(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 053 703**
A2

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **81108910.1**

(22) Date of filing: **26.10.81**

(51) Int. Cl.³: **F 23 L 17/00**
F 04 D 25/08

(30) Priority: **05.12.80 US 213260**

(43) Date of publication of application:
16.06.82 Bulletin 82/24

(84) Designated Contracting States:
DE FR GB IT NL

(71) Applicant: **HONEYWELL INC.**
Honeywell Plaza
Minneapolis Minnesota 55408(US)

(72) Inventor: **Connell, John C.**
5108 Penn Avenue South
Minneapolis Minnesota 55419(US)

(74) Representative: **Rentzsch, Heinz et al,**
Honeywell Europe S.A. Holding KG Patent- und Lizenzabteilung Kaiserleistrasse 55
D-6050 Offenbach am Main(DE)

(54) **Blower motor cooling arrangement.**

(57) An induced draft type of furnace or heating system (10) is operated with a fan (31) that draws cooling air through the motor (24) that operates the fan or blower. The cooling air is drawn through passage means (23, 27, 29, 35) in the motor and then into the vent stack (11) of the furnace where the cooling air is mixed with the flue products and the mixture is forced out of the vent stack of the furnace (Figure 2).

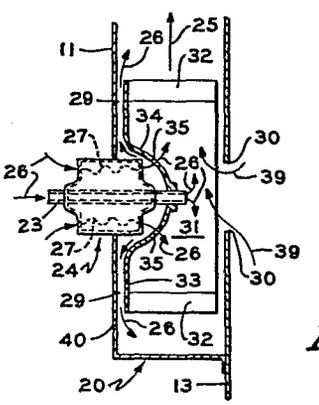

FIG. 2

EP 0 053 703 A2

HONEYWELL INC.
Honeywell Plaza
Minneapolis, Minn., USA

22.Oktober 1981
1008825 EP
Hz/umw

Blower Motor Cooling Arrangement

Background of the invention

The present invention relates to an electric blower motor cooling arrangement according to the preamble of claim 1.

For sometime it is known to use a blower in the vent stack of a furnace to induce a draft for moving the products of combustion from the combustion chamber to the atmosphere. Typically this type of induced draft furnace had the blower mounted in the heating system or furnace vent stack and the blower was operated by a conventional shaft and bearing connected to the motor that was mounted external to the stack. With the electric motor mounted external to the stack, the motor derived its basic cooling from the ambient air through the use of supplementary cooling fans driven by the motor.

This known type of an arrangement occupied a great deal of space for clearance around the cooling fans and consumes additional power.

It is therefore the main object of the present invention to provide for an electric blower motor cooling arrangement with fewer space and power requirements. This object is achieved by the invention as characterized in claim 1. Further advantageous embodiments of the present invention may be taken from the subclaims.

Summary of the invention

The present invention provides for mounting an electric blower motor through the vent stack itself to operate an associated impeller means to move the combustion products in the vent stack. The motor is designed with cooling air passage means through the motor. The mounting, motor, and impeller means are designed to create a negative pressure differential across the cooling air passage means to draw cooling air trough the motor structure to cool the motor and then exhaust this air into the furnace vent stack along with the products of combustion. This structure allows for a positive cooling function for the motor and its bearings, along with the ability to provide a trim profile for the furnace vent structure.

Brief description of the drawings

Figure 1 is a pictorial representation of a furnace incorporating the invention;

Figure 2 is a cross section of a blower means showing the cooling arrangement for the motor; and

Figure 3 is an isometric drawing of the motor and fan structure.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 discloses a pictorial representation of a conventional heating system or furnace 10 having a furnace vent stack 11 mounted through the top 12 of the furnace 10. The furnace 10 has a vestibule 13 in which are placed conventional appendages and controls for the furnace. In the vestibule 13 there are placed various parts of the fuel and control system for a furnace 10 as exemplified by the showing of a control transformer 14, a gas valve 15, a gas inlet pipe 16, and a gas pipe 17 to a burner (not shown) which is internal to the furnace 10. Internal to the furnace 10 and not shown is a heat exchanger which operates with the burner fed from the gas pipe 17. The control equipment including the transformer 14 and the gas valve 15 along with all of the control circuitry are conventional in a gas fired furnace. While a gas fired heating system has been specifically disclosed in Figure 1 it should be understood that any type of heating system or furnace that is operated with an induced draft condition can be used.

