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(54) **Title:**
IMPROVED CHANNEL CLEANING SYSTEM

(57) **Abstract:**
Improved channel cleaning system Abstract An improved channel cleaning system comprises an isolating plate with a filter screen, which allows fluid instead of cleaning balls to flow through; a ball collector, which is separated into a first chamber and a second chamber; an inlet of a fluid supply tube and an outlet of a cleaning ball supply tube are arranged with a pressure difference, thus generating a suction which enables the cleaning balls to flow through the cleaning balls supply tube and be sent from the cleaning balls supply tube into the channel so as to clean the wall of the channel; an inlet of the cleaning ball return tube and an outlet of the fluid return tube are arranged to form a pressure difference, thus generating a suction which enables the cleaning balls to flow into a ball collector, with at least the cleaning ball return tube and the cleaning ball supply tube being connected to the first chamber of the ball collector via a T-shaped tube; the system has advantages that there are little contacts on the ball collector, and the inlet of the fluid supply tube and the outlet of the cleaning ball supply tube are in a straight line or present 90 degrees on the ball collector, thus enabling the flow of the fluid and the cleaning balls to be more smooth; and there is a highly flexible assembly matching, and it can also be convenient for installation and maintenance in a limited space. Fig. 1

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Improved channel cleaning system

Abstract

An improved channel cleaning system comprises an isolating plate with a filter screen, which allows fluid instead of cleaning balls to flow through; a ball collector, which is separated into a first chamber and a second chamber; an inlet of a fluid supply tube and an outlet of a cleaning ball supply tube are arranged with a pressure difference, thus generating a suction which enables the cleaning balls to flow through the cleaning balls supply tube and be sent from the cleaning balls supply tube into the channel so as to clean the wall of the channel; an inlet of the cleaning ball return tube and an outlet of the fluid return tube are arranged to form a pressure difference, thus generating a suction which enables the cleaning balls to flow into a ball collector, with at least the cleaning ball return tube and the cleaning ball supply tube being connected to the first chamber of the ball collector via a T-shaped tube; the system has advantages that there are little contacts on the ball collector, and the inlet of the fluid supply tube and the outlet of the cleaning ball supply tube are in a straight line or present 90 degrees on the ball collector, thus enabling the flow of the fluid and the cleaning balls to be more smooth; and there is a highly flexible assembly matching, and it can also be convenient for installation and maintenance in a limited space.

Fig. 1

Improved channel cleaning system

Technical Area

The present invention relates to a cleaning system for cleaning the interior of a channel using movable cleaning elements.

Background art

In many cases, an apparatus in which curved channels are arranged is needed to achieve a certain function, and the most common apparatus is a heat exchanger. In order to prevent dirt or other undesirable subsidence from being generated when fluid is flowing in these curved channels and depositing on the inner of the channel, various methods are proposed to clean the inner wall of the channels described above.

The most common method available is to use cleaning balls made of rubber or sponge material, the diameter of which is slightly larger than that of the channels to be cleaned, and when the cleaning balls are moving in the channels along with the fluid, these cleaning balls will be compressed. The purpose for cleaning the inner wall of the channels will be achieved using the friction between these compressed cleaning balls and the inner walls of the channels. Generally, the cleaning balls and the fluid pass through the channels from its upstream end to its downstream end towards the direction of the fluid flow. An improved cleaning system as disclosed in Chinese patent document CN100424461C is shown in Fig. 7, and the system comprises a channel (100) which is used to guide fluid through and is connected to an inlet tube (110) and an outlet tube (120), a ball collector (130), which is separated into a first chamber (132) and a second chamber (133) by an isolating plate with holes (131), with a certain number of elastic cleaning balls (134) being provided in the first chamber

(132), and only the fluid instead of the elastic cleaning balls (134) being allowed by the first isolating plate with holes (131) to flow from the first chamber (132) into the second chamber (133); a ball receiver (122) which is provided on an upstream end (121) of the outlet tube (120), characterized in that the ball receiver (122) is used to separate the elastic cleaning balls (134) from the fluid, with the ball receiver (122) including a filter screen (1221), which only allow the fluid instead of the elastic cleaning balls (134) to flow through; a piece of fluid supply tube (140), with a first valve (V1) being cascaded therein, an inlet end (141) of the fluid supply tube (140) being located on an upstream end (111) of the inlet tube 110, and an outlet (142) of the fluid supply tube (140) being connected to the first chamber (132) of the ball collector (130); a piece of elastic cleaning ball supply tube (150), with a first one-way valve (CV1) being cascaded therein, and the first one-way valve (CV1) only allowing the fluid and the elastic cleaning balls (134) within the first chamber (132) to discharge from the first chamber (132), an inlet end (151) of the elastic cleaning ball supply tube (150) being connected to the first chamber (132), an outlet end (152) of the elastic cleaning ball supply tube (152) being connected to the downstream end (112) of the inlet tube (110), and the elastic cleaning balls (134) being brought into the inlet tube (110) using a fluid pressure difference between the inlet end (141) of the fluid supply tube (140) and the inlet end (151) of the elastic cleaning ball supply tube (150); a piece of fluid return tube (160), with a second valve (V2) being cascaded therein, the inlet end (161) of the fluid return tube (160) being connected to the second chamber (133), and the outlet end (162) of the fluid return tube (160) being connected to the downstream end (123) of the outlet tube (120), a piece of elastic cleaning ball return tube (170), with a second one-way valve (CV2) being cascaded therein, and only the elastic cleaning balls and the fluid being allowed by the second one-way valve (CV2) to flow into the first chamber (132), the inlet

end (171) of the elastic cleaning ball return tube being connected to the outlet of the filter screen (1221), the outlet end (172) of the elastic cleaning ball return tube being connected to the first chamber (132), and the elastic cleaning balls (134) returning to the first chamber (132) using the fluid pressure difference between the filter screen (1221) and the outlet (162) of the fluid return tube (160) when the first valve (V1) is closed. This cleaning system has the advantage that as long as two valves, i.e., on or off of the first valve (V1) and the second valve (V2), are controlled, the cleaning of the channel (100) or the collection of the elastic cleaning balls (134) can be achieved conveniently. However, the fluid supply tube (140) and the elastic cleaning ball supply tube (150) are connected to the first chamber (132) in particular the same side of the ball collector (130) by this cleaning system, thus it is inevitable that after the fluid flows from the fluid supply tube (140) into the first chamber (132), the elastic cleaning balls (134) can be brought into the inlet tube (110), only if the fluid supply tube (140) is bent 360 degrees, which cause the flow of the elastic cleaning balls (134) to be blocked and not smooth. The second problem is that the fluid supply tube (140), the elastic cleaning ball supply tube (150), the fluid return tube (160) and the elastic cleaning return tube (170) of this cleaning system are all connected to the ball collector (130) individually, thus not only resulting in much more failure points, but also bring inconvenience to the field installation.

