Form P-1

Republic of Serbia
Institute for Intellectual Property
of Kneginja Ljubica No. 5
11000 Belgrade

A REQUEST

FOR PATENT RECOGNITION

Filled by the Institute		
Application number	#2023/0684	(21)
Date of receipt: 24 AUG 2023	Recognized submission date	(22)
Seal and signature		

(to be filled in by typewriter or computer)

Field number I 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 a suction hose with a rubber balloon and a pump that has a filling hole water

In English: The method of filling a suction hose with a rubber balloon and a pump that has an opening for filling with water

Field number II APPLICANT (71)

First and last name / Business name: (last name / business name should be written in capital letters)	Street and number, postal code, place and Country:	Phone number:
Boban STOJANOVIĆ	Sinđelićeva 3/10, 35230, Ćuprija, Serbia	0603584888
		Fax number:
		E-mail: boban_stojanovic@protonmail.com
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 about the joint representative signed by all applicants or appoint a joint representative for representation and submit a power of attorney

Field number III 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, the applicant's statement on the basis of acquiring the right to submit shall be submitted applications in relation to inventors who are not the applicants, and in that case data on all inventors is entered in field number III

• The inventor does not wish to be named 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 letters)	Street and number, postal code, place and Country:	Phone number:
Boban STOJANOVIC	Sinđelićeva 3/10, 35230, Ćuprija, Serbia	0603584888
		Fax number:
		E-mail: boban_stojanovic@protonmail.com

☐ Other inventors are listed in additional sheet 1 below this application

Образац П-1

Република Србија
Завод за интелектуалну својину
Кнегиње Љубице број 5
11000 Београд

ЗАХТЕВ ЗА ПРИЗНАЊЕ ПАТЕНТА

Попуњава Завод	
Број пријаве П 2023/0684 (21)	
Датум пријема 24 AUG 2023	Признати датум подношења (22)
Печат и потпис	

(попунити писаћом машином или рачунаром)

Поље број I **НАЗИВ ПРОНАЛАСКА** (54)

* Назив проналаска треба да јасно и сажето изражава суштину проналаска и не сме да садржи измишљене или комерцијалне називе, жигове, имена, шифре, уобичајене скраћенице за производе и сл.

На српском језику: Поступак за пуњење усисног црева са гуменим балоном и пумпе која има отвор за наливање водом

На енглеском језику: The method of filling a suction hose with a rubber balloon and a pump that has an opening for filling with water

Поље број II **ПОДНОСИЛАЦ ПРИЈАВЕ** (71)

Име и презиме / Пословно име: (презиме / пословно име уписати великим словима)	Улица и број, поштански број, место и држава:	Број телефона:
Бобан СТОЈАНОВИЋ	Синђелићева 3/10,35230,Ћуприја,Србија	0603584888
		Број факса:
		Е-пошта: boban_stojanovic@protonmail.com
Држављанство: Република Србија (попунити само за физичка лица)		

☐ **Остали подносиоци пријаве су наведени у додатном листу 1 у наставку овог захтева**

* Ако више лица подноси пријаву, потребно је одредити једно од тих лица као заједничког представника и доставити изјаву о заједничком представнику потписану од стране свих подносилаца или именовати заједничког пуномоћника за заступање и доставити пуномоћје

Поље број III **ПРОНАЛАЗАЧ** ☒ Проналазач је и подносилац пријаве (72)

(ако су сви проналазачи уједно и подносиоци пријаве, поље број III се не попуњава)

* Ако сви подносиоци пријаве нису и проналазачи, доставља се изјава подносилаца пријаве о основу стицања права на подношење пријаве у односу на проналазаче који нису и подносиоци пријаве и у том случају у поље број III се уносе подаци о свим проналазачим

☐ Проналазач не жели да буде наведен у пријави

(ако проналазач не жели да буде наведен у пријави поље број III се не попуњава)

*Ако проналазач не жели да буде наведен у пријави, потребно је доставити потписану изјаву проналазача да не жели да буде наведен.

Име и презиме: (презиме уписати великим словима)	Улица и број, поштански број, место и држава:	Број телефона:
Бобан СТОЈАНОВИЋ	Синђелићева 3/10,35230,Ћуприја,Србија	0603584888
		Број факса:
		Е-пошта: boban_stojanovic@protonmail.com

☐ **Остали проналазачи су наведени у додатном листу 1 у наставку овог захтева**

METHOD FOR FILLING THE SUCTION HOSE WITH A RUBBER BALLOON THAT HAS AN OPENING FOR FILLING WITH WATER

TECHNICAL FIELD

The invention, broadly speaking, falls within the field of applied electrical engineering, specifically the field of electrical machinery, while also extending into the field of mechanics.

TECHNICAL PROBLEM

The technical problem addressed by this invention consists of the following: Filling the suction hose of an electric or motor pump with water through a water filling opening, without a check valve at the beginning of the suction hose that would submerge into the well after being filled with water. By using a rubber balloon at the beginning of the suction hose, the non-return valve is replaced once, reducing the construction's dimensions. Furthermore, applying this invention increases the pump flow in certain cases, especially when the system is used on a manual pump pipe.