The furnace 10 is equipped with an induced draft blower means 20 that is disclosed as mounted in the vestibule 13 of the furnace 10. The induced draft blower 20 is energized by conductors 21 and 22 from control equipment (not shown) in a conventional fashion. The induced draft blower 20 includes a blower motor 24 that is central to the present invention. Its details will be provided after a general description of the operation of an induced draft blower type of furnace 10 is completed. The motor 24 operates a blower or impeller means 31 (Figures 2 and 3) within the induced draft blower 20 that draws the flue gases from

the combustion chamber and the internal heat exchanger within the furnace 10. The flue gases are then forced out of the stack 11 as indicated by the arrow 25. The operation of the motor 24 draws combustion air into the combustion chamber of the furnace 10 where it is efficiently burned to supply heat to the heat exchanger. The flue gases are then positively forced up the stack 11 rather than relying on gravity as in conventional furnaces. Also moved up the stack 11 is some cooling air which has been schematically represented at 26. The cooling air 26 is drawn through the motor 24 into the blower means 20 and is combined with the flue gases. The combination of the flue gases and the cooling air 26 is forced up the stack 11 and provides for a positive means of cooling the blower motor 24 as will be described in detail in connection with Figures 2 and 3.

In Figure 2 the vestibule 13 of the furnace 10 has been disclosed having an opening 30 that communicates with the combustion chamber. Immediately adjacent the opening 30 is an impeller means 31 of a centrifugal or squirrel cage type of blower. At 32 blower or impeller blades are disclosed, and the structure of the squirrel cage blower 31 is of a conventional design at least as to the portion 32. The blower means 31 further has an impeller backplate 33 that has a raised portion 34 which includes a plurality of holes 35, the purpose of which will be described later. The raised portion 34 of the backplate 33 is used to partially enclose the motor 24 in a protective manner from the inside of the stack 11. The motor 24 has a central shaft 23 that is disclosed as being hollow to form an air passage between the outside ambient air in the vestibule 13, and the interior of the stack 11. The motor 24 further has cooling air passage means generally disclosed at 27 through which cooling air 26 is drawn. The hollow shaft 23 forms part of the cooling air passage means.

In the disclosure of Figure 2 the cooling air drawn through the cooling air passage means 27 can flow through the holes 35 in the impeller backplate 33 as well as being drawn through the center opening of the motor shaft 23. The blower housing 20 further has an end member 40 or a housing backplate that forms one side of the blower. This can best be seen in Figure 1. There is a small space 29 between the housing backplate 40 and the impeller backplate 33 that forms a further air passage for the air flow disclosed at 26.

The operation of the furnace and the blower 20 can best be explained in connection with Figure 2. When the motor 24 is energized and is rotating, the impeller means 31 is driven by the motor means 24 and rotates to draw combustion products indicated at 39 into the impeller means 31 where they are driven up the stack 11 as indicated at 25. The operation of the blower motor means 24, in rotating the impeller means 31, creates a pressure drop between the free ambient air around the motor 24 and the vent stack 11. This pressure drop causes the cooling air 26 to flow through the shaft 23, the passage means 27 and into the stack 11. Some of the air is drawn through the holes 35 into the stack 11 while other parts of the air flow are at 29 between the scroll wall 40 and the back wall 33 of the impeller means 31.

It is important to point out at this time that the mounting of the motor 24 into a hole or opening in the vent stack 11 reduces the silhouette of the structure and further allows for the development of well defined cooling air passage means to allow cooling air to be drawn through the motor to keep the motor and its bearing structure within an acceptable operating range. The air 26 that is used for cooling is drawn from the ambient air into the stack 11 where it is mixed with the flue gases and this mixture is then expelled through the stack 11 as indicated at 25. By creating a pressure drop across the openings from ambient air

to the interior of the stack 11 a safe operating mode that allows for positive cooling of the blower motor 24 is created.

