(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 981 031 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
23.02.2000 Bulletin 2000/08

(51) Int. Cl.[7]: **F24H 1/52**

(21) Application number: **98124821.4**

(22) Date of filing: **30.12.1998**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **18.08.1998 KR 9833525**

(71) Applicant:
ALCO Corporation
of Namdong Industrial Area
156BL/10LT
Namdong-gu, Incheon (KR)

(72) Inventor: **Choi, Seong Bong**
Kajwa-dong, Seo-gu Incheon (KR)

(74) Representative:
Reinhard - Skuhra - Weise & Partner
Postfach 44 01 51
80750 München (DE)

(54) Heating water flow circulation and instantaneous hot sanitary water supply apparatus in a combi-boiler

(57) Disclosed is a heating water flow circulation and hot sanitary water supply apparatus in a combi-boiler which preheats cold water during heating and instantaneously supplies hot water when turning a tap on for use in the kitchen and bath room, etc. The apparatus comprises a water-to-water heat exchanger, in which sanitary water layers and heating flow layers are alternately multilayer-formed to perform heat exchange between heating flow and sanitary water, and a heating flow diverting unit controls the five direction of the heating flow circulation according to a heating mode or a hot sanitary water supply mode. Also, the apparatus rapidly supplies the hot sanitary water by circulating part of the heating flow to the heating flow layers of the water-to-water heat exchanger during the supplied heating flow is circulated for heating. Accordingly, the heating water flow circulation and instantaneous hot water supply apparatus of the present invention can shorten a outflow time of cold water when using hot sanitary water and simplify many components in a boiler including a heating flow bypass valve, which is integrated in a single module.

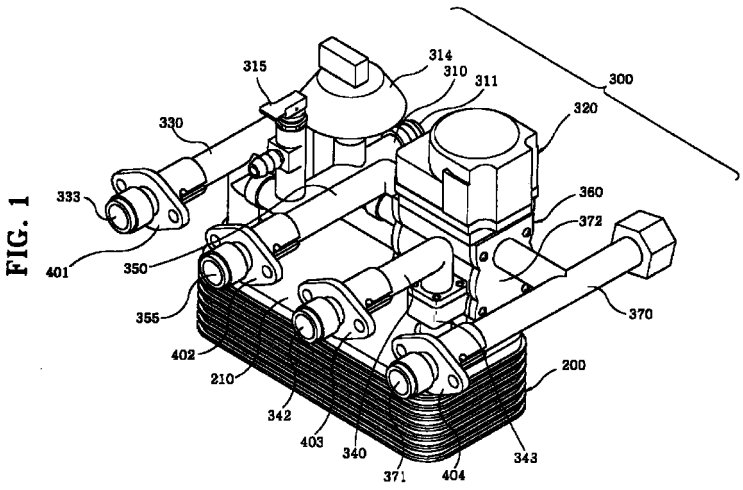


FIG. 1

EP 0 981 031 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a heating water flow circulation (which is referred to as "heating flow") and instantaneous hot sanitary water (which is referred as to "hot water") supply apparatus in a combi-boiler (which is referred to as "boiler" hereinafter) which uses part of the heating flow as a heat exchange medium for pre-heating cold sanitary water (which is referred as to "cold water") during the heating flow of the boiler is circulated to heat rooms, to thereby shorten an initial outflow of cold water when using hot sanitary water, and which is integrated in a single module

2. Description of the Related Art

[0002] Fig. 10 shows a conventional boiler with which a heating water flow circulation and hot sanitary water supply equipment is provided, as one example. The heating flow and hot water supply equipment diverts the direction of heating flow from a heating position to hot water supply position with a three-way valve 150. In case of heating position, the heating flow is circulated through heating pipes of a radiator, and in case of hot water supply position, the heating water is circulated through a water-to-water exchanger 110. Therefore, cold sanitary water from the heating flow is heated at a predetermined temperature, and the heated hot water is supplied to the kitchen, bath room, etc.

[0003] In more detail, the hat water supply equipment of a boiler is provided with a burner 103 for burning fuels in a combustion chamber 102 provided with a flue 101, water pipes 104 for making the filled water heated with the burner 103, a circular pump 120 for forcing the obtained hot water to be circulated, a flow switch 140 for sensing the flow of the sanitary water, located at an inlet in the supply structure of the sanitary water, a plurality of connection pipes 160 to 165 for heating flow and hot water, installed at the inlet and outlet of the water pipes 104, a fuel supply pipe 180 of gases oils etc. a fuel control valve 170, a pipe 191 for bypass and a bypass valve 190.

[0004] In the heating water flow circulation and hot water supply equipment, when a heating mode is selected in the three-way valve 150, the heating water obtained through the main heat exchanger 100 is circulated via the pipe 160 connected to the three-way valve 150, to thereby heat a room. A hot sanitary water supply structure includes a cold water inlet pipe 163, a flow switch 140, a cold water inlet pipe 164, a water-to-water exchanger 110 and a hot sanitary water supply pipe 162. When a hot water mode is selected with the three-way valve 150, heating flow heats cold water through the water-to-water heat exchanger 110, to thereby supply hot water.

[0005] Meanwhile, the cooled heating flow after heating a radiator, etc. is returned to the main heat exchanger 100 through a water return pipe 165 and again heated, and the heating flow through the water-to-water heat exchanger 110 is again returned to the main heat exchanger 100 via the water return pipe 165.

[0006] A conventional heating water flow circulation and hot water supply system in which pre-heating is not performed with a water-to-water heat exchanger during heating, and then heating flow starts to heat exchange with cold water from a few seconds after turning a hot water tap on, and thus it takes long time to obtain hot water from the tap.

[0007] Also, in the conventional apparatus, when a temperature control valve which is installed in a radiator or pipes is controlled according to the temperature change, sometimes it creates a problem due to big pressure drop across the heating flow. For preventing the pressure drop, the bypass valve 190, the connection pipes 190, etc. must be equipped, and then the internal structure of boiler become more complicated.

[0008] As shown in Fig. 10, the conventional apparatus has a complicated structure which is composed of a number of pipes and connection units. That is, a heating flow supply pipe and a pipe from the main heat exchanger and the water-to-water heat exchanger are connected in three directions. Also, the water-to-water heat exchanger is provided with a pipe for allowing the heating flow after heat exchanging to return, a pipe for introducing the cold water, and a plurality of pipes for allowing the heat-exchanged hot water to flow out. Therefore, the apparatus has demerits to construct complicated pipe lines and to need long time for boiler assembly and to require broad space therefor.

SUMMARY OF THE INVENTION

[0009] To solve the above problems, it is an object of the present invention to provide a heating water flow circulation and instantaneous hot water supply apparatus in a boiler for shortening the time of hot water to flow out, in which pre-heating is performed using part of the heating flow as a water-to-water heat exchange medium.

[0010] It is another object of the present invention to provide a heating water flow circulation and instantaneous hot water supply apparatus in a boiler, in which a water-to-water heat exchanger, a heating flow diverting unit and a bypass unit are integrated in a single module, different from the conventional structure that many components in a boiler are individually connected to a plurality of pipes.

[0011] To accomplish the above abject of the present invention, there is provided an instantaneous hot water supply apparatus in a boiler comprising;

a water-to-water heat exchanger, in which sanitary

water layers and heating flow layers are alternately multilayer-formed to perform heat exchange between heating flow and sanitary water; and a heating flow diverting unit (which is referred to as "a diverting unit" hereinafter), for controlling to pre-heat cold sanitary water by using part of the beating flow during the heating flow is circulated to beat rooms, and to perform heat exchange between the heating flow and sanitary water flow when supplying hot sanitary water.

[0012] The water-to-water heat exchanger includes a casing, of which the top and bottom is interconnected in flow communication with each other, in which the heating flow layers and the sanitary water layers are alternately formed.

[0013] The water-to-water heat exchanger has a structure appropriate to heat-exchanging between the beating flow and the sanitary water, in which an inlet and an outlet of heating flow are disposed at the top of the casing where flow-communicates with the heating flow layers, and an inlet and an outlet of sanitary water where flow-communicates with the sanitary water layers.