TECHNICAL BACKGROUND

A system is known that includes a centrifugal pump, suction hose, and a check valve at the beginning of the suction hose. Removing air from the system is done by pouring water into the system through a filling opening on the pump. Water is poured into the pump and the suction hose using a funnel into the filling opening, which is usually sealed with a screw. A system with a manual pump is also known. The pump is connected via a check valve to the handle located on the manual pump's pipe. To start the pump, the manual pump first creates a vacuum to pull water and then the motor or electric pump is filled with water along with the suction pipe up to the check valve. Water is poured into the pump and suction pipe using a funnel into the filling opening, which is usually sealed with a screw. In general, when the pump draws water from a certain depth, a non-return valve is necessary before the pump on the suction hose. The function of the non-return valve is to prevent the water used for filling the pump and suction pipe from falling into the well. The invention emerged as an upgrade and improvement of the inventor's application titled "Procedure 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 No. 55013), as well as WO/215/199569 and P-2022/0782, PCT/RS2022/000010, titled "Rubber Balloon for Water Pump Suction Hose" and "Procedure for Filling the Suction Hose with a Rubber Balloon and Self-Priming Pump with Water."

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 installed beside a sunk pipe with a smaller diameter, typically the pipe of a manual pump. Underneath this sunk pipe is a well with water. Inserting the suction hose with a check valve is only possible if the check valve has small dimensions. However, the small dimensions of the check valve create a bottleneck in the system, significantly reducing its flow rate. This construction is not suitable for most pumps due to the size of the check valve. For the

pump to function, the entire system must be filled with water. It is necessary to pour water into the pump and suction hose without letting the water fall into the well. A check valve can also be installed behind the pump. When the pump is working, this check valve allows water to flow out of the pump in the forward direction, creating a vacuum in the reverse direction to prevent water from falling into the well when the pump is not in operation. In this configuration, when the check valve is positioned behind the pump, the pump draws water when operating, and the water from the pump cannot fall into the well when the pump is not working. The system only needs to be filled with water initially. By attaching a rubber balloon to the beginning of the suction hose, so that the hose enters the balloon and the balloon wraps around the hose's entrance, water cannot escape before the pump is turned on. The closed system with a rubber balloon at the beginning of the suction hose must be filled with water before lowering the suction hose with the rubber balloon into the well. After carefully placing the filled system into the well with water, the pump can be activated, causing the rubber balloon to burst and enabling the pump to function smoothly. There is a significant difference between the procedure of lowering an empty suction hose closed with a rubber balloon into the well and then filling the entire system through the filling opening, and the procedure of lowering a filled suction hose with water closed with a rubber balloon into the well. When an empty suction hose is lowered into the well and the entire system is filled with water, the water gains kinetic energy described by $\mathbf{mgh = mv^2/2,}$ which, at a height of $\mathbf{h = 8m}$, results in a speed of $\mathbf{v = 45}$ km/h, neglecting friction. This is why balloons burst during the filling process. To ensure the success of the entire procedure, it needs to be divided into four phases:

Phase I - Rubber Balloon Mounting Phase at the Beginning of the Suction Hose In Phase I, the method involves mounting a rubber balloon at the very start of the suction hose.

Phase II - Suction Hose Filling Phase with Rubber Balloon and Water Pump Phase II of the method entails filling the suction hose with water using a rubber balloon and a water pump. The height difference between the water level and the pump ranges from 0.5 to 1 meter, assisted by a funnel at the filling opening.

Phase III - Suction Hose Installation Phase with Full Water and Rubber Balloon into the Well The procedure's Phase III includes installing a water-filled suction hose along with a rubber balloon into the well.

Phase IV - Pump Activation Phase, Rubber Balloon Burst, and Continued Operation Phase IV covers the process of activating the pump, leading to the bursting of the rubber balloon, and allowing for further operation.

BRIEF DESCRIPTION OF DRAWINGS

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

Figure 2: Depicts a cross-section of the check valve.

Figure 3: Presents a cross-section of the suction hose.

Figure 4: Represents an electric water pump.

Figure 5: Depicts the appearance of a flat chisel or push-pin.

Figure 6: Displays the appearance of the punctured starting point of the suction hose.

Figure 7: Illustrates the appearance of a rubber balloon.

Figure 8: Shows the appearance of the part of the method involving mounting a rubber balloon on the suction hose.

Figure 9: Presents the appearance of the starting point of the suction hose with a stretched rubber balloon attached.

Figure 10: Represents the appearance of a rubber clamp for securing the rubber balloon.

Figure 11: Depicts the appearance of the starting point of the suction hose with a stretched rubber balloon attached and secured with two rubber clamps. Figure 12: Illustrates the appearance of the waterless system with a rubber balloon attached and secured by rubber clamps.

Figure 13: Shows the appearance of the system on a stand, filled with water through a funnel, with a rubber balloon attached and secured by rubber clamps.

Figure 14: Represents the appearance of the system filled with water, with a rubber balloon attached and secured by rubber clamps, mounted on the well just before exploitation.

Figure 15: Depicts the appearance of the starting point of the water-filled suction hose submerged in the well, with a rubber balloon, before the balloon bursts, and while the pump is not yet in operation.