Summary of the invention

The purpose of this invention is to overcome the above shortcomings, and provide for the society an improved channel cleaning system, in which there are some contacts on a ball collector as little as possible, and because an outlet of a fluid supply tube and an inlet of a cleaning supply tube are in a straight line or present 90 degrees, cleaning balls can be flushed into a cleaning ball supply tube

directly under the pressure of the fluid, and the flow of the cleaning balls will be more smooth when the elastic cleaning balls are in a circle.

The second purpose of the present invention is to make the system be with highly flexible assembly matching.

The third purpose of the present invention is to make the system be convenient for installation and maintenance in a limited space as well.

The technical scheme of the present invention is to design an improved channel cleaning system, with a channel being used to guide fluid through and being connected to one inlet tube and one outlet tube, wherein, the system comprises:

a ball collector, characterized in that the ball collector is separated into a first chamber and a second chamber by a first isolating plate with holes, with a certain number of elastic cleaning balls being provided in the first chamber, and only the fluid instead of the elastic cleaning balls being allowed by the first isolating plate with holes to flow from the first chamber into the second chamber;

a ball receiver which is provided on a downstream end of the outlet tube, characterized in that the ball receiver is used to separate the elastic cleaning balls from the fluid, and includes a filter screen, which only allow the fluid instead of the elastic cleaning balls to flow through;

a piece of fluid supply tube, a piece of elastic cleaning ball supply tube, a piece of fluid return tube and a piece of elastic cleaning ball return tube; characterized in that:

the outlet end of the fluid supply tube is connected to the second chamber of the ball collector by a first T-shaped tube, with the inlet end of the fluid supply tube being located within an upstream end of the inlet tube, the nozzle direction of the inlet end of the fluid supply tube being opposite to the direction of the fluid flow F1, and a first valve being cascaded in a pipe of the fluid supply tube

which is located between the first T-shaped tube and the inlet end of the fluid supply tube;

the inlet end of the elastic cleaning ball supply tube is connected to the first chamber of the ball collector by a second T-shaped tube, and the outlet end of the elastic cleaning ball supply tube is connected to the downstream end of the inlet tube, with a first one-way valve being cascaded in a pipe of the elastic cleaning ball supply tube which is located between the second T-shaped tube and the outlet end of the elastic cleaning ball supply tube, and the first one-way valve only allowing the fluid and the elastic cleaning balls to discharge from the ball collector;

the inlet end of the fluid return tube is connected to the first T-shaped tube, and the outlet end of the fluid return tube is connected to the downstream end of the outlet tube which is connected to the back end of the ball receiver, with a second valve being cascaded in the fluid return tube;

the inlet end of the elastic cleaning ball return tube passes through the housing of the ball receiver and is connected to the outlet end of the filter screen being located within the housing of the ball receiver, and the outlet end of the elastic cleaning ball return tube is connected to the second T-shaped tube, with a second one-way valve being cascaded in the elastic cleaning ball return tube, and the second one-way valve only allowing the fluid and the elastic cleaning balls to flow into the ball collector.

As an improvement of the present invention, an extension line of an axle wire of a pipe where the first T-shaped tube and the ball collector are connected and an extension line of an axle wire of a pipe where the second T-shaped tube and the ball collector are connected vertically intersect each other, with a backup interface being provided on the ball collector, and the backup interface being located on the extension line of the axle wire of the pipe where the first T-shaped

tube and the ball collector are connected.

As a further improvement of the present invention, the ball receiving screen of the ball receiver has a double funnel shape.

The present invention can also be designed as an improved channel cleaning system, with a channel being used to guide fluid through and being connected to one inlet tube and one outlet tube, wherein, the system comprising:

a ball collector, characterized in that the ball collector is separated into a first chamber and a second chamber by a first isolating plate with holes, with a certain number of elastic cleaning balls being provided in the first chamber, and only the fluid instead of the elastic cleaning balls being allowed by the first isolating plate with holes to flow from the first chamber into the second chamber;

a ball receiver which is provided on an upstream end of the outlet tube, characterized in that the ball receiver is used to separate the elastic cleaning balls from the fluid, with the ball receiver including a filter screen, which only allow the fluid instead of the elastic cleaning balls to flow through;

a piece of fluid supply tube, a piece of elastic cleaning ball supply tube, a piece of fluid return tube and a piece of elastic cleaning ball return tube, characterized in that:

the outlet end of the fluid supply tube is connected to the second chamber of the ball collector by a first T-shaped tube, with the inlet end of the fluid supply tube being located within an upstream end of the inlet tube, the nozzle direction of the inlet end of the fluid supply tube being opposite to the direction of the fluid flow F1, and a first valve being cascaded in a pipe of the fluid supply tube which is located between the first T-shaped tube and the inlet end of the fluid supply tube;

the inlet end of the elastic cleaning ball supply tube is connected to the first chamber of the ball collector, and the outlet end of the elastic cleaning ball

supply tube is connected to the downstream end of the inlet tube, with a first one-way valve being cascaded in the elastic cleaning ball supply tube, and only the fluid and the elastic cleaning balls being allowed by the first one-way valve to discharge from the ball collector;

an inlet end of the fluid return tube is connected to a first T shaped tube, and an outlet end of the fluid return tube is connected to the downstream end of the outlet tube which is connected to the back end of the ball receiver, with a second valve being cascaded in the fluid return tube;

an inlet end of the elastic cleaning ball return tube passes through the housing of the ball receiver and is connected to the outlet end of the filter screen being located within the housing of the ball receiver, and an outlet end of the elastic cleaning ball return tube is connected to the first chamber of the ball collector, with a second one-way valve being cascaded in the elastic cleaning ball return tube, and only the fluid and the elastic cleaning balls being allowed by the second one-way valve to flow into the ball collector.

As a further improvement of the present invention, the ball collector has a cylinder shell, with a cover being provided on the upper end of the ball collector, a funnel-shaped outlet being provided on the lower end of the ball collector, a second isolating plate with holes being provided at the interface of the lower end of the ball collector and the funnel-shaped outlet, and only the fluid instead of the elastic cleaning balls are allowed by the second isolating plate with holes to flow from the first chamber into the funnel-shaped outlet, a fifth valve being connected at the funnel-shaped outlet, a drain tube being connected at the outlet of the fifth valve, and an obstacle ball filter screen being provided within the drain tube.

As a further improvement of the present invention, an extension line of the axle wire of the outlet tube connected to the housing of the ball receiver is

perpendicular to an extension line of the axle wire of the housing of the ball receiver.

As a further improvement of the present invention, a third valve is provided on the elastic cleaning ball return tube; and a fourth valve is provided on the elastic cleaning ball supply tube. The system has several advantages as follows: firstly, there are little contacts on the ball collector, and because the outlet of the fluid supply tube and the inlet of the cleaning supply tube are in a straight line or present 90 degrees, cleaning balls can be flushed into the cleaning ball supply tube directly under the pressure of the fluid when the elastic cleaning balls are in a circle, thus enabling the flow to be more smooth; secondly, the present invention is with highly flexible assembly matching, and thirdly, the present invention can also be convenient for installation and maintenance in a limited space.

