping apparatus, for pumping water out of excavations, other holes in the ground, or emptying large tanks or the like.

In pumping apparatus of the general type to which the present invention pertains, several shortcomings have existed, some of which are difficulty in priming the pump assembly, difficulty in locating and mounting the motor and its connection to the impeller of the pump assembly, and in being unable to prevent water from leaking into and around the coupling between the impeller of the pump assembly and fluid motor to which the impeller is connected.

Other shortcomings include the excessive time and labor necessary to dismantle the pressure fluid pump and its associated controls, and the water pump assembly itself including the impeller, in order to inspect, repair or replace various parts as required.

Furthermore, these prior art devices did not provide sufficient flexibility of interchanging various sizes or types of pump assemblies and/or power units so as to provide maximum efficiency of the entire apparatus under all conditions of operation. For example, the pumping conditions vary from job site to job site and in fact may vary considerably at any one job site. That is to say, different conditions of the material to be pumped are frequently encountered, for example, sometimes a straight dewatering operation is necessary, particularly during the first phase of the evacuation task. At other times a certain amount of sand or fine material must be pumped together with the water and in fact sometimes this sand or other material constitutes the major portion of material to be pumped. Under other conditions, it may be necessary to pump other trash or rocks, for example up to a considerable diameter, say for example 4 inches in diameter. Furthermore, this material must be pumped to different heights depending on the depth of the particular hole being dewatered or pumped out. All of these varying conditions, in order for the apparatus to function efficiently, and under certain conditions to enable the apparatus to do its job at all, require the use of the most efficient type of pump and type of power source or combinations thereof for any given job.

SUMMARY OF THE INVENTION

The present invention provides pumping apparatus having a power source to which is attached a fluid pressure tank assembly including a fluid pressure pump which is directly attached to the power source. The assembly also includes various controls mounted with the pump and directly to a mounting plate and which then form a single unit; the tank itself can be removed from the unit while the unit and particularly the pump is still attached to the power source.

Another aspect of the invention relates to the pumping assembly which is located down in the hole. One aspect of the pump assembly includes a housing in which the fluid motor is located to drive the pump impeller in the housing. Bearing means are provided in a bearing housing between the motor and the impeller and which housing can be pressurized by fluid pressure from the motor; the housing being sealed in such a manner that water is prevented from entering the bearing housing and particularly the bearings due to pressurization of the pressure fluid in the bearing housing. The motor is thus able to efficiently drive the impeller with no particular drag being imposed on it. Another aspect of the pump assembly relates to a removable liner within the housing and which is located around the periphery of the impeller, thereby enabling the removable liner to be quickly inspected or replaced due to the considerable wear to which that internal area of the pump assembly is subjected.

These and other objects and advantages of the present invention will appear hereinafter as this disclosure progresses, reference being had to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of a dewatering pumping apparatus made in accordance with the present invention and certain parts being shown as broken away or removed for the sake of clarity;

FIG. 2 is an enlarged view, partially in section, and with certain parts broken away of a portion of the apparatus shown in FIG. 1, namely the pump assembly.

FIG. 3 is a still further enlarged and fragmentary view showing a portion of the pumping assembly shown in FIG. 2;

FIG. 4 is a fragmentary and enlarged view of the shaft sealing arrangement shown in FIG. 3;

FIG. 5 is a sectional view taken generally along the line 5—5 in FIG. 2;

FIG. 6 is a sectional view taken generally along the line 6—6 in FIG. 2;

FIG. 7 is a side elevational view in section of the tank assembly shown in FIG. 1; but on an enlarged scale;

FIG. 8 is a modification of the filter arrangement shown in FIG. 7, the view being partially in section;

FIG. 9 is an elevational, sectional view of a modification of the pump assembly shown in FIG. 2 and illustrating a two stage pump assembly, the view being on a smaller scle than FIG. 2;

FIG. 9*a* is a sectional veiw taken along the linc 9A—9A in FIG. 9;

FIG. 10 is a perspective view of a different type of pump than that shown in FIG. 1;

FIG. 11 is a sectional view through the pump shown in FIG. 10;

FIGS. 12 to 15 are views of a modified form of power source and tank assembly from that shown in FIGS. 1 and 7.