Figure 16: Displays the appearance of the starting point of the water-filled suction hose submerged in the well, with a rubber balloon, immediately after the pump is started, and before the balloon bursts.

Figure 17: Illustrates the appearance of the starting point of the suction hose with a rubber balloon after the balloon bursts, with the pump in operation.

Figure 18: Depicts the appearance of a manual pump with a well beneath it.

Figure 19: Shows the appearance of the system on a stand, filled with water through a funnel, with a rubber balloon attached and secured by rubber clamps, beside the pipe of a manual pump.

Figure 20: Presents the appearance of the system filled with water, with a rubber balloon attached and secured by rubber clamps, mounted on the well just before exploitation.

DISCLOSURE OF THE INVENTION

Phase I - Balloon Mounting Phase at the Start of the Suction Hose. In Figure 1, the pump marked as number 10 is represented, connected to the suction plastic hose 6, and at its beginning, attached to the check valve 20 submerged in the well 1. An outlet hose 12 is also connected to the pump 10. The pump 10 is mounted on the stand 5 next to the well 1. Before starting the pump 10 via switch 14 and power source 13, it is necessary to fill the pump with water through the filling hole 11 on the pump 10. After water is poured into the pump 10 and the plastic suction hose 6, the filling hole 11 is mostly closed with a screw. The pump 10 is filled with water only once, as water cannot flow through the check valve 6 from the well 1 towards the pump 10. The figure presents a known pump attachment system. It is necessary to mount the check valve 20 at the beginning of the suction hose 6 to prevent water from flowing back into the well 1 when the pump 10 is not operating.

In Figure 2, the check valve 20 is presented. The check valve is permeable from the inlet to the outlet, with the connected flexible plastic hose 6. The check valve 20 consists of a spring 21 that pushes a seal or gasket 22. When the check valve 20 is closed, the gasket 22 rests on the body of the check valve 23. When there is water pressure between the inlet and outlet, the check valve 20 opens, allowing the gasket 22 to be separated from the body of the check valve 23 by the stream of water.

In Figure 3, the cross-section of the plastic suction hose 6 is depicted. The plastic suction hose 6 should be flexible and can be ribbed or smooth. Ribbed hoses are more flexible.

In Figure 4, an electric water pump 10 is presented. The specific type of pump is not essential for the current design; what matters is that the pump creates fluid pressure from the inlet to the outlet. The pump can be motor-driven using fossil fuels or electrically powered. The inlet of the pump 10 is marked as number 15, and the outlet as number 16. For the assumed construction, the default is an electric centrifugal pump 10 powered by an electrical energy source 13. Filling the pump 10, when it is empty, is done through the filling hole 11 on the pump 10. The hole 11 is closed with a screw with a seal after filling the pump and the suction hose 6. To fill the suction hose 6 and the pump 10, a few liters of water are needed.

In Figure 5, the appearance of a push-pin 31 or a presser with a blade 32 is presented, used for puncturing the rubber balloon 30. The push-pin 31 can also be a flat chisel.

In Figure 6, the appearance of the tip of the suction plastic hose 6, punctured by the push-pin 31, is shown. The plastic hose 6 is a few millimeters thick, allowing the push-pin 31 to easily puncture it. The push-pin is inserted all the way into the hose.

The distance from the beginning of the suction plastic hose to the push-pin is approximately equal to the radius of the hose and smaller.

In Figure 7, the appearance of the rubber balloon 30 is depicted. The balloon is made of rubber or latex. Decorative balloons can also be used. The figure provides a shape

of a decorative rubber balloon for better understanding. The optimal balloon shape is cylindrical, open on one side, and it is pulled onto the suction hose 6. Due to its

elasticity, the rubber balloon follows the shape of the solid object to which it's attached. Some balloons burst under strong pressure, while others don't. Therefore, a push-pin 31 is inserted, puncturing the balloon 30 attached to the suction hose 6, to prevent bursting.

In Figure 8, the cross-section of the rubber balloon 30 pulled onto the beginning of the suction hose 6 and punctured by the push-pin 31 is shown.

In Figure 9, the cross-section of the balloon 30 pulled onto the beginning of the suction hose 6, punctured by the push-pin 31, and tightened towards the middle of the suction hose 6 is depicted. The tightened and stretched rubber balloon 30 needs to be secured at the beginning of the suction hose 6.

In Figure 10, the appearance of the rubber clamp 40 for securing the rubber balloon to the suction hose 6 is presented. To secure the rubber balloon externally to the suction hose 6, rubber clamps 40 are necessary. The rubber clamps 40 have a smaller diameter than the suction hose 6. By stretching and placing the rubber clamps 40 externally over the tightened balloon 30, the balloon 30 remains stretched, held by the rubber clamps 40.

In Figure 11, the appearance of the rubber balloon 30, pulled onto the beginning of the suction hose 6, tightened and secured by two rubber clamps 40 or adhesive tape, is shown. The beginning of the suction plastic hose 6 is punctured by the push-pin 31 at a distance smaller than the radius of the hose 6.

