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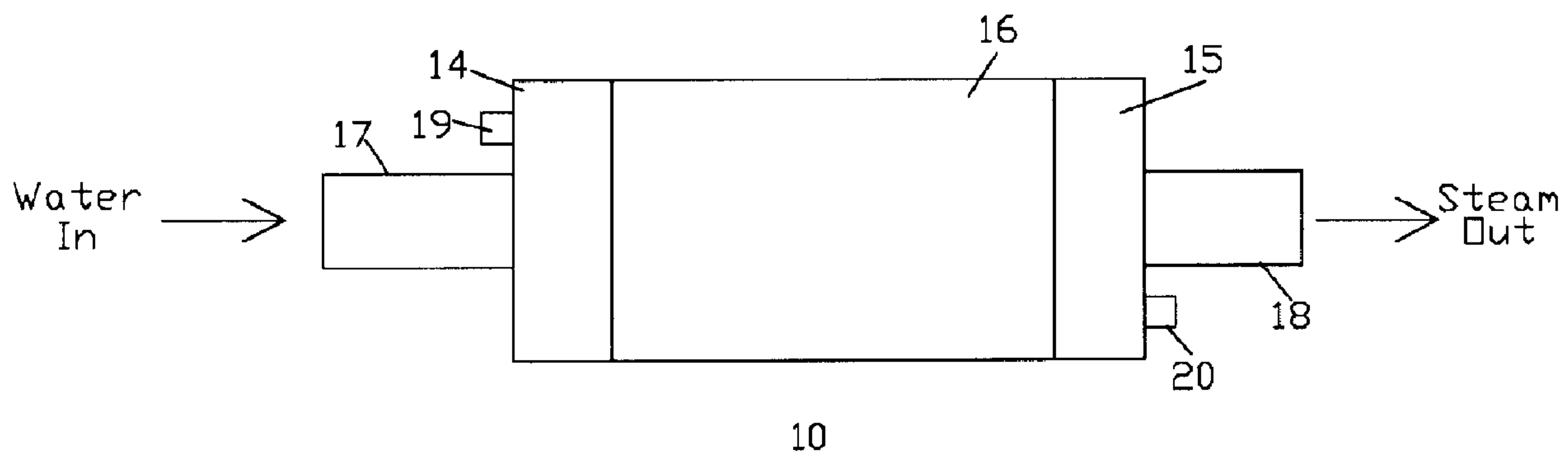
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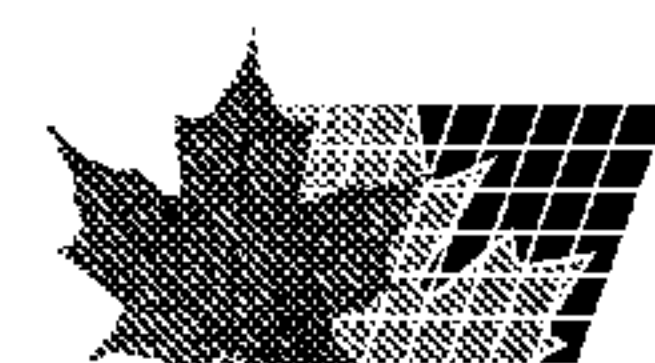
(54) Titre : APPAREIL ET SYSTEME DE PRODUCTION DE VAPEUR

(54) Title: STEAM GENERATION DEVICE AND SYSTEM



(57) Abrégé/Abstract:

Water is introduced into a steam production apparatus and system to produce steam. Electrical power is supplied to the apparatus though spaced apart electrical terminals to heat water introduced into the apparatus to turn the water into steam. The steam can be used for various purposes including powering of steam turbines for generating electricity, driving machinery, and for providing heat for heating systems. The generated steam can be used for various other purposes.



ABSTRACT OF THE DISCLOSURE

Water is introduced into a steam production apparatus and system to produce steam. Electrical power is supplied to the apparatus through spaced apart electrical terminals to heat water introduced into the apparatus to turn the water into steam. The steam can be used for various purposes including powering of steam turbines for generating electricity, driving machinery, and for providing heat for heating systems. The generated steam can be used for various other purposes.

STEAM GENERATION DEVICE AND SYSTEM

FIELD OF THE INVENTION

The invention relates to steam generation and to a device and system for generating high pressure steam.

