March 12, 1957 N. FODOR 2,784,945

HEATING AND COOLING SYSTEM FOR A BUNGALOW

Filed July 1, 1954

2 Sheets-Sheet 1

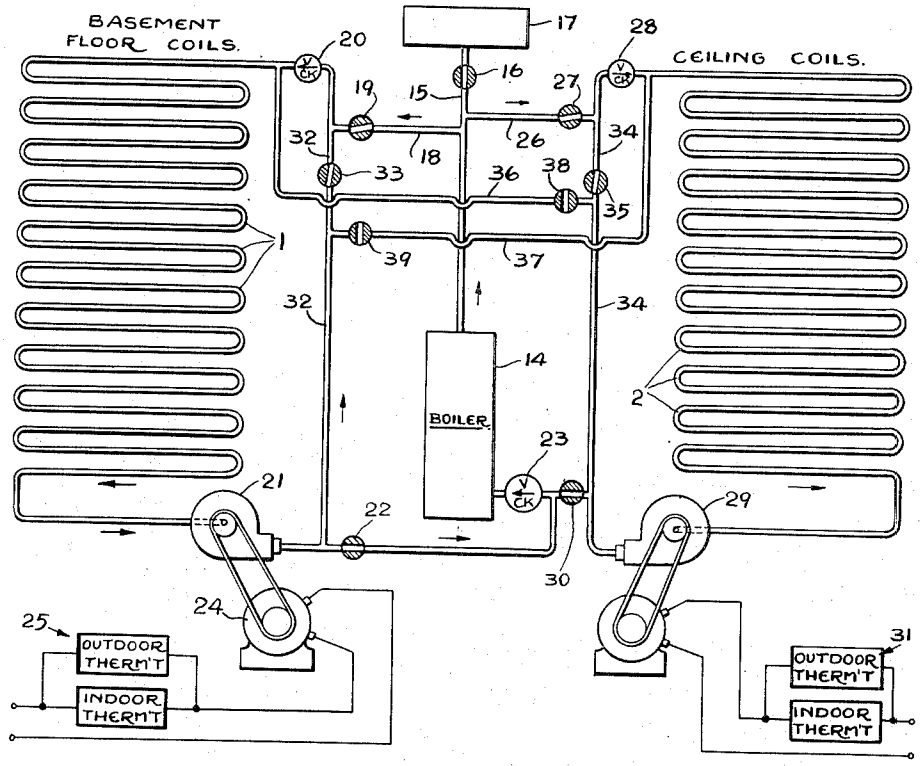


FIG 1.

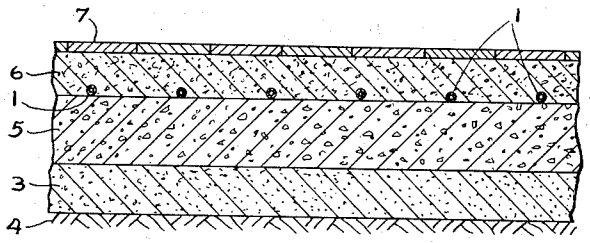


FIG 4.

INVENTOR
NICHOLAS FODOR

BY

Mayber & Legris

ATTORNEYS

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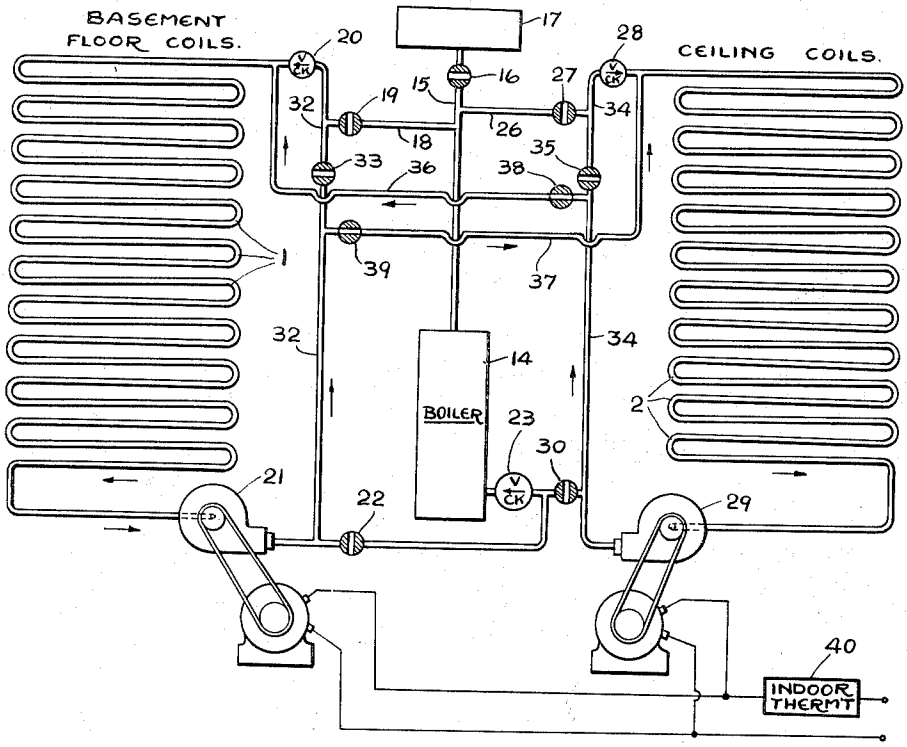


