

FIG. 1B

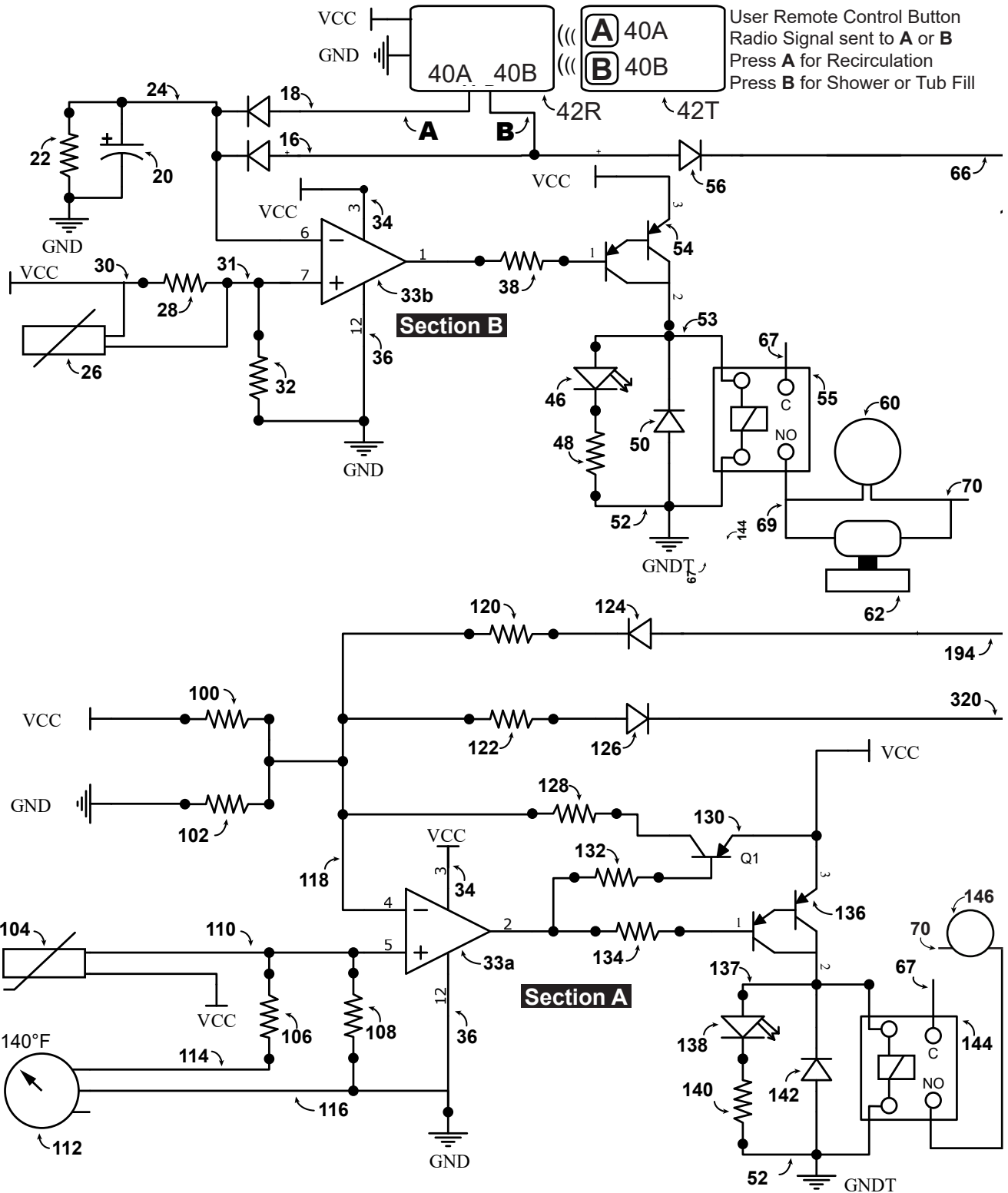


FIG. 2A