[0014] It is preferable that a heating flow direction diverting unit (which is referred to as "diverting unit" hereinafter) includes a diverting valve, a first heating flow pipe, a first sanitary water pipe, a second heating flow pipe, a second sanitary water pipe and a water return pipe

[0015] The diverting valve includes a valve box at a central portion of which is provided with a valve chamber, and of which the top, bottom, left and right are opened in a certain shape, a ball valve disposed in the valve chamber of the valve box, for performing a predetermined diverting operation, and a valve actuator disposed on the valve box, for rotatably driving the ball valve. Also, a body of a flow switch of the sanitary water is integrally formed at the front face of the valve box, and is connected to the water-to-water heat exchanger.

[0016] The first heating flow pipe is provided with a predetermined pressure switch having an inlet and two outlets of the heating flow pipe and a pressure safety valve, one of outlets is connected to one side of the second heating flow pipe, and the other is connected to one side of the first sanitary water supply pipe.

[0017] The first sanitary water supply pipe is provided with an inlet and an outlet of the heating flow and an inlet and an outlet of the sanitary water, respectively, which is connected to the inlet of the heating flow and an outlet of the sanitary water of the water-to-water heat exchanger as well as the first heating flow pipe.

[0018] The second heating flow pipe is provided, of which the right is associated with a flange forming a valve seat, of which the left is connected to the first heating flow pipe. Here, the flange is connected to the diverting valve body.

[0019] The second sanitary water supply pipe includes an inlet and an outlet of the sanitary water and a flow switch, which is connected to the flow switch body of the diverting valve and the inlet of the sanitary water of the water-to-water heat exchanger.

[0020] The water return pipe is provided, one of which is connected to the valve seat at the other side of the diverting valve, and the other of which is provided with an inlet and outlet of heating flow return after heating rooms.

[0021] It is preferable that the diverting unit 320 is provided with a two-stage ball valve 362, and a bypass valve 380 which is opened/closed by differential pressure between the diverting valve chamber 363 and the water return pipe 370.

[0022] The diverting unit 320 includes a drive shaft 325 installed eccentrically on the top end of the ball valve, a motor base 324 installed on the valve box 361, a drive motor 321 disposed centering the motor base 324, for driving the drive shaft, and a cover member 322.

[0023] According to one aspect of the present invention, there is provided a heating flow and instantaneous hot water supply apparatus in a boiler, in which cold water is preheated during the heating flow from the main heat exchanger is repeatedly circulated to heat rooms, and then the pre-heated hot sanitary water is supplied instantaneously when hot water is used.

[0024] According to another aspect of the present invention, there is provided a heating flow and instantaneous hot water supply apparatus in a boiler which is integrated in a single multifunctional module for heat-exchanging between the sanitary water and the heating flow to thereby simplify complicated construction due to the increase of pipe members and components such as a connection unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The above object and other advantages of the present invention will become more apparent by describing the preferred embodiment thereof in more detail with reference to the accompanying drawings in which:

Fig. 1 is a perspective view illustrating a heating water flow circulation and hot sanitary water supply apparatus in a boiler according to the present invention;

Fig. 2 is an exploded perspective view illustrating a heating water flow circulation and hot sanitary water supply apparatus in a boiler according to the present invention;

Fig. 3 is a schematic plan view showing a heating water flow circulation and hot sanitary water supply apparatus in a boiler according to the present invention;

Figs. 4A and 4B are sectional views taken along a line A-A of Fig. 3 showing a state that the direction

of heating flow is diverted from a heating position to a hot water supply position during heating, and vice versa;

Fig. 5 is a sectional view taken along a line B-B of Fig. 3 showing an operation relationship between a first sanitary water pipe and a water-to water heat exchanger;

Fig. 6 is a sectional view taken along a line C-C of Fig. 3 showing an operation relationship between a first heating flow pipe and a water-to-water heat exchanger;

Fig. 7 is a sectional view taken along a line D-D of Fig. 3 showing an operation relationship between a second sanitary water pipe and a diverting valve and a water-to-water heat exchanger;

Figs. 8A and 8B are sectional views taken along a line E-E of Fig. 3 showing a bypass state of heating flow between a valve box and a water return pipe according to the present invention;

Fig. 9 is a schematic view showing, as a whole, a heating flow and hot sanitary water supply apparatus in a boiler according to the present invention; and

Fig. 10 is a schematic view showing, as a whole, a conventional boiler with which a heating flow and hot sanitary water supply apparatus is provided.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0026] A preferred embodiment of the present invention will be described with reference to the accompanying drawings.

[0027] Fig. 1 is a perspective view illustrating a heating water flow circulation and hot sanitary water supply apparatus in a boiler according to the present invention, Fig. 2 is an exploded perspective view illustrating a heating water flow circulation and hot sanitary water supply apparatus in a boiler according to the present invention, and Fig. 3 is a schematic plan view showing a heating water flow circulation and hot sanitary water supply apparatus in a boiler according to the present invention.

[0028] The heating water flow circulation and hot sanitary water supply apparatus comprises a water-to-water heat exchanger 200 in which sanitary water layers and heating flow layers are alternately multilayer-formed to perform heat exchange between heating flow and sanitary water, and a heating flow diverting unit 300 for diverting a heating flow position so that the heating flow is circulated through heating units, e.g. a radiator, and part of the heating flow is bypassed to the water-to-water heat exchanger 200

[0029] The water-to-water heat exchanger 200 performs heat exchange with a compartment panel 221 having good heat conductivity which is disposed between the heating flow of a high temperature and the sanitary water of a low temperature. The water-to-water heat exchanger 200 comprises a casing 210 having a predetermined shape and the compartment panel 221 forming a plurality of layers in the casing 210. The compartment panel 221 should form another layer so that the upper layer flow-communicates with the lower layer centering any one layer.

[0030] Four connections are positioned upward from the casing 210 which are an inlet 242 and an outlet 248 of the heating flow and an inlet 246 and an outlet 244 of the sanitary water.

[0031] The heating flow, as shown in white arrows in Figs. 4A, 4B, 5, 6 and 7, is introduced to a plurality of heating flow layers 220 and is directed to the outlet 248 of the heating flow.

[0032] Also, the sanitary water is, as shown in black arrows in Figs. 4B, 5, 6 and 7, is introduced to a plurality of sanitary water layers 230 and is directed to the outlet 244 of the sanitary water after heat exchanging.

[0033] A diverting valve 360 of the diverting unit 300 diverts the direction of a heating flow at the instant the flow of the sanitary water is sensed by the flow switch during normal circulation of the heating flow.

[0034] In order to divert the heating flow direction, the water-to-water heat exchanger 200 is associated with the diverting unit.

[0035] The diverting unit 320 includes the diverting valve 360, the second heating flow pipe 350, the second sanitary water pipe 340 and the water return pipe 370.

[0036] Specifically, the diverting valve 360 is interconnectedly installed at the upward of the heating flow outlet 248 of the water-to-water heat exchanger 200 for flow communication, in order to change the direction of the heating flow in the case of circulating the heating flow via heating pipes such as a radiator or using hot water. The diverting valve 360 is disposed in a valve box 361 of an approximately cubic shape. At one side of the valve box 361, the second heating flow pipe 350 is associated with a first flange 364 to form an outlet 352 and an inlet 353 of the heating flow. At the other side of the valve box 361, the water return pipe 370 is associated with a second flange 365.

[0037] The top of the valve box 361 is opened, in the inside of which a valve chamber 363 is formed. The valve chamber 363 is provided with the two-stage ball valve 362. The ball valve 362 is rotated at a predetermined angle by a drive shaft 325 eccentriclly installed. The ball valve 362 is composed with two through shperes on a vertical shaft, allows inlet and outlet holes of the heating flow of the valve box 361 to be simultaneously opened and closed, and then opens and closes the valve seat 368 of the flange 365.

[0038] That is, in the case of using hot water, all the heating flow introduced vertically from the heating flow outlet 248 flow into the water return pipe 370, and the valve seat 368 at the flange 364 is opened as shown in Fig. 4B. However, in the case of circulating the introduced heating flow for heating rooms, as shown in Fig. 4A, the circular direction of the heating flow is diverted

with the ball valve 362, and the inlet 352 and the outlet 353 of the heating flow are opened so that the heating flow returned from the water-to-water heat exchanger 200 is circulated through the outlet 353, together with the heating flow from the inlet 352 after heat-exchanging, thereby allowing the heating flow to pass in five directions.