In Figure 3 an isometric view of part of the structure in detail has been disclosed. The difference between Figure 3 and Figure 2 is that the shaft 23 is shown as a solid shaft as opposed to a hollow shaft and vent holes 35 are not shown. In Figure 3 the shaft 23 is disclosed passing into motor coils 24' that are placed in a motor means 24. The cooling entering the motor means 24 has been again designated at 26 as a number of phantom lines. The blower structure 20 has been disclosed viewed from inside of the furnace 10, and it becomes apparent that the blower 20 is a squirrel cage type of blower having the impeller backplate 33 but in the version disclosed in Figure 3 the holes 35 have not been provided as all of the air passes in space 29 between the housing backplate 40 and the impeller backplate 33. The structure disclosed in Figure 3 has generally the same reference numerals as that disclosed in Figure 2, and a further description is believed unnecessary. The operation of the impeller means 31 causes air to be driven by the impeller means 31 up the stack 11 as indicated at 25. The rotation of the impeller means 31 creates a pressure drop that draws the cooling air 26 through the motor 25 and exhausts the cooling air 26 in the space 29 between the impeller backplate 33 and the housing backplate 40 where the air mixes with the products of combustion.

The primary differences between the disclosures of Figures 2 and 3 are in the design and extent of the cooling passage means for carrying the cooling air 26 into the stack 11. In Figure 2 a motor shaft 23 that is hollow has been disclosed along with vent holes 35 in the impeller backplate 33. In Figure 3 this means of cooling has been done away and the sole cooling path is through the motor structure and between the impeller backplate 33 and the housing backplate 40.

The exact structure for implementing the present invention is not limited to the specific structural details disclosed by the applicant. The invention is broadly directed to the principle of drawing cooling air through a blower motor that has cooling air passage means that extend from the normal ambient surrounding to the interior of a vent stack of a furnace. The operation of the blower within the vent stack creates a pressure drop that draws cooling air through the cooling air passage means to cool the motor and then mixes this air with the products of combustion from the furnace where they are in turn expelled in the furnace vent stack. Many modifications of the structure of the present invention are possible, and the applicant wishes to be limited in the scope of his invention solely by the scope of the appended claims.

Claims:

1. Anelectric blower motor cooling arrangement adapted to be operated in conjunction with a heating system vent stack to cool the blower motor with free ambient air while moving the flue gases of the furnace in said vent stack, c h a r a c t e r i z e d b y cooling air passage means (23,27,29) in said motor (24) extending from said free ambient air to an interior portion of said vent stack (11).

2. Cooling arrangement according to claim 1 with said motor being connected to drive impeller means within said vent stack, c h a r a c t e r i z e d i n t h a t said cooling air paasage means (23,27,29) extend to an interior portion of said vent stack (11) adjacent to said impeller means (31).

3. Cooling arrangement according to claim 2, c h a r a c t e r i z e d i n t h a t said impeller means (31) includes squirrel cage impeller means (32) mounted for rotation in a housing scroll (40) that forms part of said heating system.

4. Cooling arrangement according to claim 3, c h a r a c t e r i z e d i n t h a t said impeller means(31) includes an impeller backplate (33)with a central opening connected to mount said impeller means to said blower motor (24) with said impeller backplate (33) having a portion (34) partially covering said blower motor (24) and said opening in said vent stack (11) to protect said blower motor from said flue gases while at the same time providing a portion (29) of said cooling air passage means.

5. Cooling arrangement according to claim 4, characterized in that said portion (34) of said impeller backplate (33) has openings (35) as part of said cooling air passage means.

6. Cooling arrangement according to claim 4, characterized in that, said blower motor (24) has a hollow rotor shaft (23) as part of said cooling air passage means.

