Form P-1

Republic of Serbia
Institute for Intellectual Property
Kneginje Ljubica number 5
11000 Belgrade

A REQUEST

FOR PATENT RECOGNITION

Filled by the Institute	
Application number	p -2022/0779"
Date of receipt: 18 AUG 2022	Recognized submission date (22): 16 AUG 2022
Seal and signature	

(to be filled in by typewriter or computer)

Field number 1 NAME OF THE INVENTION (54)

* The name of the invention should clearly and concisely express the essence of the invention and must not contain fictitious or commercial names, trademarks, names, codes, common abbreviations for products, etc.

In Serbian: Procedure for filling the suction hose with a rubber balloon and the self-priming pump with water

In English: Method for filling the suction hose with a rubber balloon and the self-priming pump with water

Field number | I APPLICANT (71)

First and last name / Business name: (last name / business name should be written in capital letters)	Street and number, postal code, city and country:	Phone number:
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Citizenship: Republic of Serbia (fill in only for natural persons)		

☐ Other applicants are listed in additional sheet 1 below this request * If several persons submit an application, it is necessary to designate one of those persons as a joint representative and submit a statement of joint to a representative signed by all applicants or to appoint a joint representative for representation and submit a power of attorney

Field number II | THE INVENTOR • The inventor is also the applicant (72)

(if all inventors are also applicants, field number III is not filled in)

* If all the applicants are not also inventors, a statement of the applicants on the basis of acquiring the right to submit an application in relation to inventors who are not also the applicants is submitted, and in that case data on all inventors is entered in field number III. The

☐ inventor does not want to be listed in the application

(if the inventor does not want to be listed in the application, field number III is not filled in) *If the inventor does not want to be listed in the application, a signed statement by the inventor that he does not want to be listed must be submitted.

Name and surname: (write the surname in capital letters)	Street and number, postal code, place and Country:	Phone number:
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• Other inventors are listed in additional sheet 1 below this request

METHOD FOR FILLING THE SUCTION HOSE WITH A RUBBER BALLOON AND SELF-PRIMING PUMP WITH WATER

TECHNICAL FIELD

The invention, broadly considered, falls within the field of applied electrical engineering, specifically in the area of electric machines, with some involvement in machinery.

TECHNICAL PROBLEM

Addressed by this invention consists of the following: Filling the suction hose of an electric or motor-driven self-priming pump with water without a water-filling opening and without a check valve immersed in the well. By using a rubber balloon at the beginning of the suction hose, the one-way valve is replaced once, thereby reducing the dimensions of the construction. Additionally, the application of this invention, in some cases when the system is used on a manual pump pipe, increases the pump flow.

TECHNICAL BACKGROUND

A self-priming pump, depending on its design, has a self-priming capacity of several meters, usually up to 2m. To enable the pump to draw water from the maximum declared suction depth, typically 8-10m, the entire system, pump, and suction hose must be filled with water.

A known system includes a centrifugal pump, a suction hose, and a check valve at the beginning of the suction hose. The removal of air from the system is accomplished by pouring water into the system through a filling opening on the pump itself. Water is poured into the pump and suction hose using a funnel in the filling opening, which is usually closed with a screw.

There is also a known system that involves a manual pump. The pump is connected to the pipe of the manual pump through a check valve. To start the pump, it is first necessary for the manual pump to draw water with its vacuum and then for the motor or electric pump and the suction hose to be filled with water up to the check valve. Water is poured into the pump and the suction hose using a funnel in the filling opening, which is usually closed with a screw.Unlike centrifugal pumps, which do not have self-priming capabilities, the self-priming diaphragm pump has a self-priming capacity of several meters, usually 2m. For a given height, the diaphragm pump can create a vacuum to draw water without a check valve.

By adding a check valve at the beginning of the suction hose or suction pipe, the diaphragm pump can draw water from depths of 8-10m.

Generally, when a pump draws water from a certain depth, a check valve before the pump on the suction hose is necessary. The function of the check valve during the water-filling process is to prevent the water used for filling the pump and suction hose from falling back into the well.

The invention is an upgrade and improvement of the author's application "METHOD FOR FILLING A PLASTIC FLEXIBLE SUCTION HOSE OF A SELF-PRIMING DIAPHRAGM PUMP," recognized by the Intellectual Property Office of the Republic of Serbia (2014/340 RS Br 55013) and WO/215/199569, as well as P-2022/0364 "Rubber Balloon for Water Pump Suction Hose".

