United States Patent [19]

Pfister et al.

[11] **3,782,303**

[45] **Jan. 1, 1974**

[54] **DRAFT INDUCER**

[75] Inventors: **Leo F. Pfister**, Mendota; **Darold K. Rosenow**, LaSalle, both of Ill.

[73] Assignee: **Conco, Inc.**, Mendota, Ill.

[22] Filed: **July 6, 1972**

[21] Appl. No.: **269,498**

[52] **U.S. Cl.** **110/162**, 98/50, 126/312

[51] **Int. Cl.** **F23l 17/16**

[58] **Field of Search** ..... 126/312, 307 R; 110/162; 98/58, 60, 43

[56] **References Cited**

UNITED STATES PATENTS

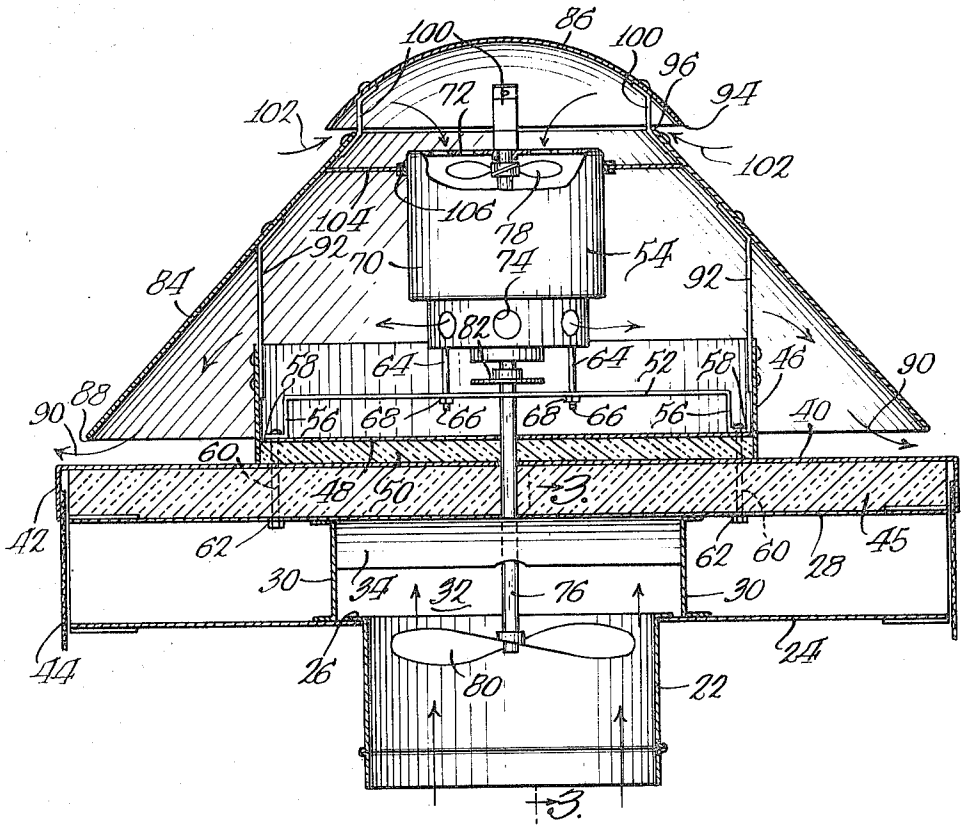
3,211,080	10/1965	Rader	110/162 X
2,300,578	11/1942	Lane	110/162
3,401,624	9/1968	Mohrman	98/116

Primary Examiner—William E. Wayner
Attorney—Ernest A. Wegner et al.

[57] **ABSTRACT**

A draft inducer adapted to be secured to flues or the like to improve draft conditions therein. The inducer includes a tubular element to be secured to a flue and a gas directing housing located above the tube and in fluid communication therewith for directing gases radially outwardly of the tube at a high velocity. To assist in inducing the draft, a motor is located above the gas directing housing and includes a shaft extending into the tube and mounting a fan blade. Insulation is provided between the gas directing housing and the motor and a motor housing structured to insure excellent cooling of the motor is also included.

6 Claims, 3 Drawing Figures



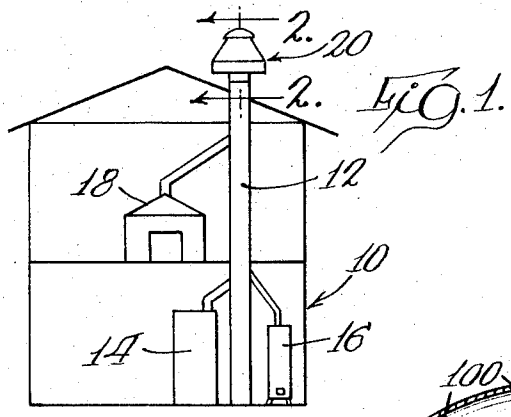


Fig. 1.