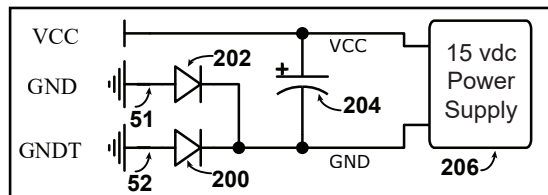
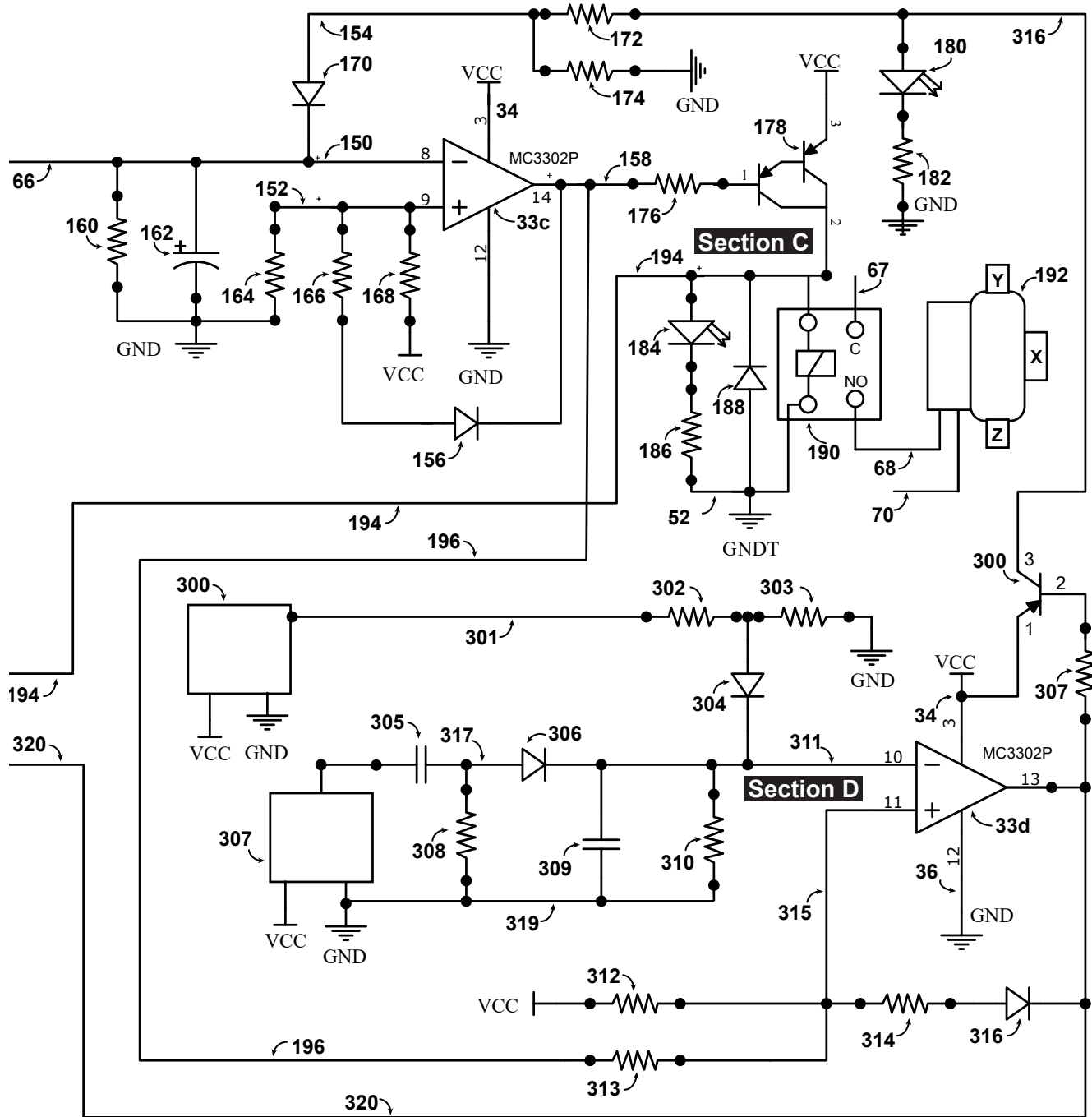


