Dec. 25, 1951 M. MANNIST 2,580,111

HEATING SYSTEM

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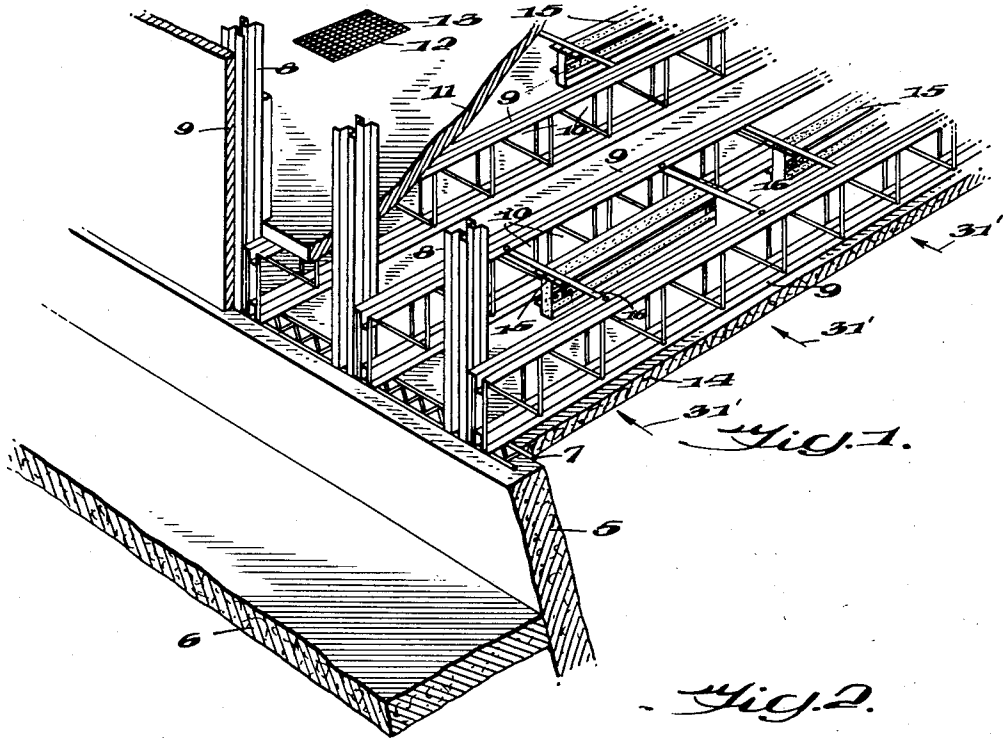


Fig. 1.

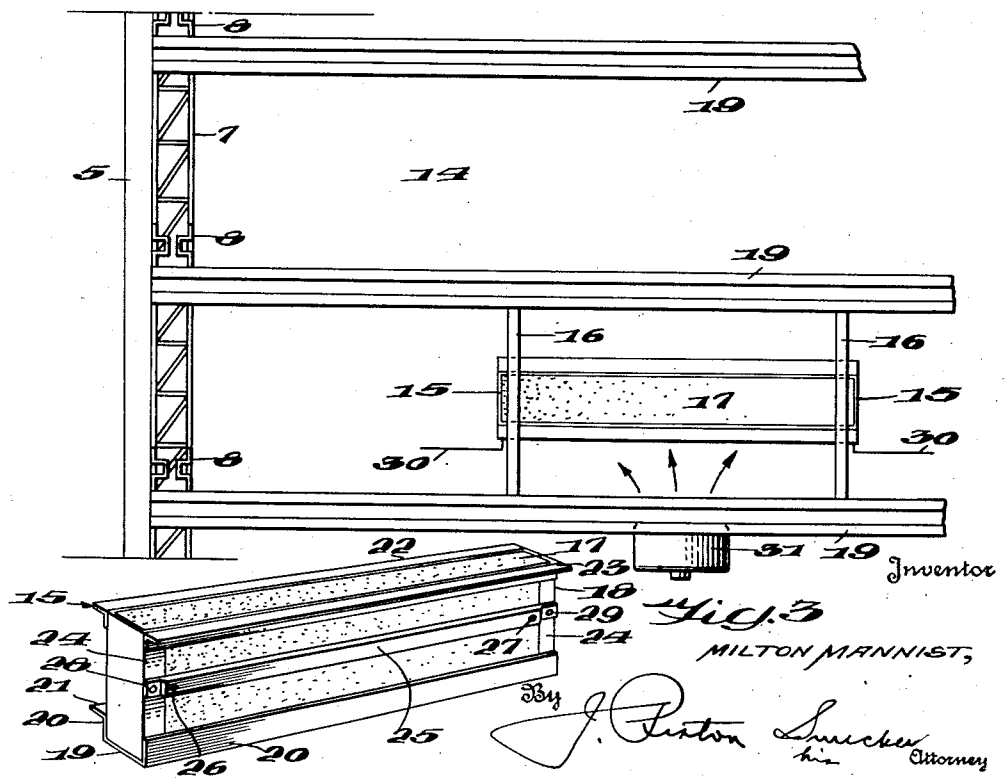


Fig. 2.