[0039] Meanwhile, the present invention shows a plurality of O-shaped rings, reference numerals of the other except an O-shaped ring 366 are omitted herein. The O-shaped rings 366 are interposed between the inlet and outlet of each flange and the connection portions as well as the right and left flange connections of the valve box 361, to thereby prevent the leakage of water.

[0040] The diverting unit 320 is disposed on the diverting valve 360 in order to drive the ball valve 362. The diverting unit 320 is connected to the drive shaft 325 with a pin 323 between a motor base 324 of a motor 321 and the ball valve 362. A cover member 322 is disposed at the top of the motor base 324 in which the motor 321 is incorporated.

[0041] The first heating flow pipe 310 introduces the heating flow flown out from the main heat exchanger through the inlet 311, of which part is supplied to the second heating pipe and the remaining is dispensed to the first sanitary pipe.

[0042] The first heating flow pipe 310, as shown in Fig. 6, is provided with an inlet 311 of the heating flow for dispensing the heating flow introduced from the main heat exchanger to the water-to-water heat exchanger 200 and the diverting unit 300, and also is provided with a plurality of outlets 312 and 313 which are respectively connected to the first sanitary water pipe 330 and the second heating flow pipe 350, and includes a pressure switch 314 and a safety valve 315.

[0043] The first sanitary water pipe 330 is composed of two supply paths, one of which is a heating flow inflow path and the other of which is a sanitary water outflow path, as shown in Fig 5. The heating flow inflow path has an outlet 331 of the heating flow which is connected to the inlet 242 of the heating flow in the water-to-water heat exchanger, and the sanitary water outflow path has an inlet 332 of the sanitary water which is connected to the outlet 244 of the sanitary water, and an outlet 333 of the hot water which is connected to the hot water supply pipe through a connection 401.

[0044] The second heating flow pipe 350 is positioned between the first heating flow pipe 310 and the diverting valve 360. The second heating flow pipe 350 includes a flange 354 in which the outlet 352 and the inlet 353 of the heating flow are formed, and which is connected to the first flange 364.

[0045] At the second heating flow pipe 350 are formed an inlet 351 of the heating flow which is connected to the first beating flow pipe 310 to pass the heating flow, and toward the heating flow outlet 352 is provided a connection 102 connected to the pipes of radiators.

[0046] The second sanitary water pipe 340 is provided, as shown in Fig. 7, with a flow switch 344 for generating a signal to sense the flow of cold sanitary water to the water-to-water heat exchanger 200, an outlet 341 of the sanitary water which is connected to the flow switch body 343, and an inlet 342 of the sanitary water associated with a connection 403.

[0047] At one side of the diverting valve 360 is installed the water return pipe 370 to which the heating flow of a low temperature heat-exchanged in the water-to-water heat exchanger 200 is returned to be again supplied to the main heat exchanger 100. The water return pipe 370 is provided with a connection 404 associated with an inlet 371 into which the heating flow after circulation through heating unit is introduced, and a flange 372 attached to the flange 365 positioned at the other side of the diverting valve 360 to again supply the heating flow obtained after heat-exchanging to the main heat exchanger 100.

[0048] Meanwhile, Figs. 4A and 4B are sectional views taken along a line A-A of Fig. 3. Here, Fig. 4A shows a state that heating flow (indicated in white arrows) during heating is circulated to a heating pipe such as a radiator, and part of the heating flow passes through the water-to-water heat exchanger 200. Fig. 4B shows a state that the ball valve 362 is diverted at the moment the sanitary water flow is sensed in the state of Fig. 4A.

[0049] Fig. 4A shows a state that the sanitary water is pre-heated in the water-to-water heat exchanger during heating. Under this pre-beating state, when the flow of the sanitary water flow is sensed, the ball valve 362 is diverted from the state of Fig. 4A to that of Fig. 4B to block the outlet 352 and the inlet 353 of the second heating flow pipe 350. At the same time, all heating flow passes through the inlet 334 and the outlet 331 of the heating flow of the first sanitary water pipe 330 from the outlet 313 of the first heating flow pipe 310, and is directed form the inlet 242 of the heating flow to the heating flow layers 220 in the water-to-water heat exchanger 200, to thereby perform successive supply of the hot water.

[0050] Accordingly, the sanitary water of the water-to-water heat exchanger 200, as indicated in black arrows in Fig. 7, is rapidly heated via the sanitary water layers 230, and then the heated hot sanitary water is supplied to hot water taps via the first sanitary water pipe 330. During the above period, the completely-heat-exchanged heating flow flows out toward the water return pipe 370 via the outlet 248 of the heating flow at the heating flow layer 220 and the opened valve seat 368 of the second flange 365 in the diverting valve 360, and then is again supplied to the main heat exchanger 100.

[0051] Meanwhile, as shown in Figs. 2, 8A and 8B, provided is the bypass valve 380 which is opened and closed by differential pressure between the valve box 361 of the diverting valve 360 and the water return pipe 370.

[0052] The bypass valve 380 includes a valve seat 385 formed at the valve box 361, a valve 381 for opening and closing the valve seat 385 formed at the valve box 361 with a valve face 382. The valve 381 is provided with springs 383 for elastically maintaining the valve 381. The valve 381 which is elastically installed with the springs 383, is closely supported by a support member 384 supported through a hole 386 of the water return pipe 370.

[0053] Figs. 8A and 8B show the operation of the bypass valve 380 according to the present invention. Fig. 8A shows that a differential pressure between the valve box 361 and the water return pipe 370 is less than a predetermined pressure when the heating flow is normally circulated. But, Fig. 8B shows that a differential pressure between the valve box 361 and the water return pipe 370 is more than a predetermined pressure.

[0054] That is, in the case that the heating flow which is normally circulated through the heating flow pipe blocks or opens/closes an opening path of the heating flow pipe with a temperature control valve (not shown) installed in the heating flow pipe, rapid pressure drop occurs at the inlet side of the heating flow pipe, and thus the valve 381 is opened by the hydraulic pressure of the heating flow in the valve chamber 363 to thereby allow the heating flow in the valve chamber 363 to be bypassed to the water return pipe 370.

[0055] Fig. 9 schematically shows, as a whole, the heating flow and hot sanitary water supply apparatus in a boiler according to the present invention.

[0056] The heating flow circulated in water pipes is heated by combustion of oils, gasses, etc, through the main heat exchanger 100. The heated heating flow is circulated through the heating flow pipes to heat a radiator. During heating, part of the heating flow is circulated to pre-heat the sanitary water. As above, the heating water flow is repeatedly circulated to heat rooms and at that time the sanitary water is maintained under the preheated condition. Thus, when hot sanitary water is used in the kitchen and bath room during heating, the hot water can be supplied very soon.

[0057] In the conventional apparatus, part of the heating flow during heating is not circulated via the water-to-water heat exchanger 200, and then sanitary water remains cold. Thus, a certain amount of the cold water, not being pre-heated, is initially supplied for a comparatively long time.

[0058] As described above, the present invention, considering the problem of the conventional hot water supply apparatus in a boiler, circulates the heating flow during heating and bypasses part of the heating flow to pre-heat the sanitary water, thereby even during heating, instantaneously supplying hot water to the bath room, etc.

[0059] Also, the apparatus of the present invention provides a simplified structure of a hot water supply system which is integrated in a multifunctional module by heat-exchange between sanitary water and heating flow, and simplifies complicated construction due to the increase of pipe lines and components such as a connection unit to provide an assembled structure.

[0060] Particularly, the bypass valve which controls the supply of the heating flow is installed between the valve box and the return water pipe to provide a further simplified apparatus.

[0061] Also, a heating water flow circulation and instantaneous hot water supply apparatus according to the present invention is integrated in a single module and thus can reduce a production cost, shorten assembly time and processes, decrease problems due to leakage and installation space, and enhance heat efficiency.

[0062] While only a certain embodiment of the invention has been specifically described herein, it will be apparent that numerous modifications may be made thereto without departing from the spirit and scope of the invention.

