

[54] **FIREPLACE SYSTEM**
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[22] Filed: **Jan. 2, 1974**
[21] Appl. No.: **430,075**

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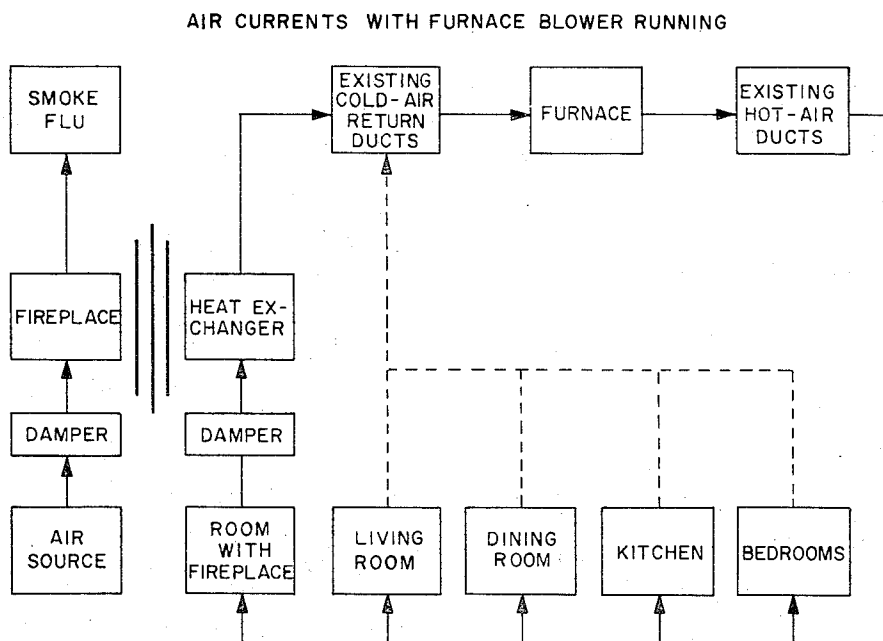
[52] U.S. Cl. 237/81, 126/121, 126/122, 237/53
[51] Int. Cl. **F24b 7/00**
[58] Field of Search 126/121, 122, 129, 131; 237/48, 51, 53, 81

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[57] **ABSTRACT**

This fireplace system consists of an integrated fireplace heat exchanger and forced air furnace. The heated air from the fireplace heat exchanger flows to the furnace cold air return duct, through the furnace and thence to the structure. A preferred fireplace heat exchanger for use in this system is a downdraft heat exchanger.

10 Claims, 6 Drawing Figures



SHEET 1 OF 3

AIR CURRENTS WITH FURNACE BLOWER RUNNING

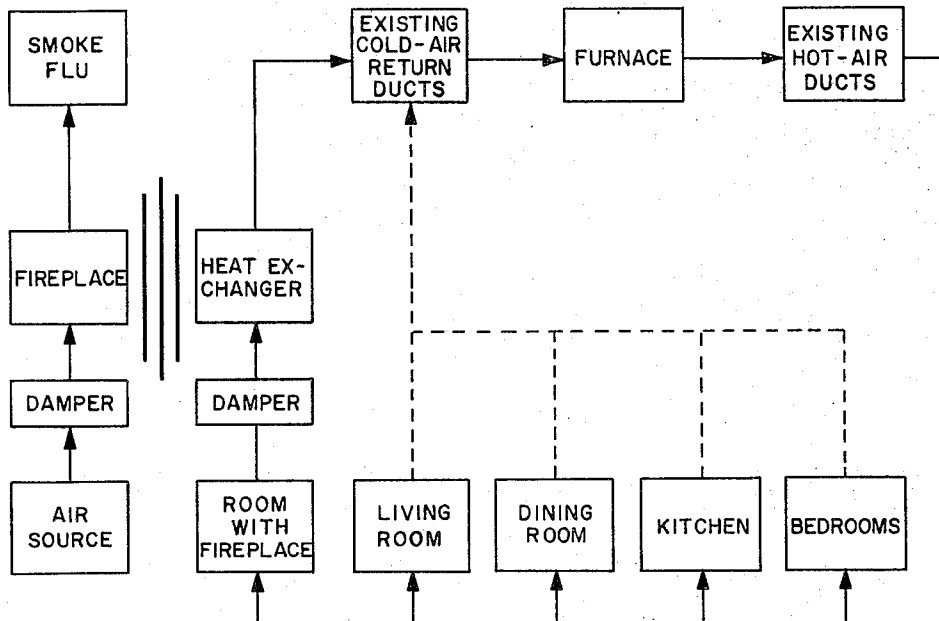


Figure 1.

