United States Patent [19]

Shriver

[11] **3,815,670**

[45] **June 11, 1974**

[54] **STREAMLINED DIFFUSER PLATE FOR A BASEBOARD HEATER**

[75] Inventor: **Charles S. Shriver,** Oreland, Pa.

[73] Assignee: **Orbit Manufacturing Company,** Perkasie, Pa.

[22] Filed: **Dec. 4, 1972**

[21] Appl. No.: **311,765**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 119,563, March 1, 1971, Pat. No. 3,714,982.

[52] **U.S. Cl.** **165/55,** 165/128

[51] **Int. Cl.** **F24h 9/04**

[58] **Field of Search** ..... 165/85, 122, 57, 67, 68, 165/128, 129; 237/79 F

[56] **References Cited**

UNITED STATES PATENTS

3,714,982 2/1973 Shriver 165/55

Primary Examiner—Charles Sukalo

Attorney, Agent, or Firm—Howson & Howson

[57] **ABSTRACT**

A baseboard heater having a housing with finned tubing mounted in an air flow path between a cool air inlet extending along the base of the housing and a hot air outlet extending along the top of the housing is provided with a streamlined diffuser plate having a series of apertures extending along the length of the outlet. A series of vanes are mounted to the diffuser plate for dividing the interior of the housing into a series of plenums corresponding in number to the apertures with a plenum in registry with an aperture. A preferred form of vane has a lower edge which overlies the finned tubing in closely spaced relation and a pair of curved legs diverging outwardly and upwardly in V-fashion from the lower edge and toward the edges of adjacent apertures. The vanes operate to improve the operational cleanliness of the heater by streamlining the flow of air through the heater. Other forms of vanes are also disclosed.

The present invention relates to basboard heaters, and more particularly, the present invention relates to baseboard heaters having means for altering the flow pattern of hot air as it exists from the heater to improve the operational cleanliness of the heater.

14 Claims, 6 Drawing Figures

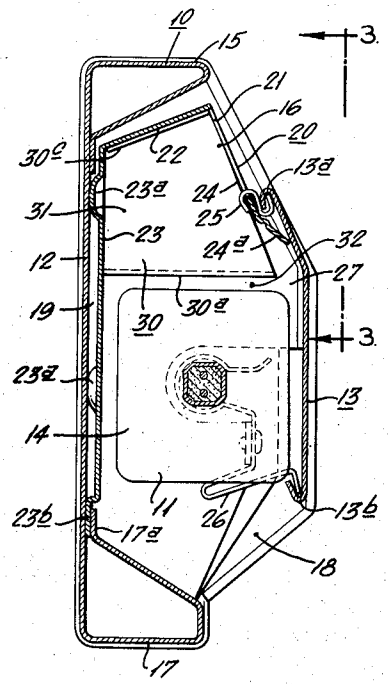


FIG. 1.

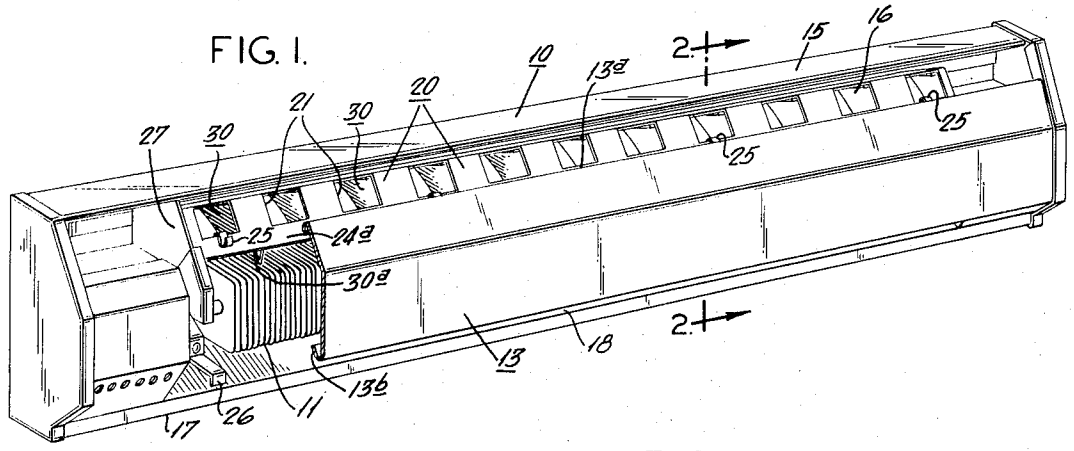


FIG. 2.