BACKGROUND OF THE INVENTION

Water heaters have existed in many forms, such as boilers where water is heated by applying heat to the water container. In more advanced systems, such as the diathermal water heater in U.S. Patent 5,506,391. In this system electrical oscillations are generated by an electrical controller, the oscillations being applied to a heater through which water flows while providing oscillations to heat the water.

Another heater system is described in U.S. Patent 7,764,869. This system also provides electrical oscillations to the electrodes in a diathermal heating chamber. This system also requires the liquid to be heated to have a predetermined minimum concentration of dissolved solids which are replaced when the minimum concentration falls below a predetermined concentration.

SUMMARY OF THE INVENTION

The invention relates to a steam production apparatus and system to produce wet and dry steam for various purposes, including powering of steam turbines for generating electricity, driving machinery, and for providing heat for heating systems. The generated steam can be used for various other purposes.

The technical advance represented by the invention as well as the objects thereof will become apparent from the following description of a preferred embodiment of the invention when considered in conjunction with the accompanying drawings, and the novel features set forth in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the external view of the steam generating apparatus. Figure 2, shows a cross-sectional view of the apparatus of Figure 1, showing the internal structure of the apparatus.

Figure 3 shows a different cross-sectional view of the apparatus of FIGURE 2, showing the placement and configuration of the electrical conductive elements, and the insulated support between them.

FIGURE 4 shows a plurality of steam generating units connected together to produce steam and supply it to one steam outlet.

DESCRIPTION OF A PREFERRED EMBODIMENT

Figure 1 illustrates the steam generating device 10 of the present invention. Device 10 has an outer tubular structure 16 with an input opening 17 into which water is introduced into steam generating device 10. There is a second opening 18 from which steam leaves the steam generating device 10. There is a first electrical contact 19 and a second electrical contact 20 to which the electrical power is applied. There are two non-conductive ends 14 and 15 which, in combination with the outer structure 16 encloses and electrically isolates the internal electrical elements 11 and 12 shown in FIGURE 2.

Figure 2 is a cross-sectional view of the entire structure. There are two electrical terminals 19 and 20 which supply power to two electrical elements 11 and 12. Elements 11 and 12 are secured to an insulating structure 13, which electrically isolates elements 11 and 12 from each other and forms a tubular chamber 31 (FIGURE 3) into which the water is introduced via inlet 17 to produce steam which exits through outlet 18 (FIGURE 1). An outer enclosure 16 is positioned around internal chamber 31 formed by electrical elements 11 and 12 and the insulating structure 13, which has two parts 13a and 13b (FIGURE 3). Enclosure 16 is spaced apart from the internal chamber 31 by spacing 32 and held in position by end mounts 14 and 15 (FIGURE 1) which hold the electrical elements apart, insulating them from each other. Each of the parts 14, 15 and 16 as well as inlet 17 and outlet 18 are heat resistant non conductive material.

As shown in Figures 1 and 2, electrical power is applied to electrical terminals 19 and 20. As water flows into opening 17 it is converted into steam which flows out opening 18. Current flowing through the water from elements 11 to contact 12 heats the water and converts the water to steam. Several different voltages can be applied to terminals 19 and 20 and to elements 11 and 12 from approximate 210 volts A.C., to 880 volts A.C., but in testing the steam generated, 240 volts A.C. has been found sufficient to produce instant steam. In testing, wet and dry steam was produced and began to flow out of opening 18 within about 15 seconds after power was connected to terminals 19 and 20. During testing, a steam pressure of about 750 psi was produced. This can depend upon the voltage used, the flow rate of water, the temperature of the water, and the amount of impurities in the water. Water with impurities is more conductive than pure water. Once the steam is produced, the

amount of current flowing will drop as steam is less conductive than water. This means that the current drawn from the power source will decrease after the steam is produced, lowering the power requirement to maintain steam production and flow.

FIGURE 3 is a cross sectional view 3-3 of FIGURE 2. Show is the outer structure 16 enclosing the tubular structure made of of electrical elements 11 and 12 which are insulated from each other by the insulators 13a and 13b. Electrical elements 11 and 12, joined to insulators 13a and 13b form a tubular structure, and chamber 31, in which the steam is formed. The end mounts 14 and 15 (illustrated in FIGURE 2) hold the outer structure 16, and tubular structure comprised of elements 11, 12, 13a and 13b together and provided the opening 17 into which water is introduced and opening 18 from which steam exits. As the current flows between electrical elements 11 and 12, and through the introduced water, the heating of the water by the current flowing through produces steam.