FIG. 12 is a perspective view of a small, manually portable power source and tank assembly in accordance with the present invention;

FIG. 13 is another perspective view of the pump apparatus shown in FIG. 12, but taken generally from the other side of the device;

FIG. 14 is a perspective view of the mounting plate and the power plant and other components thereon, certain parts shown as broken away; the view being taken generally from the underside of the plate; and

FIG. 15 is a perspective view of the power plant of FIGS. 12 and 13 but the view being taken from underneath the engine and on an enlarged scale.

DESCRIPTION OF A PREFERRED EMBODIMENT

General Organization

FIGS. 1–11

The general arrangement of the overall pumping apparatus includes a mobile power source PS comprising,

for example, an internal combustion engine E, having a conventional flywheel 1 to which a positive displacement, pressure fluid pump 2 is attached for being driven by the engine. The power source PS may be one of a variety of different types of sizes, depending on the power requirements, sizes or types of the pump assembly required for the conditions encountered. The power source may be a four or six cylinder, internal combustion engine for example, is highly mobile, and is located up at normal ground level.

The fluid pump 2 is located together with other elements in a novel tank assembly 3, mounted by stand-off brackets 4 on the mobile power source, and which tank assembly contains various other components to be later described in detail. The fluid pump 2 directs pressurized fluid through a long flexible conduit 5 to a water pump assembly 7 which is located in the bottom of an excavation 8 and more precisely, directly in the water to be pumped from the excavation. One of the major problems in dewatering pumping work is priming and maintaining a prime on the water pump. With the pump assembly 7 located directly down in the water to be pumped, this problem is eliminated. Another conduit 10 returns the pressure fluid back up to the tank assembly 3 on the power source PS.

Water Pump Assembly

The water pump assembly includes a positive displacement pressurized fluid motor 12 which is located in a tubular discharge housing 13 of the pump assembly 7. A heat exchanger HE is secured on the lower end of the assembly. The pressure fluid conduit 5 directs pressure fluid from the fluid pump 2 to the fluid motor 12. After passing through the motor, the fluid is directed via conduit 10*a* to the heat exchanger.

The heat exchanger, shown clearly in FIGS. 2, 9, 9*a* and 10 is fabricated from steel plates and is generally hollow so as to define a chamber 9 (FIG. 2) and in which baffle plates 11 are located (FIG. 9*a*) so that the pressure fluid is directed into the chamber 9 via conduit 10*a* and is caused to circulate thoroughly in the chamber to effect cooling. The heat exchanger is located in the coolest part of the water being pumped and is therefore very effective in cooling the pressure fluid after it has passed through the fluid motor 12. The fluid then is returned via conduit 10 to the fluid pump.

In addition to the discharge housing 13, the pump assembly 7 also includes a bearing and stator housing 22 which houses 33, a concentric pump shaft and bearing housing 29, and an impeller 34, all to be referred to. The assembly also includes a stator housing 23 containing sators 35 and located generally near the intake of the pump assembly 7, and an endmost water intake section 24. The intake section shown has an end closure plate 24*a* (FIG. 2) and an open grill 24*b* around its periphery for the entry of material such as water, sand, sludge, etc. to be pumped. Annular flanges 25, 26 and 27 are provided around the peripheries of the housings 22, 23 and section 24, respectively, and through which flanges the bolt means 28 extend to detachably hold the housings and intake section together. As will later appear, this flange construction and bolt means between the housings and intake section, permits various housings to be assembled together, including different type intake sections to be utilized depending on the material to be pumped, that is to say, depending on whether "trash," such as water and sand and/or rocks, or other material is to be pumped.

As previously mentioned, the pump assembly 7 includes a pump shaft and bearing housing 29 mounted concentrically within the bearing and stator housing 22. This housing 29 extends through a central stator hub 22*a* (FIGS. 2 and 3) of the stators 33 and is connected by bolt means 30 to the flange 31 of the motor 12. Within the bearing housing 29 is journalled a pump shaft 32 connected at one end to and driven by the fluid motor 12, as will appear, and a pump impeller 34 is fixed on the threaded end of the pump shaft 32 by shoulder 32*a*, key 32*b* and by nut means 32*c* and is rotationally driven by the fluid motor 12.