FIG 2.

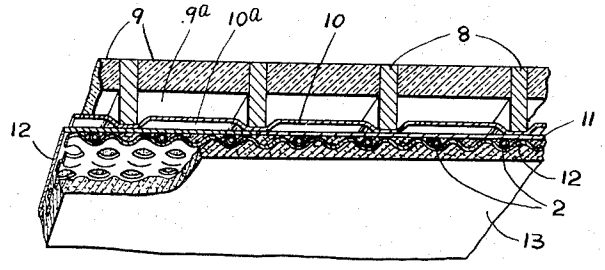


FIG 3.

INVENTOR
NICHOLAS FODOR
BY Maybee & Legris
ATTORNEYS

United States Patent Office 2,784,945 Patented Mar. 12, 1957

2,784,945

HEATING AND COOLING SYSTEM FOR A BUNGALOW

Nicholas Fodor, Toronto, Ontario, Canada

Application July 1, 1954, Serial No. 440,797

Claims priority, application Canada July 4, 1953

8 Claims. (Cl. 257—3)

This invention relates to a heating and cooling system for buildings, and is particularly adapted for the heating and cooling of bungalows having basements.

The object of the invention is to provide a heating and cooling system which is economical to operate, which provides winter heating and summer cooling, and which is trouble free and reasonably easy to install.

A preferred embodiment of the invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a schematic diagram of a system arranged for heating a bungalow;

Fig. 2 is a schematic diagram of the same system arranged for cooling a bungalow;

Fig. 3 is a fragmentary perspective view of the ceiling structure of a bungalow in which the system of Figs. 1 and 2 is installed; and

Fig. 4 is a fragmentary sectional view of the basement floor structure of the bungalow.

In Figs. 1 and 2, a first group of interconnected pipes **1** is labelled "basement floor coils" and a second group of pipes **2** is labelled "ceiling coils." The basement coils **1** are embedded in the floor structure of the basement of a bungalow, as shown in section in Fig. 4. In Fig. 4 it will be seen that the floor structure consists of a layer of sand **3** laid on the earth **4**, a layer of crushed stone **5** above the sand, the coils **1** laid on the crushed stone, a slab of concrete **6** in which the coils **1** are embedded, and finally a finished surface of mastic tile **7**. By way of example, the layer of sand **3** may be approximately six inches deep, the layer of crushed stone **5** approximately eight inches deep, the concrete slab **6** approximately six inches thick, and the coils **1** may be of three-quarter inch steel pipe.

The ceiling coils **2** are imbedded in the ceiling below the roof of the bungalow, and a fragment of the ceiling structure is shown in Fig. 3. Joists **8** have between them bats **9** of thermal insulation such as that sold under the trademark "Fiberglas." Aluminum foil **10** is secured to the lower edges of the joists, and below the aluminum foil is a layer of insulating lath or plasterboard **11** such as that sold under the trademark "Gyproc." Between the joists **8** the foil **10** is spaced upwardly from the lath **11** to provide an air space **10***a* and similarly there is an air space **9***a* between the foil **10** and the bats **9**. The pipes **2** lie below the lath **11** and are held in position by sheets of expanded metal lath **12** in contact with the undersides of the pipes **2**. The pipes **2** are embedded in plaster **13** laid onto the lath **11** and **12**. By way of example the pipes **2** may be one-half inch copper pipes.