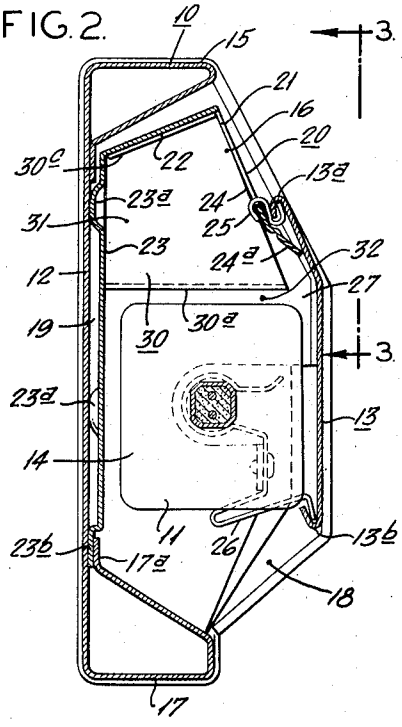


FIG. 3.

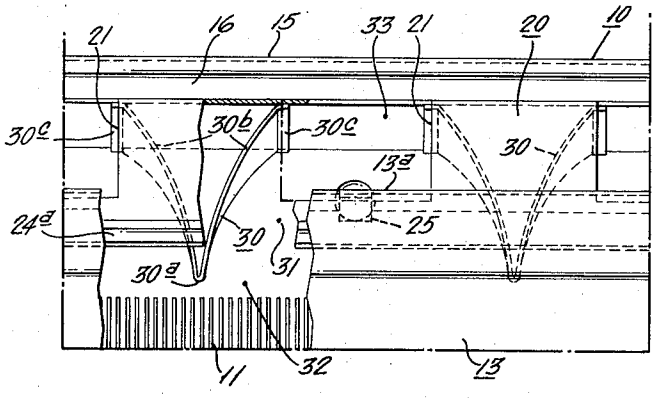


FIG. 5.

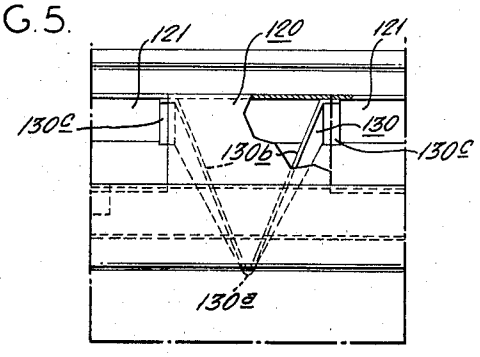


FIG. 4.

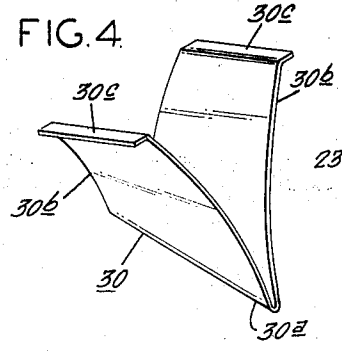
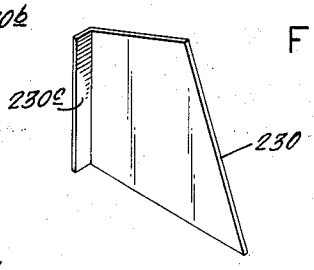


FIG. 6.



STREAMLINED DIFFUSER PLATE FOR A BASEBOARD HEATER

The present application is a continuation-in-part of my copending application Ser. No. 119,563 filed Mar. 1, 1971, and entitled "Clean-Operating Baseboard Heater" and now U.S. Pat. No. 3,714,982 granted Feb. 6, 1973.

In my above-mentioned patent application there is disclosed a baseboard heater having a hot air outlet in which is mounted a diffuser plate having a series of apertures spaced apart along the length of the outlet. The apertures cause hot air to exit from the heater in a series of columns so that dust entrained in the air is prevented from being deposited on the surface of a wall above the heater. Heaters constructed according to the teachings of that application are capable of operating for relatively long periods of time without depositing a significant amount of dust on the wall above the heater. Thus, the heaters are capable of more than meeting minimum industry standards. Although these heaters have been entirely satisfactory, an efficient heater which is capable of operating at cooler housing temperatures and in a clean manner for considerably longer periods of time is even more desirable.