Fig. 3

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HEATING SYSTEM

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9 Claims. (Cl. 219—39)

1

This invention relates to improvements in heating systems for building structures, and particularly to combined radiant and convection heating systems for buildings constructed with skeleton or open studs and joists.

The object of this invention is to provide an improved heating system which can be adapted to or constructed in a building having skeleton studs or joists which will give a radiantly heated floor or wall and a convection heated interior where one heating unit supplies the heat to both the radiant and convection systems.

This invention is adapted to utilize the skeleton structural members described in detail in my prior application, Serial No. 579,170, filed February 22, 1945, now Patent No. 2,475,103. However the heating system of this invention is not necessarily limited to the particular structure described and claimed in said copending application.

Other objects and advantages of this invention will become apparent as the description proceeds and is considered in connection with the accompanying drawings, illustrating one embodiment thereof, in which:

Fig. 1 is a perspective view, partially in section, showing a building floor structure and a room interior with the heating system of this invention installed therein;

Fig. 2 is a top plan view showing my improved heating unit installed between the floor joists of Fig. 1; and

Fig. 3 is an enlarged perspective view of the improved heating unit detached.

Referring now to the drawings, the numeral 5 designates one of the conventional walls forming a basement or other suitable foundation structure, illustrated as being embedded in the ground 6. Resting upon the foundation walls 5 and securely anchored thereto in any desirable manner is a plate 7 illustrated here as being of a metallic skeleton structure, the details of which structure are described fully in my copending application Serial No. 579,170.

Securely anchored to the wall 5 and affixed to the plate 7 are upright metallic studs 8 onto which conventional siding 9 is secured in any suitable manner.

Resting upon the plate 7 and anchored thereto as well as against the studs 8 and rigidly secured to both, as by welding, riveting, bolting, or the like, is a plurality of metallic skeleton joists 9 formed with openings 10 therein as shown and more particularly described in my copending application mentioned above. While it has been found desirable to use as joists the metallic studs

2

of my copending application, it is to be understood here that other suitable skeleton joists may be substituted therefor, without departing from the spirit of this invention. It is also to be understood that while the drawings show only one wall 5, the joists 9 extend transversely between two or more sustaining walls, the additional walls not being shown in the drawing for the sake of simplicity of illustration.

Resting upon the joists 9 and secured thereto in a conventional manner, is a floor 11, shown partially in section in Fig. 1. In the flooring 11, in any location thereof, dictated by good engineering principles, is an opening 12, which serves as a conduit between the space underneath the floor 11 and the joists 9. Extending over the opening 12 is a conventional grill-work. Located beneath the joists 9 is a sheeting 14 which covers the entire under surface of the joists and forms a bottom wall of a conduit which encases the joists 9. This conduit is in open communication with the opening 12.

Suspended from the joists 9 and abutting against the underside of the floor 11, is a plurality of heating units 15. The number and size of these heating units 15 installed in any building will be dependent upon the size of the building to be heated, insulation used, temperature desired and such other factors as are dictated by good heating principles. The heating units 15 are suspended between two of the joists 9 by means of a pair of arms 16 which are secured to the joists in any manner desired as by riveting, bolting, welding or the like. The supporting arms 16 are likewise secured to the heating units 15 in a similar manner.

Each of the heating units 15 consists of a refractory body 17 in the form of a rectangular slab which, preferably, should be of a high heat conductivity and should also have a high heat retentivity. The refractory unit 15 is encased in a skeleton metallic frame 18, as shown more clearly in Fig. 3. The frame preferably is constructed of channel iron or other metal, as shown. The lower or bottom thereof is formed by a U-shaped member 19 having upturned lips 20 and an outturned flange 21. Bars of angle irons 22 and 23 are secured firmly to the top portion of the block 17 and are connected to the bottom angle iron 19 by means of flat iron straps 24. Connected between the straps 24 and lying against the refractory material 17 is an electrical resistance strip heating element 25. While only one strip heater 25 is shown in the drawings, it is to be understood that two or more strip heaters 25

may be provided on each unit 17 and may be located on several of the sides thereof. Electric connectors 26 and 27 are provided at each end of the strip heater 25. The strip heater 25 is secured to the straps 24 by means of rivets or bolts 28 and 29.

It will be seen from the foregoing description of the heating unit, that when electric current is passed through the strip heater 25, heat will be transmitted by radiation to the refractory material 17, and because of the location of the units 15, the floor will be heated from these units by radiant heat.