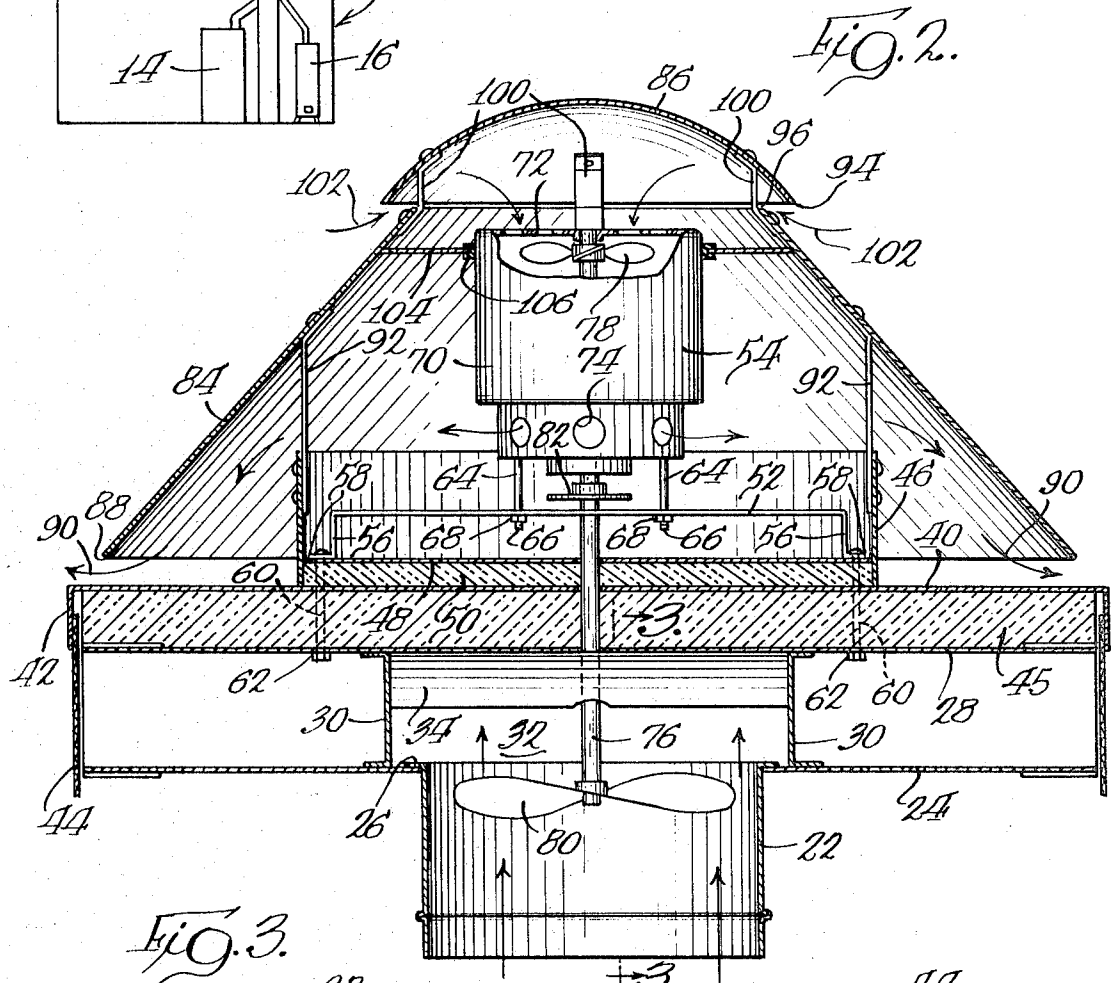


Fig. 2.