AIR CURRENTS WITHOUT FURNACE BLOWER RUNNING

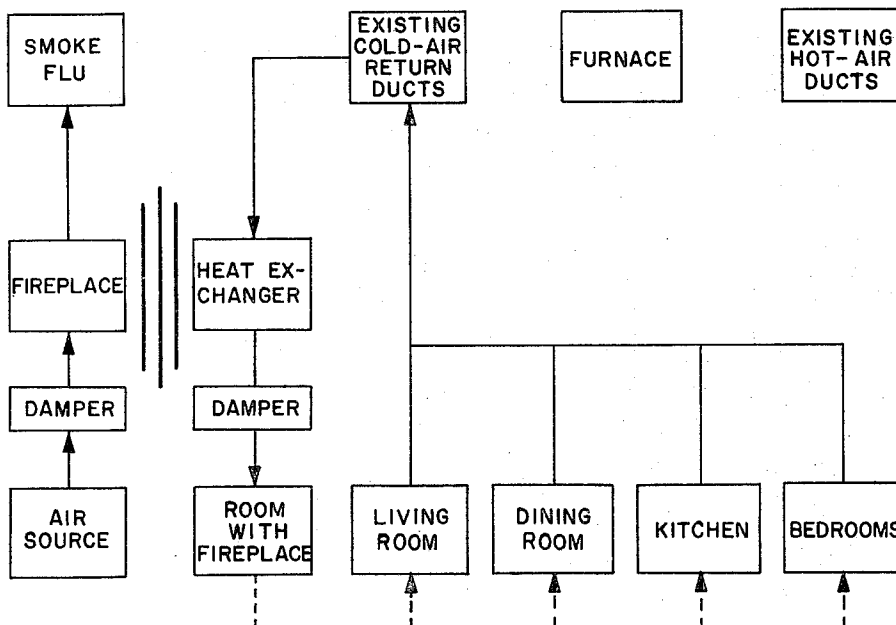


Figure 2.

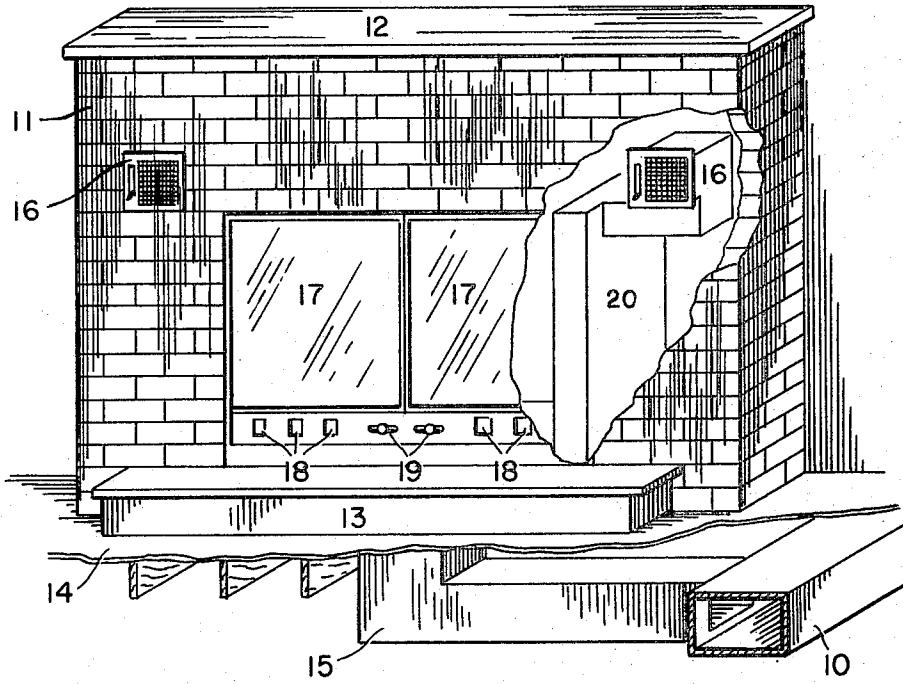


Figure 3.