In Figure 12, the appearance of the entire system is presented before mounting the system on the stand 5 and before pouring water through the funnel 50 for balancing the suction hose 6 in the well 1. The tip of the rubber balloon 30, emerging at the start of the suction hose 6, is marked as number 30. The suction hose 6 is attached to the pump 10 at the other end. The rubber balloon 30 is tightened towards the middle of the suction hose 6 and secured with several rubber clamps 40 at the beginning of the suction hose 6. The pump 10 has a filling hole 11. A check valve 20 is mounted at the pump's outlet, which allows flow from the pump 10 towards the outlet hose 12. The pump is powered through switch 14 and power source 13.

II Phase - Filling the suction hose with a rubber balloon and pump with water, where the height difference is 0.5-1m, using a funnel at the filling opening. Figure 13 shows the appearance of the entire system before installation in well 1. Pump 10 and suction hose 6 are not filled with water. Label 30 indicates the top of rubber balloon 30,

protruding at the beginning of suction hose 6. Balloon 30 is stretched and secured with several rubber bands 40 at a distance less than a few centimeters from the beginning of suction hose 6. Air is present in suction hose 6 and pump 10. To allow the pump to draw water, the entire system needs to be filled with water. The other end of suction hose 6 is connected to pump 10. Pump 10 has a pump filling opening 11. A non-return valve 20 is mounted at the outlet of pump 10, allowing flow from pump 10

to discharge hose 12. Pump 10 is powered by electricity via switch 14 and power source 13. The function of non-return valve 20 is to prevent water from returning to well 1 after pump 10 is stopped. Filling pump 10 and suction hose 6 is done through

filling opening 11, which is closed by twisting it shut. The most crucial aspect of the filling process for pump 10 and suction hose 6 is that the height difference between balloon 6 and filling opening 11 is not greater than 1m. If the suction hose is empty, it can drop into the well. Therefore, during the filling process, the system should be filled from a height of less than 1m to reduce the kinetic energy of the water.

III Phase - Installation of the filled suction hose with the rubber balloon into the well. Figure 14 shows the appearance of the entire system installed in well 1. Pump 10 and suction hose 6 are filled with water. Label 30 indicates the top of rubber balloon 30, protruding at the beginning of suction hose 6. Balloon 30 is stretched and secured with several rubber bands 40 at a distance less than a few centimeters from the beginning of suction hose 6. In the suction hose 6 and pump 10, there is water, and suction hose 6 is submerged into well 1 to a depth of up to 1m below the well water surface. The top of balloon 30 is not even slightly curved towards the middle of suction hose or towards the well, as water in suction hose 6 is incompressible and non-return valve 20 controls the water pressure in suction hose at 0 bar. The other end of suction hose 6 is connected to pump 10. Pump 10 has a pump filling opening 11. A non-return valve 20 is mounted at the outlet of pump 10, allowing flow from pump 10 to discharge hose 12. Pump 10 is powered by electricity via switch 14 and power source 13. The function of non-return valve 20 is to prevent water from returning to well 1 after pump 10 is stopped.

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

Figure 15 shows the appearance of rubber balloon 30 where pump 10, suction hose 6, and balloon 30 are filled with water. Pump 10 is not yet operational. Rubber balloon 30 is attached to the beginning of suction hose 6, stretched and secured with two rubber bands 40. The beginning of the suction plastic hose 6 is pierced with a push-pin 31 at a distance less than half the diameter of hose 6 from the beginning of suction hose 6. Balloon 30 is together with the beginning of suction hose 6 submerged in the well 1. The beginning of the suction hose with the top of the balloon is at the working depth. As the entire system is filled with water, pump 10 can be started.

Figure 16 shows the appearance of rubber balloon 30 submerged below the well water surface 1 just after starting pump 10. Pump 10 is filled with water and has just started operating. Rubber balloon 30 is attached to the beginning of suction hose 6, stretched and secured with two rubber bands 40. The beginning of the suction plastic hose 6 is

pierced with a push-pin 31 at a distance less than half the diameter of hose 6 from the beginning of suction hose 6. As pump 10 is started, the pump will draw water. There is now pressure from well 1 towards the suction hose 6 and pump 10. Under this pressure, balloon 30 will bend towards the middle of suction hose 6. At the moment when the bent rubber balloon 30 hits the tip of push-pin 32, the balloon will burst. Figure 17 shows the appearance of rubber balloon 30 after bursting, immediately after starting pump 10. As the previous rubber balloon 30 was stretched, hitting the tip of

push-pin 32 causes the top of the balloon to burst. Additionally, if a push-pin 31 is not used, the balloon can burst at critical pressure.

Figure 18 shows the appearance of a manual pump 80. Label 81 denotes the inlet pipe of manual pump 80. Label 84 marks the holes on the inlet pipe 81 for water to enter from well 83 into the inlet pipe 81.

Figure 19 shows the appearance of the complete system ready for water filling and mounted on the pipe of manual pump 81.

Figure 20 is identical to Figure 14, with the difference that suction hose 6 with rubber balloon 30 on top, instead of being submerged in well 1, is pushed into the pipe of manual pump 81.