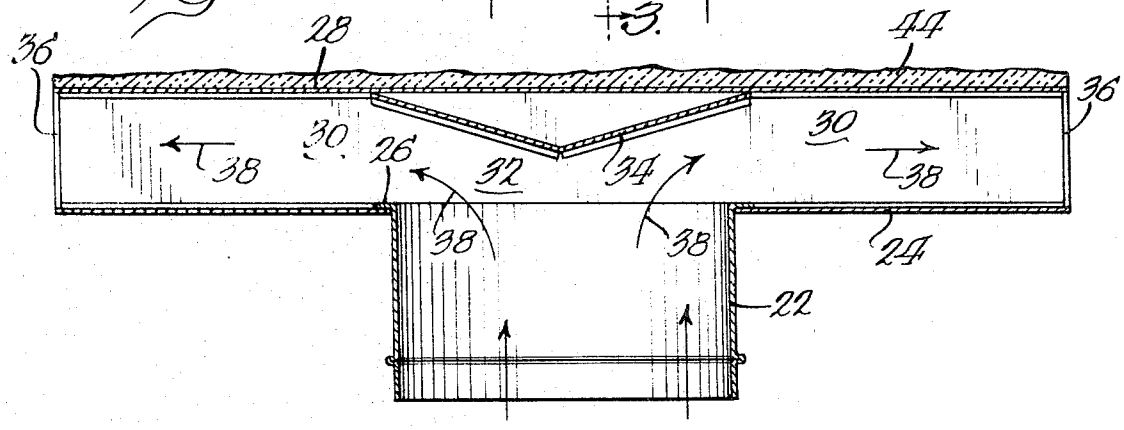


Fig. 3.

DRAFT INDUCER

BACKGROUND OF THE INVENTION

This invention relates to draft inducers.

Many flue systems and structures suffer draft problems due to inadequate size or design deficiencies. Frequently, the result is a smoky fireplace or the inability of a flue system to adequately serve accessory equipment to a main furnace as, for example, water heaters or incinerators. Frequently, such problems are overcome by extending the height of a chimney, but the expense of the same is often prohibitive and frequently the result is aesthetically unsightly.

In many modern structures employing exhaust equipment, the problems are frequently exaggerated by reason of the flue providing a convenient path for inlet air during operation of an exhaust fan.

There have been some proposals for solving the foregoing problem by means of draft inducers as, for example, disclosed in Delamere U.S. Pat. No. 1,923,079 and Rader U.S. Pat. No. 3,211,080 which constitute the best prior art known to applicant. Such structures have been of some benefit but may suffer from operating defects in terms of necessary isolation of a motor for driving an impeller from the hot gases being exhausted through the flue, either by conduction from the flue, or by drawing hot flue gases into a motor cooling system. As a result, the useful life of such devices is shortened by reason of increased deterioration of an electrical motor due to the hot environment in which it must operate to perform the draft inducing function.

SUMMARY OF THE INVENTION

It is the principal object of the invention to provide a new and improved draft inducer for flues. More particularly, it is an object of the invention to provide such a draft inducer wherein the motor is effectively isolated from hot gases emanating from the flue in terms of both conduction and in terms of its own cooling requirements.

The exemplary embodiment of the invention achieves the foregoing object in a structure including a vertically oriented tube adapted to be affixed to a flue and terminating in an upper, gas directing housing. Within the housing is a V-shaped baffle for directing hot flue gases to either side thereof out of exits therefrom at high velocity to cause the same to move rapidly away from the immediate environment of the draft inducer so as not to interfere with a motor cooling system therefor.

The upper surface of the gas directing housing is provided with insulation means, in the exemplary embodiment, first and second layers. The fist layer of insulation serves to provide isolation for a superimposed motor housing while the second layer is operative to isolate the motor in the housing from the high temperatures immediately above the flue. In this way, insulation costs are minimized.

As alluded to previously, a motor housing is affixed above the layers of insulation and comprises a frusto-conical housing element having its lower edge spaced above the upper surface of the first insulation layer so as to define an air outlet for the motor housing. The upper end of the frusto-conical housing element is closed by a cap having its edges spaced radially outwardly from the upper edge of the frusto-conical element so as to define an air inlet for the motor housing.

Within the housing is a baffle dividing the same into two compartments. An electrical motor having a casing including an upper air inlet, a lower air outlet, a drive shaft extending from a casing, and a cooling fan affixed to the drive shaft within the casing is located within the housing and in conjunction with the baffle so that operation of the internal fan draws cooling air through the inlet in the housing and forces the same out of the outlet.

One end of the shaft extends downwardly into the tubular element and there mounts an impeller. Rotation is such as to draw hot flue gases upwardly and force the same out at high velocity through the gas directing housing as mentioned previously.

According to one embodiment, the shaft, intermediate the impeller and the motor, may be provided with means for minimizing heat conduction along the shaft from the flue to the motor.