FIG. 2B

Section 33a Calculations Sheet 134° - 140°

System Net Volts DC	12.6	vdc
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Voltage in B1 is net VCC

Actual Circuit Board	Patent Schematic		
Part Number	Item Number		
Total Inline Goal Ω		4,335	Ω
R10 Ω	106	910	Ω
5K Potentiometer	112	3,250	Ω
R3	108	18,000	Ω
Net Resistance		3,379	Ω
Net Ohm Goal		2,736	Ω
Off Temperature		140	°F
Thermistor	104	3,041	Ω
Pin 4 Off Volts	Pin 4 of 33a	6.63	vdc

Column C Formula or Setting
Manual Adjustment / Test
Manual Adjustment / Test
=C5-C6
Manual Adjustment / Test
=1/(1/(C8+C9)+1/C10)
Tankless Pump Turned OFF
From 10K-4 Thermistor Table for 140 °F
=C11/(C11+C14)*B\$3

When Pin 5 drops below 6.30 volts, 33a turns on, pin 4 goes up to 6.63 volts with hysteresis influence by transistor 130 turning on. Now, pin 5 won't turn 33a off until pin 5 reaches 6.64 volts when temperature reaches 140 °F

On Temperature		134	°F
Thermistor	104	3,387	Ω
Pin 5 On Volts	Pin 5 of 33a	6.29	vdc

Tankless Pump Turned ON
From 10K-4 Thermistor Table for 134 °F
=C11/(C11+C19)*B\$3 volts to turn ON