SUMMARY OF INVENTION

In certain technical situations, it is necessary to pump water through a hose with a check valve at the beginning. Often, the pump is mounted next to a driven pipe of smaller cross-section, usually a pipe from a manual pump. Below such a driven pipe is a well with water. Pushing the suction hose with a check valve is only possible if the check valve is of small dimensions. Small check valve dimensions create a bottleneck for the system, leading to a significant reduction in system flow. For most pumps, this construction is unsuitable due to the size of the check valve.

For the pump to work, the entire system must be filled with water. It is necessary to fill the pump and suction hose with water without the water falling back into the well. The check valve can also be installed behind the pump. The function of such a check valve, mounted behind the pump, is to allow water to pass from the pump when it operates and create a vacuum in the opposite direction, preventing water from falling back into the well when the pump is not working. Therefore, with this construction, when the check valve is behind the pump, the pump draws water when it operates, and water from the pump cannot fall back into the well when the pump is not operating. It is only necessary to fill the system with water for the first time.

By adding a rubber balloon at the beginning of the suction hose, so that the hose enters the balloon and the balloon wraps around the hose's inlet, water cannot fall back before starting the pump. The balloon would burst after starting the pump. Since most self-priming pumps do not have a water-filling opening, it is necessary to close the system full of water with the balloon.

To fill the entire system, it should be lowered into the well with water, and then the pump should be started, after which the rubber balloon bursts, and the pump operates smoothly. To ensure the success of the whole process, it needs to be divided into four phases:

Phase I - Filling the suction hose without the rubber balloon and pump with water using the self-priming pump.

Phase II - Mounting the rubber balloon at the beginning of the suction hose below the water surface.

Phase III - Installing the suction hose full of water together with the rubber balloon into the well.
Phase IV - Starting the pump, bursting the rubber balloon, and continuing with the operation.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 represents a cross-section of the well and pump with a check valve at the beginning of the suction hose.

Figure 2 represents a cross-section of the suction hose.

Figure 3 represents a cross-section of the check valve.

Figure 4 represents an electric water pump.

Figure 5 represents the appearance of an electric water pump with mounted suction and discharge hoses.

Figure 6 represents the appearance of a flat push-pin or needle.

Figure 7 represents the appearance of the beginning of the suction hose pierced by the push-pin.

Figure 8 represents the appearance of a part of the process of filling the suction hose and pump with water.

Figure 9 represents the appearance of the rubber balloon.

Figure 10 represents the appearance of a part of the process of mounting the rubber balloon on the suction hose.

Figure 11 represents the appearance of the beginning of the suction hose with a mounted and tightened rubber balloon.

Figure 12 represents the appearance of a rubber band for fixing the rubber balloon.

Figure 13 represents the appearance of a water-filled system with a mounted rubber balloon fixed with rubber bands.

Figure 14 shows the appearance of the beginning of the suction hose with a mounted rubber balloon fixed with rubber bands.

Figure 15 represents the appearance of a water-filled system with a mounted rubber balloon fixed with rubber bands and mounted on the well just before exploitation.

Figure 16 displays the appearance of the beginning of the suction hose with the rubber balloon filled with water and immersed in the well before the balloon bursts when the pump is not yet running.

Figure 17 illustrates the appearance of the beginning of the suction hose with the rubber balloon after the balloon bursts when the pump is running.

DISCLOSURE OF THE INVENTION

In Figure 1, the classic operation of the pump is shown. Self-priming pumps usually have self-priming capabilities up to 2m. For depths of 2-8m, it is necessary to install a check valve at the beginning of the suction hose. The pump can be filled by pouring water through an opening on the pump or by using a fitting with a plug. Alternatively, the pump can be pre-filled with water

from a container and then lowered into the well. The function of the check valve is to prevent water from leaking into the well when the pump is not operating. In Figure 1, the check valve (denoted as 10) is connected to the beginning of the suction hose (denoted as 2). The suction hose 2 together with the check valve 10 is submerged below the water surface in the well (denoted as 1) from which the water is pumped.

Figure 2 shows a cross-section of the suction plastic hose (denoted as 2). The hose 2 is made of flexible plastic, allowing it to bend easily with a bend radius of 0.5m, but it is rigid enough to

prevent deformation during pump operation or pressure from fingers. The hose 2 can also be ribbed.

Figure 3 presents the appearance of the check valve (denoted as 10). An arrow (denoted as 11) indicates the spring on the check valve 10, an arrow (denoted as 12) points to the closure or diaphragm on the check valve 10, and an arrow (denoted as 13) indicates the body of the check valve that the closure uses to seal the water flow. The check valve allows water to flow from the inlet to the outlet or hose 2 and prevents backflow in the opposite direction.

