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3,240,206

FIREPLACE GRATE

Filed March 9, 1965

2 Sheets-Sheet 1

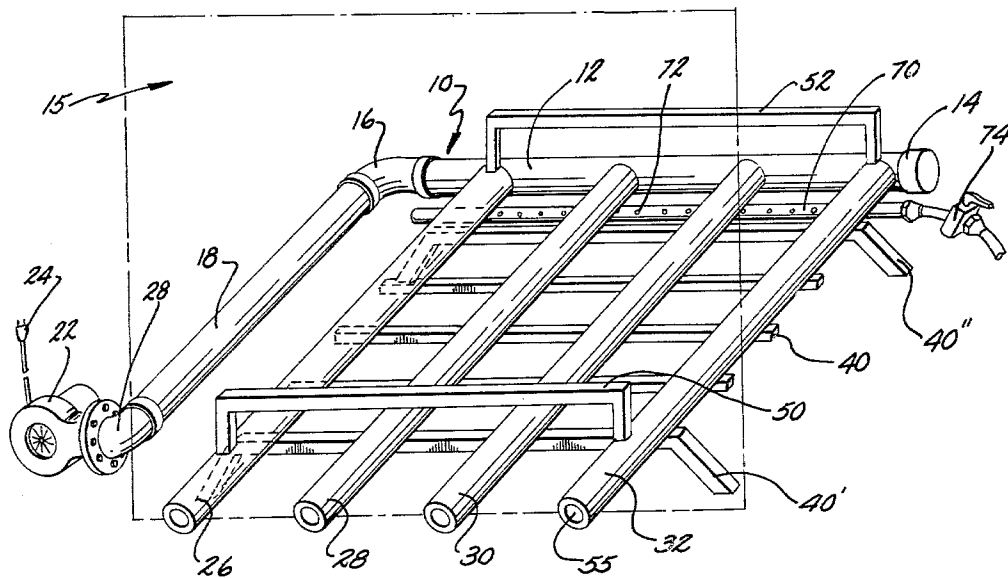


FIG. 1.

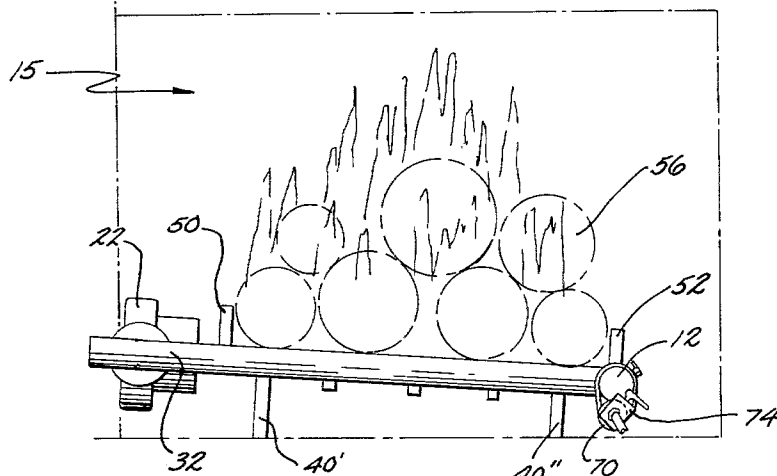


FIG. 2.

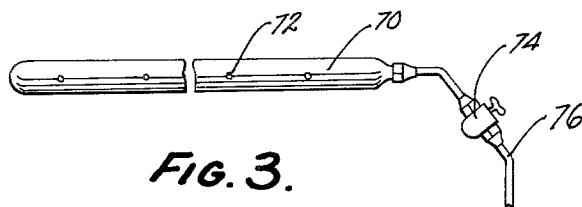


FIG. 3.

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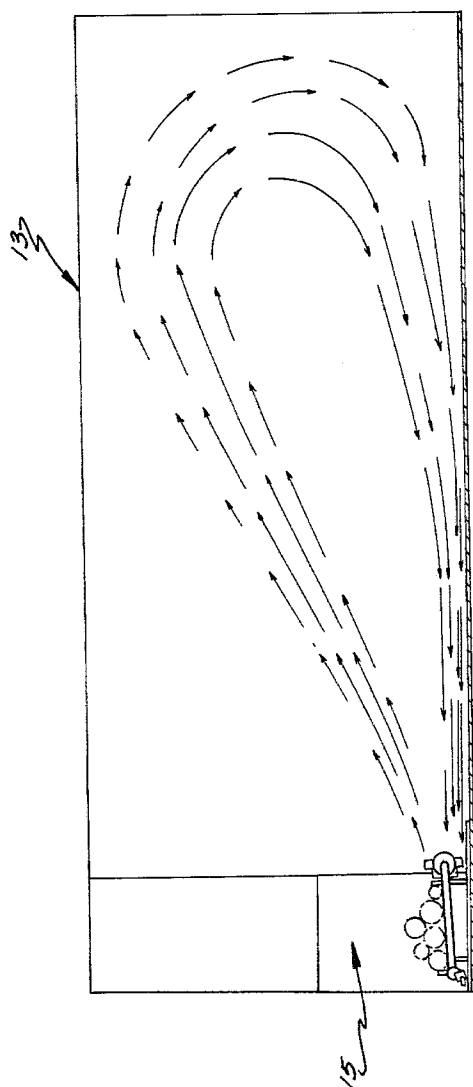


FIG. 4.