A plurality of circumferentially spaced stators 33 are located within the bearing and stator housing 22 and a plurality of circumferentially spaced stators 35 are fixed within the stator housing 23. Stators 33 and 35 act to straighten out the flow of water through the pump assembly.

The general arrangement provides a mobile power source PS which can be of various sizes and which furnishes power to drive the pressure fluid pump 2. The water pump assembly 7 is located down in the bottom of the excavation, vessel or other area to be pumped out, and the pressure fluid pump 2 is connected to the fluid motor 12 of the pump assembly 7 by the long flexible hoses such as conduits 5 and 10. The water is pumped through the discharge housing 13 of the pump assembly and into a long flexible discharge pipe 36. The pipe 36 is quickly attachable to the pump assembly 7 by means of the flanges 37 and 38 (FIG. 2) of the discharge housing 13 and discharge pipe 36, respectively, which flanges are held together by the bolt means 39. The discharge pipe 36 extends upwardly out of the area to be dewatered and to a remote location if necessary, for discharge of the water, trash, sludge, rocks, or the like.

The fluid motor 12, which is driven by the pressure fluid pump 2, is of itself of conventional character and is a positive displacement, gear type motor, for example, in which intermeshing gears are rotatably driven by pressure fluid and act to drive an output 40 (FIG. 3) of the motor. These motors may be of the type manufactured by Dennison Mfg. Co., Framingham, Mass. or by Borg-Warner Corporation of Chicago, Illinois, and an example of which is shown in U.S. Pat. No. 3,348,492 issued Oct. 24, 1967 to G. D. Olsen et at.

The motor shaft 40 is connected to the pump shaft 32 as shown in FIG. 3 by means of a collar 41 and key 42. The end 43 of the pump shaft is piloted on and is supported by the motor shaft 40, thereby utilizing the internal bearing (not shown) of the fluid motor 12 for supporting one end of the pump shaft 32.

The pump shaft 32 is also supported within the bearing housing 29 by means of a pair of anti-friction thrust bearings 44 and 45 (FIG. 3). The outer race of thrust bearing assembly 44 is held from axial movement in one direction by a shoulder 46 formed in the inner surface of the bearing housing 29. The bearing assemblies 44 and 45 act to absorb the axial thrust which is imposed on the shaft when the bronze impeller 34 is pumping water. A third anti-friction bearing assembly 48 is located adjacent and abuts tightly against bearing assembly 45 and is of the radial bearing type, that is to say, its primary purpose is to absorb the radial thrust of the pump shaft 32. The three bearing assemblies 44, 45

and 48 are held captive against shoulder 46 by a tubular seal holder 50 snugly located within the bearing housing 29 and a snap ring 51, at the lower end of the seal holder, acts to hold the seal holder axially in place.

Suitable flexible O-ring seals 52 are located in the seal holder periphery and seal against the inner surface of the housing 29.

The seal holder 50 also acts to support a mechanical seal which includes ring 54 (FIGS. 3 and 4) having a ground flat radial surface 55 against which a nose piece 56 is urged by the spring 53. The nose piece 56 also has a ground flat surface 57 which bears against the surface 55 of the seal ring 54, thereby providing a mechanical, rotary sliding seal between the seal holder 50 and shaft 32. The nose piece 56 is preferably formed of tungsten carbide and is cemented to a flexible boot 58. The boot is urged against the shaft 32 by a metal ring 59.

A flexible seal 60 is press fit in the seal holder 50 and rubber lips engage shaft 32 to primarily prevent the entry of dirt.

The seal holder 50 and its mechanical seal and dirt seal can be inserted or removed as a unit for inspection, replacement, or repair.

Thus three different types of seals are provided between the shaft 32 and the bearing housing 29, namely the anit-friction bearing seals 44, 45 and 48, the mechanical fluid seal 55, 56, and the third flexible seal 60.