The present invention does not require an electronic controller as required in the prior art. Steam is simply generated by passing electrical current through water between electrical elements 11 and 12.

Figure 4 illustrates a multi-unit system 40 for generating steam. There are four steam generating units 41, 42, 43 and 44. Each of the units are the same unit illustrated in Figures 1 and 2. They are connected to consecutively generate steam in series. Each of the steam output openings 45a, 45b, 45c and 45d are connected to steam line 45. Steam then exits out opening 46, which may be a

nozzle. The electrical terminals 19a, 19b, 19c, and 19d and 20a, 20b, 20c and 20d are connected in parallel by electrical terminal input lines 50, and 51. Control units 55, 57 and 59 are for determining when water flows into steam generating units 42, 43 and 44.

Operation of multi-unit system is as follows. Electrical power is connected to each of the units, 41, 42, 43 and 44. Water flows only into unit 41 through input 61. Steam will only be produced in unit 41. For example, with a power input of 240 volts A.C., the current flow can be initially about 40-60 amps. As steam is produced, the current will fall to as low as about 15 amps. This is possible as steam is not as conductive as water. By introducing water into the steam units 41-44 one at a time, the amount of current required is limited. When all units are producing steam the current required at any one time should be limited to about 40-60 amps. With each unit drawing approximately only about 15-20 amps, the total required is limited to about 60-80 amps total. If units 41-44 were all supplied with water at the same time, the current could rise to about 200 amps. By sequentially introducing water in the four units, the current could be limited, thereby limiting the power required to produce steam. Since current in each unit should drop to about 15-20 amps in about 15 seconds, the multi-unit systems should be producing steam in all units in 60 seconds or less. Units 55, 57, and 59 are timers set to open the connected water valves after a set time. Since the current in each steam unit 41-44 should reduce after about 15 to 20 seconds of introducing water into the steam unit, the timers 55, 57, and 59 can be set to open the water valves after the set time. Timer 55 would open valve 56 after approximately 15 to 20 seconds allowing

water to flow through input 62 into steam unit 42, timer 57 would open water valve 58 after approximately 30-40 seconds allowing water to flow through input 63 into steam unit 43, and timer 59 would open water valve 60 approximately 45 to 60 seconds after allowing water to flow through valve 60 and through input 64 to steam unit 44. These times are after water is initially supplied to water input 70.

WHAT IS CLAIMED

1. A steam generating apparatus and system, comprising:

a housing having a first opening for inserting water into the housing, a second opening for releasing steam from the housing, two metallic elements extending through the housing, but insulated from each other;

two insulating end elements, secured to two opposite ends of the housing and metallic elements, securing them in place and electrically insulating them from each other;

two electrical terminals one each attached to one of the two metallic elements;

wherein when water is inserted into the housing, and electrical power is applied to the two electrical terminals, the water inserted into the metallic housing is heated and converted to steam which exits the housing through the second opening.

2. The steam generating apparatus and system according to Claim 1, wherein the two metallic elements in combination with two insulating elements form a cylindrical chamber into which water is introduced and wet and dry steam is generated.

Claim 3, The steam generating apparatus and system according to Claim 2, wherein the cylindrical chamber is enclosed by an outer housing and is spaced therefrom.

4. The steam generating apparatus and system according to Claim 1, wherein the first electrical terminal and the second electrical terminal are spaced apart on opposite ends of the steam generating apparatus.

5. The steam generating apparatus and system according to Claim 1, wherein steam is generated within 15 - 20 second after power is connected to the first and second electrical terminals and water is introduced into the cylindrical chamber.

6. A steam generating system, including a plurality of steam generating apparatuses connected together.

7. The steam generating system according to Claim 6, wherein the steam generating apparatuses are sequently activated to produce steam.

8. The steam generating system according to Claim 6 wherein the steam generated in each steam generating apparatus is introduced into and exits in a single outlet.

9. The steam generating system according to Claim 6, including terminals for applying power to the steam generating apparatuses, a first input for supplying water to the steam generating apparatus, and an output releasing the generated steam from the steam generating system.