Now reverting to Fig. 1, in the basement of the bungalow is a boiler **14** containing water and heated by any suitable means. The boiler is connected by a stand pipe **15** through an open valve **16** to an air cushion tank **17**. The boiler **14** supplies hot water to the basement floor coils **1** through a pipe **18**, a partly open valve **19**, and a check valve **20**, the water returning to the boiler through a circulating pump **21**, an open valve **22**, and a check valve **23**. The pump **21** is driven by a motor **24** which is

started and stopped by conventional indoor and outdoor thermostatic means **25**.

The boiler similarly supplies hot water to the ceiling coils **2** through a pipe **26**, a partly open valve **27**, and a check valve **28**, the water returning to the boiler through a circulating pump **29**, an open valve **30**, and the check valve **23**. The operation of the pump **29** is again controlled by conventional indoor and outdoor thermostatic means **31**. Thus it will be seen that with the system arranged as in Fig. 1, the basement coils **1** and the ceiling coils **2** are supplied with hot water from the boiler **14**, the coils **1** being connected in parallel with the coils **2**.

In the circuit of the floor coils **1**, a pipe **32** and a partly open valve **33** partially by-pass the boiler **14**, so that part of the water circulates through the coils **1** passes from the pump **21** through the pipe **32** and the valve **33** and check valve **20** back to the floor coils, only a portion of the water circulating from the pump **21** through the valve **22**, check valve **23**, boiler **14**, pipe **18** and valve **19** to the check valve **20** and the basement floor coils. Adjustment of the valves **19** and **33** controls the proportion of water flowing through the boiler **14** for re-heating before returning to the coils **1**. Similarly, a by-pass pipe **34** and partly open valve **35** are provided for the ceiling coils **2**.

A pipe **36** extends from the pipe **34** to the basement floor coils, and similarly a pipe **37** extends from the pipe **32** to the ceiling coils, but the pipes **36** and **37**, for the connections shown in Fig. 1, are blocked by closed valves **38** and **39** respectively.

It will be seen that with the system arranged as in Fig. 1, the heating of the basement and of the main story of the bungalow is effectively achieved by means of the embedded coils **1** and **2** respectively. Each set of coils has its own circulating pump controlled by its own thermostats.

The connections for warm weather are shown in Fig. 2. The boiler **14** is rendered inoperative by closing the valves **16**, **19**, **27**, **22** and **30**, thus cutting the boiler out of the system, and the by-passes are eliminated by closing the valves **33** and **35**. The valves **38** and **39** are opened, so that there is a series circuit from the coils **1** through the pump **21**, pipe **32**, valve **39**, pipe **37**, ceiling coils **2**, pump **29**, pipe **34**, valve **38** and pipe **36** back to the basement coils **1**. Since the pipes **1** are in the basement floor structure they are affected largely by the temperature of the earth, which is relatively cool in the summer, so that water circulated from the coils **1** to the coils **2** cools the main story of the bungalow, the water returning to the pipes **1** to be cooled again. The pumps **21** and **29** being in series, they are controlled by a common thermostat **40**.

It is noteworthy that while the main story is being cooled by the coils **2** the basement is warmed by the water which returns from the coils **2** to the coils **1**. The warming of the basement is of course desirable to decrease the relative humidity in the summer and thus to make the basement livable. Condensation in the basement is eliminated because of the warming effect of the coils **1**. Thus it will be seen that the coils can be connected with suitable fluid heating means for winter heating and can be re-connected with the heating means out of the system for summer cooling.

Referring to Fig. 3, the metal lath **12** in contact with the ceiling coils **2** is a good thermal conductor and substantially equalizes the temperature across the ceiling **13**. If some sort of thermal conductor **12** is not provided between the coils **2** there is a danger of condensation occurring on the ceiling immediately below each of the pipes **2**. If necessary, conventional dehumidifier equipment may be added to take moisture out of the upper floor.

The effectiveness of the ceiling coils **2** for controlling the temperature of the room below is increased by the provision of the insulating bats **9**, the air spaces **9***a* and

10*a* and the insulating lath **11**, as well as by the provision of the heat reflecting aluminum foil **10**.

