July 29, 1947. H. GOODMAN 2,424,657

LIQUID LEVEL CONTROL DEVICE FOR PUMPING UNITS

Original Filed Oct. 19, 1942

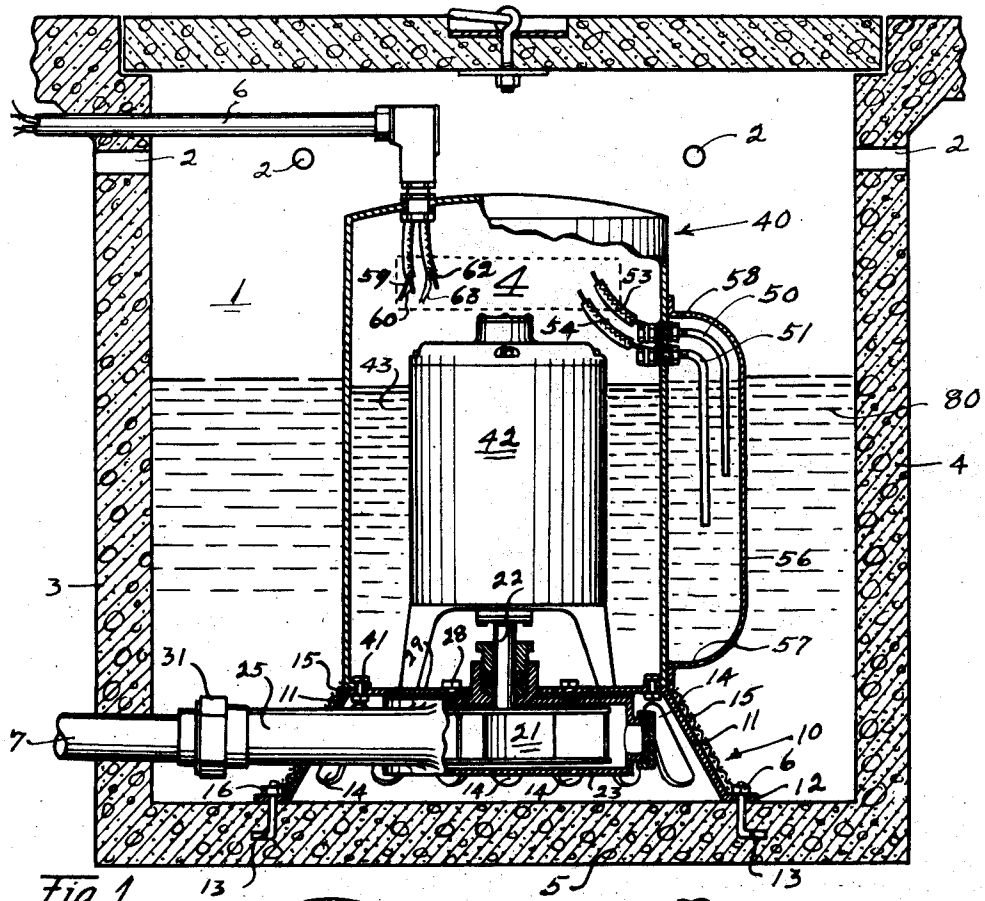


Fig. 1

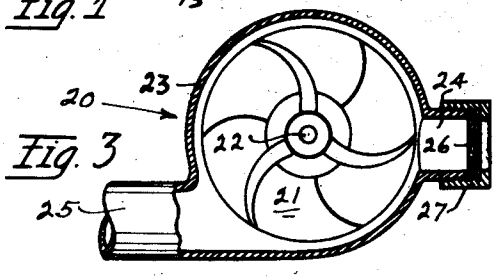


Fig. 3

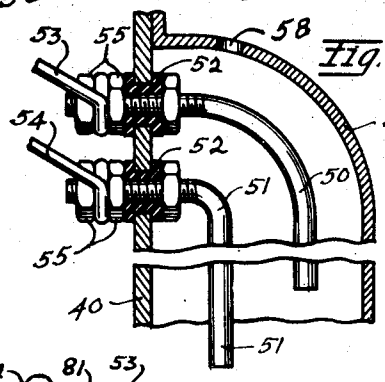


Fig. 2

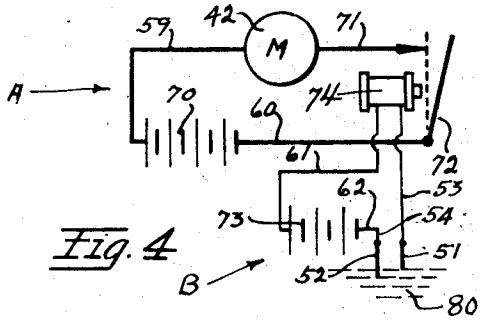


Fig. 4

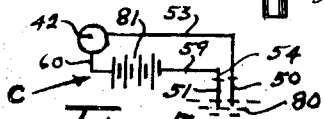


Fig. 5

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LIQUID LEVEL CONTROL DEVICE FOR PUMPING UNITS

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Substituted for application Serial No. 462,475, October 19, 1942. This application April 3, 1944, Serial No. 529,354