10. A steam generating apparatus and system, comprising:

a housing having a first opening for inserting water into the housing, a second opening for releasing steam from the housing;

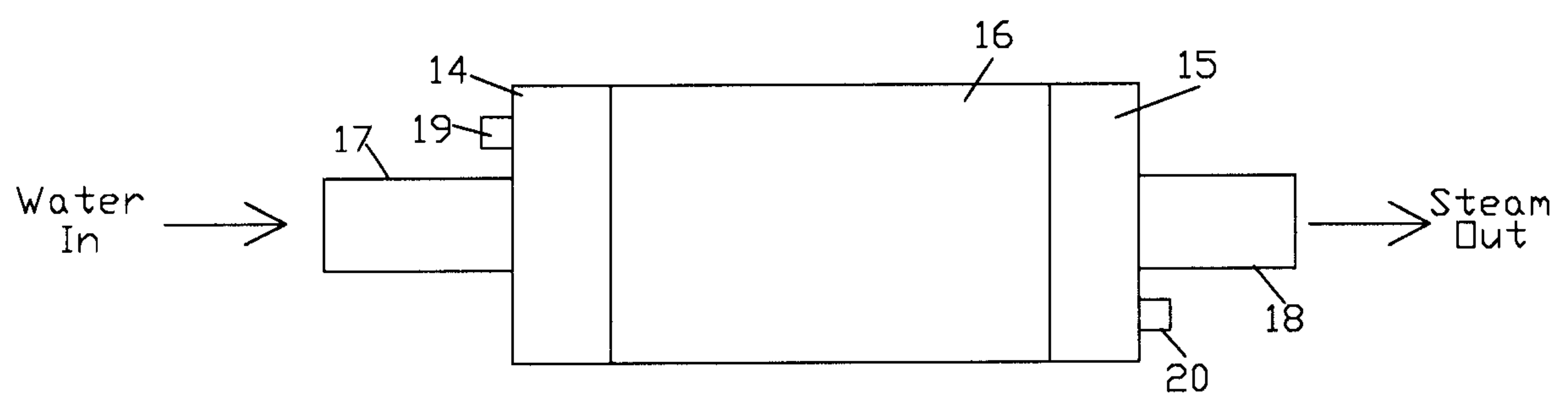
two metallic elements extending through the housing, but insulated therefrom;

two insulating end elements, secured to two opposite ends of the metallic housing and metallic element, securing them in place and electrically insulating them from each other;

two electrical terminals one each attached to the two metallic elements;

wherein when water is inserted into the housing, electrical power is applied to the two electrical elements, the water inserted into the housing is heated and converted to steam which exits the metallic housing through the second opening; and

wherein the metallic housing is cylindrical with the metallic element secured by the insulating end elements in the center of the cylindrical metallic housing.