The arrangement is such that the interior of the bearing housing 29 is flooded with pressurized oil from the fluid motor 12, and this pressure is maintained in the bearing areas and within the bearing housing and prevents water from entering these areas. In other words, water is prevented from entering the bearings and the bearing housing, by pressurizing the interior of the housing 29 with oil at a greater pressure than that of the water pressure of the water being pumped. Furthermore, and importantly, with this pressurized oil feature, the pump assembly 7 can run dry, that is to say, it can regardless of whether or not water is in the hole being excavated.

Thus, a water pump is provided which is sealed against the outside water by purposely providing pressurized fluid, such as oil from the pressurized motor 12, in the interior of the bearing housing 29. The pressure of the oil within housing 29 need only be slightly greater than the pressure of the water, and slight leakage of oil out of the housing is permissible.

Generally, with the present pump apparatus, water pump assemblies 7 of different styles and of different sizes may be interchangably used as conditions require.

The pump shown in FIGS. 1–6, has an impeller 34 which is of the axial flow type and known as a dewatering pump. This particular pump assembly finds particular utility when pumping principally water with no sand and in pumping under low pressure head conditions, say a lift of 15 to 17 feet, and for high volume discharge.

The pump assembly arrangement shown in FIG. 9 utilizes two pump assemblies of the type shown in FIG. 2, that is to say it is a two-stage pump assembly utilizing two sets of impellers and driving motors. The previously mentioned flanges thus not only permit the various pump assembly housings to be separated from one another for inspection, repair or replacement of the various parts, but also permit the impeller and its associated fluid motor to be assembled in series, that is in multiple stages as shown in FIG. 9. Both motors 12 in FIG. 9 are fed by the same conduit 5, and a common return line 10 also services both fluid motors. The torque may be the same on both motors 12 and with this arrangement there is no mechanical linkage to adjust or wear of the propellers and instead the motors inherently speed up when their propellers wear. Thus the pump assembly has internal hydraulic balancing.

Furthermore, the second stage pump, that is the pump assembly located downstream from the inlet can be made to run somewhat faster than the first pump assembly, the first pump assembly acting to "feed" the second pump assembly.

The two pumps 34 are driven in counter rotating directions and a stator is not required ahead of the second pump. The arrangement provides less drag, higher efficiency and less weight of the assembly.

Other types of pump assemblies may be utilized with the present invention, such as a "trash" pump TP (FIGS. 10 and 11) which is another centrifugal pump of the single-suction volute type and having a volute shaped casing 63 and tangential discharge end 64. An intake section 65 is bolted to the inlet side 66 of the casing and communicates with the housing inlet 67 (FIG. 10). This trash pump, known as a trash head, is designed for moderate pressure head work and for handling water with sand, sludge or solids up to 4 inches in diameter, for example.

The present invention provides a pump assembly that is easily taken apart for service, repair or replacement of parts and which can be assembled and put into operation. Furthermore, these pumps can be readily interchanged with one another to provide for any type of pump for any job condition.

In pump assemblies of this character, one principal area of wear in the pump is in the interior of the pump housing adjacent the tips of the impeller and this area is subjected to particularly abrasive action, galling or other wear. The pump assemblies of the present invention are provided with a cylindrical steel sleeve or liner 70 (FIGS. 2 and 3) which can be axially press fit into the stator housing 22. A counterbore 71 may be formed in the housing, forming a shoulder 72 in the housing, and one end of the liner abuts against the shoulder 72. This cylinder wear sleeve or liner 70 is then held captive in the counterbore and in precise relationship with the tips of the impeller, when the bearing and stator housing 23 is bolted by its flange 26, to the lower flange 25 of the stator housing 22. To remove the liner for inspection or repair, it is only necessary to remove the stator housing 23 to gain access to the liner 70.

Tank Assembly

The tank assembly 3 (FIGS. 1 and 7) which includes the fluid pressure pump 2, provides a modular package that includes various controls, the tank assembly having stand-off brackets 4 so it can be readily attached to and detached from the power source engine E that drives the fluid pump. As will appear, the arrangement is such that the pump and other components are mounted on a pump mounting plate 80 which in turn acts as one end of a fluid storage tank T, a tank filler cap 78 is provided for filling the tank with fluid such as oil, and a tank drain plug 70 is also provided for draining the tank. The pump and the other components mounted on the mounting plate can be readily separated as a unit from the rest of the tank for service, replacement of parts and other maintenance procedures.

