March 26, 1968 W. F. SIEVERDING 3,374,831

BLOWER DIFFUSER

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FIG.1

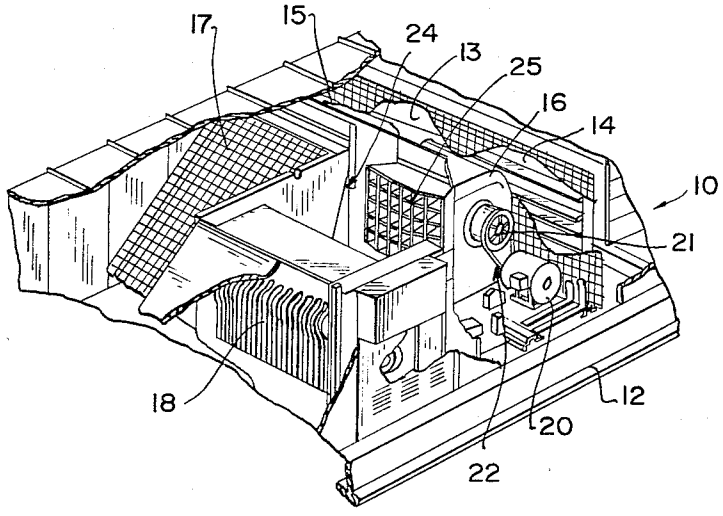
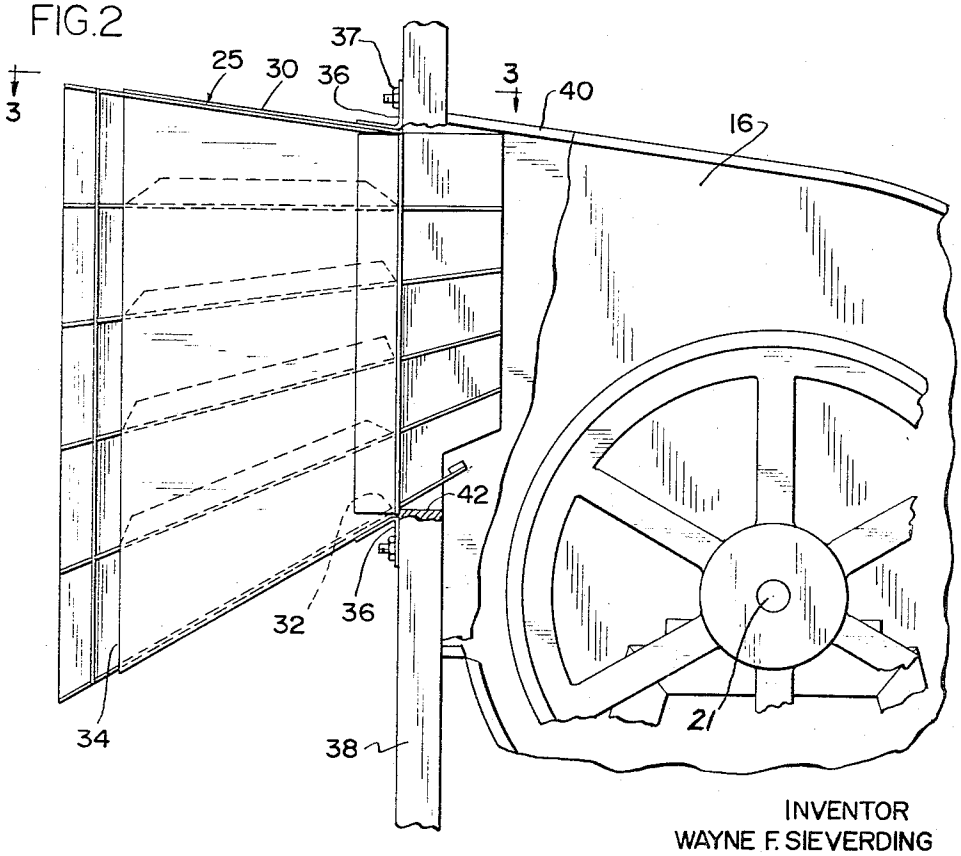