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FIGURE 1

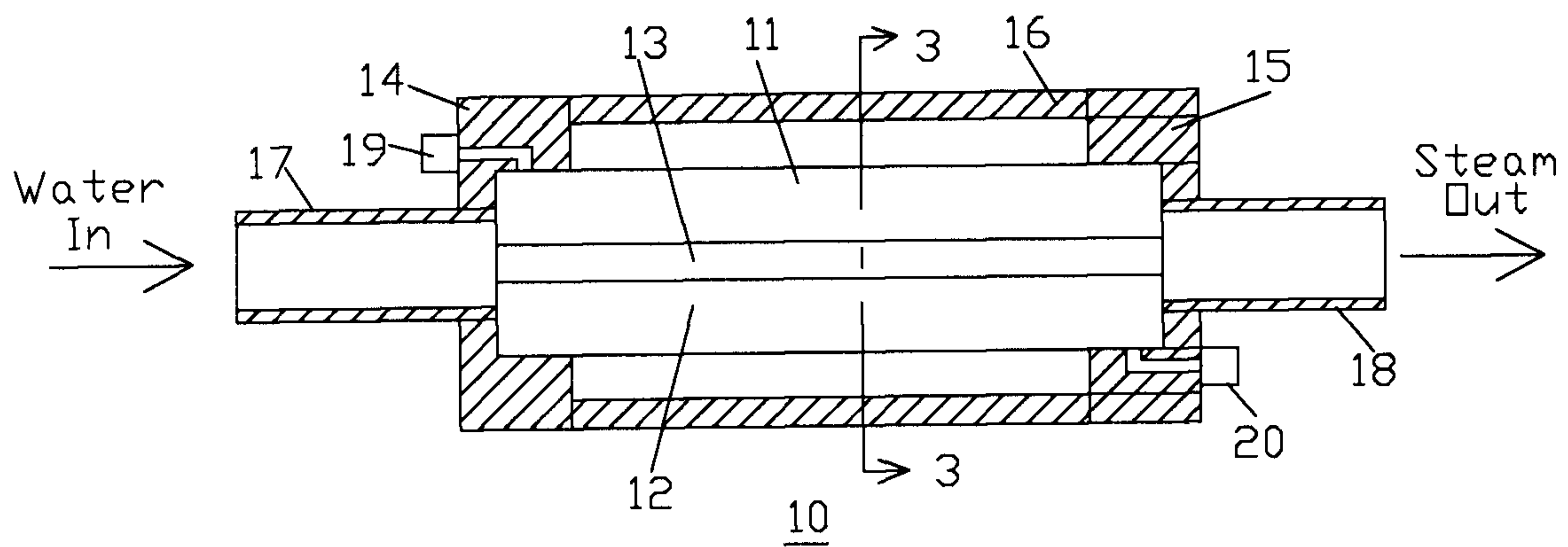