This permits the assembly to be easily worked on in the field, as well as easily assembled in production.

More specifically, the tank assembly 3 as shown in detail in FIG. 7, includes a pump mounting plate 80 which is secured by bolt means 81 to the end ring 84 at one end of a cylindrical tank T. Bolt means 81 includes a bolt 81*a*, welded by its head to the inside of tank T and also includes a removable nut 81*b*. An O-ring seal 83 is interposed between the mounting plate 80 and the end ring 84 of the tank. The fluid pump 2 is mounted by bolts 85 which extend through its flange end through the mounting plate 80 so as to rigidly mount the pump 2 on the plate. The pump shaft 86 extends through the plate for being drivingly connected to the flywheel 1 of the engine E. A coupling 87 and clamp assembly 88, together with a tapered lock bushing 89, suitably connect the pump shaft 86 to the engine flywheel 1.

The pressurized fluid pump discharge conduit 90 extends from the discharge side of the pump and outwardly of the tank through end wall 91 and is connected by means of the conventional and quick detachably hydraulic coupling 92 to the flexible conduit 5 previously mentioned. The pressurized fluid is returned from the water pump assembly 7 via conduit 10 through a conventional, quick detachable hydraulic coupling 93, conduit means 93*a*, then through a "spin on" filter 94 of the conventional one-way flow type which is mounted by return filter mounting plate 96 detachably mounted by bolt means 97 on the end wall 91 of the tank T. The return fluid such as oil is then simply dumped into the tank T. The filter 99 located within and forming part of the outer casing 99*a* can be readily replaced from the outside of the tank assembly by simply unscrewing the casing 99*a* and its integral filter 99 from manifold 100.

As shown in FIG. 8, an alternative form of quickly replaceable filter may be provided for the tank assembly and this includes a filter container 102 which is secured by its flange 103 by bolt means 104 to the end wall 91 of the tank T. An end plate 106 is secured to the outermost flange 107 of the container 102 by means of bolts 108 and the quick disconnect, hydraulic coupling 110 is connected directly to a conduit 111 fixed to the plate 106. In this manner, is is only necessary to remove the bolts 108, thus permitting the plate to be removed from the end of the container 102 and consequently permitting withdrawal of the filter cartridge 113 for cleaning or replacement. A one-way valve 114 is provided and through which the fluid is returned from conduit 10 to the interior of the tank T.

The level of the fluid in the tank T is regulated by a normally open single pole switch 115 which is also mounted on the pump mounting plate 80. Electrical wire 116 leads from the safety float level switch 115, through the pump mounting plate 80, and to a conventional fuel valve 115*a* on the engine. Thus, when the hydraulic oil in the tank drops too low, valve 115*a* closes, shutting off the engine and preventing pump damage.

The pump 2 sucks the fluid from inside the tank T, via a filter 117 which is attached by suitable conduit means 118 to the inlet side of the pump 2.

Also connected to the discharge side of the pressure fluid pump 2 by means of the flexible hose 119 is a high pressure gauge 120 readable from the outside of the tank. A pressure relief valve 121 is also located in the discharge conduit means 90 of the pump. In addition, a control valve 122 having an external manual control 123 is connected by conduit means 124 to the discharge conduit means 90 of the pump. This control valve 122 determines the amount of fluid flow from the pump and consequently the speed of the fluid motor 12 in the pump assembly 7. As indicated and shown, these various components have quick detachable threaded connections 125 and 126 to facilitate removal of the various components.

To remove the tank T from its mounting plate 80, the tank would be drained, the coupling 92 would be detached, the elbow 90*a* would be unscrewed, the bolt means 81 removed and the tank then pulled from the mounting plate. The quick connect connections 125 then are detached.