INDUSTRIAL OR ANOTHER USE OF INVENTION

The application of the invention is in all situations where a non-return valve located before the pump needs to be relocated after the pump. The most significant application is shown in Figure 24. When using rubber balloon 30 at the beginning of suction hose 6, the dimensions or cross-section of hose 6 are significantly smaller than the dimensions of non-return valve 20. By using rubber balloon 30 instead of non-return valve 20 at the beginning of suction hose 6, as shown in Figures 1 and 16, the water flow with the same pump is increased. This difference is most pronounced when the non-return valve is small in size. When pump 10 is used above the pipe of manual pump 81, as shown in Figure 24, the difference in flow between the system with balloon 30 (Figure 24) and non-return valve 20 (Figure 1) at the beginning of suction hose can be 30-50% in terms of flow rate. In addition, no plumbing work is required. The suction hose 6 with rubber balloon 30 is simply lowered into well 1 or into the pipe of manual pump 81.

Stojanović Boban

CLAIMS

1. A method for filling the suction hose (6) with a rubber balloon (30) and a pump (10) that has a water inlet (11) is **characterized by** pouring water into the suction hose (6) and the pump (10) before lowering the hose into the well (1) or the hose of the manual pump (81) on a stand (5) from a height of up to 1m.

2. A method for filling the suction hose (6) with a rubber balloon (30) and a pump (10) that has a water inlet (11) is **characterized by** lowering the water-filled suction hose (6) with the rubber balloon (30) into the well (1).

3. A method for filling the suction hose (6) with a rubber balloon (30) and a pump (10) that has a water inlet (11) is **characterized b**y lowering the water-filled suction hose (6) with the rubber balloon (30) on its free end into the well (1), after which the pump (10) is activated using the switch (14), causing the rubber balloon (30) to enter the beginning of the suction hose (6) and hit the push-pin (31) and burst.

4. A method for filling the suction hose (6) with a rubber balloon (30) and a pump (10) that has a water inlet (11) is **characterized by** the fact that after the rubber balloon (30) bursts, the operation proceeds smoothly as a non-return valve (20) is attached to the pump's (10) outlet.

5. A method for filling the suction hose (6) with a rubber balloon (30) and a pump (10) that has a water inlet (11) is **characterized by** fixing the rubber balloon (30) with push-pins (40).

Abstract
A method for filling the suction hose (6) with a rubber balloon (30) and a pump (10) that has a water inlet (11) is characterized by consisting of four phases: Phase I - Phase of mounting the rubber balloon at the very beginning of the suction hose. Phase II - Phase of filling the suction hose with a rubber balloon and pumping water, with a height difference of 0.5-1m, using a funnel at the water inlet. Phase III - Phase of mounting the water-filled suction hose together with the rubber balloon into the well. Phase IV - Phase of activating the pump, bursting the rubber balloon, and continuing operation. The method for filling the suction hose with a rubber balloon that has a water inlet is characterized by a system consisting of a rubber balloon (30) being pulled onto the beginning of the suction hose (6) connected to the pump (10) at the other end. The system, in addition to the pump (10), suction hose (6), and rubber balloon (30), also includes a drainage hose (12) and a power source (13) and a switch (14). The rubber balloon (350) prevents water from sinking into the well (1) until the pump (10) is activated. After the pump (10) is activated, the rubber balloon (30) bursts on the push-pin (32) of the push-pin (31), creating a continuous water column from the well (1) to the pump (10). After the balloon (30) bursts, water from the pump (10) cannot sink into the well (1) because a non-return valve (20) is mounted behind the pump.

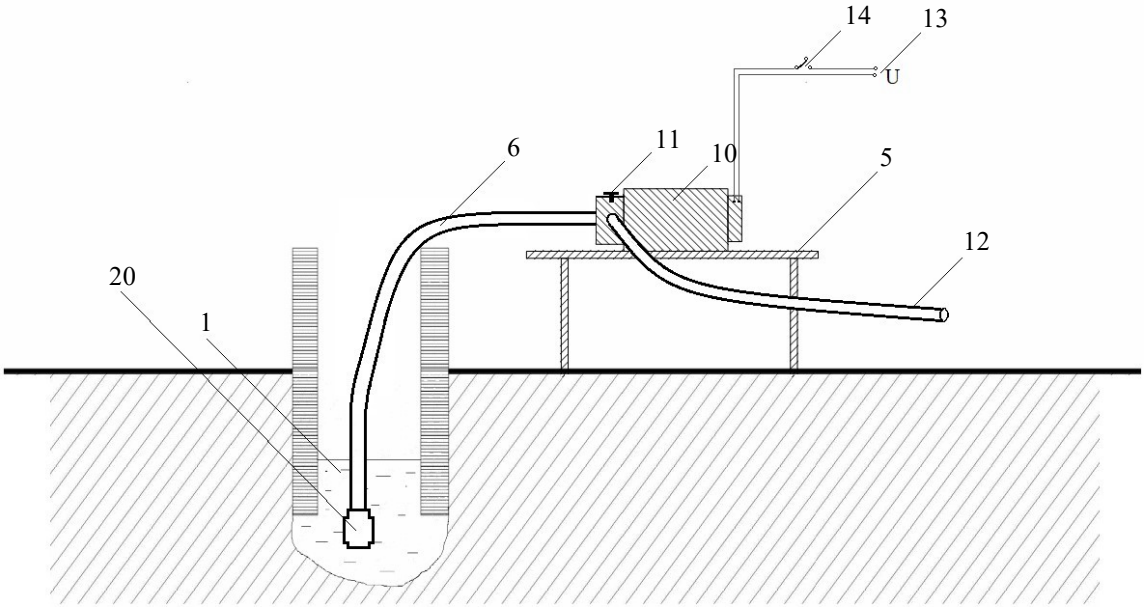

Fig 1.