Claims

1. A heating water flow circulation and instantaneous hot sanitary water supply apparatus in a boiler comprising:

   a water-to-water heat exchanger, in which sanitary water layers and heating flow layers are alternately multilayer-formed to perform heat exchange between heating flow and sanitary water; and

   a heating flow diverting unit for circulating part of the heating flow to the heating flow layers of the water-to-water heat exchanger during the supplied heating flow is circulated for heating, supplying the hot sanitary water through the sanitary water layers of the water-to-water heat exchanger, and controlling the direction of the heating flow circulation according to a heating mode or a hot sanitary water supply mode.

2. The heating water flow circulation and instantaneous hot sanitary water supply apparatus according to claim 1, wherein said heating flow diverting unit comprises:

   a first heating flow pipe, including a plurality of outlets of the heating flow which are respectively connected between a first sanitary water pipe and a second heating flow pipe, in order to dispense the heating flow introduced from a main heat exchanger to the water-to- water heat exchanger and a diverting unit;

   a second heating flow pipe which includes an outlet of the heating flow supply, being a heating flow path having an inlet and an outlet of the heating flow, of which one side is associated with a flange forming a valve seat and is connected to the flange of the diverting valve and

the other is connected to the first heating flow pipe;

a diverting valve, including a valve box at a central portion of which is provided with a valve chamber, and of which the top, bottom, left and right are opened in a certain shape, a ball valve disposed in the valve chamber of the valve box, for performing a predetermined diverting operation, and a valve actuator disposed on the valve box, for rotatably driving the ball valve,

wherein a flow switch body of the sanitary water is integrally formed at the front face of the valve box, and is connected to the water-to-water heat exchanger and a second sanitary water pipe;

a first sanitary water pipe, provided with an inlet and an outlet of the heating flow and an inlet and an outlet of the sanitary water, respectively, which is connected to the inlet of the heating flow and an outlet of the sanitary water of the water-to-water heat exchanger as well as the first heating flow pipe;

a second sanitary water pipe, provided with an inlet and an outlet of the sanitary water and the flow switch, which is connected to the flow switch body of the diverting valve and the inlet of the sanitary water; and

a water return pipe, one of which is connected to the valve seat at the other side of the diverting valve, and the other of which is provided with an inlet and an outlet of the returned heating flow, in order to re-heat and circulate the heating flow.

3. The heating water flow circulation and instantaneous hot sanitary water supply apparatus according to claim 2, wherein the ball valve of said diverting valve has a five direction path, having two-stage balls.

4. The heating water flow circulation and instantaneous hot sanitary water supply apparatus according to claim 2, further comprising bypass means which is opened and closed according to differential pressure between the valve box of the diverting valve and a water return pipe of the heating flow.

5. The heating water flow circulation and instantaneous hot sanitary water supply apparatus according to claim 4, wherein said bypass means comprises a valve seat formed at the valve box, a valve for opening and closing the valve seat, springs for elastically maintaining the valve, and a support member for supporting the springs and the valve fixed through a hole formed at the water return pipe.

FIG. 1

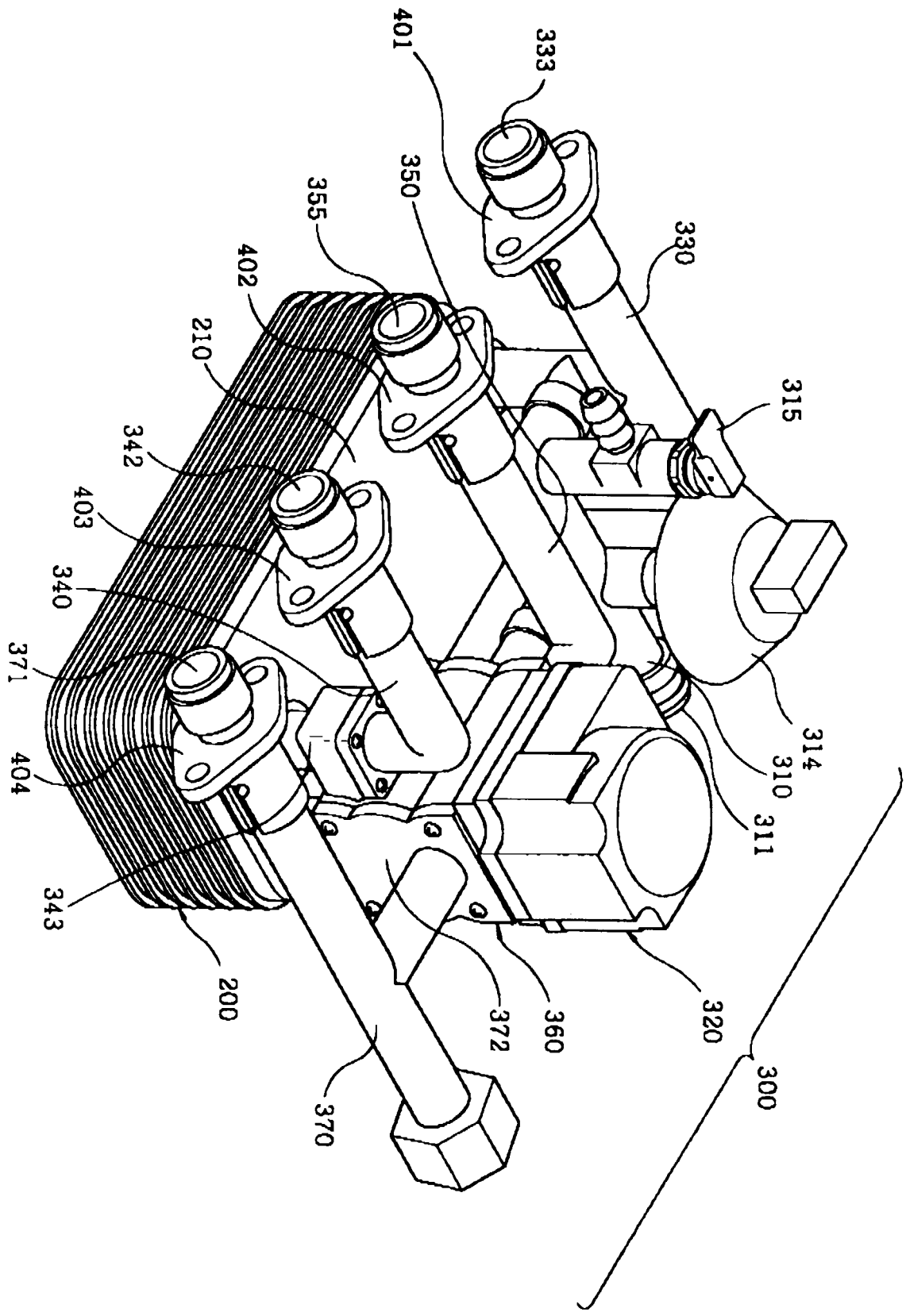

401
333
350
355
330
402
210
315
342
403
340
371
314
310
404
311
343
200
372
360
320
370
300