Brief description of the drawings

Figure 1 is a structural schematic of a first embodiment of the present invention.

Figure 2 is a structural schematic of a second embodiment of the present invention.

Figure 3 is another installation schematic of the embodiment illustrated in figure 2.

Figure 4 is a structural schematic of a third embodiment of the present invention.

Figure 5 is a structural schematic of a fourth embodiment of the present invention.

Figure 6 is a sectional schematic of the ball collector in the present invention.

Figure 7 is a plane schematic of an available cleaning system.

Detailed description of the invention

Referring to Fig. 1, in which an improved channel cleaning system is disclosed, and in the present embodiment, this system is used on a heat exchanger, which includes a heat medium inlet (99) and a heat medium outlet (98) for exchanging heat with a cooling medium in a channel (10). The most common heat medium is hot steam, while the most common cooling medium is cooling water, i.e., the fluid described below.

The channel (10) is used to guide fluid through and is connected to one inlet tube 20 and one outlet tube (30), wherein, the system comprising:

a ball collector (40), characterized in that the ball collector (40) is separated into a first chamber (42) and a second chamber (43) by a first isolating plate with holes (41), with a certain number of elastic cleaning balls (44) being provided in the first chamber (42), and only the fluid instead of the elastic cleaning balls (44) being allowed by the first isolating plate with holes (41) to flow from the first chamber (42) into the second chamber (43);

a ball receiver (50) which is provided on an upstream end (31) of the outlet tube (30), characterized in that the ball receiver (50) is used to separate the elastic cleaning balls (44) from the fluid, and includes a filter screen (51), which only allow the fluid instead of the elastic cleaning balls (44) to flow through;

a piece of fluid supply tube (60), a piece of elastic cleaning ball supply tube (70), a piece of fluid return tube (80) and a piece of elastic cleaning ball return tube (90); characterized in that:

the outlet end (61) of the fluid supply tube (60) is connected to the second chamber (43) of the ball collector (40) by a first T-shaped tube (62), with the inlet end (63) of the fluid supply tube (60) being located within an upstream end (21) of the inlet tube (20), the nozzle direction of the inlet end (63) of the fluid supply

tube (60) being opposite to the direction of the fluid flow (F1), and a first valve (64) being cascaded in a pipe (65) of the fluid supply tube (60) which is located between the first T-shaped tube (62) and the inlet end (63) of the fluid supply tube 60;

the inlet end (71) of the elastic cleaning ball supply tube (70) is connected to the first chamber (42) of the ball collector (40) by a second T-shaped tube (72), and the outlet end (73) of the elastic cleaning ball supply tube (70) is connected to the downstream end (22) of the inlet tube (20), with a first one-way valve (74) being cascaded in a pipe (75) of the elastic cleaning ball supply tube (70) which is located between the second T-shaped tube (72) and the outlet end (73) of the elastic cleaning ball supply tube (70), and the first one-way valve (74) only allowing the fluid and the elastic cleaning balls (44) to discharge from the ball collector (40);

the inlet end (81) of the fluid return tube (80) is connected to the first T-shaped tube (62), and the outlet end (82) of the fluid return tube (80) is connected to the downstream end (32) of the outlet tube (30) which is connected to the back end of the ball collector (50), with a second valve (83) being cascaded in the fluid return tube (80);

the inlet end (91) of the elastic cleaning ball return tube (90) passes through the housing (52) of the ball collector (50) and is connected to the outlet end of the filter screen (51) being located within the housing (52) of the ball collector (50), and the outlet end (92) of the elastic cleaning ball return tube (90) is connected to the second T-shaped tube (72), with a second one-way valve (93) being cascaded in the elastic cleaning ball return tube (90), and the second one-way valve (93) only allowing the fluid and the elastic cleaning balls (44) to flow into the ball collector (40). The ball receiving screen (51) of the ball receiver (50) has a double funnel shape, with a screen ring (512) being connected

behind a big funnel (511) at the front end, and a small funnel (513) being connected behind the screen ring (512), such design thus increasing the area of the filter screen of the ball receiving screen and making the flow of the water more smooth.

With reference to the above embodiments, when this system is stopped and not in use, the first valve (65) and the second valve (83) are in an inactive state, and all the elastic cleaning balls (44) are concentrated on the ball collector (40). When the channel (10) is needed to be cleaned, the first valve (65) is opened, and then the fluid flows from the inlet end (63) of the fluid supply tube (60) into the first valve (65), flows through the ball collector (40) and flows from the outlet end (73) of the elastic cleaning ball supply tube (70) into the channel (10) along with the elastic cleaning balls (44); at this point, the second valve (83) is opened, and the first valve (65) is closed, and then the elastic cleaning balls (44) flow from the channel (10) into the ball receiver (50), and after the ball receiver (50) separates the elastic cleaning balls (44), the elastic cleaning balls (44) enter directly through the elastic cleaning ball return tube (90). The ball collector (40) in the embodiment is only used as a function of a filling station for the elastic cleaning balls (44) in the process of cleaning channel. After the end of the cleaning, the first valve (65) is closed, and the second valve (83) is opened. At this point, because the pressure of the outlet end (73) of the elastic cleaning ball supply tube (70) is higher than that of the outlet end (92) of the elastic cleaning ball return tube (90), the first one-way valve (74) is closed, the second one-way valve (93) is opened, and the elastic cleaning balls (44) return to the ball collector (40) under the action of the ball receiver (50), while the fluid return to the outlet tube (30) from the fluid return tube (80), thus completing the work of receiving balls. A third valve (94) is further provided on the elastic cleaning ball return tube (90); and a fourth valve (76) is further provided on the elastic cleaning ball

supply tube (70). In the normal state, the third valve (94) and the fourth valve (76) is in normally open state, and the third valve (94) and the fourth valve (76) are closed only when the ball collector (40) is needed to be cleaned or to be replaced.

Referring to Fig. 2, Fig. 2 is a structural schematic of a second embodiment of the present invention. Compared to the embodiment shown in Fig. 1, Fig. 2 has essentially the same structure, and the only difference is that an extension line of an axle wire (621) of the pipe where the first T-shaped tube (62) and the ball collector (40) are connected and an extension line of an axle wire (721) of the pipe where the second T-shaped tube (72) and the ball collector (40) are connected vertically intersect each other (see Fig. 3), with a backup interface (45) being provided on the ball collector (40), and the backup interface (45) being located on the extension line of the axle wire (621) of the pipe where the first T-shaped tube (62) and the ball collector (40) are connected. This structure may use the backup interface (45) on the left side when the inlet tube (20) is located on the left of the ball collector (40), as shown in Fig. 3. The present invention is made to be with highly flexible assembly matching.