With the above arrangement, the pump, gauges, controls, filter and safety float level switch are all mounted together as a unit with the pump mounting plate 80, and this facilitates the production of the assembly because the majority of the work is done on the unit and the latter can then later simply be set in the tank and secured therein. Furthermore, all of the components and their mounting plate 80 can be left attached to the flywheel 1 of the engine E while the tank T is removed therefrom for completely exposing the components for repair, replacement, and cleaning.

FIGS. 12–15

Another modification of a power source and its tank assembly is shown in FIGS. 12 to 15 and this modification would be used for much smaller jobs, that is to say, where the rate of pumping is considerably less and also the head against which pumping is to be done is also considerably less than the previously described modifications.

As shown in FIGS. 12 and 13, the mobile power source is adapted to be pushed by an operator through the handle 130 which is attached to the tank T'. Rotatably mounted on tank T' are the transport wheels 131.

In describing this modification of the invention, reference numerals similar to the description of the FIGS. 1–7 arrangement will be used, except that a prime mark (') will be used along with the similar reference numerals.

The tank assembly 3' includes the previously mentioned tank T' to the top of which is detachably secured by bolts 81' the mounting plate 80'. The mounting plate 80' is secured to a small internal combustion engine E' by bolt means 134 which extend through the mounting plate 80' and through a mounting ring 135 to which the engine E' is fixed. The pressure fluid pump 2' is secured, as shown in FIG. 15, to the underside of the plate 80' by casing 136 which encloses the drive shaft 137 of the engine E' and to which is directly attached the drive shaft 86' of the fluid pump 2'. In this embodiment also, the mounting plate 80' has directly connected to it a float level switch 116', a control valve 122' and a control knob 123' for regulating the discharge of the pump 2'. As in the previously described embodiment, this arrangement also has a high pressure discharge conduit means 90' which is connected externally of the tank to the quick disconnect hydraulic coupling 92'. An externally mounted spin on filter 94' can be quickly removed, from the outside of the tank, by unscrewing the outer container 99*a*' along with its integral filter interior 99'. A return fluid quick disconnect hydraulic coupling 93' is connected via the conduit

means 93a' to the interior of the spin on filter 94' thus permitting the return fluid to flow through the filter and a suitable check valve 98' and be dumped in the interior of the tank. In addition, the pressure relief valve 121' is also located in the high pressure discharge line 90' of the pump 2'.

Oil within the tank is sucked up by pump 2' through a filter 117' which is attached directly to the pump 2'.

When the unit is to be disassembled for inspection, replacement of parts, or repair, it is only necessary to remove the bolt means 81' which fasten the upper mounting plate 80' to the tank T' and all of the components are removable with the mounting plate for easy and complete accessibility.

Recapitulation

The dewatering pumping apparatus provided by the present invention can utilize various types of water pumps that are located directly down in the water and which therefore eliminate any priming problems. These various type pumps can be readily interchanged depending on the need for one type of pumping apparatus or the other, and all of the pumps can be quickly connected to the power source. Furthermore, various sizes or types of power sources can be readily interchanged, depending upon the job requirements and the type of pump being utilized. The power assembly includes a pressure fluid pump which is directly connected to the power source and is enclosed in a replacable package in the form of a tank assembly. The tank assembly can be readily disassembled, that is to say, the tank itself can be readily removed from the pump and its mounting plate which also includes other controls. This construction not only facilitates production of the tank assembly, but permits easy and ready access to the various parts of maintenance, repair or replacement.

The bearing assembly for one form of water pump and which assembly is connected between the fluid pressure motor and the impeler, provides a pressurized area within the sealing arrangement of the anit-friction bearing assemblies and which pressurized area keeps the water from entering the bearing area. The bearing assemblies provide good radial and axial thrust, support, and also provides a rotary sliding seal arrangement between the pressurized area of the bearings and the water being pumped.

The replacable sleeve liner located in a precise relationship to the impeller is easily removed for inspection, replacement or repair.

With the pump assembly as shown, various intake sections can be readily interchanged depending on the material being pumped, for example. Furthermore, various stages of stators can be assembled together for most efficient operation under certain circumstances.