FIG. 2

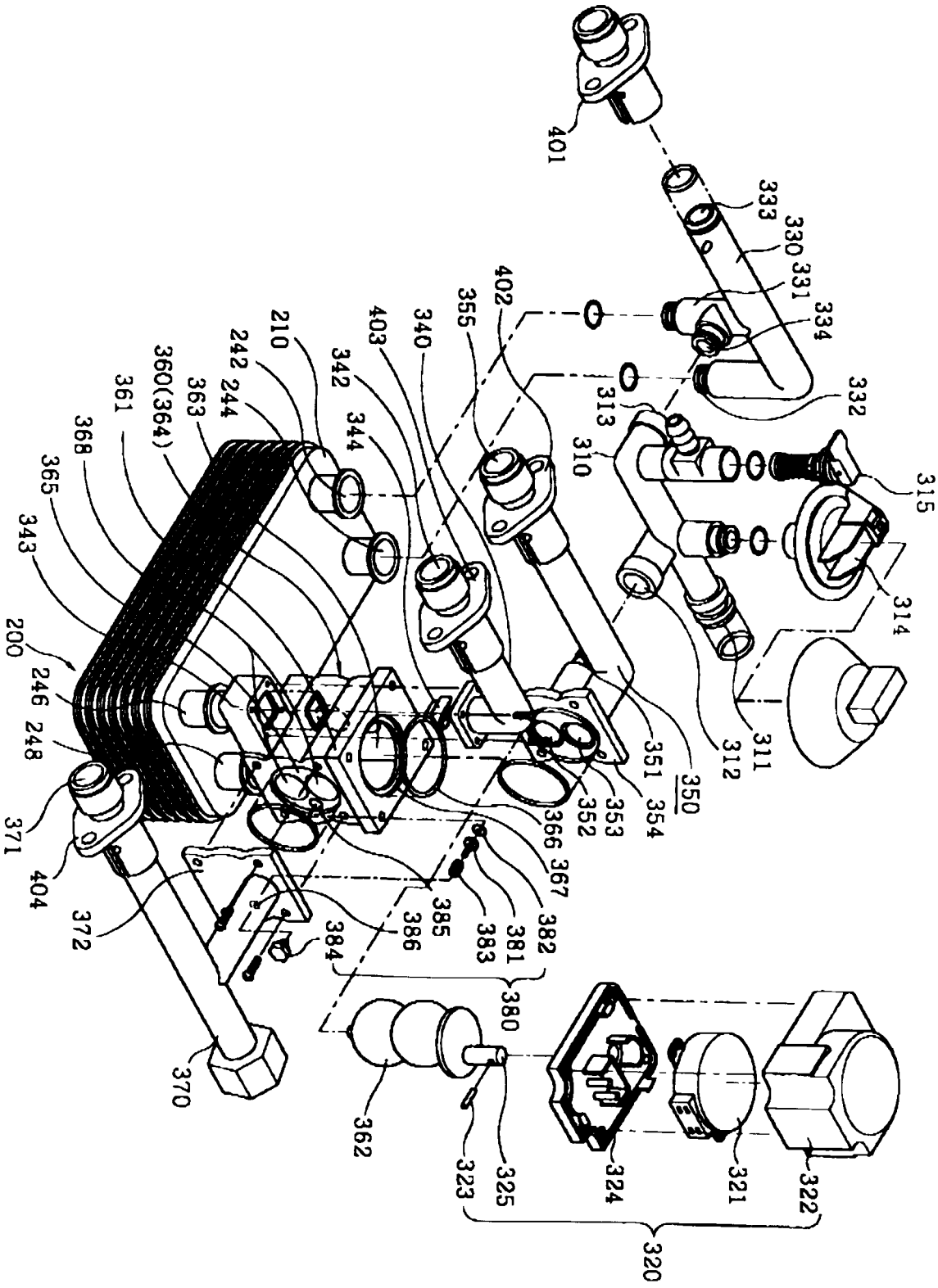

401
333
330
331
334
332
313
310
315
314
311
312
350
351
352
353
354
366
367
382
381
383
385
386
384
380
362
323
325
324
321
322
320
402
355
340
403
342
344
210
242
244
360(364)
363
361
368
365
343
200
246
248
371
404
372
370