With the foregoing in mind, it is a primary object of the present invention to provide an improved baseboard heater which is capable of operating for relatively long periods of time without depositing any appreciable amount of dust on the surface of a wall above the heater.

It is another object of the present invention to provide a novel air diffuser for use in a baseboard heater to improve the operational cleanliness of the heater.

As a further object, the present invention provides a unique diffuser plate for streamlining the flow of air through a baseboard heater to improve the operational cleanliness of the heater while increasing the heat transfer efficiency of the heater.

As a still further object, the present invention provides an air-flow diffuser which is relatively inexpensive to manufacture and to install in a baseboard heater.

More specifically, the present invention provides an air-flow diffuser which is mounted in the hot air outlet of a baseboard heater for causing the hot air to exit from the heater in such a manner as to prevent dust entrained in the air from being deposited on the surface of a wall above the heater. The diffuser plate has a series of shaped apertures spaced apart along its length, and a series of vanes are mounted to the diffuser plate for providing a series of plenums. The plenums overlie finned tubing mounted in the heater, and each plenum is in registry with an aperture. A preferred form of vane has a lower edge which overlies the finned tubing in closely spaced relation and has a pair of curved upwardly-diverging legs terminating at their upper extremities in proximity with the edges of adjacent apertures to provide each plenum with a relatively wide lower entrance and a relatively narrow exit in registry with the aperture. The vanes operate to channel the hot air upwardly toward and through the apertures, thereby minimizing eddy currents inside the heater and significantly improving the operational cleanliness of the heater. Other types of vanes are also disclosed.

These and other objects, features and advantages of the present invention should become apparent from the following description when taken in conjunction with the accompanying drawing in which:

FIG. 1 is a perspective view of a baseboard heater embodying the present invention;

FIG. 2 is an enlarged sectional view taken along line 2—2 of FIG. 1 to illustrate a vane mounted to a diffuser plate and overlying finned tubing inside the heater;

FIG. 3 is an elevational view taken along line 3—3 of FIG. 2 and with portions of the heater broken away to illustrate the arrangement of the vanes and apertures in the diffuser plate;

FIG. 4 is a perspective view of one of the vanes mounted to the diffuser plate of the present invention;

FIG. 5 is a view similar to FIG. 3 but illustrating a modified vane; and

FIG. 6 is a perspective view of another modified vane which may be employed in the present invention.

Referring now to the drawing, there is illustrated in FIG. 1 a baseboard heater embodying the present invention. The heater has a horizontally-elongated housing **10** mounting a length of finned tubing **11** which, in the present instance, is electrically energized to produce heat. As best seen in FIG. **2**, the housing **10** has an upstanding rear wall **12** which cooperates with a front wall **13** to form an air-flow passage **14** inside the housing **10**. The upper portion of the rear wall **12** is turned to form an upper forward protrusion **15** which cooperates with the upper edge **13***a* of the front wall **13** to define a heated air outlet **16** extending lengthwise of the heater housing **10**. The lower portion of the wall is also turned forwardly to form a lower forward protrusion **17** which cooperates with the lower edge **13***b* of the front wall **13** to form a cool air inlet **18** extending along the lower front of the housing **10**.

In my aforementioned patent application, there is disclosed a diffuser plate **20** which is mounted in the outlet **16**. The diffuser plate **20** has a series of apertures **21,21** which are of a predetermined size and shape and which are spaced apart along the length of the diffuser plate **20**. The apertures **21,21** cause the heated air to exit from the outlet **16** in a series of discrete columns, thereby preventing dust entrained in the air from becoming deposited on the wall above the heater. For a more detailed disclosure as to the theory and operation of the diffuser plate **20**, reference is hereby made to my U.S. Pat. application Ser. No. 119,563 filed Mar. 1, 1971.