FIG. 3

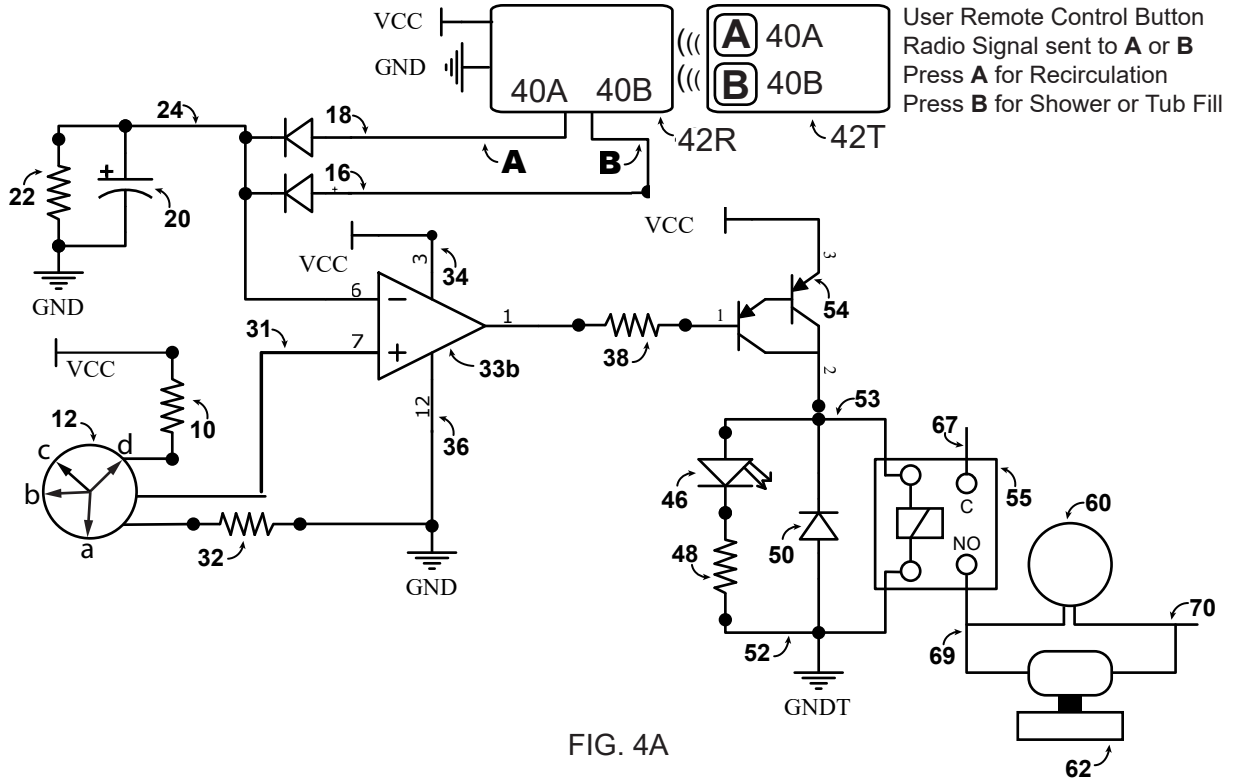


FIG. 4A

"Pot" is Potentiometer			2 resistors pot in middle								
12.6 vdc	Max Turn 270°									Wiper	Wiper
Pot Position	Run Seconds	° Pot Turn	% of circle	resistor 10	R10 side Pot Ω	Net Top Side	resistor 32	R32 side Pot Ω	Net Lower Side	Net bus 31	Goal vdc
d	120	0	0%	5100	0	5100	1000	5000	6000	5.79	5.74
c	90	64	24%	5100	1200	6300	1000	3800	4800	7.15	7.06
b	60	138	51%	5100	2600	7700	1000	2400	3400	8.74	8.55
a	30	222	82%	5100	4200	9300	1000	800	1800	10.56	10.36