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3,240,206 FIREPLACE GRATE

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3 Claims. (Cl. 126-121)

This invention relates to a fireplace grate, and more particularly to a forced air integral manifold grate having direct conduction-convection heat transfer from the burning logs to the room.

Fireplaces, although providing considerable heat, are ordinarily very inefficient. The amount of heat effectively transferred to the room, mostly by radiation, is only a small fraction of the total heat of combustion evolved. Various types of devices and schemes have been developed heretofore in efforts to capture and utilize more of this heat. Air ducts through the stone work of the fireplace constitute one such type. An air pipe extending around the wall of the fireplace adjacent the grate constitute another type. These are improvements, but have definite limitations. The first must be formed when initially constructing the fireplace. The second captures only a relatively small amount of the heat since it is mainly dependent upon radiant heat or on a small amount of convection heat from the flames.

As far as is known, no device has been available heretofore which would efficiently capture the heat directly by conduction from the hot coals of the burning wood.

It is an object of this invention to provide a unique fireplace grate which actually receives heat directly from the hot coals of the burning logs by conduction, as well as radiation, and efficiently transfers the heat to the room by forced air convection.

It is another object of this invention to provide a fireplace grate wherein efficient heat transfer is obtained by employing outlet hot air tubes themselves as support for the burning firewood, and uniquely orienting the outlet portions thereof to obtain optimum air circulation.

It is another object of this invention to provide a highly portable, lightweight fireplace grate having forced air heat transfer directly from the burning coals of the firewood to the room, and yet which can be readily carried from place to place, can be inserted and removed from any fireplace without connecting or disconnecting anything. It is rigid, sturdy, and unitary. It can be taken along on hunting and camping trips with complete convenience for use in a cabin fireplace, for example. Yet, the complete apparatus is relatively inexpensive to manufacture from standard, available stock.

These and several other objects of this invention will become apparent upon studying the following specification in conjunction with the drawings in which:

FIG. 1 is a perspective view of the novel fireplace grate shown in a fireplace illustrated in phantom;

FIG. 2 is a side elevational view of the novel grate shown with burning wood illustrated in phantom thereon;

FIG. 3 is an elevational view of an optional burner attachment unit usable in combination with the grate; and

FIG. 4 is a diagrammatic view of the novel grate in operation in a room.

Referring now specifically to the drawings, the novel grate is shown inserted in a fireplace chamber 15 of conventional type in a room 13. The grate includes an elongated hollow manifold conduit 12 which extends transversely across the rear of the fireplace and across the rear of the grate. One end of this manifold 14 may be plugged while the other end includes an elbow connection 16 communicating with a cool air inlet conduit pipe 18. This pipe extends from front to rear of the grate along one end thereof. On the front end of this conduit pipe is a second elbow 20 connecting conduit 18

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with a conventional blower 22. This blower is electrically powered by an electric motor 21 having an electrical plug 24 for attachment into a conventional outlet.

Extending perpendicularly to manifold 12, and toward the front of the grate and fireplace, is a plurality of equally spaced conduit pipes 26, 28, 30 and 32. These extend from the rear to the front of the grate and cover the entire bed area of the grate. The several upper surfaces of these co-planar conduits form the complete supporting bed surface for the fireplace wood to be placed crosswise thereon. Consequently, this plurality of outlet conduit tubes of soft porous iron serves the dual function of supporting the wood, and also as heat transfer means for conduction from the hot coals of the burning wood through the wall of the pipes by conduction into the air therein. The burning fuel heats the pipes to a red hot condition over a substantial portion of their length.

Extending transversely of the grate and under the elongated conduits is a plurality of equally spaced metallic cross-tie members 40. These are welded to the underside of the respective pipes to integrate the assembly into a sturdy, unitary whole. The front cross member 40' and the rear cross member 40'' include downwardly extending ends to form support legs for the four corners of the apparatus.

Extending upwardly from the grate at the front and the rear thereof is a pair of wood retention elements 50 and 52. Each of these is shaped generally like an inverted, elongated U. The downwardly depending ends of the front element are fixedly secured to the two conduits 26 and 32 on the sides of the grate, as by weldment. The rear element is affixed to the manifold. These retain the wood 56 (FIG. 2) on the conduits while burning.