FIG.2



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FIG. 3

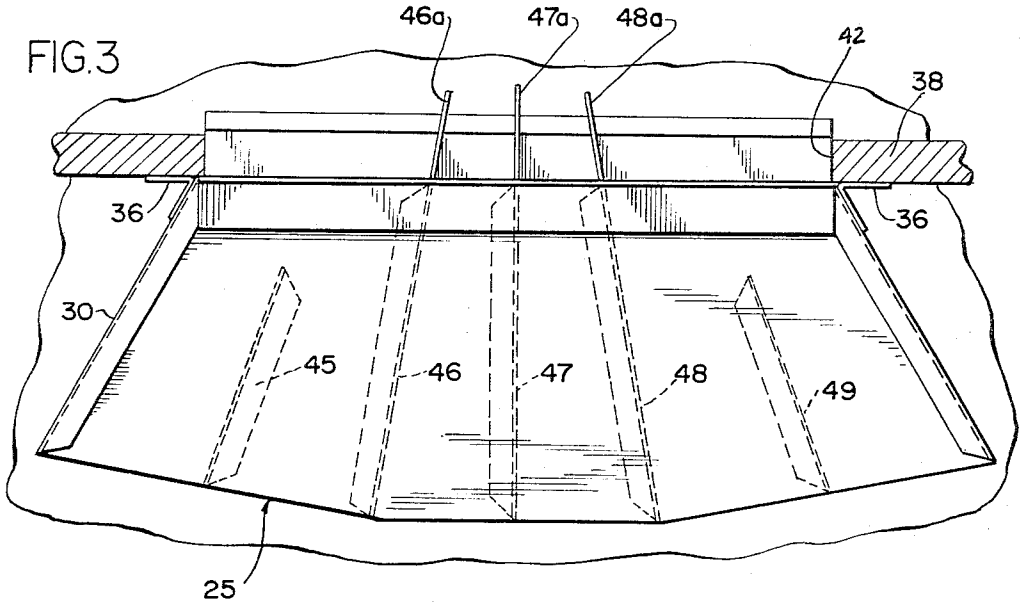
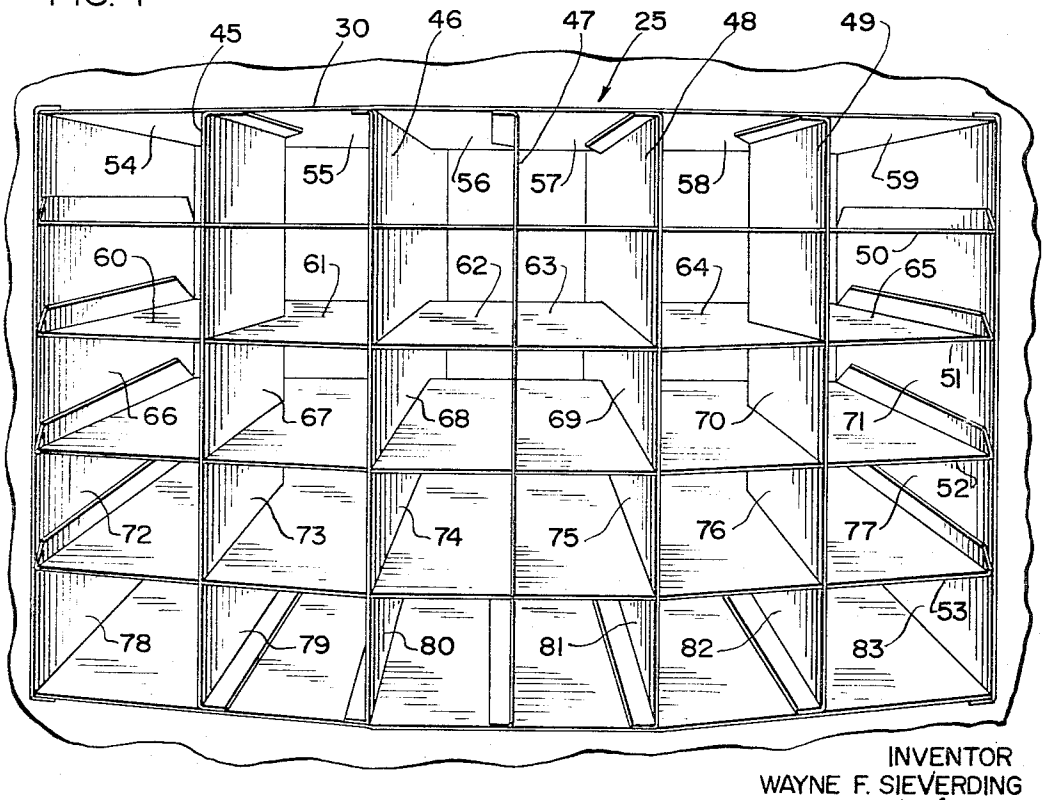


FIG. 4



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BLOWER DIFFUSER

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3 Claims. (Cl. 165—122)

ABSTRACT OF THE DISCLOSURE

An air treating device including a blower, a heat exchanger downstream of the blower, and a blower diffuser disposed at the outlet from the blower for converting the velocity energy of the air to static energy for improving the heat transfer of the air as it passes over the heat exchanger.

This invention relates to a diffuser for a blower as used, for example, in air treating apparatus, wherein it is desired to reduce the velocity of the air discharging from the blower in a relatively short distance prior to passage of the air over a heat exchange member.