Figure 4 displays the appearance of the water pump (denoted as 3). The pump 3 has an inlet connection (denoted as 32) to which the suction hose 2 is attached. The pump also has an outlet connection (denoted as 31) to which the discharge hose 7 is attached. The pump has power connectors (denoted as 5) to which the power cable is connected. The water pump is self-priming

and can draw water up to 2m through an empty hose or up to 8m depth if the hose is filled with water.

Figure 5 shows the appearance of a self-priming water pump 3 with a mounted suction hose 2 with an opening on the hose 21. On the outlet end of the pump 3, a check valve 10 is attached, which is connected to the discharge hose 7. The check valve 10 allows water to flow from the pump 10 to the discharge hose 7. The pump 3 is also connected through a switch 6 to the power cable 5 from which the pump is powered by electricity.

Figure 6 depicts the appearance of a push-pin 40 or a flat clamp or presser. The push-pin 40 has a blade 41.

Figure 7 displays the appearance of the starting point of the suction hose 2. This end is submerged in water, while the other end of the suction hose 2 is connected to the pump 10. At a distance equal to the radius of the hose, it is necessary to puncture the suction hose 2 with the push-pin 40. The blade 41 of the push-pin is now inside the suction hose 2 when the hose 2 is punctured.

Phase I - Filling the suction hose and the pump with water using a self-priming pump.

Before starting to fill the suction hose 2 and the self-priming pump 3 with water, it is necessary to prepare the suction hose 2 by puncturing it with the push-pin 40 at the very beginning.

Figure 8 provides an illustration of part of the process of filling the self-priming pump 3 and the suction hose 2 with water.

Filling the suction hose 2 and the pump 3 with water is done as follows: First, a container 100 with a capacity of around twenty liters is filled with water. The container should be wide enough to allow the suction hose and two hands to pass through the top, approximately 30cm. Using a 20-liter bucket is most convenient. Then, the end of the suction hose 2, which was previously punctured with the push-pin 40, is immersed in the container 100 with water, deep below the water surface. The other end of the suction hose 2 is connected to the self-priming pump 3. Then, the pump 3 is turned on using the switch 6. After a certain time, a jet of water will appear at the outlet hose 7. Once the jet of water appears, the pump 3 should be turned off using the switch 6. Now, the pump 3 and the suction hose 2 are filled with water. On the outlet end of the self-priming pump 3, a check valve 10 is attached, which is connected to the discharge hose 7. The check valve 10 allows water to flow from the pump 10 to the discharge hose 7. The self-priming pump 3 is also connected to the power cable 5 via the switch 6, from which it is powered by electricity.

Phase II - Mounting the rubber balloon at the starting point of the suction hose below the water surface.

Now that the suction hose 2 is filled with water, it is necessary to mount the rubber balloon 50 at the beginning of the suction hose 2 to prevent water from spilling out.

This is only possible if the rubber balloon 50 is slipped onto the suction hose 2 below the water surface 100). The free end of the suction hose 2 should be held under the water surface 100 while using the other hand to slide the rubber balloon 50 onto the hose, all under the water surface 100. Now, with the rubber balloon 50 attached to the free end of the suction hose 2, water from the hose 2 cannot leak out anymore, but it is still not necessary to remove the hose from the water preventively.

Figure 9 shows the appearance of the rubber balloon 50. The balloon is made of rubber or latex. Decorative balloons can also be used. Figure 9 illustrates the shape of a decorative rubber balloon for better understanding. The best shape for the balloon is in the form of a cylinder, open on one side, which can be pulled over the suction hose 2. Since the rubber balloon is highly elastic, it takes the shape of whatever solid object it is attached to. Some balloons may burst under stronger pressure, while others may not. Therefore, a push-pin 40 is inserted, which punctures the balloon 30 when it is slipped onto the suction hose 2.

Figure 10 presents the appearance of the complete system, together with the container with water 100 and the rubber balloon 50 slipped onto the beginning of the suction hose 2. The other end of the suction hose 2 is connected to the pump 3. On the outlet end of the self-priming pump 3, a check valve 10 is attached, which is connected to the discharge hose 7. The check valve 10 allows water to flow from the pump 10 to the discharge hose 7. The self-priming pump 3 is also connected to the power cable 5 via the switch 6, from which it is powered by electricity.