FIG. 3

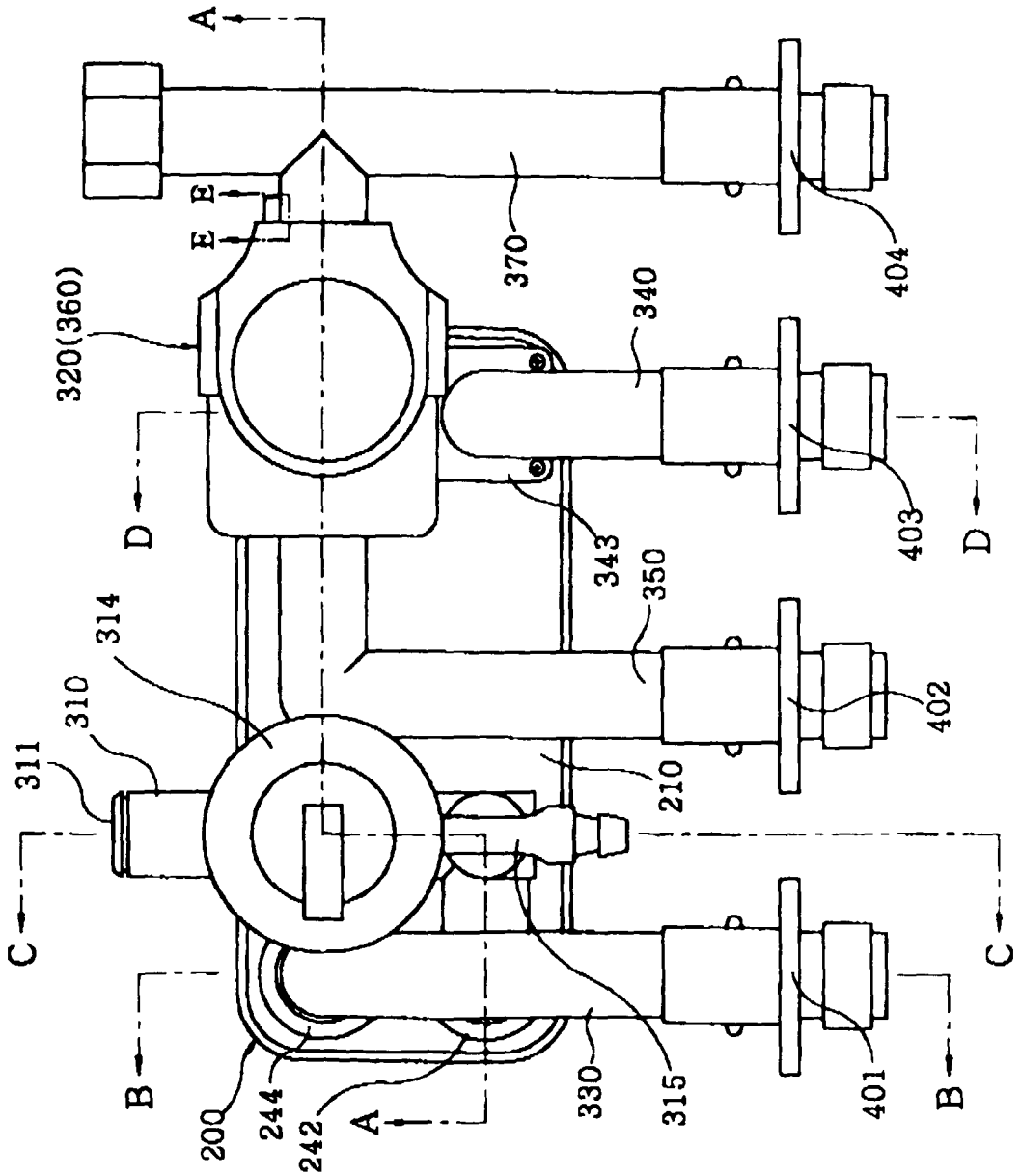

A
E
E
370
404
320(360)
340
D
403
D
343
350
314
310
311
402
210
C
C
B
B
200
244
242
A
330
315
401

FIG. 4A

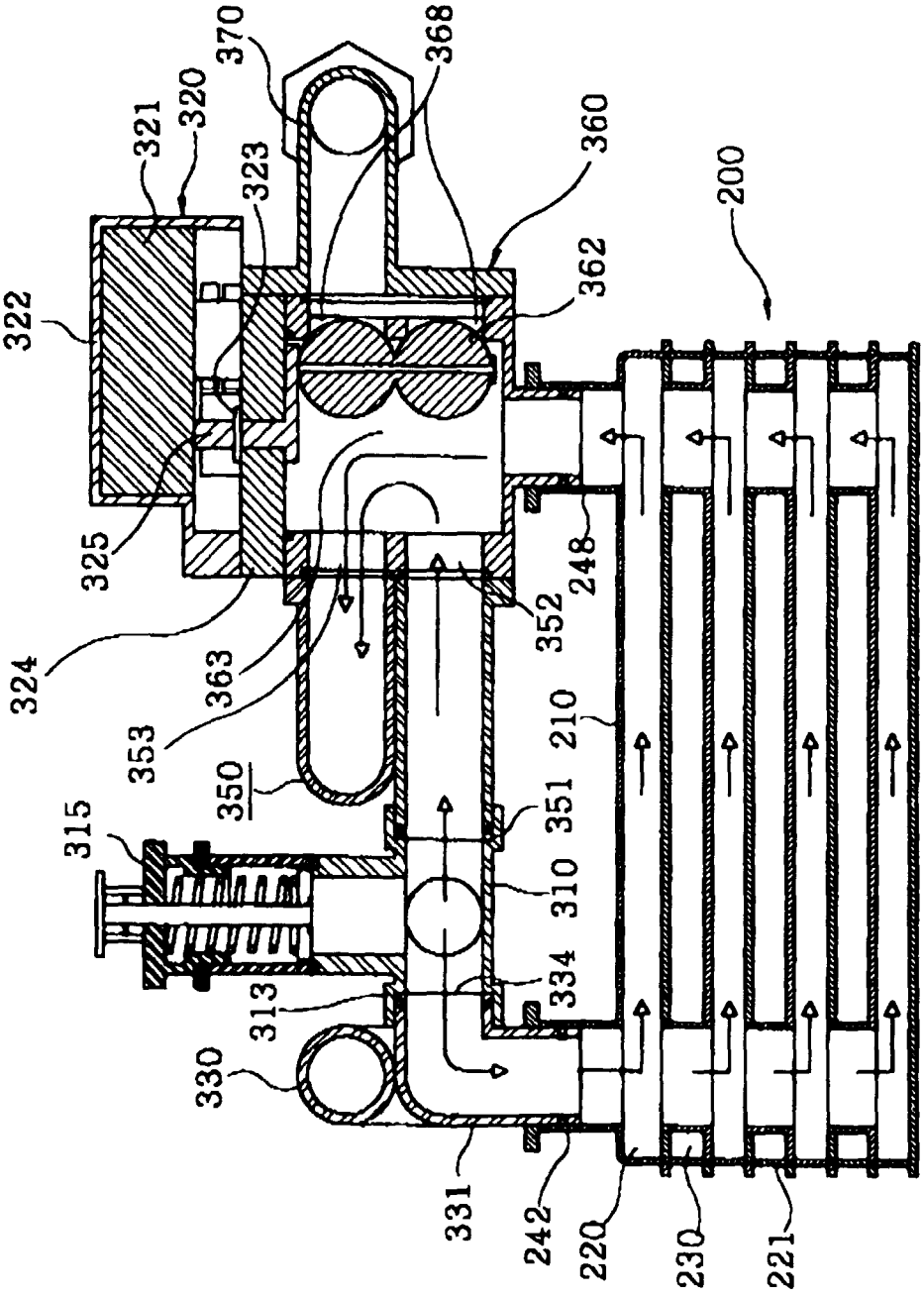

370
368
321
320
323
360
200
322
362
325
248
324
352
363
210
353
350
351
315
310
334
313
330
331
242
220
230
221

FIG. 4B

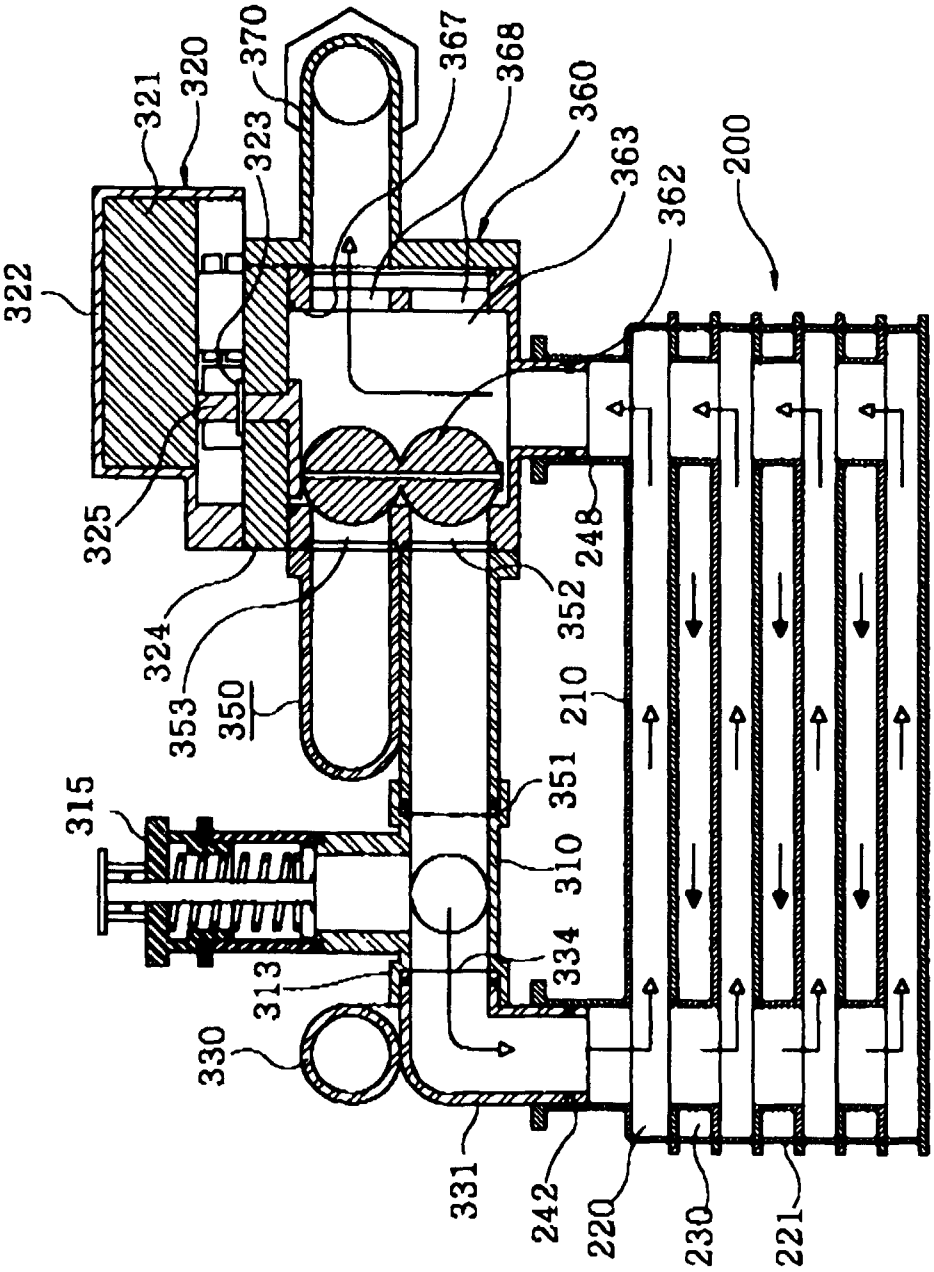

322
321
320
370
323
367
368
360
363
362
200
325
324
353
350
248
352
210
351
315
310
334
313
330
331
242
220
230
221