I claim:

1. Dewatering pumping apparatus comprising, a mobile internal combustion engine, a fluid tank assembly including a pressure fluid pump connected to and driven by said engine, said tank assembly including an enclosed fluid storage tank and a mounting plate for said tank, said mounting plate having means for connection to said engine, whereby said tank may be removed from said mounting plate, pump control means in said tank and operatively connected with said pump for controlling the fluid discharge thereof, and float level regulating means in said tank and operatively connected with said power source for regulating the latter, a water pump assembly for being located in a hole to be dewatered and including a housing, a pressure fluid motor mounted in said housing, flexible fluid conduits connected between said motor and said tank assembly for conducting pressure fluid therebetween to drive said motor, an impeller in said housing and connected to said motor for being rotationally driven by said motor to thereby pump water from said hole.

2. Dewatering pumping apparatus comprising a power source, a fluid tank assembly including an enclosed fluid storage tank, a mounting plate for detachably connecting said tank thereto, said plate having means for connection to said engine, whereby said tank may be removed from said mounting plate, said assembly also including a pressure fluid pump operatively connected to and driven by said power source, said tank assembly including pump control means in said tank and associated with said pump for controlling the fluid discharge of said pump, float level regulating means in said tank and operatively connected with said power source for regulating the latter and consequently regulating the level of fluid in said tank, and conduit means extending from said pump and from said tank for fluid communication with a fluid motor.

3. Dewatering pumping apparatus comprising, a power source, a fluid tank assembly including a mounting plate, an enclosed fluid storage tank detachably secured to said plate and a pump connected therewith and having means for connection to said power source for being driven by said source, whereby said tank may be removed from said mounting plate; pump control means in said tank and operatively connected with said pump for controlling the fluid discharge thereof, float level regulating means in said tank and operatively connected with said power source to regulate the latter, a pump assembly for being located in a hole to be dewatered, said pump assembly including a housing, a pressure fluid motor carried in said housing, flexible fluid conduits connected between said fluid motor and said pump for conducting pressure fluid from said pressure fluid pump to drive said fluid motor, a water pump in said housing and including a rotatable impeller connected to said fluid motor for being rotationally driven by said motor to thereby pump water from said hole.

4. Dewatering pump apparatus comprising, a power source, a fluid tank assembly including a pump mounting plate, a tank detachably secured to said plate, a pressure fluid pump connected to said tank and also connected to and driven by said power source, whereby said tank may be removed from said pump mounting plate, pump control means in said tank and connected with said pump for controlling the fluid discharge thereof, and float level regulating means in said tank and operatively connected with said power source for regulating the latter; a pump assembly for being located in a hole to be dewatered and including a housing, a pressure fluid motor carried by said housing, fluid conduits connected between said fluid motor and said tank assembly for conducting pressure fluid therebetween to drive said fluid motor, and an inpeller in said housing and connected to said fluid motor for being rotationally driven by said fluid motor to thereby pump water from said hole.

5. Dewatering pump apparatus comprising, a mobile internal combustion engine, a fluid tank assembly including a pump mounting plate, a fluid storage tank detachably secured to said pump mounting plate, a pres-

sure fluid pump connected with said tank and connected to and driven by said engine, whereby said tank may be removed from said pump mounting plate, pump control means in said tank and operatively connected with said pump for controlling the fluid discharge thereof, and float level regulating means in said tank and operatively connected with said power source for regulating the latter; a water pump assembly for being located in a hole to be dewatered and including a housing, a pressure fluid motor mounted in said housing, flexible fluid conduits connected between said motor and said tank assembly for conducting pressure fluid therebetween to drive and motor, and an impeller in said housing and connected to said motor for being rotationally driven by said motor to thereby pump water from said hole.

6. Dewatering pump apparatus comprising, a power source, a fluid tank assembly including a pump mounting plate having means for connection to said power source, a fluid storage tank detachably secured to said pump mounting plate, a pressure fluid pump connected with said tank and connected to and driven by said power source, whereby said tank may be separated from said pump mounting plate, pump control means in said tank and associated with said pump for controlling the fluid discharge of said pump, float level regulating means in said tank and operatively connected with said power source for regulating the latter and consequently regulating the level of fluid in said tank, and conduit means extending from said pump for fluid communication with a fluid motor.

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