Figure 11 depicts the appearance of the tightened balloon 50 at the beginning of the suction hose 2. By pulling the balloon towards the middle of the suction hose 2, the balloon takes the shape of the suction hose 2.

Now, it is necessary to fix the tightened rubber balloon below the water surface 100. The easiest way to fix the rubber balloon 50 is using two strong rubber bands.

Figure 12 illustrates the appearance of the rubber bands 60 used to fix the tightened rubber balloon 50 onto the suction hose 2.

Figure 13 presents the appearance of the complete system, together with the rubber balloon 50 fixed with rubber bands 60 below the water surface 100 and slipped onto the beginning of the suction hose 2. The other end of the suction hose 2 is connected to the self-priming pump 3. On the pump 3, a check valve 10 is attached on the outlet end, which is connected to the discharge hose 7.

Non-return valve 10 is connected from the pump 10 to the discharge hose 7. The pump is also connected to the power cable 5 through the switch 6, which supplies the pump with electricity. Now, with the rubber bands 60 in place, water cannot leak from the suction hose 2.

Phase III - Mounting the suction hose together with the rubber balloon into the well.

Since the suction hose 2 and the water pump 3 are filled with water and water cannot leak from the suction hose 2 due to the fixed rubber balloon 50 secured with push-pins 60 at the free end of the suction hose 2, that end should be carefully lowered into the well 1 below the water surface 100. The non-return valve 10, mounted at the pump 3 outlet, creates a vacuum towards the well, and the balloon itself does not burst under pressure lower than 1 bar.

In Figure 14, the appearance of a part of the suction hose 2 and the rubber balloon 50 is shown before being lowered into the well 1. Due to the presence of the non-return valve 10 behind the water pump 3, a zero pressure zone is created in the suction hose 2 towards the balloon 50, making the balloon 50 level with the top of the suction hose 2. By moving the suction hose 2, the balloon 50 remains level.

Figure 15 represents the appearance of the complete water-filled system, including the rubber balloon 50 attached to the free end of the suction hose 2, fixed with push-pins 60 and submerged below the water surface of the well 1. The suction hose 2 is connected at the other end to the self-priming pump 3. The pump 3 is equipped with a non-return valve 10 at the outlet, which is connected to the discharge hose 7. The non-return valve 10 allows water to flow from the pump 10 to the discharge hose 7. The pump is also connected to the power cable 5 through the switch 6, which supplies the pump with electricity. Now, with the rubber bands 60 in place, water cannot leak from the suction hose 2.

Phase IV - Starting the pump, bursting of the rubber balloon, and further operation.

The entire system is filled with water and lowered into the well. When the water pump 3 is started, the rubber balloon 50 starts entering the suction hose 2 as shown in Figure 16. With further operation of the pump 3, the rubber balloon 50 hits the push-pin 41, and the balloon 50 bursts. As the rubber balloon 50 is stretched, it retreats towards the middle of the suction hose as shown in Figure 17.

After the balloon bursts, the pump 3 starts functioning without interruption, and water flows smoothly. After completing the pump's operation, due to the non-return valve 10, water from the self-priming pump 3 and the suction hose 2 cannot drain when the pump is not running. The pump operates without any issues until it is dismantled.

There are self-priming diaphragm water pumps with built-in non-return valves at their ends, so these pumps do not require the installation of additional non-return valves. They only need a

suction and discharge hose, a power source, a balloon, and a push-pin. There are no further plumbing works required.

INDUSTRIAL OR ANOTHER USE OF INVENTION

The application of the invention is in all situations where it is necessary to move the non-return valve, located before the pump, to a position after the pump. The most significant application is certainly on dismantled hand pumps. When using the rubber balloon 50 at the beginning of the suction hose 2, the dimensions or cross-section of the hose 2 are significantly smaller than the dimensions of the non-return valve 10.

By using the rubber balloon 50 instead of the non-return valve 10 at the beginning of the suction hose 6, as shown in Figures 1 and 17, the water flow with the same pump is increased. This difference is most significant when the non-return valve is of small dimensions. When the pump 3 is used above the pipe of the hand pump, the difference between the system with the balloon 50 and the non-return valve 10, shown in Figure 1, at the beginning of the suction hose can be as much as 30-50% in terms of flow rate. Moreover, no further plumbing works are required. The suction hose 2 with the rubber balloon 50 is simply lowered either into the well 1 or into the pipe of the hand pump.