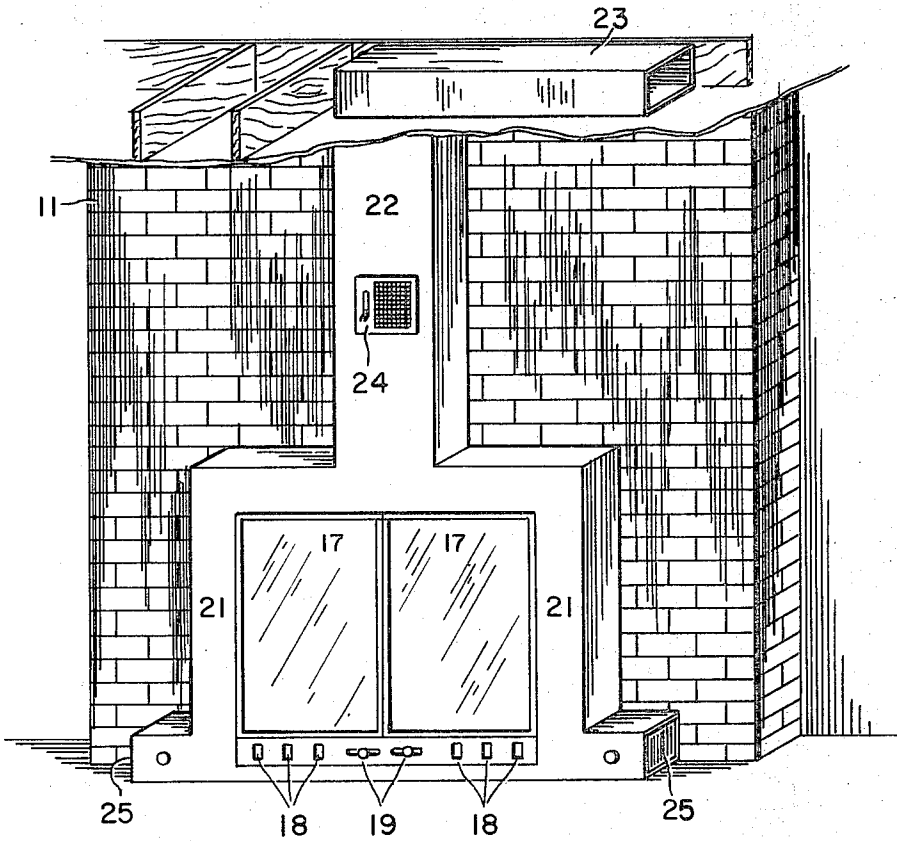


Figure 4.