4 Claims. (Cl. 200—152)

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This application is filed as a substitute for my former application Serial Number 462,475, filed October 19, 1942, and later abandoned.

My invention relates to unitary pumping units, and particularly to pumping units for emptying sump-pits.

The primary object of the invention is the provision of a sump-pit pumping unit which is designed to be completely housed within a sump-pit that is to be emptied by the unit.

Another object is to provide a pumping unit of this class which is automatically started when liquid in the pit reaches a predetermined high level, and which will then operate until the high level has been reduced to a predetermined point, at which time it will be automatically stopped.

A further object is to provide a pumping unit which will function when completely submerged in liquid.

Another object is to provide a pumping unit for sump-pits which is electrically energized and in which the driving element is permanently sealed in oil.

Other objects will be apparent from the following description when taken in connection with the accompanying one-sheet drawing wherein:

Figure 1 is a vertical sectional view of a usual sump-pit with the device operatively installed therein, the device being partially shown in vertical section;

Figure 2 is an enlarged detail in vertical section showing the electrodes;

Figure 3 is a horizontal sectional view through the rotary pump;

Figure 4 is a diagrammatic view of the electric systems; and,

Figure 5 is a diagrammatic view of an optional wiring arrangement.

Like characters of reference designate like parts in all the figures, wherein they occur.

In the drawings:

The reference numeral 1 designates, as a whole, a sump-pit which may receive drainage or liquid refuse through a plurality of inlet openings 2. In the present instance, the pit is shown as being constructed of concrete, having side-walls 3 and 4, and having an integral floor 5. Such sump-pits are commonly used for accumulating waste liquids from basements, and the like, and proper operation of the present invention does not depend upon any particular construction or configuration of the sump-pit per se. In the drawings a usual electrical conduit 6 is shown passing through the upper portion of the side

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wall 3, and it is preferable that the conduit be embedded therein so that no leakage of liquid can occur around the same. The lower portion of the wall 3 receives a liquid outlet pipe 7 which is also preferably embedded therein. The elements indicated by reference numerals 1 to 7 are all conventional, and are not a part of the present invention.

The inventive apparatus per se consists substantially of a rigidly constructed base 10 which is preferably shaped similar to an inverted bowl and which may be made of cast metal. The base 10 has an annular sloping side wall 11 surrounded at its lower edge by an integral annular flange 12 which receives a plurality of stay bolts 13 for holding the base firmly anchored to the floor 5 of the sump-pit. The wall 11 of the base 10 is provided with a plurality of radially spaced openings 14 for admission of liquid from the sump-pit, and these openings 14 are covered by a suitable metal screen 15 held in place at the lower end by nuts 16 on the stay bolts 13. The upper end of the screen 15 is preferably spot-welded to the wall 11 of the base 10.

Referring now more particularly to Figure 3 of the drawings, there is shown a conventional or usual rotary pumping unit 20 which includes a suitable bladed rotor 21 keyed to a drive shaft 22 which is journaled for rotation in a suitable housing 23. The housing has an intake opening 24 and an outlet pipe 25, and the opening 24 is preferably covered by a suitable screen 26 held in place by an annular interiorly threaded cap 27. The pumping unit 20 is mounted within the base 10 by stud-bolts 28 passing through the top 29 of the base, and the drive shaft 22 passes upwardly through the base and through a suitable packing gland assembly 30 carried by the pump housing 23. The outlet pipe 25 passes horizontally through the wall 11 of the base 10 and is connected through a suitable pipe union 31 with the outlet pipe 7 in the wall 3 of the sump-pit. Obviously rotation of the drive shaft 22 will actuate the rotor 21 which will cause any liquid in the sump-pit to be drawn into the intake 24 and to be exhausted from the pit through the outlet pipes 25 and 7.

As a means for suitably rotating the drive shaft 22 the following described structure is provided.