CLAIMS

1. A method for filling the suction hose with a rubber balloon and a self-priming pump with water, **characterized by** placing the suction hose (2), water pump (3), filled with water from the container (100), by starting the pump (3) on the switch (6), after which the rubber balloon (50) is mounted on the free end of the suction hose (2), below the water surface in the well (1).

2. A method for filling the suction hose with a rubber balloon and a self-priming pump with water, **characterized by** lowering the water-filled suction hose (2), closed with a rubber balloon (50), into the well

3. A method for filling the suction hose with a rubber balloon and a self-priming pump with water, **characterized by** placing the water-filled suction hose (2), closed with a rubber balloon (50), at its free end, in the well (1), and then starting the pump (3) on the switch (6), causing the rubber balloon (50) to enter the beginning of the suction hose (2), hit the push-pin (4)0, and burst.

4. A method for filling the suction hose with a rubber balloon and a self-priming pump with water, **characterized by** the uninterrupted operation after the rubber balloon (50) bursts, as a non-return valve (10) is attached at the pump (3) outlet.

5. A method for filling the suction hose with a rubber balloon and a self-priming pump with water, **characterized by** fixing the rubber balloon (50) with push-pins (60).

Abstract

The method for filling the suction hose with a rubber balloon and a self-priming pump with water is characterized by consisting of four phases:

I Phase - Filling the suction hose (2), without a rubber balloon (50), and the pump with water using the self-priming pump (3).

II Phase - Mounting the rubber balloon (50) at the beginning of the suction hose (2), below the water surface (100).

III Phase - Mounting the water-filled suction hose (2), together with the rubber balloon (50), in the well (1).

IV Phase - Starting the pump 3, bursting the rubber balloon (50), and further exploitation.

The method for filling the suction hose with a rubber balloon and a self-priming pump with water is characterized by a system consisting of a rubber balloon (50) that is placed at the beginning of the suction hose (2) and is connected to the pump (3) on the other end. The system also includes the discharge hose (7) and the power source (5) and switch (6) in addition to the pump (3), suction hose (2), and rubber balloon (50). The rubber balloon (50) prevents water from falling back into the well (1) until the pump (3) is activated. After starting the pump (3), the rubber balloon (50) tears on the blade (41) of the push-pin (40), creating a continuous water column from the well (1) to the pump (3). After the balloon (50) bursts, water from the pump (3) cannot fall back into the well (1) because a non-return valve (10) is mounted behind the pump.

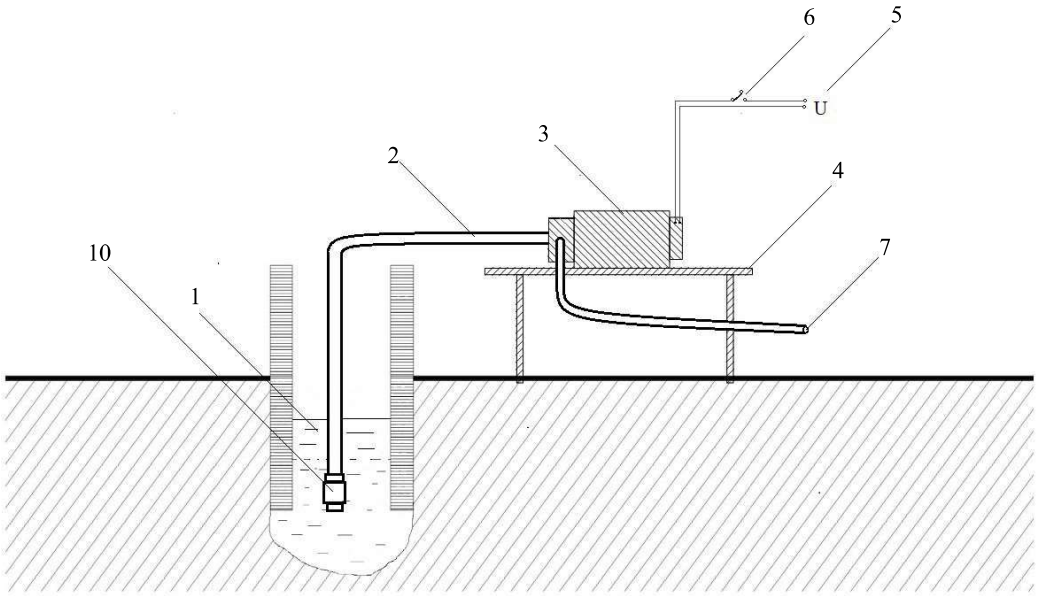

Fig 1.