Heretofore, it has been known to utilize a screen or perforated plate to reduce the velocity of air discharging from a blower prior to passage of such air over a heat exchange member, as for example, a furnace heat exchanger or an evaporator coil. Prior arrangements have not been entirely satisfactory, for often when the blower is spaced closely adjacent to the heat exchange member, there is excessive back pressure created in the blower and blower operation is impaired. In some applications, if no means are provided for reducing the velocity of air discharging from the blower and the blower is disposed closely adjacent to a heat exchange member, the air will rush through the heat exchange member with a minimum of heat exchange. Further, in the case where the heat exchange member is a cooling coil, air traveling at high velocity may concentrate over the center of such cooling coil and adversely affect the operation of the control valve commonly used to control the passage of refrigerant through such cooling coil. In one air treating unit in use today, where blowers are utilized to pass air over a heater and a cooling coil disposed in side-by-side relationship and the heater and cooling coil are operative at the same time, in the event that there were substantial demand for cooling and the air were discharged from the blower at a high velocity, then with the mixing damper associated with the heater closed, much of the air passed over the heater would be recirculated and passed over the cooling coil, thus reducing the efficiency of the cooling coil.

An object of the present invention is to provide an improved blower diffuser between a blower and a heat exchange member, such blower diffuser comprising a plurality of diverging nozzles for converting velocity energy to static energy in a relatively short distance so as to minimize the distance required between the blower and the heat exchange member associated therewith without adversely affecting heat transfer of air passing over the heat exchange member or impairing blower operation.

Other objects and advantages of the present invention will be made more apparent hereinafter.

The specific structural details of the invention and their mode of operation will be made most manifest and clearly pointed out in clear, concise and exact terms in conjunction with the accompanying drawings, wherein:

FIG. 1 is a fragmentary perspective view of an air treating unit embodying the blower diffuser of the present invention;

FIG. 2 is an enlarged side view of the blower diffuser of this invention, with the parts being broken away;

FIG. 3 is a cross-sectional view through the blower diffuser, taken generally along the line 3—3 of FIG. 2; and.

FIG. 4 is a front view of the blower diffuser of this invention.

Referring to FIG. 1, there is shown in perspective a portion of a Lennox DMS air treating unit embodying the present invention. The air treating unit **10** includes an enclosed frame **12** having defined therein chambers **13** and **14**, respectively, for receiving outdoor air and recirculated air. Blowers **15** and **16** draw the air from the chambers **13** and **14** through the damper openings and force the air over the cooling coil **17** and heat exchanger **18**, respectively. The blowers **15** and **16**, which may be of the centrifugal type, are driven by a blower motor **20** resiliently supported on the frame **12** and operatively connected to the blower shaft **21** by means of a belt and pulley drive **22**. The air treating unit per se is not part of this invention and reference may be made to the copending Norris and Sieverding application Ser. No. 421,427, filed Dec. 28, 1964, now Patent No. 3,324,782, granted June 13, 1962, for a fuller description thereof.

As seen in FIG. 1, the outlet from the blowers **15** and **16** is spaced relatively closely adjacent to the cooling coil **17** and the heat exchanger **18**. The heat exchanger **18** may be gas or oil-fired, though it will be understood that other suitable heaters may be utilized, as for example, an electrical resistance heater. In the absence of the blower diffuser or velocity pressure converter of the present invention, high velocity air discharging from the blowers **15** and **16** would pass through the cooling coil **17** and the heater **18** without affecting optimum cooling or heating of the air. In addition, high velocity turbulent air flow over the cooling coil could cause erratic hunting of the thermal expansion valve commonly utilized to control the flow of refrigerant to the evaporator or cooling coil **17**. Furthermore, in certain periods of operation, high velocity air impingement forces air partially through the heater, which then recirculates back to the cooling coil, adding substantially to the cooling load.

To overcome the difficulties noted above, there is provided by this invention a blower diffuser or velocity pressure converter **24**, **25** closely adjacent the discharge from each blower to convert the kinetic energy of the high velocity blower discharge to static pressure so as to produce nearly laminar air flow between the outlet from the blower diffuser and the associated cooling coil **17** or heater **18**. The blower diffusers **24** and **25** include frame means defining a plurality of diverging nozzles for converting velocity energy to static energy in a relatively short distance.

Turning now to FIGS. 2, 3 and 4, there is better illustrated constructional details of the blower diffuser or velocity pressure converter of the present invention. Each blower diffuser **24**, **25** includes a housing **30** having top and bottom walls and spaced side walls. The opposed wall members diverge away from one another from the inlet **32** of the housing **30** to the outlet **34** from housing **30**. Flanges **36** are provided on the housing adjacent the inlet end for permitting affixation of housing **30** to the upright frame **38** in the air treating unit **10**. Suitable fastening means **37** are provided for securing the blower diffuser **25** to frame **38**. The scroll or housing **40** of the fan or blower **16** is suitably affixed to the frame support **38**. The outlet **42** from the blower is complementary to the inlet **32** to the blower diffuser and is in juxaposition as shown in FIG. 2. It is apparent from FIGS. 2, 3 and 4 that the cross-sectional area of the inlet **32** to housing **30** is less than the cross-sectional area of the outlet **34** from housing **30**.