A hollow substantially cylindrical dome or housing 40 having a closed upper end is mounted upon the upper surface of the top 29 of the base 10 by a plurality of detents 41. A suitable electric motor 42 is mounted in the housing 40 and

is drivably connected to the drive shaft 22 of the pumping unit 20. The motor 42 is of the conventional submersible type adapted to operate while submerged in oil. The housing 40 is consequently partially filled with oil, shown at 43, so that there will rarely, if ever, be occasion to remove the housing 40 from the base 10.

In order to avoid the necessity of starting and stopping the motor 42 by the manual operation of an electric switch, and in order to obtain automatic operation of the entire pumping unit by the liquid level in the sump-pit without resorting to floats, the following described mechanism is provided.

The side wall of the housing 40 is provided with two spaced-apart terminals 50 and 51, the upper end of each of which passes through the housing wall and are suitably insulated from the wall by sleeves 52. The sleeves 52 also act to beneficially seal around the terminals. Conductor wires 53 and 54 are connected to the inner ends of the terminals 50 and 51 by suitable nuts 55 in an obvious manner. Outside of the housing 40 the terminals are bent downwardly in spaced relation to each other, and their ends preferably terminate at different levels for a purpose more fully described hereinbelow.

Attached firmly by suitable holding means to the exterior surface of the housing 40, and located in a position to cover the terminals 50 and 51, is a hollow shield 56. The lower end of the shield is provided with a small through perforation 57, while its upper end has a larger through perforation 58.

Entering the housing 40 through the previously described conduit 6 are four electrical conductors or wires, 59, 60, 61 and 62 which lead from a seat or seats of electrical energy.

In Figure 4 are illustrated schematically two independent electrical circuits which function in the automatic operation of the pumping unit. One circuit supplies power to the motor upon the closure of a control switch, and the other circuit operates the control switch of the motor power circuit. The motor circuit is indicated as a whole by the reference character A, while the switch or secondary circuit is indicated as a whole by the reference character B. These two circuits, except for their seats of power, will be located in the housing 40 approximately in the area bounded by the dotted lines in Figure 1, and indicated by the large numeral "4" therein.

The previously described conductor wires 59 and 60, which enter the housing 42 through the conduit 6, are the two sides of the motor power circuit A (Figure 4), and both of these wires lead from a seat of power 70. The wire 59 is connected to one terminal of the motor 42, and a wire 71 connects the other motor terminal. A suitable switch 72 acts to open and close the motor power circuit A.

The conductor wires 60 and 62, which also enter the housing 40 through the conduit 6, are the two sides of the secondary circuit B, and both lead from a seat of power 73. The wire 61 leads to one side of a usual electro-magnet 74 which is located adjacent the switch 72 of the motor circuit A, and the magnet 74, when energized, acts to close the switch 72, and complete the motor circuit. The previously described conductor wire 53 leads from the other side of the magnet 74 to the terminal 50 in the jacket 56. The wire 62 is connected to the previously described wire 54 which connects the other terminal 51 in the jacket 56. The circuit B is completed when sufficient liquid 80 has accumulated in the jacket 56 to bridge between the two terminals 50 and 51. When the circuit B is completed by the liquid, the magnet 74 is energized to close the switch 72 of the motor circuit A. The switch 72 is of a type which will remain open so long as the magnet 74 is not energized and is not therefore holding the same closed.

Obviously other wiring arrangements could be made to reach the same results as do the two illustrated circuits A and B. For instance, the motor 42 and the electro-magnet 74 could well be energized from a single seat of power. The illustrated wire arrangement is merely one manner of obtaining the desired operation of motor and magnet.

In Figure 5 is illustrated one optional wire arrangement which could be used in lieu of that shown in Figure 4. In this arrangement, only the wires 59 and 60 would enter the housing 40 through the conduit 6 and these wires would be connected respectively to wires 54 and 53 within the housing.

In this figure the circuit is indicated as a whole by the reference character C which includes a seat of electrical energy 81.

It will be apparent that if no means were provided to prevent it, as soon as the liquid level in the sump-pit became high enough to bridge between the two terminals 50 and 51, the motor switch 72 would be closed and the motor would start to lower the liquid level; also, that as soon as this liquid level was slightly lowered, the bridge between the terminals 50 and 51 would be broken and the motor would stop. This condition would result in the liquid standing at a level approximately that of the lower end of the terminal 50, with the motor being started each time the liquid arose to contact the terminal 50, and being instantly stopped each time it was lowered slightly therebelow. This, of course, would not be a practical method of operation because the motor would be constantly starting and stopping, and the sump-pit would never be drained.

The perforations 57 and 58 in the jacket 56 act in the following described manner to delay starting the motor until the sump-pit is practically filled, and delay stopping the motor until the pit has been substantially emptied.