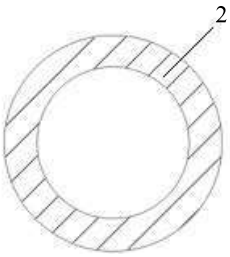

Fig 2.

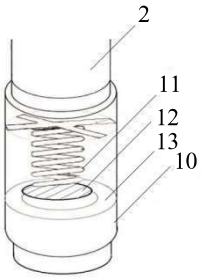

Fig 3.

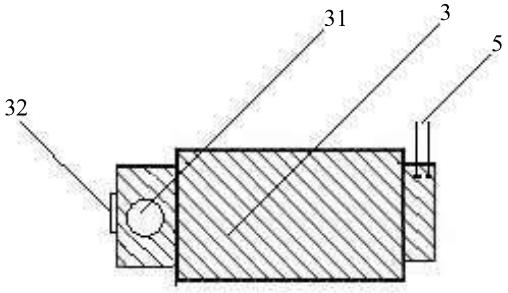

Fig 4.

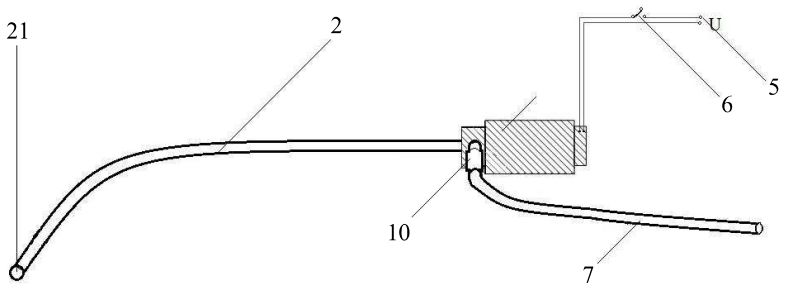

Fig 5.

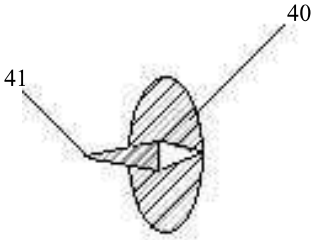

Fig 6.

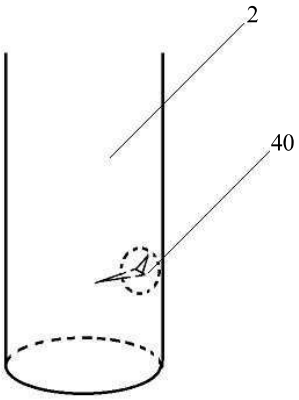

Fig 7.

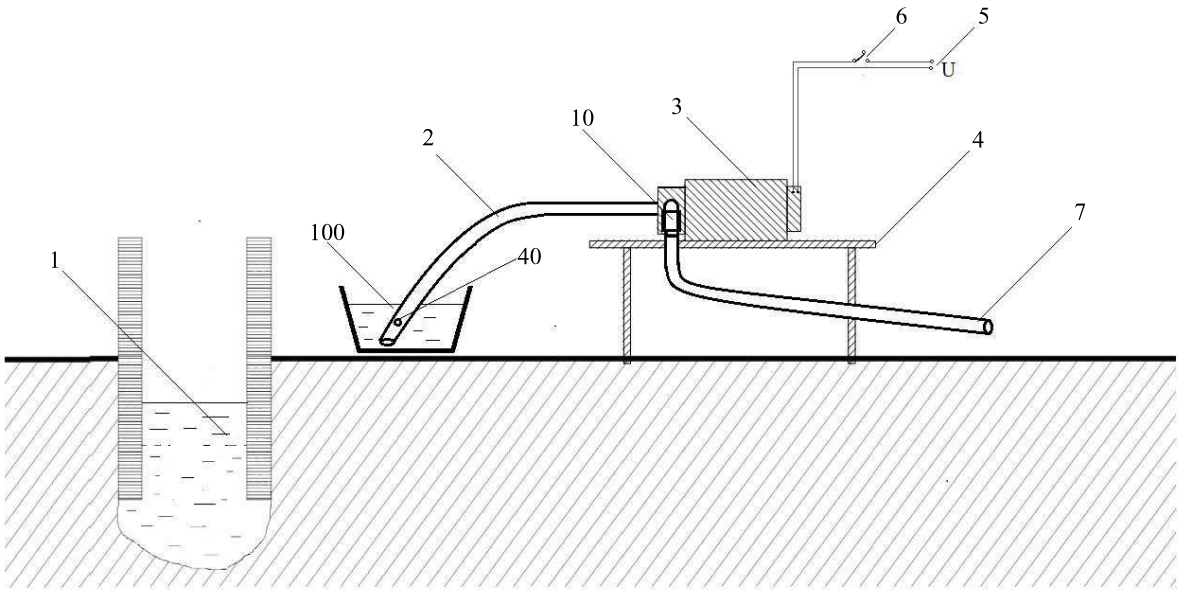

Fig 8.