Provided within housing **30** are a plurality of upright

wall members **45**, **46**, **47**, **48** and **49**. Disposed transversely of the wall member **45–49** in the housing **30** are a plurality of wall members **50**, **51**, **52** and **53**. The wall members may be made from sheet metal. The transverse wall members may be suitably notched or cut to provide for interengagement of the respective upright and transverse wall members so as to provide a cluster of diverging nozzles **54–83**. The diverging nozzles are substantially of uniform configuration.

In the illustrated embodiment of the invention, each wall member **45–49** and **50–53** is provided with a flange at each end which is adapted to be suitably affixed to the sides, top and bottom, respectively, of housing **30**. Preferably, each of the nozzles **54–83** is a diverging 7½ degree nozzle.

Referring to FIGS. 2 and 3, it is noted that the wall members **46**, **47** and **48** are each provided with extensions **46***a*, **47***a* and **48***a*, respectively. The extended portions of these wall members pass through the inlet **32** to the blower diffuser and into the outlet **42** from the blower for better distributing the air entering the blower diffuser from the adjacent blower.

In one form of the present invention adapted to be utilized for a 12-inch or 15-inch blower, the inlet opening of the blower diffuser is substantially rectangular and is about $11\frac{5}{16}$ x $18\frac{13}{16}$ inches. The outlet opening from the blower diffuser is similarly a rectangle about $28\frac{3}{16}$ x $17\frac{1}{16}$ inches. The walls defining each nozzle **54–83** are constructed and arranged so as to define approximately 7½ degree diverging nozzles.

In this form of the invention, the longitudinal length of the housing from the inlet to the outlet is about 8 inches. Thus, the velocity of the air discharged from the blower is substantially reduced within an axial distance of about 8 inches. The flow of air from the outlet of the blower diffuser of this invention is substantially laminar. In effect, a static pressure area is provided at the outlet from the blower diffuser. Thus, the heat exchanger, either the cooling coil or heater, may be disposed about two feet from the outlet of the blower diffuser while obtaining optimum heat transfer and without adversely affecting blower operation. For example, it has been found that a typical centrifugal blower having a wheel diameter of 15 inches and having a velocity pressure of 1.55 inches water gauge at the inlet to the diffuser (at the outlet from the blower) will have a velocity pressure of 0.35 inch water gauge at the outlet from the diffuser. Further, it has been found that there is a greater negative velocity pressure at the blower outlet when the novel blower diffuser of this invention is used. This, in turn, results in improved blower performance.

The present invention provides a blower diffuser which is essentially a cluster of highly sophisticated diverging nozzles, in front of each blower, for converting the kinetic energy of the high velocity blower discharge to

static pressure to produce nearly laminar air flow at the blower diffuser outlet. Thus, the heat exchanger used with the blower can be positioned relatively closely adjacent to the blower diffuser outlet with assurance that desired heat transfer will occur. The blower diffuser has application in an air treating unit as illustrated, for example, in FIG. 1 and also has utility in many other applications, as for example, in a furnace where it is desired to place a high-speed blower closely adjacent to a gas or oil-fired heat exchanger or to an electric resistance heater.

While the invention has been described with reference to a preferred embodiment thereof, it will be appreciated that it may be otherwise embodied within the scope of the following claims.

I claim:

1. In an air treating device, the combination of a blower, a heat exchanger and a blower diffuser, said blower having a housing with inlet and outlet means, said heat exchanger being disposed relatively closely adjacent said blower downstream of said diffuser and said blower, said blower diffuser having a housing with an inlet and an outlet, the inlet of said diffuser being complementary to the outlet means of said blower and in juxtaposition thereto, the cross sectional area of the outlet of said diffuser being greater than the cross sectional area of the inlet of the diffuser, said diffuser including a cluster of diverging nozzles within the housing thereof, whereby the nozzles convert velocity energy to static energy in a relatively short distance and the flow of air from the outlet of the diffuser housing is substantially laminar and of reduced velocity, thereby enhancing heat transfer as the air passes over the heat exchanger down-stream of the diffuser and blower.

2. An air treating device as in claim **1** wherein the blower includes a centrifugal fan, the blower diffuser providing a relatively greater negative velocity pressure at the blower outlet so as to improve blower performance.

3. An air treating device as in claim **1** wherein a plurality of upright and transverse wall members provided within the housing define the cluster of diverging nozzles, said nozzles being of substantially uniform configuration, with the wall members forming each nozzle diverging from the entrance to the exit of each nozzle about 7½ degrees.

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