The heaters 15 are connected together by wires or buses 39 connected to the terminals 26 and 27 of the strip heating elements, and in turn the electric connections 30 are connected in any suitable manner to a source of electric current, not shown. Furthermore, the strip arms preferably are provided with thermostatically controlled switches for regulating the amount of current flowing to the strip heating elements.

In order to adapt this system into a combined radiant and convection heating system a number of blower fans 31 are located in the conduit formed between the floor 11 and the sheeting 14 and discharge a mass of air in the direction indicated by the arrows 31' through the skeleton structure of the joists 9 against and around the refractory heating units 15, where the air is heated by direct contact thereagainst. The fans 31 are preferably supported upon the joist 19, as shown in Fig. 2, but if desired may be mounted independently in the conduit. The air from the fans 31 is heated as it passes over the heating units 17 and then passes out through the opening 12 into the building or room above the floor 11. In order to facilitate movement of the heated air into the room, it is recommended that some form of suction fan (not shown) be provided in the attic or ceiling of the building structure.

It will be seen from the foregoing that the interior of the building above the floor 11 will be heated from the hot air passing over the refractory heating units 15 by convection air currents moving through the opening 12, and at the same time will be radiantly heated through the floor by virtue of the location of the refractory heating units 15.

It is to be understood that changes in location, material, form and structure of the joists, studs, and heating units can be resorted to without departing from the spirit of this invention.

I claim:

1. A heating system for building structures having skeleton joists comprising an electric radiant heating unit, means for suspending said heating unit from said joists, and means for forcing a mass of air over said heating unit and to discharge the air into the interior of the structure to heat the same by convection.

2. In a heating system for a building structure having skeleton joists supporting a floor, a radiant heating unit adjacent the underside of said floor, and means suspending said heating unit from the skeleton joists.

3. In a heating system for a building structure having skeleton joists supporting a floor, a radiant heating unit adjacent the underside of said floor, means suspending said heating unit from the joists, and means for forcing a mass of air over said heating unit, across said joists, and to discharge the heated air out into the interior of the structure to heat the same by convection.

4. In a heating system for a building structure having skeleton joists, a floor carried by the joists, a covering supported by the joists whereby a conduit is formed around the joists and between the floor and the covering, a radiant heating unit abutting the underside of said floor, suspending means carried by the joists adapted to support the heating unit therefrom, and a blower fan located in the conduit adapted to discharge a blast of air around the heating unit and across the joists.

5. In a heating system for a building structure having skeleton joists, a floor provided with an opening therein, said floor being carried upon the joists, a covering suspended from the joists forming a conduit around said joists which is in communication with the opening in said floor, a radiant heating unit abutting the underside of said floor, suspending means carried by the joists adapted to support the heating unit therefrom, and a blower fan located in the conduit adapted to discharge a blast of air around the heating unit, across the joists, and through the conduit and out the opening in said floor into the interior of said structure.

6. In a heating system for a building structure having joists, a floor provided with an opening therein, said floor being carried upon the joists, a covering suspended from the joists forming a conduit around said joists which is in communication with the opening in said floor, a refractory slab adjacent the underside of said floor, a frame supporting said slab and including transverse members at opposite ends of said slab, an electrical resistance strip heater affixed at its opposite ends to said transverse members in bridging relation therebetween and means suspending the frame from the joists.

7. In a heating system for a building structure having joists, a floor provided with an opening therein, said floor being supported on the joists, a covering suspended from the joists forming a conduit with said floor around the joists which is in communication with the opening in said floor, a refractory slab adjacent the underside of said floor, a frame for said slab, said frame comprising a U-shaped channel extending substantially throughout the length of one side of said slab, bars extending substantially throughout the length of the opposite side of said slab, straps located at the ends of said slab and connecting the U-shaped channel to the bars, an electrical resistance strip heating unit affixed at opposite ends to said straps and extending substantially throughout the length of said slab, said slab heating the floor by radiant heat, and a blower fan located in said conduit positioned so as to direct a blast of air against the heating slab and through the conduit and opening in the floor whereby the interior of said building is heated by convection currents from the air.

8. A radiant heating unit for a building structure comprising a refractory slab, a frame for said slab and including transverse members at opposite ends of said slab, and an electrical resistance strip heating unit affixed to said transverse members in bridging relation therebetween and extending substantially throughout the length of said slab.

9. In a heating system for a building structure having a floor therein, joists supporting said floor, a refractory slab adjacent the underside of said floor, a frame for said slab and including

transverse members at opposite ends of said slab, an electrical resistance heater affixed to said transverse members in bridging relation therebetween and extending substantially throughout the length of said slab and means suspending the slab from the joists.

MILTON MANNIST.

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