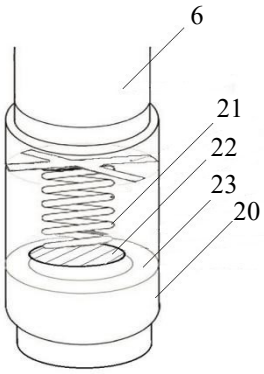

Fig 2.

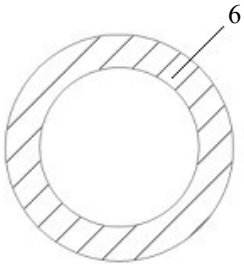

Fig 3.

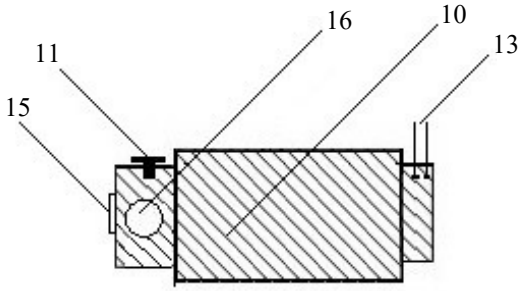

Fig 4.

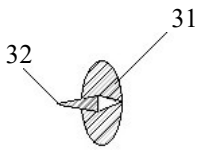

Fig 5.

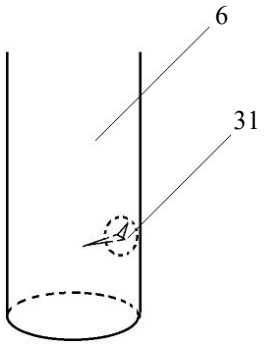

Fig 6.

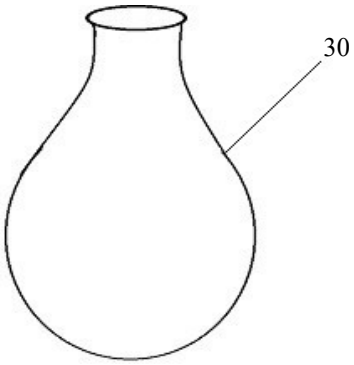

Fig 7.

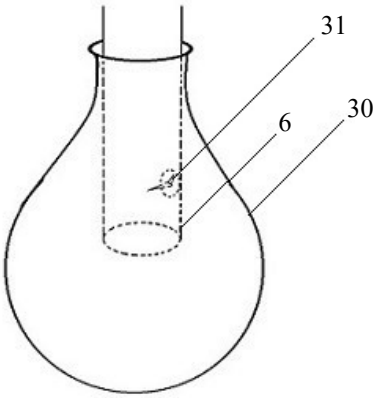

Fig 8.

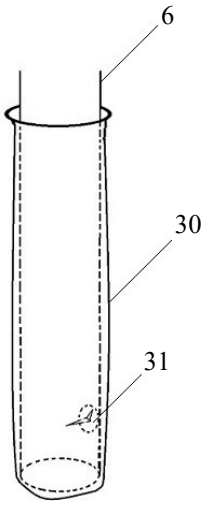

Fig 9.

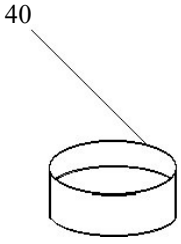

Fig 10.

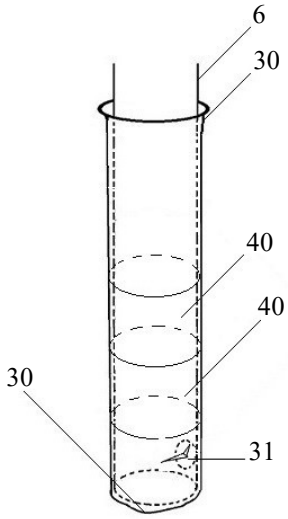

Fig 11.

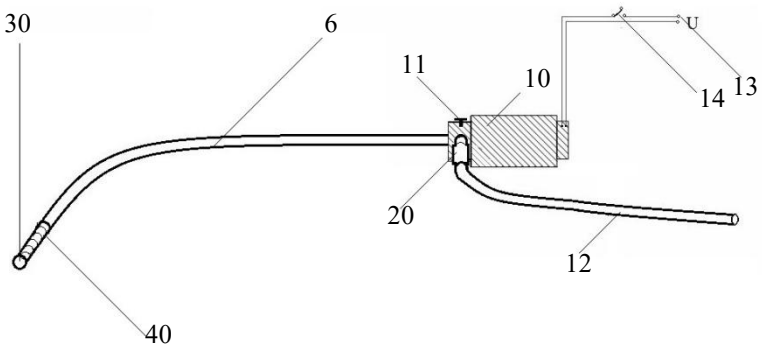

Fig 12.