As best seen in FIG. **2**, the diffuser plate **20** has an upwardly and forwardly inclined deflector flange **22** and an apertured flange **24** which depends forwardly and downwardly from the uppermost extremity of the deflector flange **22**. The diffuser plate **20** has an integral downturned extension **23** which is disposed parallel to the wall **12** and which has a series of dimples **23***a*,**23***a* engaging the wall **12** to space the extension **23** therefrom. The lower margin of the extension **23** has an offset **23***b* which is sandwiched between the rear wall **12** and an upturned margin **17***a* of the lower protrusion **17**. The offset **23***b* is spot welded in position, and selected ones of the dimples are also spot welded to the rear wall **12**. By virtue of this structure, a dead air space **19** is provided between the extension **23** and the rear wall **12** to minimize heat transfer rearwardly through the housing **10** and thereby to improve the heat-transfer efficiency of the heater.

The apertured flange **24** is joined to the front wall **13** in a leak-resistant manner. To this end, the apertured flange **24** has a lower margin **24***a* which is angulated

forwardly to engage the rear side of the front wall **13.** The front wall **13** is maintained in engagement with the marginal extension **24***a* by means of an S-shaped clip **25** which engages the lower edge of selected ones of the apertures **21,21** and which engages a reversely-turned lip extending along the upper edge **13***a* of the front wall **13.** The front wall **13** is spaced from the rear wall by means of upstanding partitions, such as the partition **27** illustrated at the left end of the heater in FIG. **1,** and the front wall **13** is releasably fastened to the housing **10** by means of a spring form **26** which is mounted to the partition **27** and which engages a reversely-turned lip extending along the lower edge **13***b* of the front wall **13.** With this structure, heated air flowing upwardly along the inside of the front wall is channeled behind the apertured flange **24** to exit through the apertures **21,21** and is prevented from leaking along the upper edge **13***a* of the front wall **13.**

As described in my aforementioned patent application, a baseboard heater constructed as described operates in a clean manner when the apertures **21,21** have lengthwise dimensions measured in a horizontal direction of between one-third and two-thirds of the center to center spacing of the apertures and the ratio of length to width of each aperture is in a range of 1/1 to 4/1. Such a heater has been tested and found to surpass the minimum industry standards set for clean operation.

According to the present invention, even greater operational cleanliness may be achieved by providing a structure which streamlines the flow of heated air through the housing. To this end, there is provided vane means in the housing **10** to channel heated air upwardly and toward the apertures for minimizing eddy currents within the heater and thereby maximizing the operational cleanliness of the heater. As best seen in FIG. **3,** the air is channeled toward the apertures **21,21** by a series of vanes **30,30** which are located above the finned tubing **11** and which alternate with the apertures **21,21** in the series. In the embodiment illustrated in FIGS. **1–3,** each vane **30** is V-shaped and is mounted in the housing with its apex or lower edge **30***a* overlying the finned tubing **11** in closely spaced relation. As best seen in FIG. **2,** the lower edge **30***a* is parallel with the top of the finned tubing **11.** Each vane **30** has a pair of curved legs **30***b*,**30***b* which diverge upwardly and outwardly from the apex **30***a* and which terminate in proximity with the vertical edges of adjacent apertures **21,21.** It is noted that the apex **30***a* is located below a horizontal plane through the lower edges of the apertures **21,21** and in a vertical plane located midway between the vertical edges of adjacent apertures. Each leg **30***b* is imperforate and extends forwardly from the rear wall **12** to engage the rear side of the apertured flange **24.**

In order to mount the vanes **30,30** in the housing **10,** the upper margin of each leg **30***b* is turned outwardly to form mounting flanges **30***c*,**30***c* which are fastened to the underside of the deflector flange **22** by means of spot welding or the like. In the embodiment of FIGS. **1–4,** the legs **30***b*,**30***b* are curved to form each vane **30** with a cusp-like shape. The confronting legs **30***b*,**30***b* of adjacent vanes **30,30** form plenums **31,31** each of which has an enlarged entrance **32** adjacent the finned tubing **11** and a narrow exit **33** in registry with the aperture **21.** Thus, as the heated air flows upwardly it is split by the vanes **30,30** and is channeled toward the apertures **21,21** in a streamlined manner, thereby minimizing eddy currents inside the housing **10** and significantly improving the operational cleanliness of the heater. Moreover, the interaction of the vanes **30,30** on the air flow reduces the operating temperature of the housing **10,** particularly at higher heating densities (heating capacity per foot of finned tubing). As a result, the heat transfer efficiency of the heater is increased.