Referring to Fig. 4, Fig. 4 is a structural schematic of a third embodiment of the present invention. Compared to the embodiment shown in Fig. 2, Fig. 4 has essentially the same structure, and the only difference is that an extension line of an axle wire (33) of the outlet tube (30) connected to the housing (52) of the ball collector (50) is perpendicular to an extension line of an axle wire (53) of the housing (52) of the ball collector (50). This structure is particularly suited to the situation that the inlet tube (20) and the outlet tube (30) need to be piped upward because the system is lack of assembly space, and using the structure of the ball receiver with a "L" shaped opening, this system can be assembled in a relative small space. In addition, a detachable maintenance window (54) is added at the back end of the ball receiver (50), and the filter screen (51) is designed as a

detachable structure, such as slip type structure, and in this way, when the filter screen (51) need to be maintained, it can be convenient to maintain from this maintenance window (54). In this embodiment, the ball collector (40) has a cylinder shell, with a cover (46) being provided on the upper end of the ball collector (40), a funnel-shaped outlet (47) being provided on the lower end of the ball collector (40), a second isolating plate with holes (48) being provided at the interface of the lower end of the ball collector (40) and the funnel-shaped outlet (47) (see Fig. 6), and only the fluid and the obsolete cleaning balls instead of the perfect elastic cleaning balls (44) are allowed by the second isolating plate with holes (48) to flow from the first chamber (42) into the funnel-shaped outlet (47), a fifth valve (494) being connected at the funnel-shaped outlet (47), a drain tube 49 being connected at the fifth valve (494), and an obstacle ball filter screen (491) being provided within the drain tube (49). A supporting bar (492) is provided under the drain tube (49), with the supporting bar (492) fixed to the floor (493). A funnel-shaped outlet (47) is provide under the ball receiver, which has the function of generating a number of sundries and chips of the elastic cleaning balls (44) when the cleaning system is in a long term operation process, and these chips will flow through the first isolating plate with holes (41) and the second isolating plate with holes (48) to deposit, and be cleaned regularly and manually through the drain tube.

Referring to Fig. 5, the present invention can further be designed as an improved channel cleaning system, with a channel (10) being used to guide fluid through and being connected to one inlet tube (20) and one outlet tube (30), wherein, the system comprising:

a ball collector (40), characterized in that the ball collector (40) is separated into a first chamber (42) and a second chamber (43) by a first isolating plate with holes (41), with a certain number of elastic cleaning balls (44) being provided in

the first chamber (42), and only the fluid instead of the elastic cleaning balls (44) being allowed by the first isolating plate with holes (41) to flow from the first chamber (42) to the second chamber (43);

a ball receiver (50) which is provided on an upstream end (31) of the outlet tube (30), characterized in that the ball receiver (50) is used to separate the elastic cleaning balls (44) from the fluid, with the ball receiver (50) including a filter screen (51), which only allow the fluid instead of the elastic cleaning balls (44) to flow through;

a piece of fluid supply tube (60), a piece of cleaning ball supply tube (70), a piece of fluid return tube (80) and a piece of elastic cleaning ball return tube (90); characterized in that

an outlet tube (61) of the fluid supply tube (60) is connected to the second chamber (43) of the ball collector (40) by a first T-shaped tube (62), with an inlet end (63) of the fluid supply tube (60) being located within the upstream end (21) of the inlet tube (20), and the nozzle direction of the inlet end (63) of the fluid supply tube (60) is opposite to the direction of the fluid flow (F1), a first valve (65) being cascaded in the pipe (64) of the fluid supply tube (60) which resides between the first T-shaped tube (62) and the inlet end (63) of the fluid supply tube (60);

an inlet end (71) of the elastic cleaning ball supply tube (70) is connected to the first chamber (42) of the ball collector (40), and an outlet end (73) of the elastic cleaning ball supply tube (70) is connected to the downstream end (22) of the inlet tube (20), with a first one-way valve (74) being cascaded in the elastic cleaning ball supply tube (70), and only the fluid and the elastic cleaning balls (44) being allowed by the first one-way valve (74) to discharge from the ball collector (40);

an inlet end (81) of the fluid return tube (80) is connected to a first T shaped

tube (62), and an outlet end (82) of the fluid return tube (80) is connected to the downstream end (32) of the outlet tube (30) which is connected to the back end of the ball collector (50), with a second valve (83) being cascaded in the fluid return tube (80);

an inlet end (91) of the elastic cleaning ball return tube (90) passes through the housing (52) of the ball collector (50) and is connected to the outlet end of the filter screen (51) being located within the housing (52) of the ball collector (50), and an outlet end (92) of the elastic cleaning ball return tube (90) is connected to the first chamber (42) of the ball collector (40), with a second one-way valve (93) being cascaded in the elastic cleaning ball return tube (90), and only the fluid and the elastic cleaning balls (44) being allowed by the second one-way valve (93) to flow into the ball collector (40).

Compared to the embodiment shown in Fig. 1, this cleaning system has essentially the same structure, and the only difference is that the elastic cleaning ball supply tube (70) and the elastic cleaning ball return tube (90) are connected to the first chamber (42) directly instead of using the second T-shaped tube (72), which illustrates that the present invention has a more flexible assembly structure.

The first valve (64) and the second valve (83) both can be controlled by a PLC controller (not shown) when the present invention is in actual use. When the PLC controller is working, it drives the first valve (64) and opens the first valve (64) to enable the fluid to flow through, while closes the second valve (83) to prohibit the fluid from flowing through. At this point, the first one-way valve (74) is opened, the second one-way valve (93) is closed, and after the fluid flows from the fluid supply tube (60) into the ball collector (40), the elastic cleaning balls (44) are sent to the first one-way valve (74), thus enabling the elastic cleaning balls (44) to enter into the channel (10) needed to be cleaned. After 3 to 10

seconds, the PLC controller closes the first valve (64) to prohibit the fluid from flowing through while the PLC controller opens the second valve (83) to enable the fluid to flow through. At this point, the elastic cleaning balls (44) flow from the ball receiver (50) into ball collector (40) under the push of the fluid. And because the first one-way valve (74) is closed under the positive pressure and there are isolating effects of the first isolating plate with holes (41) and the second isolating plate with holes (48), the elastic balls (44) can only stay in the ball collector (40). After 3 to 10 minutes, the PLC controller closes the second valve (83) to prohibit the fluid from flowing through and the overall cleaning system completes this cleaning.

The first T-shaped tube (62) and the second T-shaped tube (72) in the present invention each refer to a T-shaped three-way.