FIG. 4B

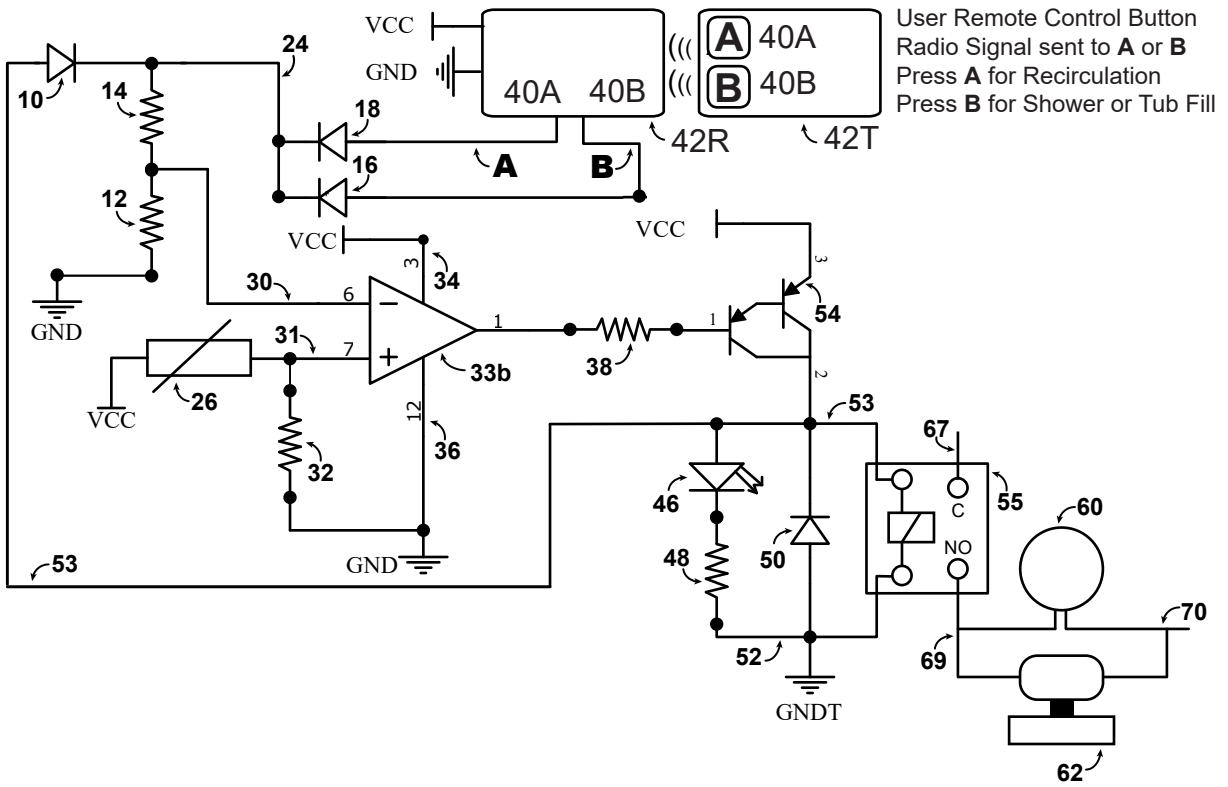


FIG. 5A

Net volts on bus 24	12.6	Resistor values	
Thermistor 26 Ω @ 70° F	11,720	Net volts on bus 24	12.6
Thermistor 26 Ω @ 108° F	5,053	R 14	5,100
		R 12	5,600
		Volts at Pin 6	6.59
Pin 7 of 33b at 70°F room temperature		Pin 7 of 33b at 108°F hot temperature	
Thermistor 26	11,720 Ω	Thermistor 26	5,053 Ω
Volts at VCC	12.6 volts	Volts at VCC	12.6 volts
R32	5,600 Ω	R32	5,600 Ω
Pin 7	4.07 volts	Volts at Pin 7	6.62 volts
Since Pin 7 of 33b is lower than Pin 6, 33b will not turn off		Pin 7 is now higher than pin 6, 33b will turn off and preheating pump 60 will turn off.	