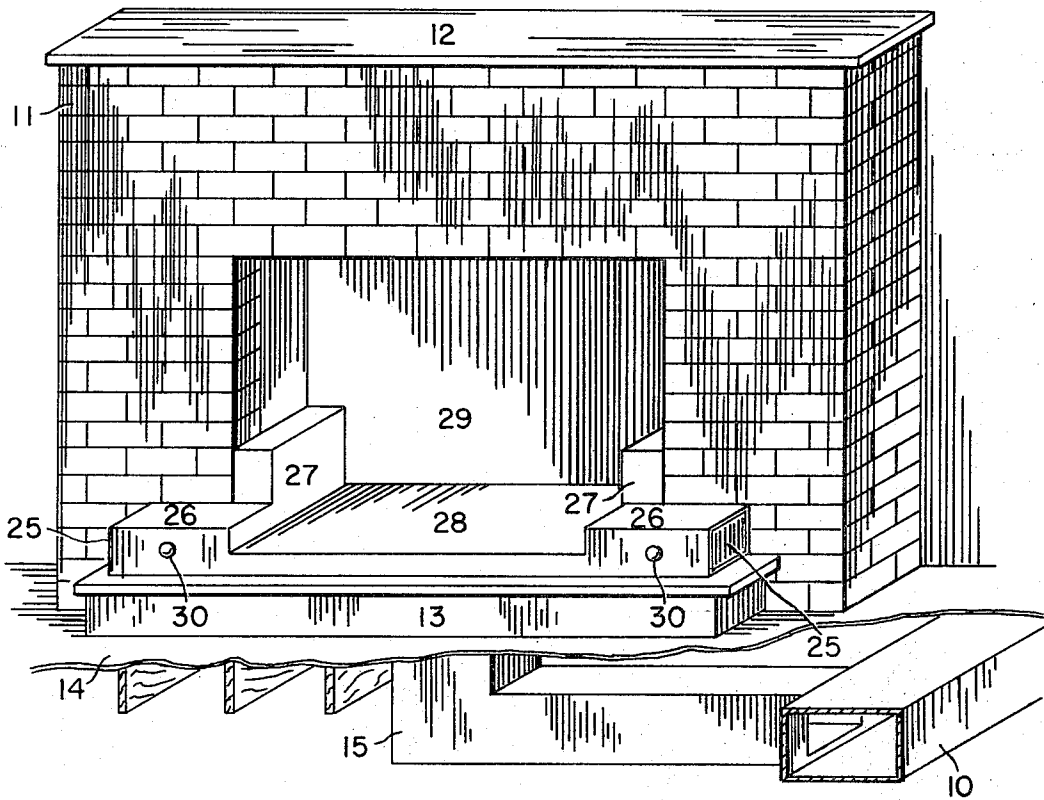


Figure 5.

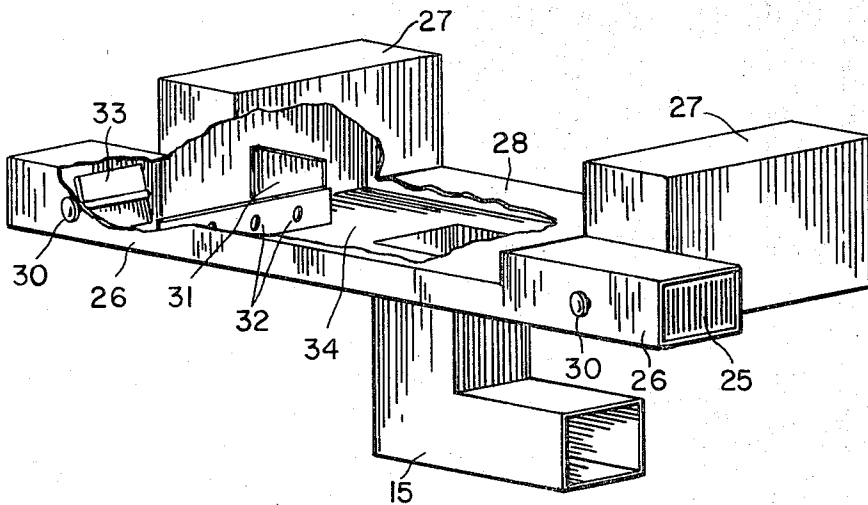


Figure 6.

FIREPLACE SYSTEM

The efficiency of a fireplace can be considerably improved using a heat exchanger. It has been found that the heated air from such a heat exchanger can be circulated throughout a structure using the existing cold-air return ducts of the structure. The furnace fan will draw air through the heat exchanger and distribute this air to the structure. This system is highly efficient when a downdraft heat exchanger is used as the fireplace heat exchanger.

This invention relates to a fireplace heat exchanger system. More particularly, this invention relates to a fireplace heat exchange system which uses the structures hot air furnace system for the distribution of heated air from the fireplace. As a further embodiment this invention also relates to a down-draft fireplace heat exchange device.

It is a known fact that most of the heat generated by a fire in a standard fireplace is lost, entrained in the combustion gases which exit up the chimney. For this reason various heat exchange devices and systems have been developed to recover and use this heat. Some of these devices are installed within the fireplace and others are installed in the chimney, with each type either having convective or forced air flow through the heat exchanger. These devices, however, are designed to heat a single room, or several rooms, directly from the fireplace. None of these devices or systems has utilized the existing forced air system of a structure for circulating the heated air from a fireplace heat exchanger. The existing hot air furnace system can be used if the heated air from the fireplace heat exchanger is flowed into the cold air return duct to the furnace. By feeding the air from the fireplace heat exchanger to the cold air return duct, the furnace blower is used to draw air through the fireplace heat exchanger. This heated air flows through the furnace heat exchanger and thence to the rooms of the structure. The furnace fan can be run continuously when the fireplace is being used or the fireplace heat exchanger can have an unincorporated thermostat which activates the furnace fan whenever the heat exchanger exceeds a given level.