As the liquid accumulates in the sump-pit and the level rises above the bottom of the jacket 56, the minute size of the perforation 57 in the bottom of the jacket 56 delays the rise of the liquid 56, and therefore the liquid level in the sump-pit, outside of the jacket, will become higher than the level within the jacket. If the liquid is entering the pit at a sufficient rate of speed, its level may become higher than the top of the jacket 56 before the liquid has entered the minute perforation 57 to bridge the terminals 50 and 51. If this occurs, the liquid may then rapidly enter the jacket through the large perforation 58 in its upper end. This will result in the jacket immediately being filled sufficiently to bridge the terminals 50 and 51, and thus will start the motor and pump as previously described hereinabove.

If entry of liquid into the sump-pit is less rapid, the motor will be started as soon as sufficient liquid has entered the jacket 56 through the minute lower perforation 57.

After the motor has once been started, the liquid level in the sump-pit will be lowered faster than the level in the jacket can be lowered by the escape of the liquid through the small perfora-

tion 57. This will maintain the liquid bridge between the terminals 50 and 51 for a sufficient period of time for the sump-pit to be substantially emptied by the pump. Obviously the motor will stop only when sufficient liquid has escaped from the jacket 56 through the lower perforation 57 to lower the liquid level in the jacket to a point below the lower end of the terminal 50.

The lower ends of the two terminals 50 and 51 may be made even but are preferred to be staggered so that there will be less tendency for a spark gap.

It is believed obvious from the above description that a pumping unit has been disclosed which will reach all of the objects disclosed herein. Also, that by providing a submersible unit adapted to be installed entirely within the sump-pit, and which is automatic in operation over long periods of time, (due to the sealed in motor) the sump-pit can be closed by a flat lid such as shown by Figure 1, and which will seldom need removal. Confining the unit entirely within the sump-pit saves the basement floor space which is usually necessary to accommodate present day sump-pit evacuating equipment.

I claim:

1. Electric apparatus for making and breaking a circuit through contact of a conductive liquid in a sump-pit, including: a pair of spaced electrical terminals within said pit; a closed housing around said terminals, said housing having a minute lower perforation and a larger upper perforation, said lower perforation acting to delay entry of liquid into the housing from the pit as the level of the liquid rises therein, and acting to delay escape of the liquid from the housing as the liquid level in the pit is lowered.

2. Electrical apparatus for making and breaking a circuit through the contact of a conductive liquid in a sump-pit, including: a pair of spaced electrical terminals within said pit; a closed housing around said terminals, said housing having a minute lower perforation and a larger upper perforation, said lower perforation acting to delay entry of liquid from the pit into the housing as the level of the liquid rises therein, and acting to delay escape of the liquid from the housing as the liquid level in the pit is lowered; and said upper perforation acting to permit rapid entry of the liquid into the housing after the liquid has risen thereabove.

3. In electrical apparatus, the combination of: two spaced electrical terminals; a closed ended housing surrounding the terminals and adapted to be installed in a container in which a variable liquid level occurs, said housing having a minute lower perforation permitting the slow entry and exit of said liquid, and having a larger upper opening for permitting rapid entry of the liquid when the liquid level rises within the container to a point thereabove.

4. In electrical apparatus, the combination of: two spaced electrical terminals having their free ends terminating at unequal levels; a closed ended housing surrounding the terminals and adapted to be installed in a container in which a variable liquid level occurs, said housing having a lower minute perforation permitting the slow entry and exit of said fluid, and having a larger upper opening for permitting rapid entry of the liquid when the liquid level rises within the container to a point thereabove.

HARRY GOODMAN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
654,631	Hays	July 31, 1900
1,628,265	Muffly	May 20, 1927
1,736,635	Steinstrup	Nov. 19, 1929
1,942,241	Duhme	Jan. 2, 1934
1,966,804	Planche	July 17, 1934
2,297,680	Alling	Oct. 8, 1942
2,303,716	Arndt	Dec. 1, 1942
2,318,066	Dodd	May 4, 1943
1,887,609	Weymouth	Nov. 15, 1932
1,755,910	Bischof	Apr. 22, 1930
2,249,994	Warrick	July 22, 1941
1,736,635	Steenstrup	Nov. 19, 1929
2,096,297	Goldner et al.	Oct. 19, 1937
2,249,994	Warrick	July 22, 1941
2,178,811	Satern	Nov. 7, 1939
1,628,265	Muffly	May 10, 1927
2,110,313	Warrick	Mar. 8, 1938

FOREIGN PATENTS

Number	Country	Date
449,453	Great Britain	1936