Other objects and advantages will become apparent from the following specification taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a somewhat schematic vertical section of a structure employing various equipment of the type that generates heated products of combustion and provided with a draft inducer made according to the invention;

FIG. 2 is an enlarged vertical section of an exemplary embodiment of the invention; and

FIG. 3 is a fragmentary vertical section taken approximately along the line 3—3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A typical structure which may advantageously employ a draft inducer made according to the invention is illustrated somewhat schematically in FIG. 1 and is generally designated 10. The same includes an upstanding flue or chimney 12 operative to conduct to the exterior of the structure 10 hot products of combustion from a furnace 14, a water heater 16, and a fireplace 18. A typical draft inducer made according to the invention is generally designated 20 and is shown mounted on the upper end of the flue 12 although substantially exaggerated in size.

Turning now to FIGS. 2 and 3, the draft inducer 20 is seen in greater detail and it is to be understood that any horizontal cross section would generally result in a circular configuration of the various elements with the exception of a portion of a gas directing housing, specifically, a portion of the interior thereof. The draft inducer 20 includes a tube 22 at its lower extremity which is adapted to be secured to the upper end of the flue 12 in any fashion known in the art. The upper end of the tube 22 extends through a central opening in a circular base plate 24 and includes a radially extending flange 26 by which the two may be secured together as by spot welding or the like. The base plate 24 in conjunction with a superimposed, spaced plate 28 define a gas directing housing of the invention. Between the plates 24 and 28 and at opposite sides of the tube 22, are channels 30 which define a combustion products passage 32 therebetween.

The channels 30 may have their legs secured by any suitable means, as for example, welding, to adjacent sides of the plates 24 and 28 and, as best viewed in FIG. 3, may sandwich a V-shaped baffle 34 having its apex

extending substantially through the center of the tube 22. Hot gases of combustion introduced into the tube 22 will therefore be directed either to the left or to the right in FIG. 3 through the hot gas passage 32 to opposed outlets 36 along the flow path generally indicated by arrows 38.

Just above the plate 28 is a plate 40 having a downturned rim 42 spaced slightly radially outwardly of the periphery of the plates 24 and 28. A safety screen which may be in the form of a sheet of expanded metal 44 may be welded to the downturned rim 42 to extend downwardly to a point just below the plate 24 to preclude inadvertent entry of birds, animals, or even human extremities into the assemblage through the outlets 36.

Sandwiched between the plate 28 and the plate 40 is a first layer of insulation 45. As will be seen, the insulation layer 45 serves to isolate cooling air outlet passages for a motor from the hot gases of combustion.

Concentrically about the axis of the tube 22 and above the plate 40 is a circular colar 46. Within the collar 46 is a circular plate 48 and between the plate 48 and the plate 40 is a second layer of insulation 50. The layer of insulation 50 insulates the motor for the draft inducer from the high temperatures existing directly above the connection of the same to the flue 12.

A mounting bracket 52 located above the plate 48 and mounts a motor 54 for the draft inducer. The bracket includes downturned legs 56 at its opposite ends together with outwardly directed feet 58 at the lower extremity thereof. Securing means such as bolts 60 and nuts 62 extend through apertures in the feet 58, the layers of insulation 44 and 50, and the plates 28 and 40 (none of which apertures are shown) to secure the entire assemblage together. Any suitable securing means may be provided for securing the plate 48 to the collar 46.

The motor 54 is supported on the bracket 52 by means of sleeves 64 surrounding bolts 66 and nuts 68 extending through suitable apertures in the brackets 52 to elevate the motor 54 somewhat thereabove. The motor 54 may be of a conventional construction and includes an outer casing 70 having inlet apertures 72 at its upper end and outlet apertures 74 at its lower end. The motor conventionally includes a shaft 76 and interiorly of the casing 70, the same mounts a rotatable impeller 78 so that, when energized, the impeller 78 will draw air through the inlets 72 and direct the same out of the outlets 74 to cool the motor during its operation.

The shaft 76 extends downwardly through apertures (not shown) in the insulation layers 44 and 50 and plates 28, 40 and 48 and through a central aperture 79 in the apex of the baffle 34 into the tube 22 and mounts a propeller or impeller 80 configured such that upon energization of the motor 54, flue gases will be drawn upwardly into the tube 22 to impinge against the baffle 34 and be directed to the outlets 36 at an extremely high velocity so as to remove the heated products of combustion from the immediate environs of the assemblage. The openings through which the shaft 76 passes are made as small as possible to minimize the flow of combustion gases concentrically thereof toward the motor 54.

If desired, at some point intermediate the second layer of insulation 50 and the motor casing 54, the motor shaft 76 may be provided with any suitable means for minimizing the amount of heat conducted from the exposed end of the shaft 76 in the tube 22 to the motor 54. In the preferred embodiment, a heat slinger 82 is provided although the same effect could be achieved by use of a coupling. Provision of such means, while helpful to the operation of the device, is not a necessary requisite of its construction.