A preferred embodiment is a downdraft fireplace heat exchanger used in conjunction with the above system. The downdraft heat exchanger can be used without the furnace blower operating, with no danger to the heat exchanger. That is, when the furnace blower is not drawing air through the fireplace heat exchanger, there will be a convective flow of air from the cold air return duct, through the heat exchanger and then into the room which contains the fireplace. A heat exchanger of the downdraft type will never overheat due to the reverse air flow property. The downdraft fireplace heat exchanger also has the advantage that the existing ash dump can be used as the means to get the heated air to a basement level where it can then be connected into the cold air return duct of the furnace.

This system is easily adapted into existing fireplaces, and can be incorporated into new fireplaces, whether they be constructed of masonry materials or metal. The downdraft heat exchanger can easily be adapted for most existing fireplaces, with downdraft, sidedraft or updraft heat exchangers being useful for newly designed fireplaces. There is obviously more versatility with a new installation since the required ducting can be more easily hidden; however, no matter what type

of fireplace heat exchanger is used, primarily these will all be connected into the existing cold air return duct of a furnace for distribution of heated air throughout the structure.

It is therefore a prime object of this invention to set out a fireplace heat exchanger system which utilizes the existing forced air furnace system for distribution of the air heated in the fireplace heat exchanger. It is also a prime object to set out a downdraft fireplace heat exchanger device which when connected into a forced air heating system cannot be overheated and damaged. These objects, as well as others, will be fully set out and understood by recourse to the appended drawings and the following description.

Briefly the appended drawings describe the following aspects of the present invention:

FIG. 1 is a schematic diagram of the fireplace heat exchanger system wherein the furnace blower draws air through the fireplace heat exchanger.

FIG. 2 is a schematic diagram of the downdraft fireplace heat exchanger without the furnace blower in operation.

FIG. 3 is a partially cutaway perspective view of a downdraft fireplace heat exchanger built into a new fireplace.

FIG. 4 is a perspective view of an updraft fireplace heat exchanger which can be adapted into existing fireplaces.

FIG. 5 is a perspective view of a downdraft fireplace heat exchanger installed in an existing fireplace and interconnected to an existing furnace cold air return duct.

FIG. 6 is a partial cutaway perspective view of the downdraft fireplace heat exchanger of FIG. 5.

FIG. 1 is essentially self-explanatory. The fireplace and heat exchanger are in indirect contact. By indirect contact it is meant that the heat generated in the fireplace enters into the heat exchanger, but smoke and soot do not. Therefore, there are really two different systems with the first being the fireplace combustion system and the second being the heat exchange and air distribution system. The fireplace system consists of the fireplace, smoke flu or chimney, air source for combustion and a damper to regulate the flow of air from the air source. The air source can be either structure interior or exterior air. A prime advantage of the damper is that the fire can be extinguished by closing the damper. A fire needs fuel and oxygen. When either component is missing there will not be combustion. This damper can be closed at night or other times when the heat from the fireplace is no longer desired.

The heat exchanger system consists of a heat exchanger of either downdraft, sidedraft or updraft type. Coupled to the heat exchanger are damper controlled air vents. When operated in conjunction with the furnace, air enters the heat exchanger from the room containing the fireplace through these damper controlled vents. This air flows through the heat exchanger and then to the existing cold-air return ducts of the structure. From this point this heated air flows through the regular furnace duct system. That is, this heated air flows to and through the furnace to the existing hot-air ducts and thereafter to the many rooms served by this furnace. In a residence, these rooms are the bedrooms, kitchen, dining room, living room, and the room which contains the fireplace a cycle has been completed with the air then reentering the heat exchanger for another

cycle. Much of the air which flows through the system does not flow through the heat exchanger, but leaves each room and flows directly to the existing cold-air return ducts. That is, the existing cold-air return vents will convey air into the duct-work where this air is mixed with heated air and circulated back to the rooms. At any time that the temperature within the rooms served drops below the room thermostat setting, the furnace will be activated to further heat the air. This present system is not meant to replace a furnace heating system, but rather to supplement such a system. It is also meant to retrieve a greater amount of heat from a fireplace fire.