Claims

1. An improved channel cleaning system, with a channel (10) being used to guide fluid through and being connected to one inlet tube (20) and one outlet tube (30), wherein, the system comprising:

a ball collector (40), characterized in that the ball collector (40) is separated into a first chamber (42) and a second chamber (43) by a first isolating plate with holes (41), with a certain number of elastic cleaning balls (44) being provided in the first chamber (42), and only the fluid instead of the elastic cleaning balls (44) being allowed by the first isolating plate with holes (41) to flow from the first chamber (42) into the second chamber (43);

a ball receiver (50) which is provided on a downstream end (31) of the outlet tube (30), characterized in that the ball receiver (50) is used to separate the elastic cleaning balls (44) from the fluid, and includes a filter screen (51), which only allow the fluid instead of the elastic cleaning balls (44) to flow through;

a piece of fluid supply tube (60), a piece of elastic cleaning ball supply tube (70), a piece of fluid return tube (80) and a piece of elastic cleaning balls return tube (90); characterized in that:

an outlet end (61) of the fluid supply tube (60) is connected to the second chamber (43) of the ball collector (40) by a first T-shaped tube (62), with an inlet end (63) of the fluid supply tube (60) being located within an upstream end (21) of the inlet tube (20), the nozzle direction of the inlet end (63) of the fluid supply tube (60) being opposite to the direction of the fluid flow (F1), and a first valve (64) being cascaded in a pipe (65) of the fluid supply tube (60) which is located between the first T-shaped tube (62) and the inlet end (63) of the fluid supply tube (60);

an inlet end (71) of the elastic cleaning ball supply tube (70) is connected to the

first chamber (42) of the ball collector (40) by a second T-shaped tube (72), and an outlet end (73) of the elastic cleaning ball supply tube (70) is connected to a downstream end (22) of the inlet tube (20), with a first one-way valve (74) being cascaded in a pipe (75) of the elastic cleaning ball supply tube (70) which is located between the second T-shaped tube (72) and the outlet end (73) of the elastic cleaning ball supply tube (70), and only the fluid and the elastic cleaning balls (44) being allowed by the first one-way valve (74) to discharge from the ball collector (40);

an inlet end (81) of the fluid return tube (80) is connected to the first T-shaped tube (62), and an outlet end (82) of the fluid return tube (80) is connected to a downstream end (32) of the outlet tube (30) which is connected to the back end of the ball receiver (50), with a second valve (83) being cascaded in the fluid return tube (80);

an inlet end (91) of the elastic cleaning ball return tube (90) passes through a housing (52) of the ball receiver (50) and is connected to an outlet end of the filter screen (51) being located within the housing (52) of the ball receiver (50), and an outlet end (92) of the elastic cleaning ball return tube (90) is connected to the second T-shaped tube (72), with a second one-way valve (93) being cascaded in the elastic cleaning ball return tube (90), and only the fluid and the elastic cleaning balls (44) being allowed by the second one-way valve (93) to flow into the ball collector (40).

2. The improved channel cleaning system as claimed in claim 1, characterized in that an extension line of an axle wire (621) of a pipe where the first T-shaped tube (62) and the ball collector (40) are connected and an extension line of an axle wire (721) of a pipe where the second T-shaped tube (72) and the ball collector (40) are connected vertically intersect each other, with a backup

interface (45) being provided on the ball collector (40), and the backup interface (45) being located on the extension line of the axle wire (621) of the pipe where the first T-shaped tube (62) and the ball collector (40) are connected.

3. The improved channel cleaning system as claimed in claim 1 or 2, characterized in that the ball collector (40) has a cylinder shell, with a cover (46) being provided on an upper end of the ball collector (40), a funnel-shaped outlet (47) being provided on a lower end of the ball collector (40), a second isolating plate with holes (48) being provided at an interface of the lower end of the ball collector (40) and the funnel-shaped outlet (47), only the fluid and the obsolete cleaning balls instead of the perfect elastic cleaning balls (44) being allowed by the second isolating plate with holes (48) to flow from the first chamber (42) into the funnel-shaped outlet (47), a fifth valve (494) being connected at the funnel-shaped outlet (47), and a drain tube (49) being connected at the outlet of the fifth valve (494).

4. The improved channel cleaning system as claimed in claim 3, characterized in that an extension line of an axle wire (33) of the outlet tube (30) connected to the housing (52) of the ball receiver (50) is perpendicular to an extension line of an axle wire (53) of the housing (52) of the ball receiver (50).

5. The improved channel cleaning system as claimed in claim 4, characterized in that a third valve (94) is provided on the elastic cleaning ball return tube (90); and a fourth valve (76) is provided on the elastic cleaning ball supply tube (70).

6. The improved channel cleaning system as claimed in claim 5, characterized in that a ball receiving screen (51) of the ball receiver (50) has a double funnel

shape, with a screen ring (512) being connected behind a big funnel (511) at the front end, and a small funnel (513) being connected behind the screen ring (512).

7. An improved channel cleaning system, with a channel (10) being used to guide fluid through and being connected to one inlet tube (20) and one outlet tube (30), wherein, the system comprising:

a ball collector (40), characterized in that the ball collector (40) is separated into a first chamber (42) and a second chamber (43) by a first isolating plate with holes (41), with a certain number of elastic cleaning balls (44) being provided in the first chamber (42), and only the fluid instead of the elastic cleaning balls (44) being allowed by the first isolating plate with holes (41) to flow from the first chamber (42) to the second chamber (43);

a ball receiver (50) which is provided on an upstream end (31) of the outlet tube (30), characterized in that the ball receiver(50) is used to separate the elastic cleaning balls (44) from the fluid, with the ball receiver(50) including a filter screen (51), which only allow the fluid instead of the elastic cleaning balls (44) to flow through; a piece of fluid supply tube (60), a piece of cleaning ball supply tube (70), a piece of fluid return tube (80) and a piece of elastic cleaning ball return tube (90); characterized in that:

an outlet tube (61) of the fluid supply tube (60) is connected to the second chamber (43) of the ball collector (40) by a first T-shaped tube (62), with an inlet end (63) of the fluid supply tube (60) being located within an upstream end (21) of the inlet tube (20), and the nozzle direction of the inlet end (63) of the fluid supply tube (60) is opposite to the direction of the fluid flow (F1), a first valve (65) being cascaded in a pipe (64) of the fluid supply tube (60) which resides between the first T-shaped tube (62) and the inlet end (63) of the fluid supply tube (60);

an inlet end (71) of the elastic cleaning ball supply tube (70) is connected to the first chamber (42) of the ball collector (40), and an outlet end (73) of the elastic cleaning ball supply tube (70) is connected to a downstream end (22) of the inlet tube (20), with a first one-way valve (74) being cascaded in the elastic cleaning ball supply tube (70), and only the fluid and the elastic cleaning balls (44) being allowed by the first one-way valve (74) to discharge from the ball collector (40);
an inlet end (81) of the fluid return tube (80) is connected to a first T shaped tube (62), and an outlet end (82) of the fluid return tube (80) is connected to a downstream end (32) of the outlet tube (30) which is connected to a back end of the ball receiver (50), with a second valve (83) being cascaded in the fluid return tube (80);
an inlet end (91) of the elastic cleaning ball return tube (90) passes through a housing (52) of the ball receiver (50) and is connected to an outlet end of the filter screen (51) being located within the housing (52) of the ball receiver (50), and an outlet end (92) of the elastic cleaning ball return tube (90) is connected to the first chamber (42) of the ball collector (40), with a second one-way valve (93) being cascaded in the elastic cleaning ball return tube (90), and only the fluid and the elastic cleaning balls (44) being allowed by the second one-way valve (93) to flow into the ball collector (40).

