FIREPLACE HEAT DISTRIBUTION UNIT

Inventors: James M. Hatfield, 10142 Clarksville Rd., Eden, N.Y. 14057; Jeremiah J. Donovan, 133 Orchard Pl., Lackawanna, N.Y. 14228

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References Cited

UNITED STATES PATENTS
1,365,912 1/1921 Greene 126/121
1,608,745 11/1926 Holbek 126/121
2,828,078 3/1958 Snodgrass 126/121

ABSTRACT

A fireplace heating unit includes an electric blower fed distribution manifold adapted to extend across the front of a fireplace chamber, a plurality of parallel, generally U-shaped heat transfer conduits having their inlet ends connected in flow communication with the rear of the manifold and outlet ends arranged above the manifold to direct heated air into a room in front of the fireplace, and an expanded metal grate supported by and extending transversely of the heat transfer conduits.

7 Claims, 4 Drawing Figures
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FIREPLACE HEAT DISTRIBUTION UNIT

BACKGROUND OF THE INVENTION

Fireplace heating units of various types have been proposed for use in increasing the space-heating efficiency of a fireplace over that ordinarily obtained, as for instance those disclosing U.S. Pat. Nos. 2,359,197; 2,828,078; 3,001,521 and 3,240,206. Many of these prior units are portable and feature a blower for supplying room air to a tube or tubes, which are heated by burning logs and in turn serve to heat air passing through prior to its discharge back into the room.

These prior units are believed to suffer from one or more drawbacks including for instance expense of construction and inefficiency.

SUMMARY OF THE INVENTION

The present invention is directed towards an improved fireplace heating unit characterized as including a blower-fed air distributing manifold; a plurality of essentially parallel and generally U-shaped heat transfer conduits arranged to extend rearwardly from the manifold in a right angular relationship relative thereto; and a grate supported on and extending transversely of the conduits.

The U-shaped construction of the heat transfer conduits and the mode of connecting same to the manifold provides for a relatively low cost, but rugged construction. Further, this arrangement serves to maximize the heating efficiency of the unit by providing an extended flow path for air being heated, and when a removable grate is employed permits periodic clearing of ashes from between the conduits without requiring removal of the unit from within the fireplace.

DRAWINGS

The nature and mode of operation of the present invention will now be more fully described in the following detailed description taken with the accompanying drawings wherein:

FIG. 1 is an exploded perspective view of the fireplace heating unit of the present invention;
FIG. 2 is a top plan view thereof with grate removed;
FIG. 3 is a front elevational view thereof; and
FIG. 4 is a partially sectionalized view taken generally along line 4--4 in FIG. 2.

DETAILED DESCRIPTION

Reference is first made to FIG. 1, wherein the fireplace heating unit of the present invention is generally designated as 10 and shown as comprising a horizontally elongated air distribution manifold 12; an electric or otherwise suitably powered blower 14; a plurality of essentially parallel and generally U-shaped heat transfer conduits 16; and a grate 18. As will be apparent from viewing FIGS. 2, 3 and 4, unit 10 is adapted to be arranged in supporting engagement with the floor 20 of a conventional fireplace 22, such that conduits 16 extend rearwardly into the fireplace recess and manifold 12 extends transversely of the front of such recess.

More specifically, manifold 12 is shown as having downwardly, upwardly, rearwardly and forwardly facing side wall portions or panels 24--27, respectively, and opposite end wall portions or panels 28 and 29, which are suitably marginally edge joined to define a plenum chamber 30, shown only in FIG. 4. The side and end wall portions may be formed from individual sheets of a suitable gauge metal stock material or may be formed by bending one or more sheets into a desired form. The side wall portions are preferably shaped and joined to define a manifold having a right angled parallelogram cross-sectional configuration, such as a square, but may of course be fabricated to produce a manifold of circular cross-sectional configuration, if desired. Blower unit 14 is shown in FIGS. 1--3 as including a blower section 32 having a forwardly opening and suitably screened room air inlet 34 and an outlet duct 36 communicating with plenum chamber 30 through end wall 29; and a heat insulated casing 38 for housing an electric motor, not shown. The illustrated construction and mode of attaching blower unit 14 to manifold 12 is for reference purposes only; it being understood that the blower unit may be of any suitable construction and connected to the manifold in any desired manner.