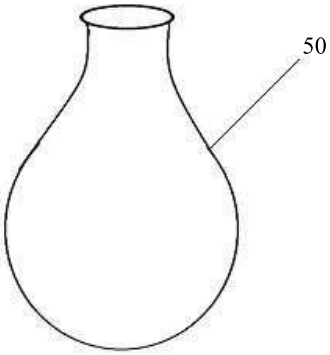

Fig 9.

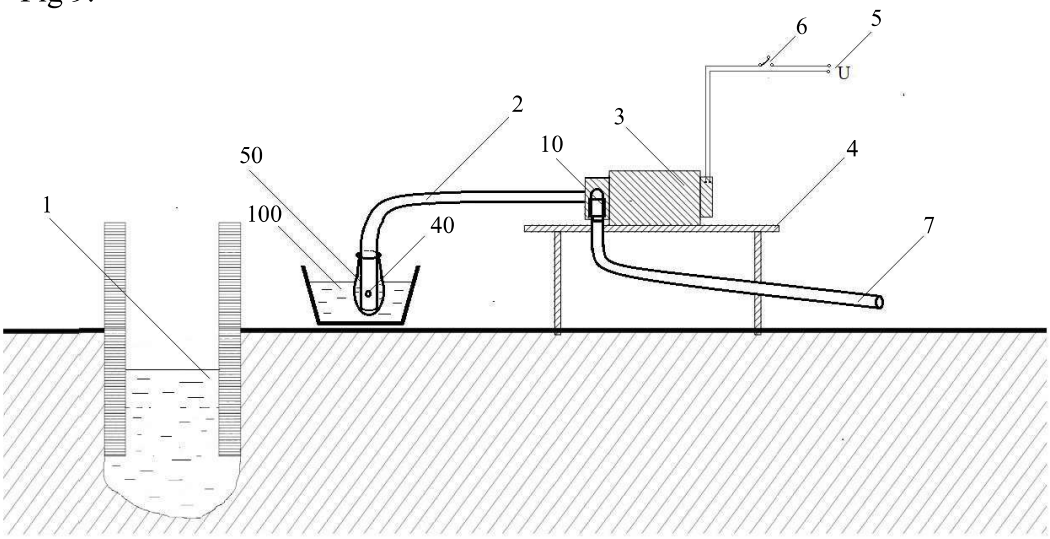

Fig 10.

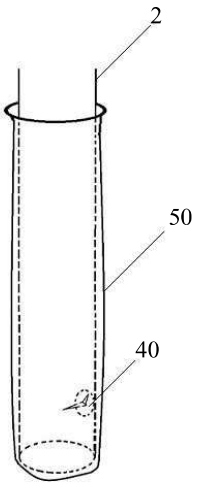

Fig 11.

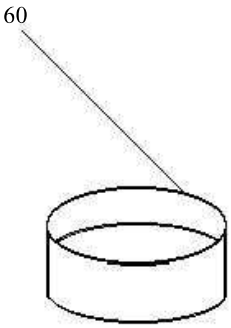

Fig 12.