FIG. 5B

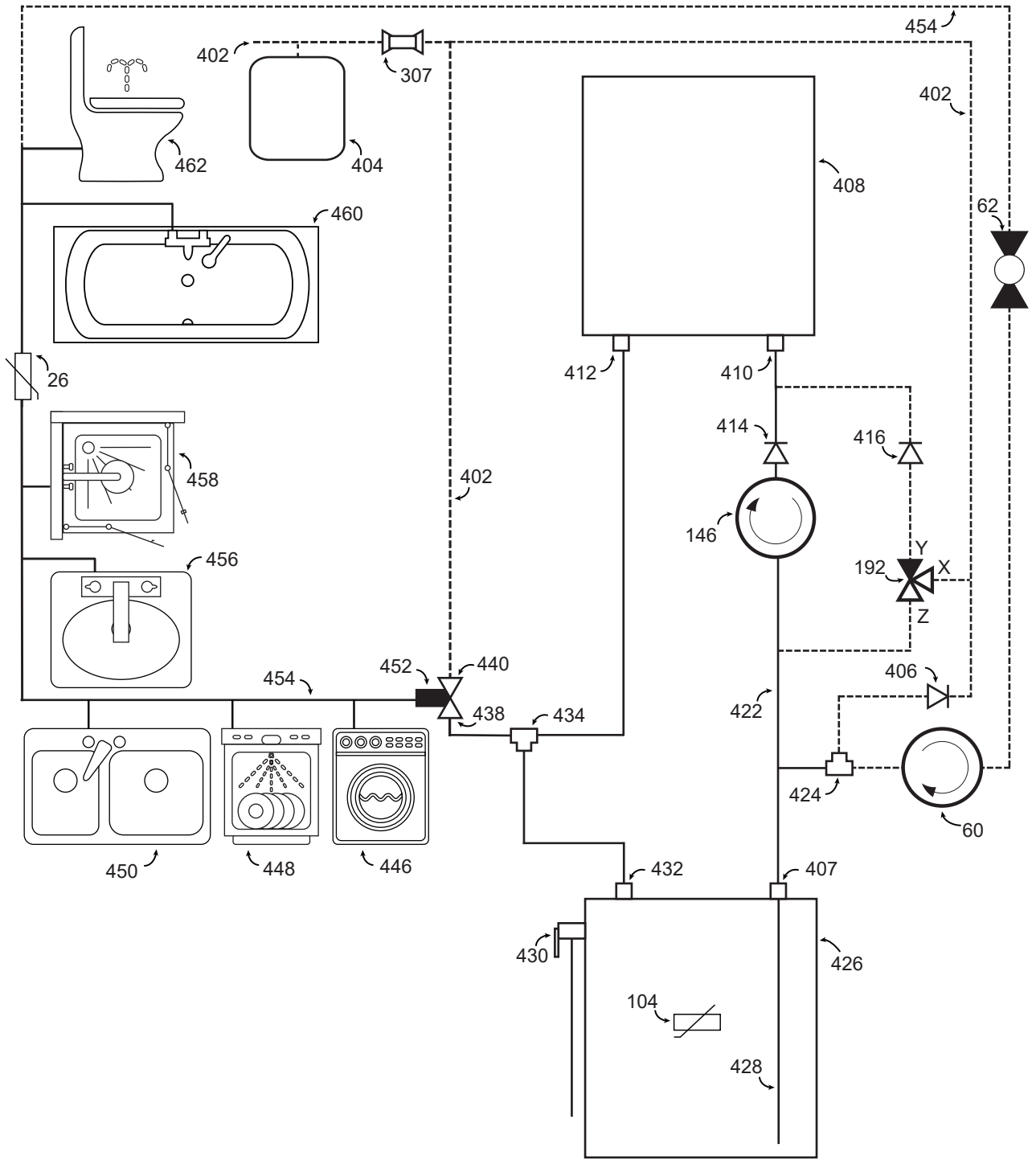


FIG. 6

FIG. 7 PRIOR ART

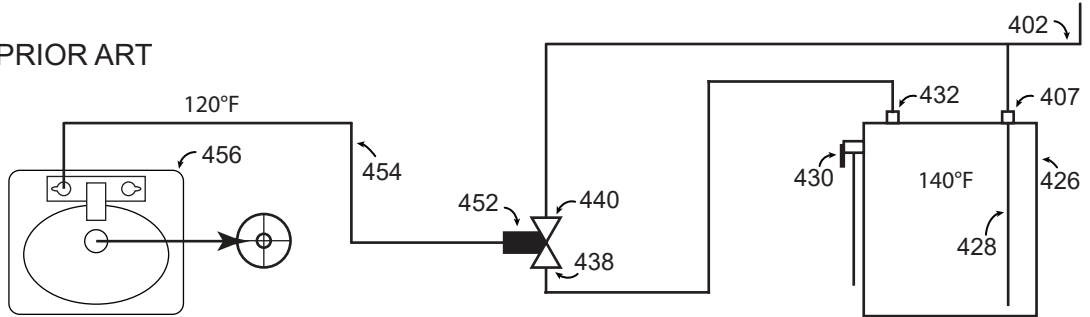


FIG. 8

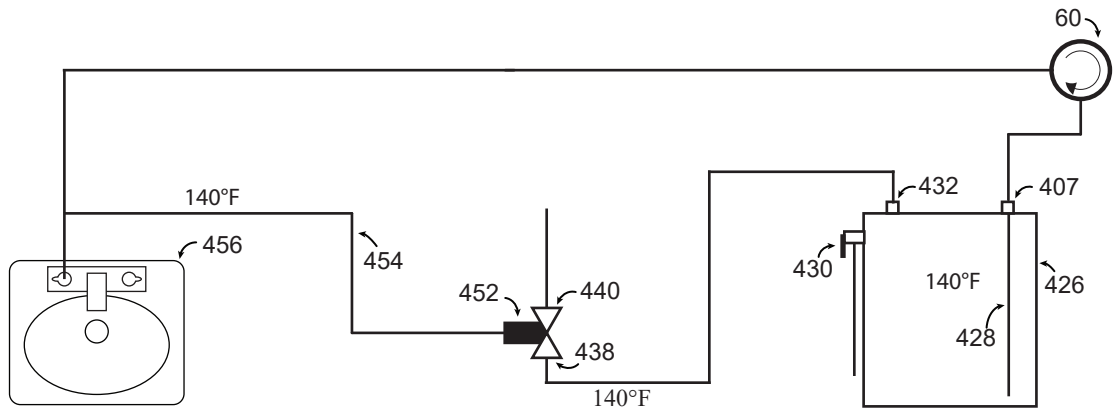


FIG. 9