The draft inducer also includes a motor housing. According to the exemplary embodiment, the same is formed of a frusto-conical housing member 84 and a cap 86. As best seen in FIG. 2, the lower end 88 of the frusto-conical housing 84 is spaced above the plate 40 and further is located radially inwardly of the periphery thereof. The spacing defines an outlet for motor cooling air which will exit the housing defined by the members 84 and 86 in the direction of arrows 90. The frusto-conical member 84 is supported in the aforementioned position by upwardly extending legs 92 secured both to the frusto-conical member 84 and to the collar 46 at, for example, four locations about the periphery of the latter.

The cap 86 has a lower edge 94 that is located radially outwardly of the upper edge 96 of the frusto-conical member and is supported by legs 100 secured to both of the frusto-conical member and to the cap 86 such as to define an inlet for cooling air for the motor 54. As viewed in FIG. 2, cooling air will enter the housing defined by the members 84 and 86 in the direction of arrows 102.

The assemblage is completed by a baffle plate 104 within the housing defined by the members 84 and 86 and, specifically, within the member 84. The baffle plate 104 is provided with a central aperture which may receive a resilient seal 106 which, in turn, embraces the casing 70 of the motor 54 at some location intermediate the inlets 72 thereto and the outlets 74 therefrom. The outer periphery of the plate 104 fairly tightly conforms to the inner surface of the frusto-conical member 84 so that the upper portion of the housing including the inlet is isolated from the lower portion of the housing including the outlet and the only path for the passage of air therebetween is through the interior of the motor casing 70 by reason of action of the internal impeller 78 within the motor casing to cool the same.

From the foregoing, it will be appreciated that the invention provides an extremely efficient draft inducer that is long-lived. The use of two layers of insulation, one having a lesser periphery than the other, minimizes insulation costs while providing sufficient heat isolation from the hot products of combustion so as to protect the motor. The location of the motor housing inlets and outlets is such that hot gases of combustion exhausted from a flue are unlikely to inadvertently enter the motor housing in any event. Moreover, the combination of the V-shaped baffle 34 and the relatively narrow configuration of the passage 32 provides a venturi action to insure a high velocity exit of the exhaust gases to immediately move the same away from the immediate environment of the cooling circuit to insure maximum motor life.

We claim:

1. A draft inducer for a flue comprising: a tubular element adapted to be connected to a flue; a gas directing housing secured to one end of said tubular element and in fluid communication with the interior thereof, said gas directing housing including opposed gas exhausting outlets and plural channel means for receiving gases from the tubular element and for directing the same

outwardly through said outlets at substantially right angles; insulating means in substantial abutment with the upper surface of said gas directing housing; and electrical motor including a motor casing and an elongated shaft extending therefrom, said casing including inlet means adjacent the upper extremity of said motor and outlet means adjacent the lower extremity of said motor, said motor further including an inlet air impelling means rotatable with said shaft for driving cooling air through said motor casing; means mounting said motor above said insulating means with the shaft thereof generally coaxial with said tubular element, said shaft extending through said insulating means and said gas directing housing into said tubular element; a fan blade on said shaft within said tubular element; and means on said insulating means defining a housing for said motor; said motor housing having an upper cooling air inlet and a lower cooling air outlet; and a baffle interposed between said inlet and said outlet and engaging said motor casing.

2. A draft inducer according to claim 1 wherein said gas directing housing is configured to provide a high velocity exit of gases and to rapidly move heated products of combustion away from said housing.

3. A draft inducer according to claim 2 wherein said gas directing housing includes a generally V-shaped baffle interposed between said outlets and above said tubular element to direct heated products of combustion to said opposed outlets.

4. A draft inducer according to claim 1 further including means on said shaft and within said motor housing for minimizing conduction of heat from heated products of combustion to said motor.

5. A draft inducer according to claim 1 wherein said motor housing is defined by a hollow, frusto-conical member having its lower edge spaced above and radially inwardly of the periphery of said insulating means to define said lower outlet and a cap located above and secured to the upper end of said frusto-conical element, said cap having its lower edges located radially outwardly of the top of said frusto-conical element to define said upper inlet, and said baffle comprising a disc-like member in engagement with the interior surface of said frusto-conical element and sealingly engaging said motor casing below said inlet means therein.

6. A draft inducer according to claim 1 wherein said lower outlet is located above and peripherally about the periphery of said gas directing housing and said insulating means comprises a first layer of insulation isolating said gas directing housing from said lower outlet and said motor and a second layer of insulation superposed on said first layer of insulation and isolating said gas directing housing and said motor.

* * * * *