FIG. 5

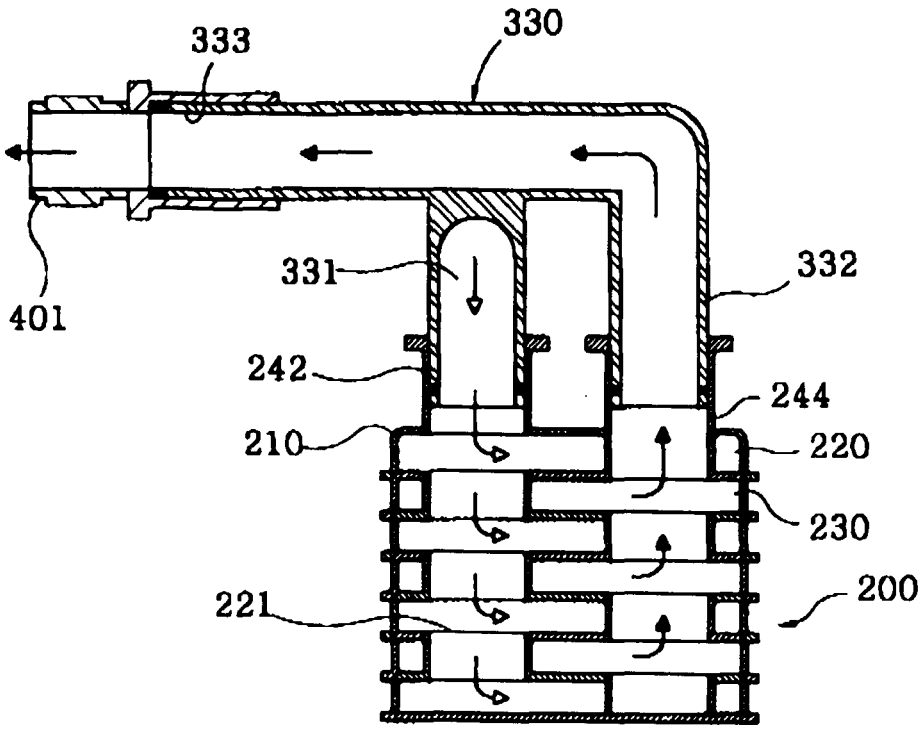

333
330
401
331
332
242
244
210
220
230
221
200

FIG. 6

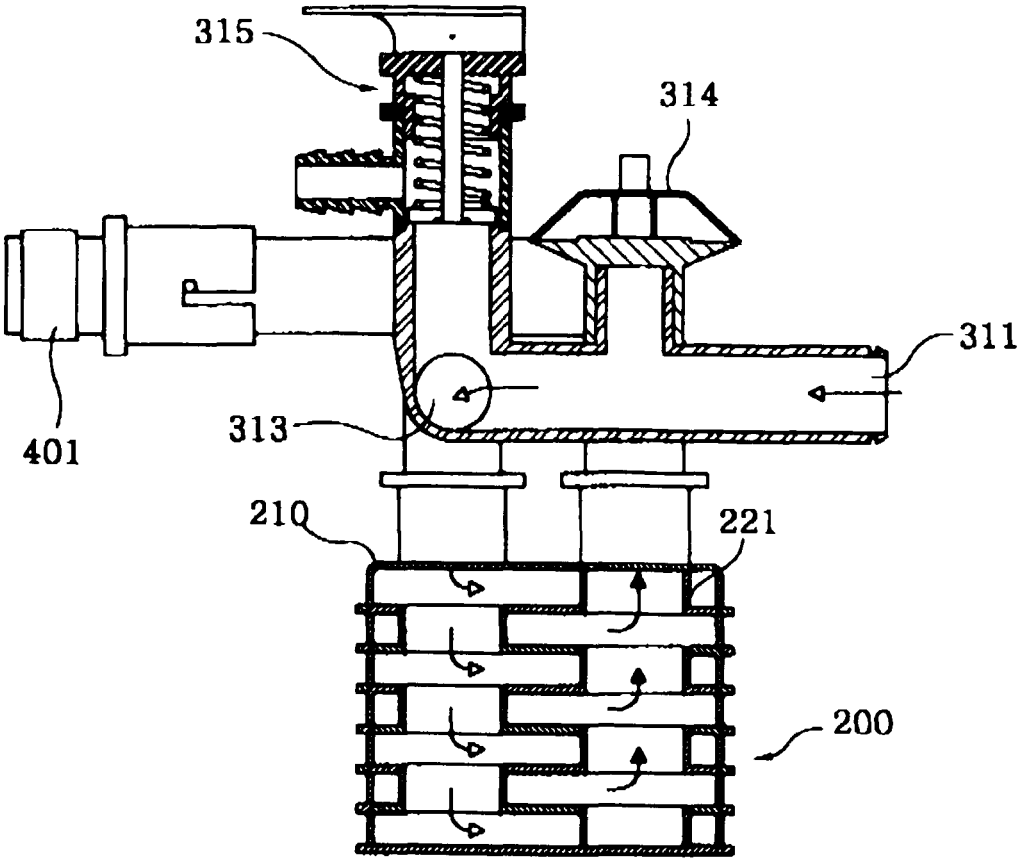

315
314
311
401
313
210
221
200

FIG. 7

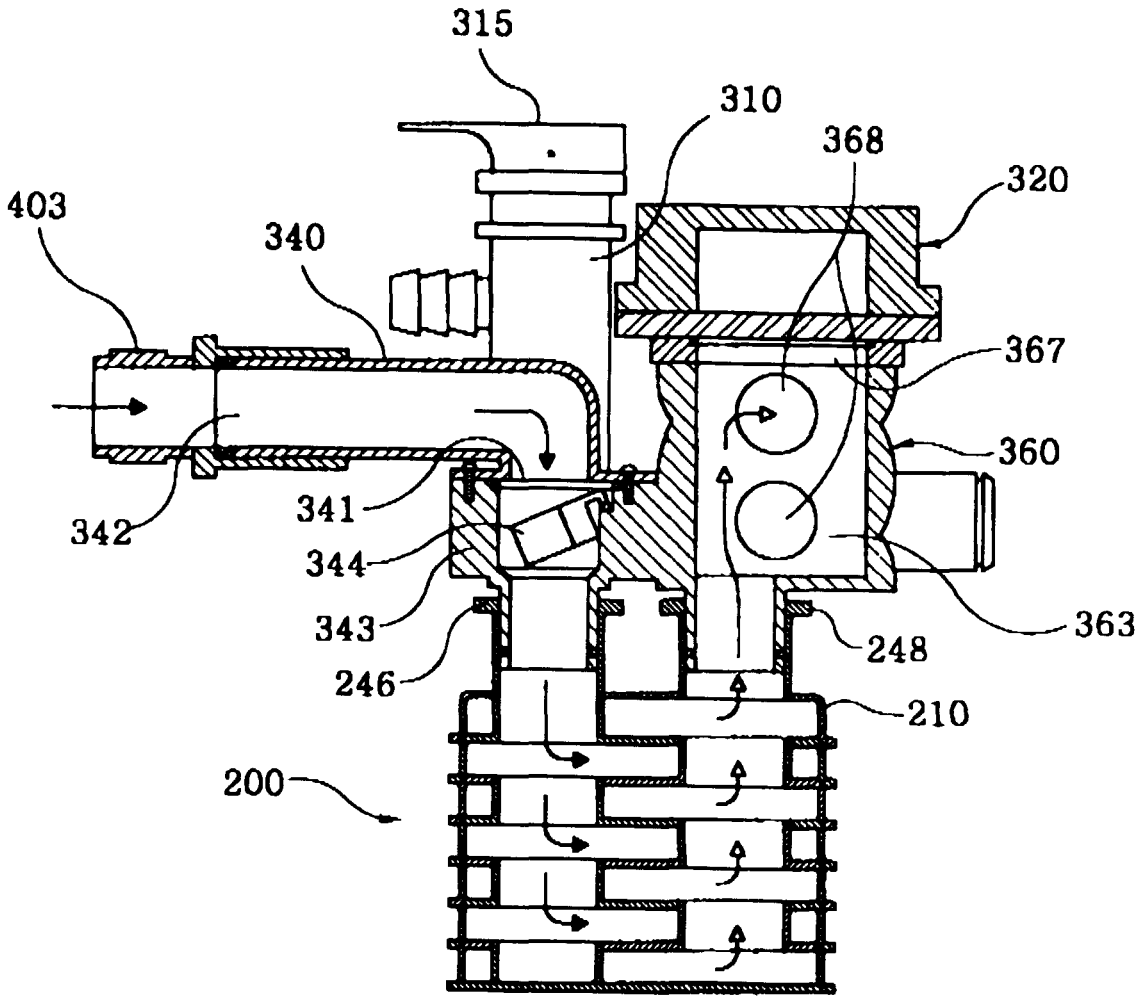

315
310
368
320
403
340
367
360
342
341
344
343
246
363
248
210
200

FIG. 8A

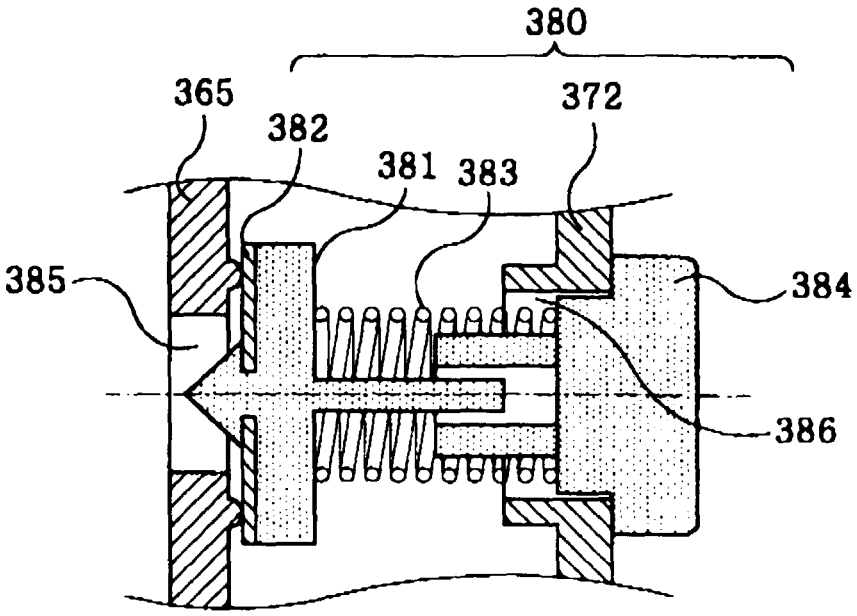