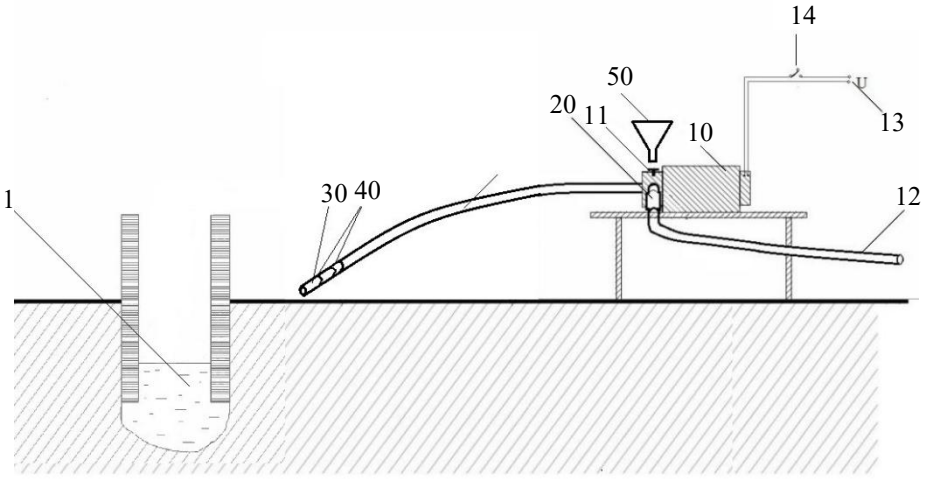

Fig 13.

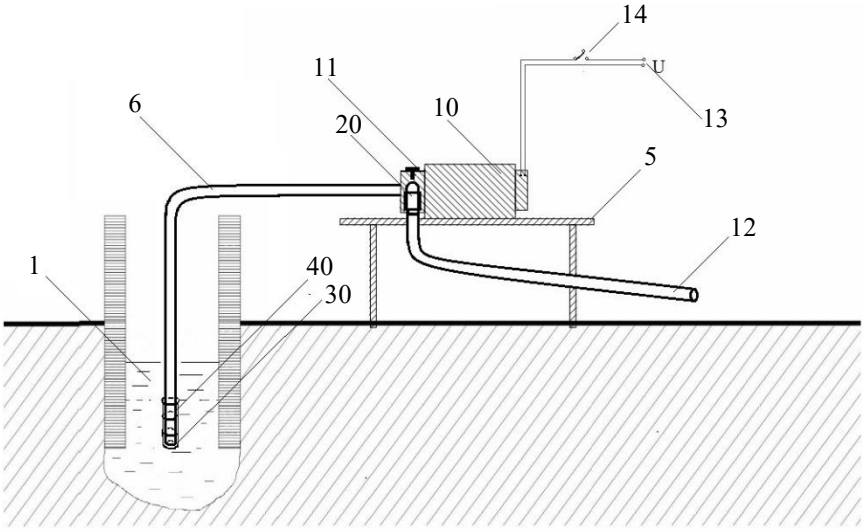

Fig 14.

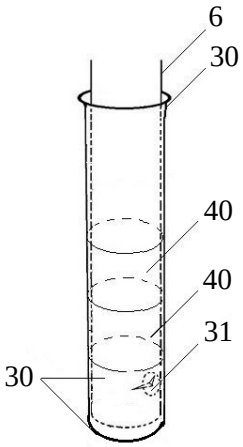

Fig 15.

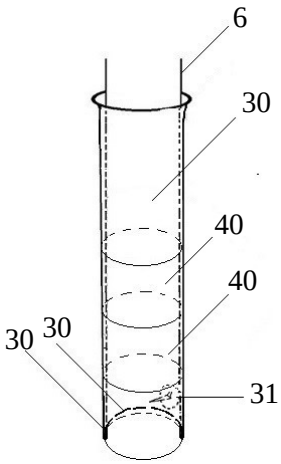

Fig 16.

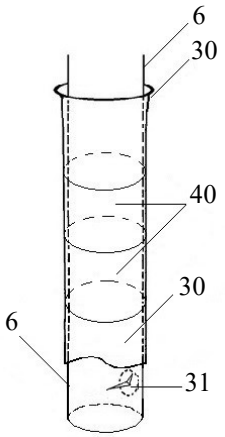

Fig17.

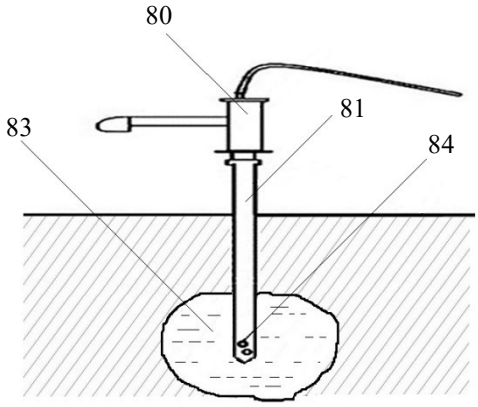

Fig 18.