8. The improved channel cleaning system as claimed in claim 7, characterized in that the ball collector (40) has a cylinder shell, with a cover (46) being provided on an upper end of the ball collector (40), a funnel-shaped outlet (47) being provided on a lower end of the ball collector (40), a second isolating plate with holes (48) being provided at an interface of the lower end of the ball collector (40) and the funnel-shaped outlet (47), only the fluid and obsolete cleaning balls instead of the perfect elastic cleaning balls (44) being allowed by

the second isolating plate with holes (48) to flow from the first chamber (42) into the funnel-shaped outlet (47), a fifth valve (494) being connected at the funnel-shaped outlet (47), and a drain tube (49) being connected at the fifth valve (494).

9. The improved channel cleaning system as claimed in claim 8, characterized in that an extension line of an axle wire (33) of the outlet tube (30) connected to the housing (52) of the ball receiver (50) is perpendicular to an extension line of an axle wire (53) of the housing (52) of the ball receiver (50).

10. The improved channel cleaning system as claimed in claim 9, characterized in that a third valve (94) is provided on the elastic cleaning ball return tube (90); and a fourth valve (76) is provided on the elastic cleaning ball supply tube (70).

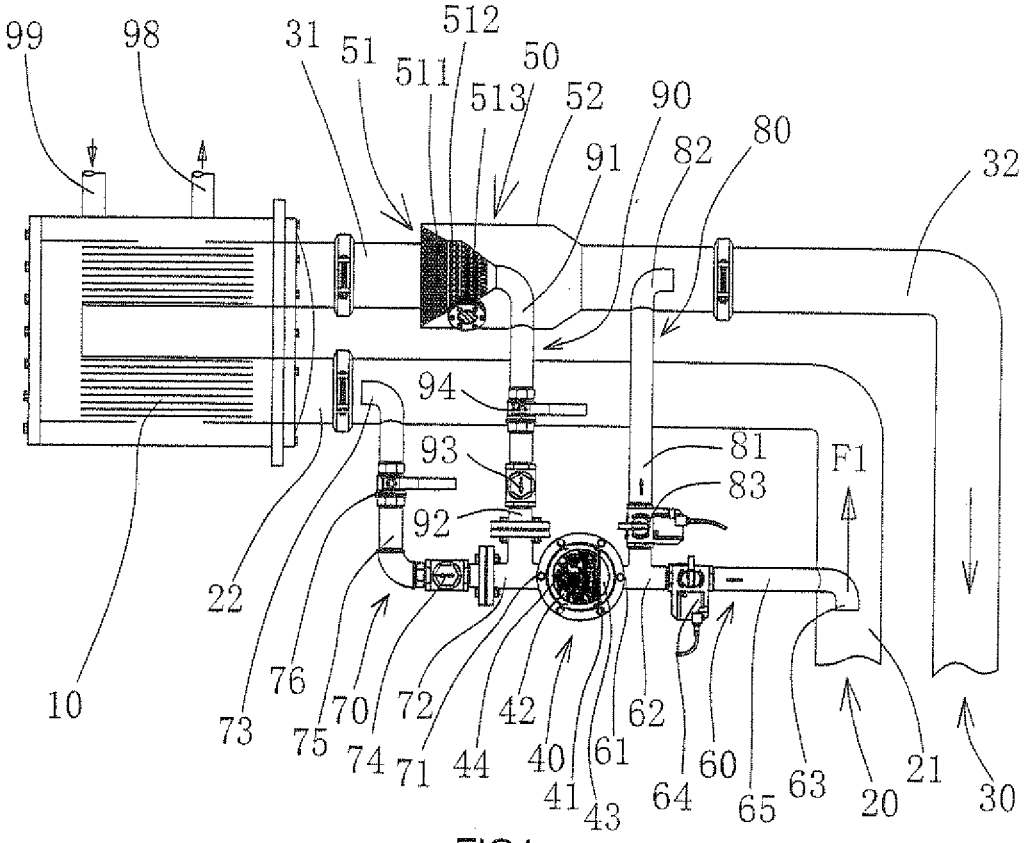

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FIG1