FIGURE 2

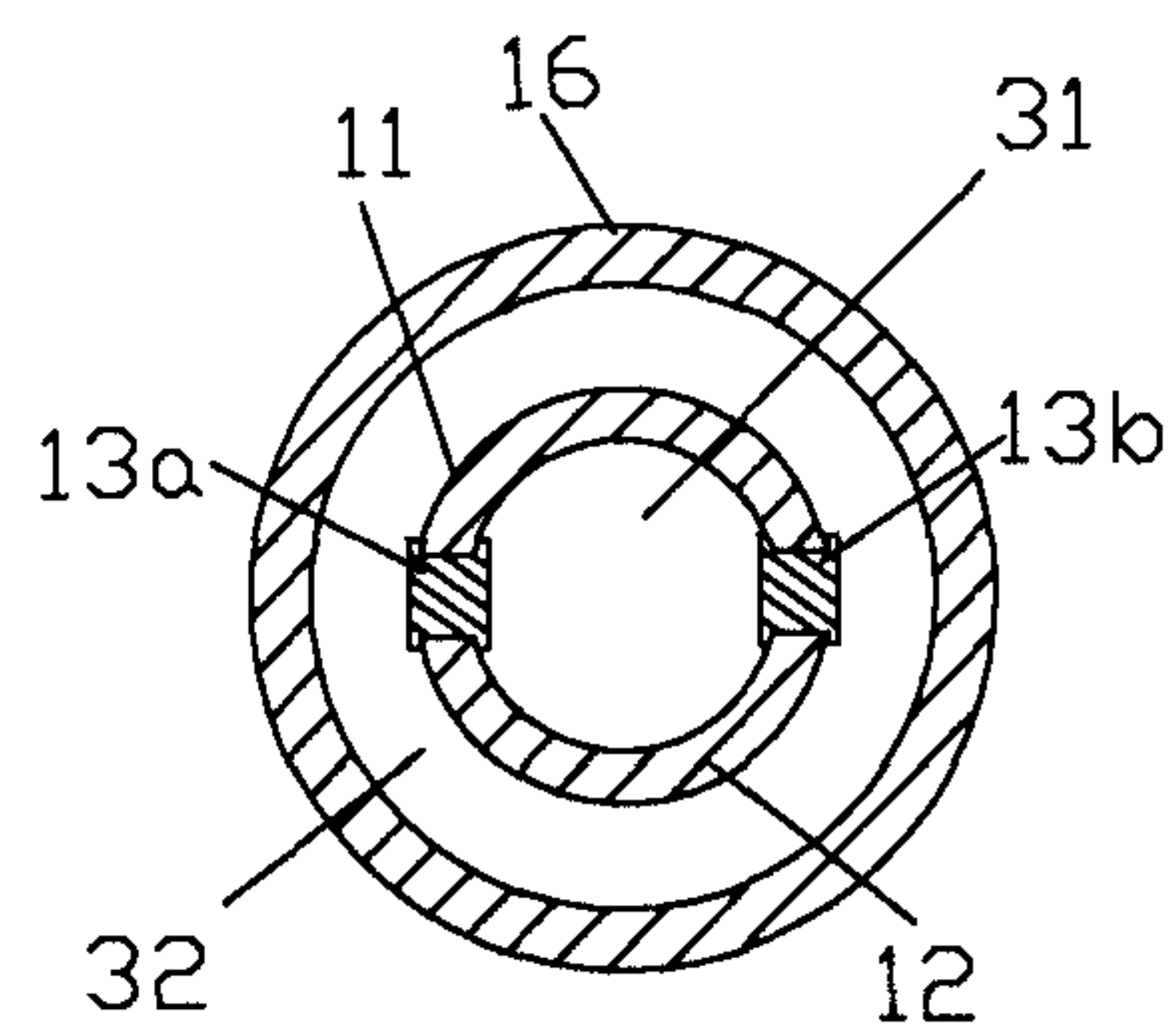


FIGURE 3

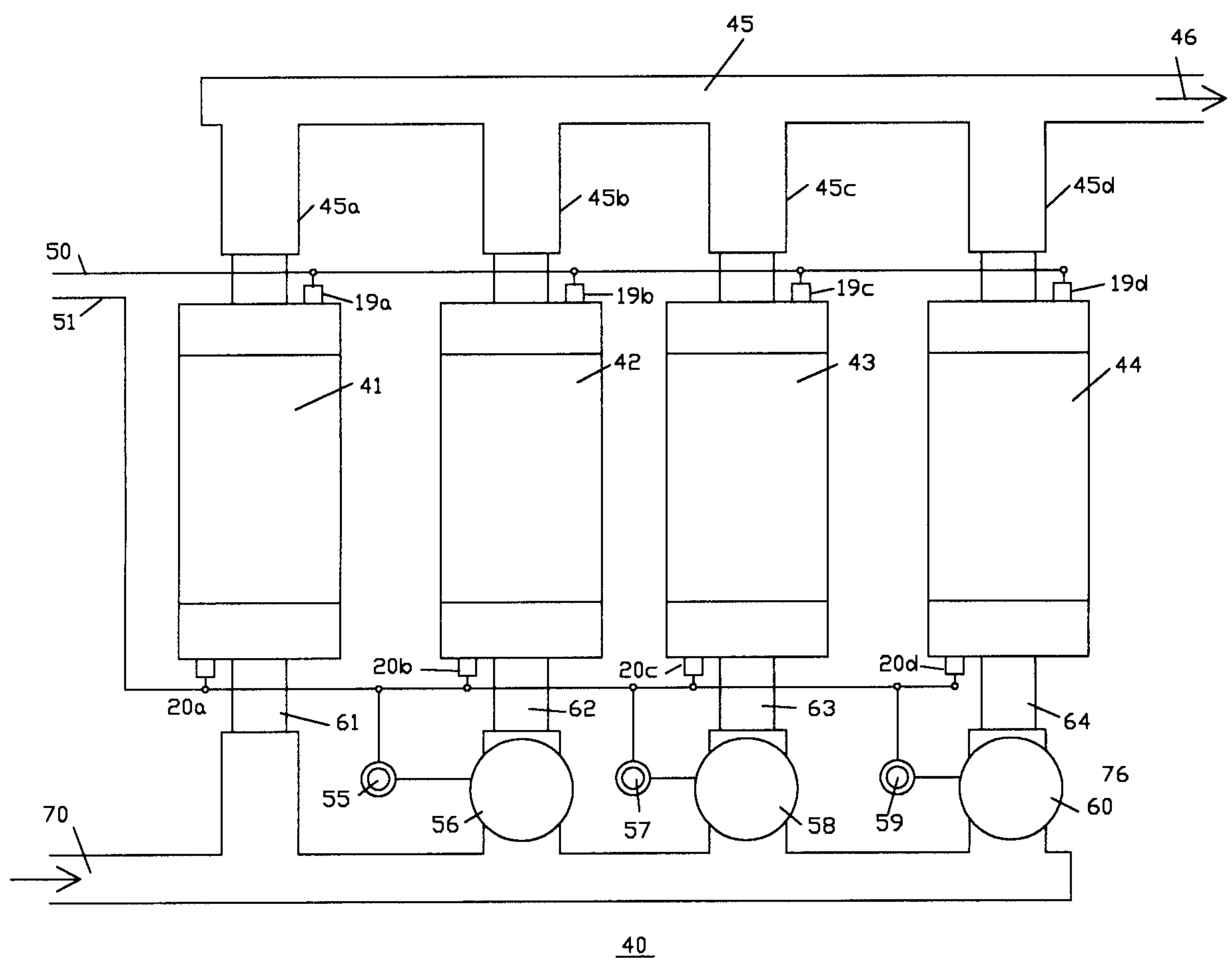


FIGURE 4