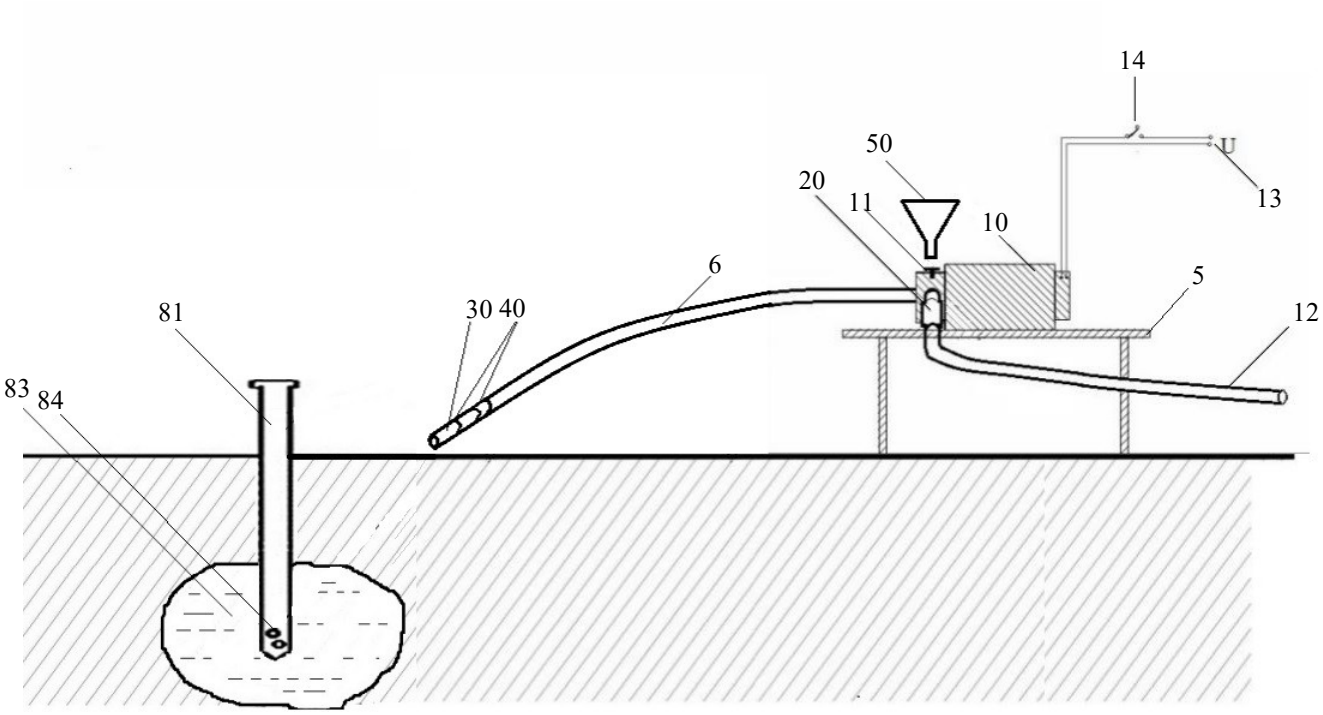

Fig19.

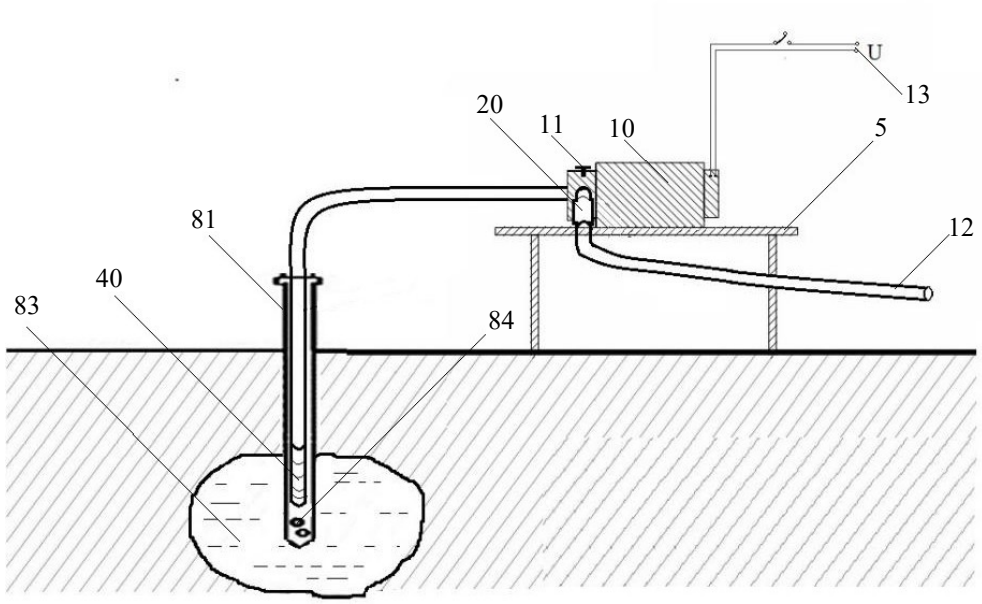

Fig 20.