Conduits 16 are preferably of identical construction, wherein each includes an elongated lower leg portion 42, an elongated upper leg portion 44 and an upper opening portion 46 for connecting rearwardly disposed ends of leg portions 42 and 44 in flow communication. As best shown in FIG. 4, lower leg portions 42 are arranged to extend horizontally adjacent floor 20 and have their forwardly disposed ends, which define air inlet openings 42a, fixed in flow communication with manifold chamber 30 through rearwardly facing wall portion 26 at a point, which is preferably disposed in a spaced relationship to downwardly facing wall portion 24. Reference is also made particularly to FIGS. 1, 2 and 4, wherein upper leg portions 44 are shown as extending forwardly from connecting portions 46 in an essentially vertically aligned and parallel relationship with the lower leg portions and as having their forwardly disposed ends, which define air outlet openings 44a, disposed above upwardly facing wall portion 25 for the purpose of directing heated air forwardly of manifold 12 for distribution in a room. More uniform distribution of heated air may be achieved by swivel connecting air director nozzles 48 to the forward ends of one or more of upper leg portions 44, as indicated in FIGS. 1 and 2, and to prevent interference with rotatable adjustments of such nozzles. The forward ends of the upper leg portions are preferably disposed essentially flush with or slightly forwardly of side wall portion 27.

Although each of conduits 16 may be of one piece construction, it is preferable to separately form leg portions 42 and 44 from lengths of iron or steel pipe having their rear ends threaded for receipt within the ends of connecting portion 46, which is shown as being conveniently formed from a pair of elbows, but may of course be a single C-shaped fitting. This construction is desirable from the standpoint of economy of materials and fabrication. Further, it possesses the advantage that connecting portions 46 serve to define abutments for properly positioning the rear marginal edge of grate 18 as best shown in FIG. 4, and cooperate with manifold 12 to maintain lower leg portions 42 disposed in a slightly spaced relationship relative to the floor 20 thereby to provide a passageway for combustion air between the lower leg portion and the floor as well as between the upper and lower leg portions. The slight spacing of the lower leg portions above the floor also affords clearance for attaching lower leg portions 42 to
rearwardly facing wall portion 26 by the simple expedient of a pair of nuts 50, which are threaded onto the lower leg portions and serve to clamp wall portion 26 therebetween. Alternatively, however, the lower leg portions may be welded affixed to the manifold. Also, it will be understood that in the preferred construction, upwardly facing wall portion 25 is employed to support the forwardly disposed ends of upper leg portions 44 and thereby cooperates with the connecting portions 46 to maintain the upper leg portions in a generally horizontally disposed relationship. As a practical matter, initial assembly of the unit is facilitated by providing a slight initial clearance between wall portion 25 and upper leg portion 44, but when the unit is placed in use, the weight of grate 18 and logs supported thereby and/or slight thermal deformation of upper leg portion 44 and/or connecting portion 46 will normally effect lowering of the former into supporting engagement with the manifold. While the close proximity or actual engagement of upper leg members 44 with manifold wall portion 25 has been found effective to maintain the former in vertical alignment with and essentially parallel to the lower leg portions, the upper leg portions may, if desired, be spot welded to the manifold, particularly when the unit is to be used under conditions requiring periodic movement and/or rough handling.

Grate 18 is preferably of an expanded metal construction and of a generally rectangular plan view configuration having a major or expansive horizontally disposed rear portion 60 and a minor forwardly and upwardly inclined front portion 62. For purposes of illustration, the openings of grate 18 are shown as being diamond shaped and being of relatively large size, as for instance 2½ × 1 inch. While the configuration of the grate openings is not critical, they should be of sufficient size to permit ash and small embers to fall through the grate during use. As will be apparent from viewing FIG. 4, rear portion 60 extends transversely of conduits 16 and is arranged in supporting engagement with the upwardly facing surface of upper leg portions 44, so as to arrange front portion 62 above manifold 12 in a position where it serves to constrain forward rolling movement or escape of the logs supported by rear portion 60. Preferably, grate 18 is sized to rest in supporting engagement on all of conduits 16 in order to provide for uniform distribution of weight thereto. Also, it is preferable that grate 18 be freely removable from supporting engagement with conduits 16, but may, if desired, be permanently attached thereto as by spot welding. Also, if desired, the construction of grate 18 may depart from that specifically illustrated in the drawings.

It will be noted that a U-shaped construction and mode of supporting conduits 16 provides for a relatively rigid, but low cost construction. Additionally, by arranging the conduits in a spaced parallel relationship to extend rearwardly of and in a right angular relationship relative to manifold 12, and by making grate 18 removable, periodic cleaning or removal of ashes from between the heat transfer conduits may be accomplished without removal of the entire unit from within the fireplace. An equally important feature of the construction and arrangement of the conduits is that it serves to maximize the residence time of air passing through the heat exchange conduits, whereby to achieve a maximum heating efficiency for a given capacity blower unit.