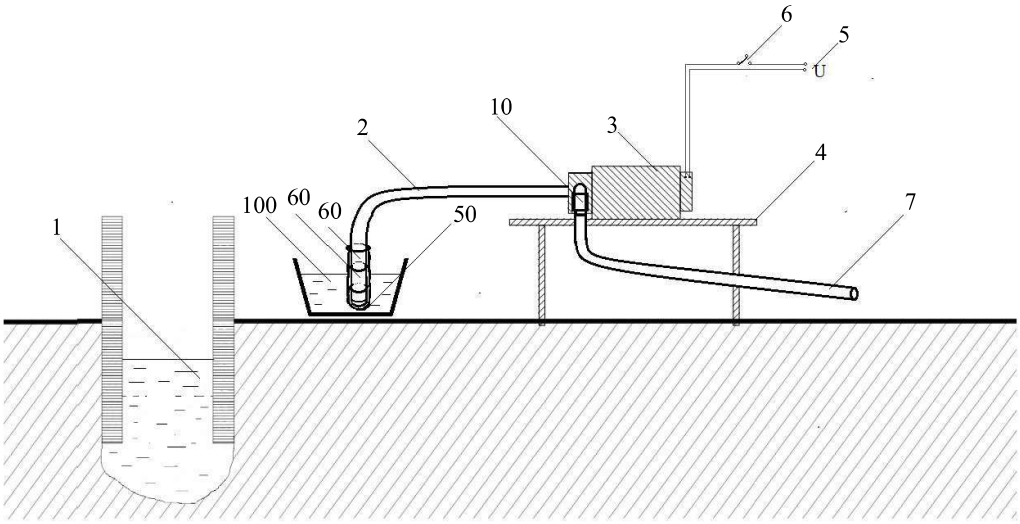

Fig 13.

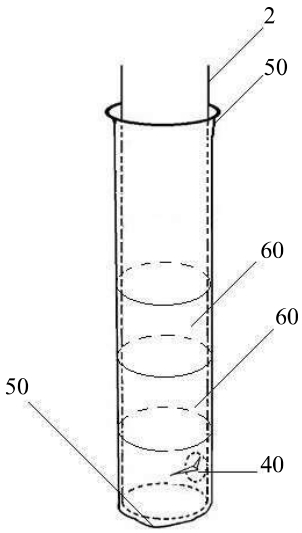

Fig 14.

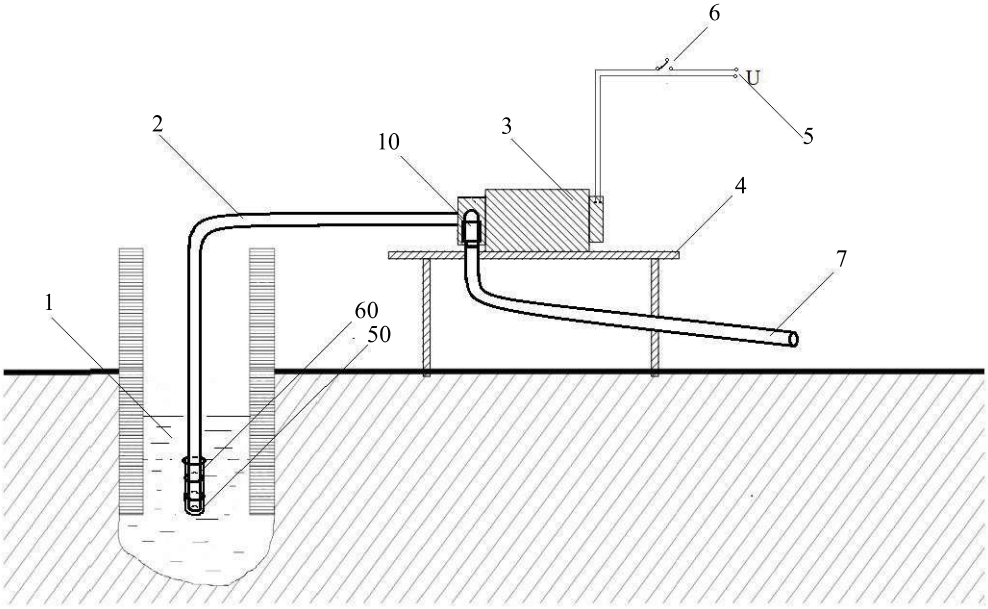

Fig 15.

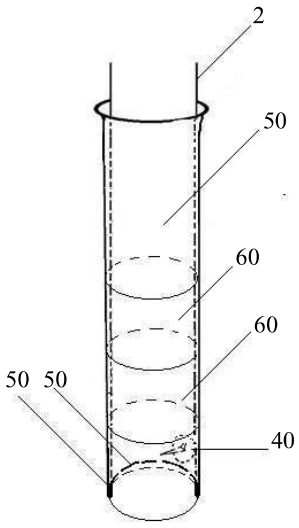

Fig 16.

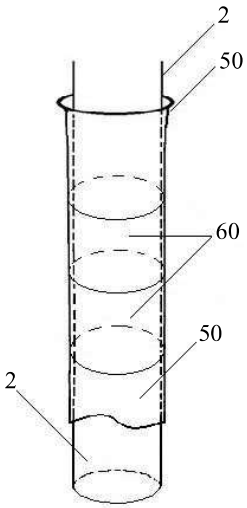

Fig 17.