While FIG. 1 illustrates the general system with furnace blower operating, FIG. 2 illustrates the preferred embodiment of the heat exchanger being of the downdraft type and the furnace blower not operating. In this embodiment and in this instance, air flows by means of convection from the cold air return duct to the heat exchanger and then from the damped vents to the room containing the fireplace. This heated air can then flow by convection to the living room, dining room, kitchen, bedrooms, and other rooms in the structure. Some of this air then reenters the existing cold-air return ducts for another cycle. In this embodiment, the furnace and existing hot-air ducts are not being used although some air from the existing hot-air duct may flow via the furnace to the existing cold-air return ducts. The advantage of this reverse flow is that if for any reason, such as a power outage, the furnace blower cannot be used, the fireplace can provide heat through a structure by means of convection. In the embodiment of FIG. 2 the fireplace system is the same as that of FIG. 1.

This is how the basic system operates. There are many types of fireplace installations which can be constructed using this system and most existing fireplaces can be adapted to use this heat exchange system. The fireplaces can be of the masonry or metal fireplace types. What is necessary is that the fireplace have an incorporated heat exchanger, and that this heat exchanger be connected to a furnace cold-air return duct so that when the furnace blower is operated, air is drawn through the heat exchanger. The system is particularly useful when a downdraft heat exchanger is used. A downdraft heat exchanger has a built in safety factor since convective air flow will maintain the temperature of the heat exchanger below that at which the heat exchanger can be damaged. FIGS. 3-6 sets out some of the preferred types of fireplace heat exchangers.

FIG. 3 shows a downdraft heat exchanger built into a masonry fireplace. Bricks 11 make up the face wall of the fireplace and mantle blocks 12 the top part of the fireplace. The separation of floors is represented by 14, which can be the separation between the first floor and a basement. The raised hearth is designated by 13. The heat exchanger consists of damper controlled vents 16, heat pickup ducting 20 through which flows the air drawn in through vents 16. The heat pick-up ducting interconnects with downdraft duct 15 which in turn connects with the existing coldair duct 10. When a fire is underway in the fireplace the blower on the furnace is activated either manually or automatically so that air is drawn in the vents 16, through heat pick-up ducts 20 and then through the downdraft duct 15 to the cold-air return duct. The heated air is thereafter distributed throughout a structure. In the embodiment of this fig-

ure the glass doors 17 enclose the front of the fireplace. Air which is needed for combustion enters the fireplace via closeable passages 18. These passages are opened and closed by means of slideable lever 19.

An advantage of this embodiment is that if the furnace blower is not activated or ceases to operate while a fire is burning in the fireplace, a convective flow of air will flow from cold-air return duct 10 through duct 15 and thereafter through heat pick-up duct 20 and exit through vents 16 into the room which contains the fireplace. The air flow for this mode of operation is shown in FIG. 2. The air flow for the preferred mode of operation using the furnace blower is shown in FIG. 1.

FIG. 4 there is shown an updraft heat exchanger adapted into an existing fireplace. This heat exchanger is preferably interconnected into the cold-air return duct of the furnace. There is the option however that the upwardly extending duct 22 be terminated below the ceiling so that the air from the heat exchanger flows solely into the room. There is also the option that the duct 22 have a damper controlled vent 24 so that some of the heated air from the heat exchanger can flow directly into the room which contains the fireplace. In more detail, in this figure the heat exchanger consists of air inlets 25 which flow air into baffled side chambers 21. The air is heated in these side chambers and flows upwardly into duct 22 and then to duct 23 whereafter the heated air is drawn into the cold-air return duct. The doors 17 of the heat exchanger enclose the fireplace with the air for combustion entering via damped openings 18. Knobs 19 control slideable dampers. By closing these combustion air openings the fire can be controlled or extinguished as desired.