In operation, blower unit 14 serves to draw in room air and supply same under a slight positive pressure to manifold 12, which in turn serves to distribute air to the air inlet ends of lower leg portions 42 for subsequent heating and discharge back into the room through the air outlet ends of upper leg portion 44. During use, burning logs and large embers are supported by grate 18 for both radiation and conductive heat exchange relationship with upper leg portions 44. As time progresses, small embers pass through the openings of grate 18 whereupon they are placed in immediate proximity for heat exchange relationship with lower leg portions 42.

1. A fireplace heating unit adapted to be disposed in a fireplace recess and comprising:
   a. a horizontally elongated air distribution manifold;
   b. a blower unit for supplying air to said manifold;
   c. a plurality of generally U-shaped heat transfer conduits, said conduits being essentially parallel and extending generally rearwardly of said manifold in a right angular relationship relative thereto, said conduits having lower leg portions, upper leg portions and connecting portions, said lower and upper leg portions of each conduit being essentially horizontal and arranged in an essentially parallel, vertically spaced relationship with their rearwardly disposed ends fixed in air flow communication by their associated connecting portion, each of said lower leg portions having a forwardly disposed end defining an air inlet opening fixed in air flow communication with said manifold, each of said upper leg portions having a forwardly disposed end defining an air outlet opening arranged to overlie said manifold for directing air forwardly thereof; and
   d. a grate supported by said upper leg portions.

2. A fireplace heating unit according to claim 1, wherein said grate is formed of expanded metal and has a generally rectangular plan view configuration, said grate having a major rear portion extending horizontally transversely of conduits and a minor upwardly and forwardly inclined front portion arranged adjacent said manifold.

3. A fireplace heating unit according to claim 1, wherein said connecting portions define abutments engageable by rear marginal edges of said grate for positionally orienting said grate relative to said conduits.

4. A fireplace heating unit according to claim 1, wherein said manifold is of essentially rectangular cross-sectional configuration having vertically upstanding front and rear wall portions, horizontally disposed upper and lower wall portions, and vertically upstanding transversely extending end wall portions, each of said lower leg portions having its forwardly disposed end fixed to said rear wall portion of said manifold, each of said upper leg portions having its forwardly disposed end supported by said upper wall portion of said manifold, and said blower is disposed in flow communication with said manifold through one of said end wall portions.

5. A fireplace heating unit adapted to be supported on the floor of a fireplace for use in circulating room air for heat exchange with burning logs arranged in said fireplace, said unit comprising in combination:
a horizontally elongated air distribution manifold having bounding wall portions including in part upwardly, downwardly and rearwardly facing wall portions, said downwardly facing wall portion being adapted to rest on said floor for supporting said manifold;
a blower connected into said manifold through one of said bounding wall portions for supplying air thereto;
a plurality of essentially parallel, generally U-shaped heat transfer conduits extending generally rearwardly of said manifold in a right angular relationship relative thereto, each of said conduits having an elongated lower leg portion, an elongated upper leg portion and a vertically upstanding connecting portion for fixing rearwardly disposed ends of said lower leg portion and said upper leg portion in air flow communication, each said lower leg portion having a forwardly disposed end defining an air inlet opening connected into said manifold through said rearwardly facing wall portion at a point disposed vertically above said downwardly facing wall portion, each said connecting portion being adapted to rest on said floor and cooperate with said manifold to maintain its associated lower leg portion essentially horizontal and in a vertically spaced relationship relative to said floor, said conduits being spaced relatively uniformly apart in a direction horizontally lengthwise of said rearwardly facing wall portion, each said upper leg portion extending horizontally forwardly from its associated connecting portion and having a forwardly disposed end thereof defining an air outlet opening and being supported by said upwardly facing wall portion for directing air forwardly of said manifold; and
a grate extending transversely of and supported by said upper leg portion of each of said conduits.
6. A fireplace heating unit according to claim 5, wherein said grate has a major rear log supporting portion dimensioned to be flatwise supported on said upper leg portion of each of said conduits and a minor front portion forwardly and upwardly inclined relative to said major rear portion, and said connecting portion of each of said conduits forms an abutment engageable by a rearwardly disposed marginal edge of said major rear portion for orientating said grate.
7. A fireplace heating unit according to claim 6, wherein said grate is formed of a sheet of expanded metal having diamond shaped openings extending therethrough.