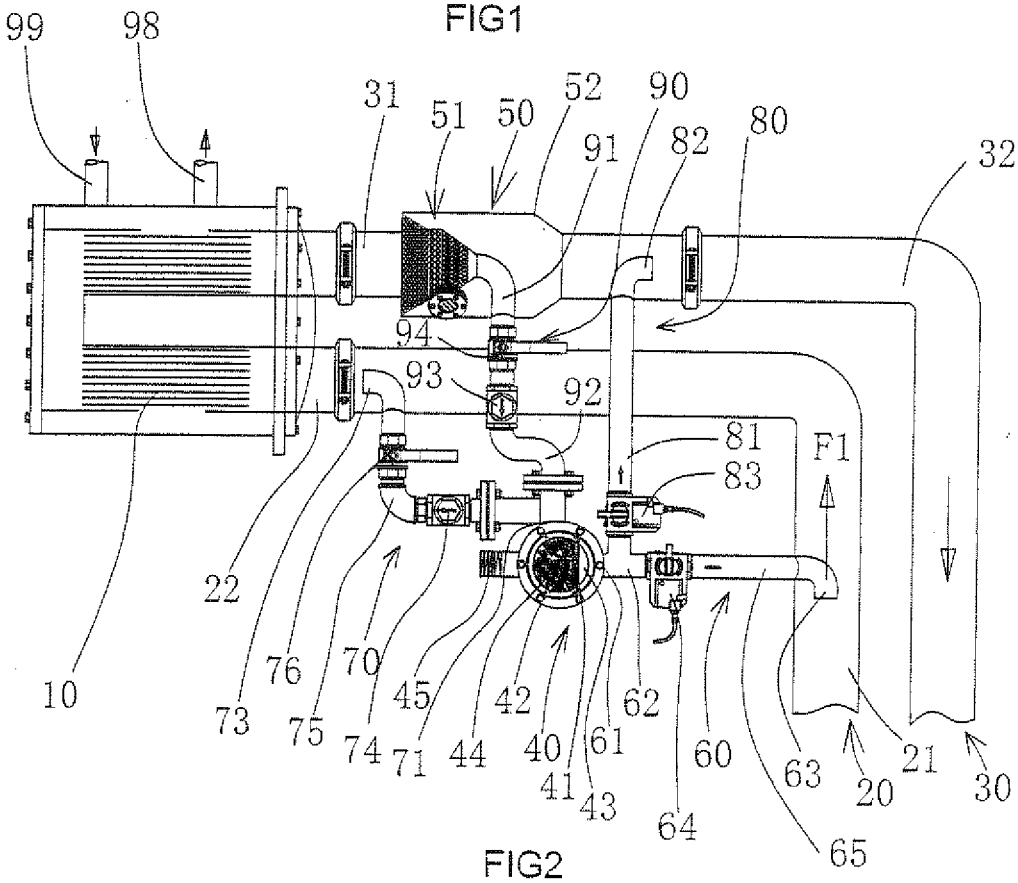

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FIG2

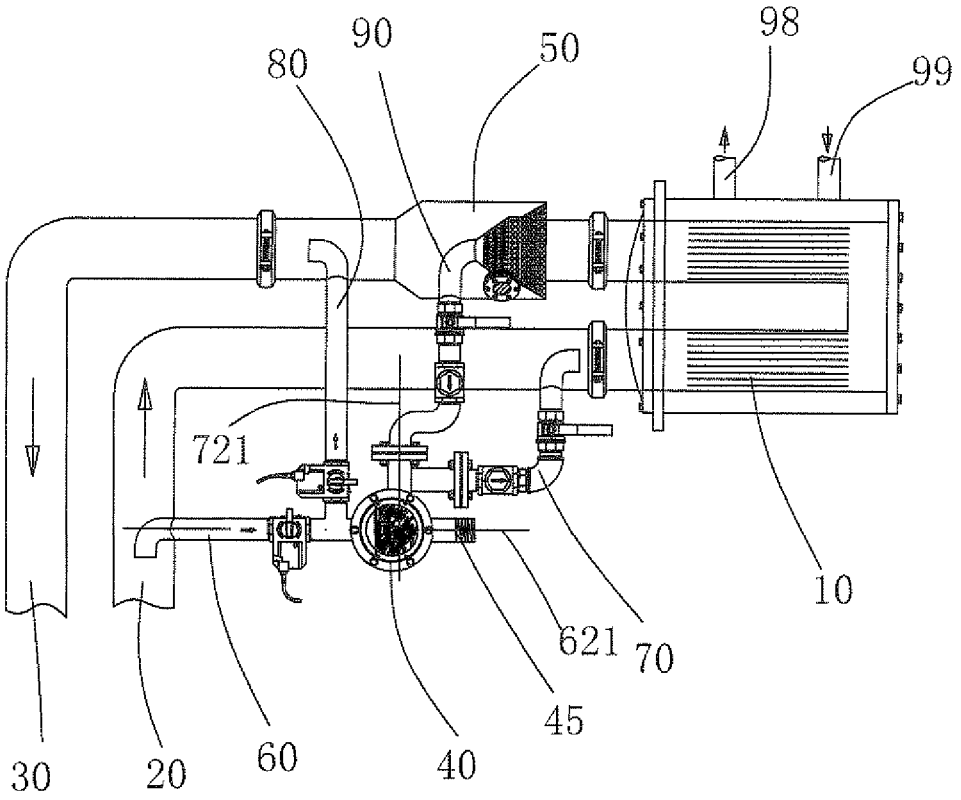

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FIG3

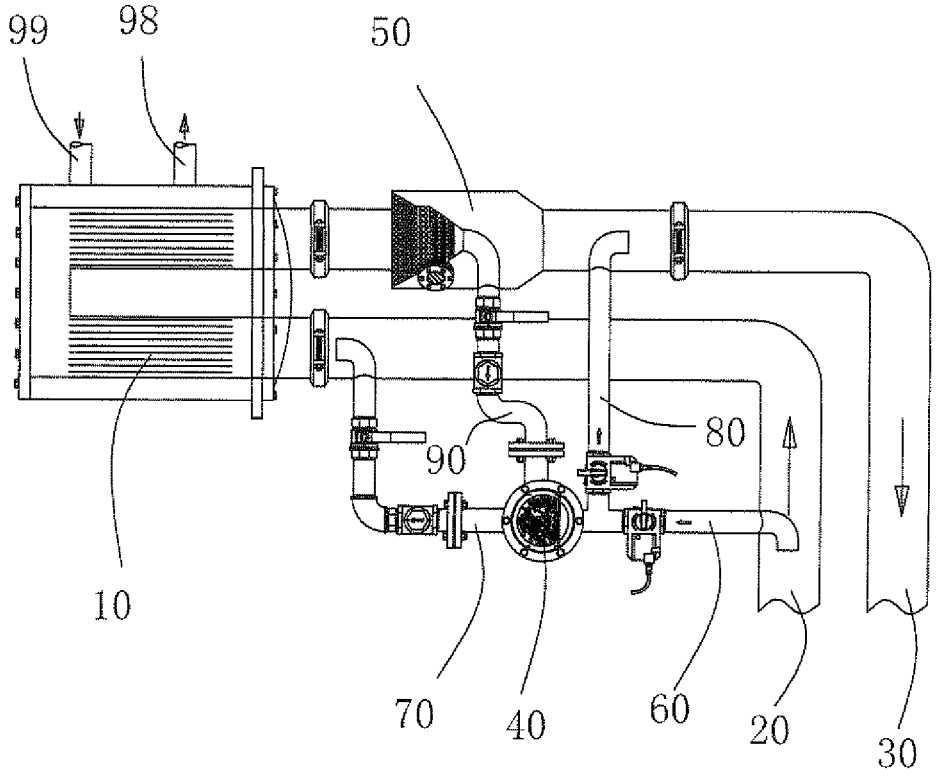

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FIG5

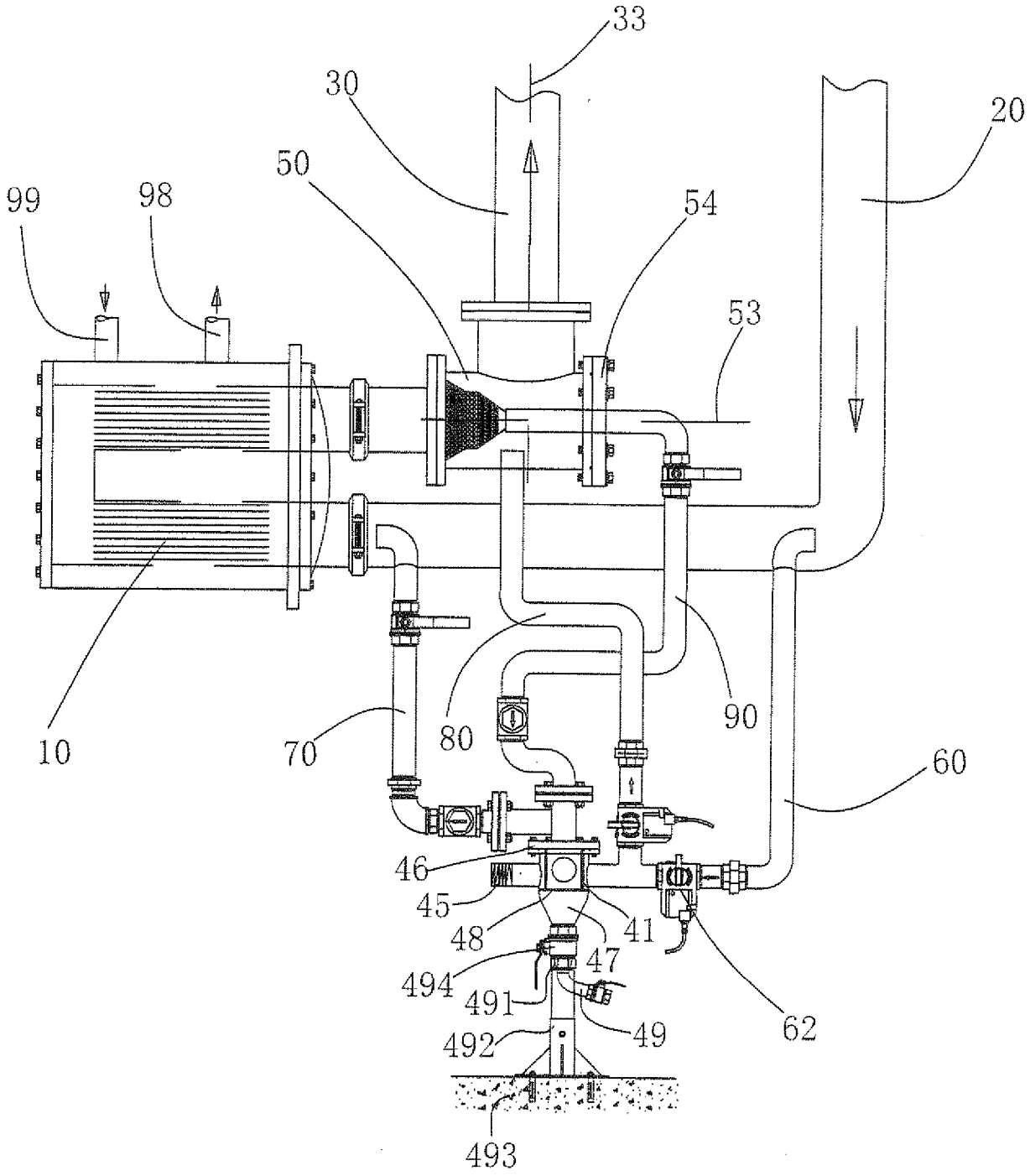

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FIG4

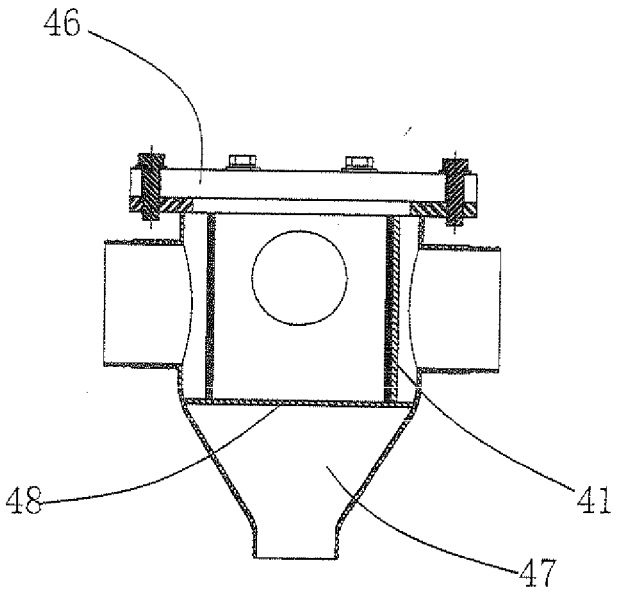

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FIG6

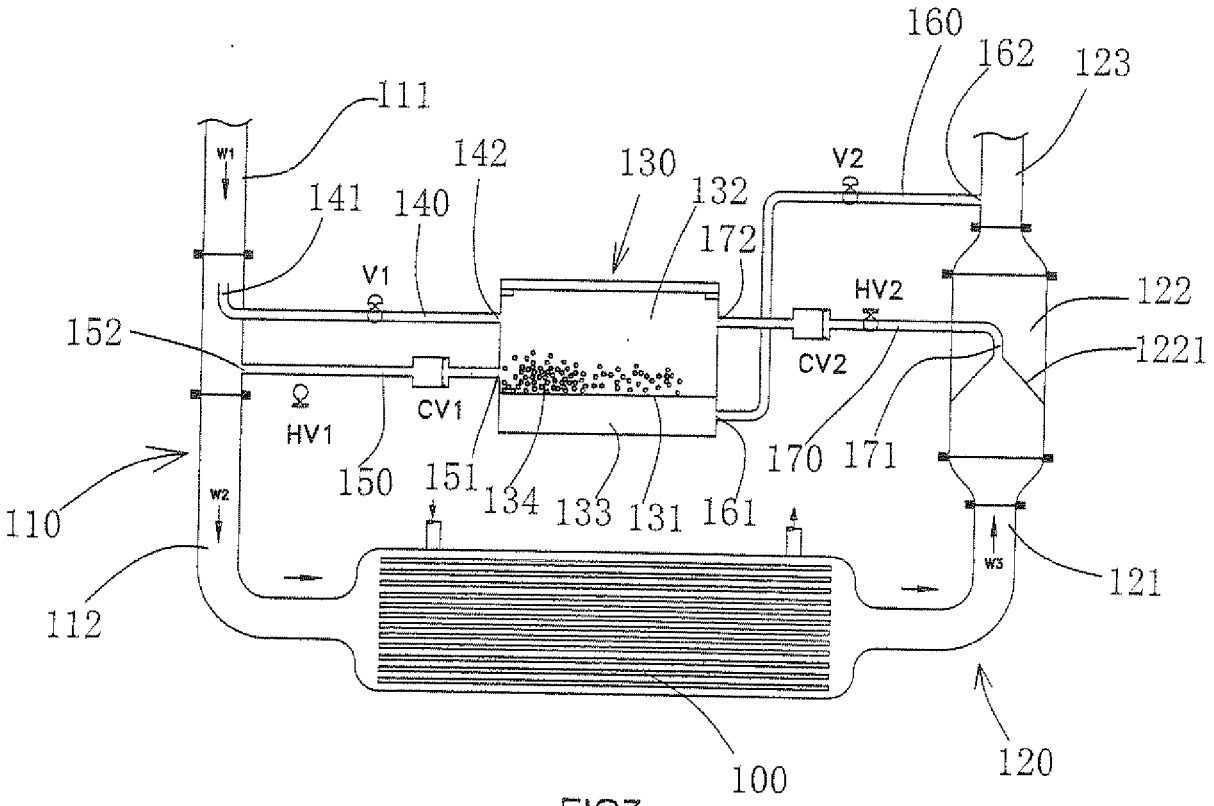

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CV2
HV1
CV1
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W2
W1
W3
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FIG7