In FIG. 5 there is shown a preferred embodiment of the present invention which consists of a downdraft fireplace heat exchanger interconnected into the existing cold-air return duct of a furnace. This downdraft fireplace heat exchanger can easily be made a part of a new fireplace installation, whether it be a masonry, metal or ceramic fireplace, or this downdraft heat exchanger can be easily adapted to an existing fireplace. In an existing fireplace the duct 15 can in part be the usually unused ash conduit. Most fireplaces have an ash conduit or chute which is rarely used. This chute can be used as a simple means to get the ducting from the fireplace to the lower level where the duct can be connected into the existing cold-air return. The existence and use of this chute makes the downdraft fireplace heat exchanger a very useful device. Another advantage is that there is no unsightly ductwork exterior to the fireplace 29. In more detail in regard to this figure, air enters via vents 25 into the heat exchanger. Knobs 30 control the dampers which open and close these vents. The air then flows into baffled chambers 27 where it gets heated and then into the baffled area below top panel 28 of the heat exchanger. The air is further heated and then drawn down into duct 15 and then into the furnace cold-air return duct. This downdraft embodiment can operate in the mode described in FIG. 1 or in FIG. 2 depending whether the furnace blower is being used.

FIG. 6 shows the downdraft fireplace heat exchanger in more detail. Air is drawn in through vents 25 which are controlled by dampers 33 adjusted by knobs 30. The air then passes partly over baffle 31 and partly through openings 32 which allow some air to enter the region between surfaces 28 and 34. Surface 28 sup-

ports the fire grate of the fireplace. Box portions 27 contain the air being heated on the side portions of the fireplace heat exchanger. After passing through these side portions the already heated air is drawn into the region between surface 28 and surface 34 prior to being drawn down into duct 15. There are a number of vanes between surface 28 and surface 34 which serve to brace surface 28, collect heat, and increase the surface area for contact with the air being heated. In the usual mode of operation air is drawn by the furnace into vent 25 and thence through the heat exchanger as described in FIG. 1. If the furnace fan is not operating air will flow by convection upwardly from duct 15, through the heat exchanger and out vents 25 in the mode described in FIG. 2. The advantage of this dual mode of operation is that the heat exchanger can never be overheated and damaged.

The heat exchanger may be controlled manually or automatically. In manual operation the furnace fan is turned on when the fire gets underway. In automatic operation the heat exchanger has a thermostatic switch which turns on the furnace fan when the heat exchanger reaches a given temperature.

There may be other modifications of the system which are within the scope of the present invention. One of these is that the combustion air for the fireplace can be drawn from a source exterior to the structure which contains the fireplace. There are yet other obvious modifications. These modifications are however all obvious in view of the present disclosure.

What I claim is:

1. A fireplace heat distribution system comprising:
a fireplace containing a heat exchange device therein;

a first opening on said heat exchange device to receive air;

a second opening through which to remove air from said heat exchange device;

a conduit means connected to second opening at one end and to the air return means of a furnace at the other end whereby heated air from said heat exchange device can be drawn to said furnace, and forced therethrough, thereby being distributed to a structure using the distribution system of said furnace.

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2. A fireplace heat distribution system as in claim 1, wherein said second opening is on a lower portion of said heat exchange device, and said conduit means extends downwardly during a portion thereof.

3. A fireplace heat distribution system as in claim 1, wherein said second opening is on a top portion of said heat exchange device and said conduit means extends upwardly during a portion thereof.

4. A fireplace heat distribution system as in claim 3, which has a vent on said conduit means for the convection removal of heated air from the system.

5. A fireplace heat distribution system as in claim 1, wherein said heat exchange device contains a heat sensitive switch for activation of the furnace blower fan to thereby draw the heated air to the furnace.

6. A fireplace heat distribution system as in claim 1, wherein said fireplace has means to control the delivery of air for combustion of the fuel in said fireplace.

7. A fireplace heat distribution system as in claim 1, wherein said heat exchange device is removably located within said fireplace.

8. A method for utilizing heat from a fireplace throughout a structure having a forced air central heating system comprising;

providing said fireplace with a heat exchange device;

flowing air through said heat exchange device and thence to the air return conduit of said forced air central heating system;

drawing said air to said furnace and distributing said air to said structure by means of the distribution conduits of said forced air heating system.

9. A method as in claim 8, wherein said heat exchange device has a heat detecting switch which activates the blower fan of said forced air central heating system thereby distributing heat when said fireplace is in use.

10. A method as in claim 8, wherein the air from said heat exchange device is drawn downwardly and thence to said air return conduit of said forced air heating system.

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