380
365
382
381
383
372
385
384
386

FIG. 8B

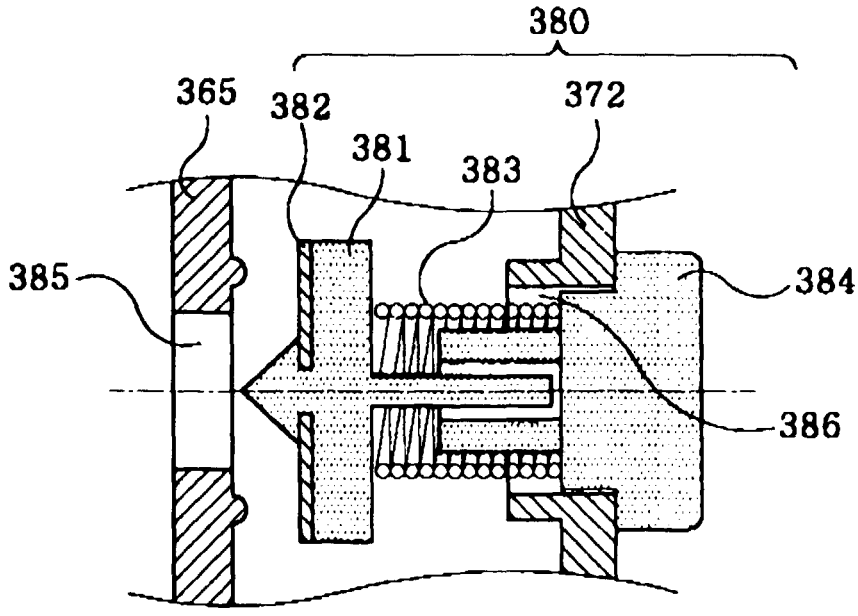

380
365
382
381
383
372
385
384
386

FIG. 9

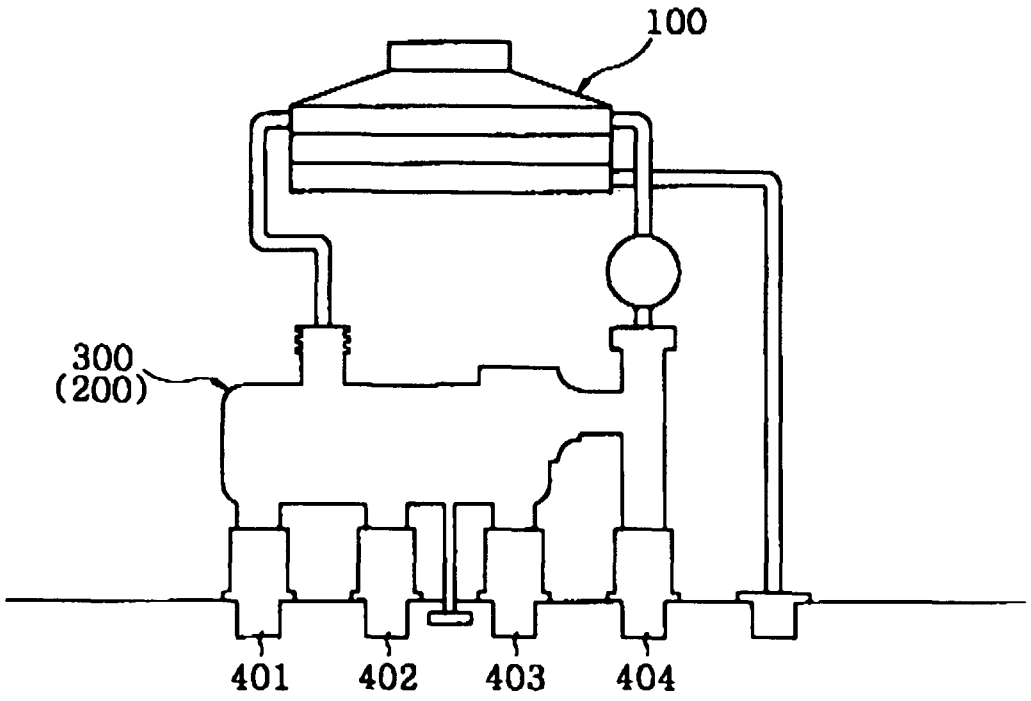
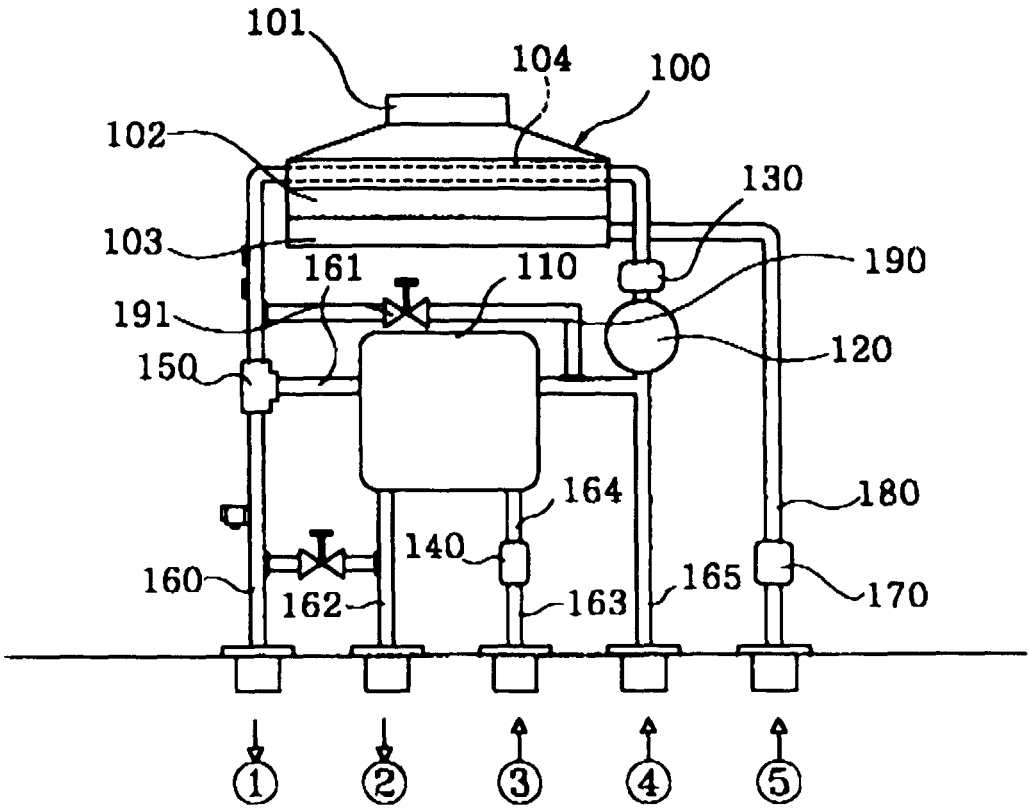


FIG. 10



① SUPPLY HEATING WATER FLOW

② SUPPLY HOT WATER

③ INTRODUCE COLD WATER

④ RETURN

⑤ FUELS(GASES)