The front legs of element 40' are longer than the legs of rear element 40''. This causes the grate to have a rear to front upward slant. The wood falls against the rear retention bracket 52 which prevents the wood from falling off the rear of the grate. The front retention means 50 prevents the logs from rolling out into the room out of the fireplace.

The upward slant of the grate causes the outlet ports of the conduits and the adjacent conduit portions to be directed upwardly as well as outwardly of the fireplace and into the room 13. Experimentation has shown that the orientation achieves excellent air flow and circulation in the room in a pattern like that illustrated in FIG. 4. The hot air slices diagonally upwardly through the room, follows the ceiling and far wall to the floor, and returns along the floor to form an excellent draft under the grate for burning the fireplace fuel. A slight negative pressure is continuously formed under the grate because of the flow pattern. In some cases, the ends of the grate pipes can be slanted even more if necessary to accommodate the dimensions of a particular room. Experiments have shown that this feature of the invention is important.

Preferably an elongated gas burner tube 70 is attached along the underside of the grate adjacent the manifold, with the outlet flame ports 72 directed generally upwardly and forwardly of the grate. It has a conventional control valve 74 associated with a gas inlet conduit 76. The burner may be secured underneath the manifold with suitable clamps 78. Alternatively, it can be secured to the bottom side of the conduits or to the rear cross piece 40''. This burner can be employed for starting the wood or other fuel, or could conceivably be employed with artificial fuel.

Operation

The structure is substantially lightweight, weighing only about 15-20 pounds depending on its size. It can be carried about by grasping bracket 50, for example. It

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can be employed anywhere necessary. Before inserted into a fireplace, the elongated gas burner 70 can be attached to a suitable gas outlet. This, of course, is not an essential component of the basic combination.

The wood 56 is piled on the grate so that it rests directly upon and in contact with the plurality of parallel, spaced, forwardly directed conduits 26, 28, 30 and 32. It is retained on these conduits by brackets 50 and 52. Ignition of the wood is then made. Subsequent to this, blower 22 is actuated by plugging plug 24 in an outlet. This causes cool air to be forced through the blower, through the inlet cool air conduit 18, and into manifold 12. Cool air then passes from the manifold simultaneously through the plurality of outlet conduits. The conduits are heated over a substantial portion of their length to a cherry red by direct conduction of the heat from the burning wood. The cool air forced therethrough is thus heated and blown out the open ends 55 of the conduits, directly into the room so that the room is heated by forced air convection. The heating process is a combination of conduction from the hot coals, to the pipes, radiation from the coals to the pipes, conduction from the pipes to the air passing therethrough, and convection heating of the air in the room. The heated air moves diagonally upwardly and across the room to create an excellent draft under the grate and fuel thereon. Thus, not only is the heat transfer to the room far more efficient, but the fire burns better also because of the created draft and circulation pattern. It has been found with extensive experimentation of the novel unit that far superior efficiency and effectiveness is achieved in comparison to prior type devices, yet with a completely portable, lightweight, and relatively inexpensive construction.

Various additional advantages may readily occur to those in the art upon studying the foregoing form of the invention. Also, slight structural modifications could conceivably be made without departing from the inventive concept taught. Thus, this invention is to be limited only by the scope of the appended claims and the reasonably equivalent structures to those defined therein.

I claim:

1. A forced air heating fireplace grate comprising: a plurality of spaced, parallel, rigid, hollow, heat transfer, conduit pipes extending from front to rear of the grate

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and spaced completely across the width thereof, forming the wood support surface of the grate and having open front ends to form outlet ports; a hollow, air manifold extending transversely of said plurality of pipes at the rear thereof and being connected to and communicant with said pipes to supply all of said pipes with cool air; a cool air supply conduit connected to said manifold, and a blower on said cool air supply conduit; a plurality of spaced transverse tie rods secured to the bottoms of said conduit pipes; downwardly depending legs at the front and back of said grate; upstanding wood retention means; and said legs at the front being longer than said legs at the rear causing said conduit pipes to be diagonally upwardly slanted toward the front of the grate so that said outlet ports create a diagonal air flow path causing a slight negative pressure under the grate for optimum draft and air circulation.

2. A forced air heating fireplace grate comprising: a plurality of spaced, parallel, rigid, hollow, heat transfer, conduit pipes extending from front to rear of the grate and spaced completely across the width thereof, forming the wood support bed surface of the grate and having open front ends for outlet ports; a hollow, air manifold extending transversely of said plurality of pipes at the rear thereof and connected to and communicant with said pipes to supply all of said pipes with cool air; a cool air supply conduit connected to said manifold, and a blower on said cool air supply conduit; and downwardly depending legs at the front and back of said grate.

3. The grate in claim 2 wherein a gas burner extends transversely of said grate across the rear thereof.

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