Although a heater having the vanes **30,30** illustrated in FIGS. **1–4** possesses superior operational cleanliness, it has been determined that a heater having modified vanes such as the vane **130** (FIG. **5**) operates satisfactorily. As best seen in FIG. **5,** the vane **130** mounts in the housing **10** similarly to the vane **30;** however, unlike the vane **30,** the legs **130***b*,**130***b* are flat between the lower edge **130***a* of the vane **130** and the outturned mounting flanges **130***c*,**130***c*. The vane **130** functions in a manner similar to the vane **30** to channel air to the apertures **121,121** in the diffuser plate **120,** and is only slightly less effective than the vanes **30,30** of the embodiment of FIGS. **1–4.**

If desired, another modified vane **230** may be provided for channeling air through the housing **10.** Unlike the vanes **30** and **130,** the vane **230** is flat and has a mounting tab **230***c* which is adapted to be secured to the downward extension **23** of the diffuser plate **20.** When mounted in the housing **10,** the vane **230** is disposed in a vertical plane midway between the edges of adjacent apertures. Although this vane improves the operational cleanliness of the heater, it does not function as efficiently as the afore-described vanes **30** and **130.**

In view of the foregoing, it should be apparent that there has now been provided an improved baseboard heater which is capable of operating in a clean manner for relatively long periods of time. Furthermore, the heater is efficient in operation.

While preferred embodiments of the present invention have been described in detail, various modifications, alterations and changes may be made without departing from the spirit and scope of the present invention as defined in the appended claims.

I claim:

1. In a baseboard heater having a housing with heat-producing means mounted therein, said housing having an upstanding rear wall for mounting against a partition in an area to be heated and a front wall spaced from said rear wall to form an air flow passage across said heat-producing means in said housing, a diffuser plate mounted in said flow passage above said heat-producing means, said diffuser plate having a deflector flange extending forwardly from the rear wall of said housing and a flange depending from said deflector flange and spanning toward said front wall with a series of apertures therein spaced predetermined distances from one another and from said rear wall, the improvement comprising: means providing a series of vanes for dividing said air flow passage above said heat producing means into a series of plenums corresponding in number to said series of apertures, said vanes alternating with said apertures so that each plenum registers with one aperture, whereby air heated by the heat producing means is split into separate streams before exiting from the apertures.

2. Apparatus according to claim **1** wherein each vane extends between said rear wall and said deflecting and

depending flanges and has a lower edge overlying said heat producing means.

3. Apparatus according to claim **2** wherein said lower edge is located in closely-spaced relation with said heat producing means and in a vertical plane midway between the edges of adjacent apertures and below a horizontal plane through the lower edge of the apertures.

4. Apparatus according to claim **2** wherein each vane includes a pair of deflecting legs inclining upwardly away from one another and from said edge, and including means to mount said legs in said housing.

5. Apparatus according to claim **4** wherein said mounting means includes an outturned flange on each leg and means to fasten said outturned flanges to said deflecting flange.

6. Apparatus according to claim **4** wherein said legs terminate closely adjacent the edges of adjacent apertures in said series.

7. Apparatus according to claim **6** wherein said legs have flat surfaces confronting said plenums.

8. Apparatus according to claim **6** wherein said legs have concave surfaces confronting said plenums.

9. Apparatus according to claim **1** wherein each vane includes a vertically-disposed planar member located substantially centrally between adjacent apertures in said series.

10. Apparatus according to claim **1** wherein each aperture in said series has a lengthwise dimension measured in a horizontal direction ranging between one-third and two-thirds of the center to center spacing of said apertures with the ratio of length to width of each aperture being in a range of substantially 1/1 to 4/1.

11. Apparatus according to claim **1** wherein said diffuser plate has a mounting flange with a depending extension spaced from said rear wall for cooperating therewith to form a dead air space at the rear of the housing for minimizing heat transfer rearwardly from the heater.

12. Apparatus according to claim **11** wherein said depending extension has a rearward offset coextensive in length with its lower margin, and including means fastening said rearward offset to said rear wall.

13. Apparatus according to claim **11** including a series of spacers interposed between said rear wall and said depending extension, and including means fastening selected ones of said series of spacers to said rear wall.

14. Apparatus according to claim **13** wherein said spacers include dimples in said depending extension and said fastening means includes spot welds between said selected dimples and said rear wall.

* * * * *