While the coils **1** are preferably located in the basement floor they may of course be located below the basement floor structure, and similarly other modifications obvious to those skilled in the art may be made without departing from the scope of the claims. In the claims the term "ceiling structure" will be understood to mean whatever structure closes the top of a room or rooms in a building.

What I claim as my invention is:

1. A heating and cooling system for a bungalow having a ceiling structure located away from the earth and a floor structure bearing on the earth, comprising coils of piping embedded in and spread through the ceiling structure to utilize the ceiling surface for heating and cooling the building, piping similarly embedded in and spread through the floor structure, water heating means, means for connecting the piping in the ceiling structure in parallel with the piping in the floor structure and to the heating means for supplying warm water to the piping in cold weather to heat the ceiling and floor structures and thus to heat the building, means for disconnecting the heating means from the piping and connecting the piping in the ceiling structure in series with the piping in the floor structure in warm weather, thermostatically controlled means for circulating water through the series connected piping, the piping in the floor structure being so located relative to the earth that its temperature is affected largely by that of the earth whereby the water circulated through the series connected piping is cooled when in the piping in the floor structure and thus cools the ceiling structure, the piping in the floor structure thus constituting cooling means for the water in warm weather.

2. A heating and cooling system for a building having a ceiling structure located away from the earth and a floor structure bearing on the earth, comprising piping spread through the ceiling structure to utilize the ceiling surface for heating and cooling the building, piping similarly spread through the floor structure, heating means connected to the piping both in the ceiling structure and in the floor structure for supplying warm fluid to the piping in cold weather to heat the ceiling and floor structures and thus to heat the building, means for rendering the heating means inoperative and connecting the piping in the ceiling structure in series with the piping in the floor structure in warm weather, and means for circulating fluid through the series connected piping, the piping in the floor structure being so located relative to the earth that its temperature is affected largely by that of the earth whereby the fluid circulated through the series connected piping is cooled when in the piping in the floor structure and thus cools the ceiling structure, the piping in the floor structure thus constituting cooling means for the fluid in warm weather, the temperature of the fluid and thus of the building being controlled by the temperature of the earth adjacent the piping in the floor structure.

3. A heating and cooling system as claimed in claim 1, in which the ceiling structure is the ceiling of the main storey of a bungalow and the floor structure is the basement floor of the bungalow, the piping in the floor structure being the sole heat distributing means for the basement floor in cold weather and being the sole cooling means for the water in the series connected piping in warm weather.

4. A heating and cooling system as claimed in claim 2, in which the ceiling structure is the ceiling of the main storey of a bungalow and the floor structure is the basement floor of the bungalow, the piping spread through the floor structure being the sole heat distributing means for the basement floor in cold weather.

5. A heating and cooling system as claimed in claim 4, in which the piping spread through the floor structure is the sole cooling means for the fluid in the series connected piping in warm weather.

6. A heating and cooling system as claimed in claim 2, in which the piping spread through the floor structure is the sole cooling means for the fluid in the series connected piping in warm weather.

7. A heating and cooling system for a building having a ceiling structure and a floor structure bearing on the earth, comprising piping spread through the ceiling structure to utilize the ceiling surface for heating and cooling the building, piping similarly spread through the floor structure, heating means, means for connecting the piping in the ceiling structure in parallel with the piping in the floor structure and to the heating means for supplying warm fluid to the piping in cold weather to heat the ceiling and floor structures and thus to heat the building, means for rendering the heating means inoperative and connecting the piping in the ceiling structure in series with the piping in the floor structure in warm weather, and means for circulating fluid through the series connected piping, the piping in the floor structure being so located relative to the earth that its temperature is affected largely by that of the earth whereby the fluid circulated through the series connected piping is cooled when in the piping in the floor structure and thus cools the ceiling structure, the piping in the floor structure thus constituting cooling means for the fluid in warm weather, the means for circulating fluid comprising a circulating pump in series with the piping in the ceiling structure and a circulating pump in series with the piping in the floor structure, the piping in the ceiling structure and its pump being in series with means for at least partially by-passing the heating means when the heating means is connected to the piping, and the piping in the floor structure and its pump being in series with means for at least partially by-passing the heating means.

8. A heating and cooling system as claimed in claim 7, in which the pumps are thermostatically controlled.

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