7. Cooling arrangement according to claim 5, characterized in that said squirrel cage impeller means (31) and said impeller backplate means (33) form part of ambient air movement means to provide a pressure drop between said ambient air and said vent stack to draw said ambient air through said blower motor cooling air passage means to cool said motor.

1/2

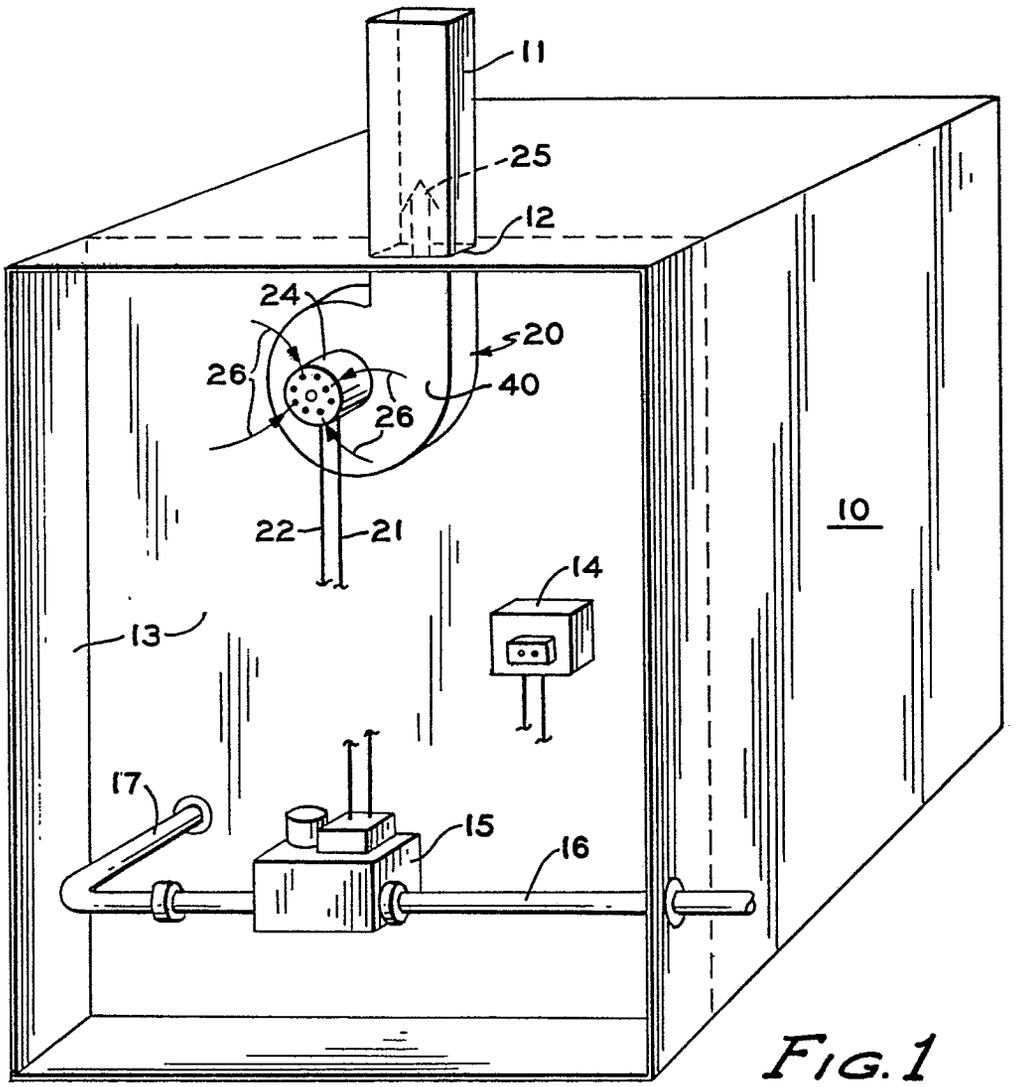
11
25
12
24
20
26
40
26
22
21
10
14
13
17
15
16

FIG. 1

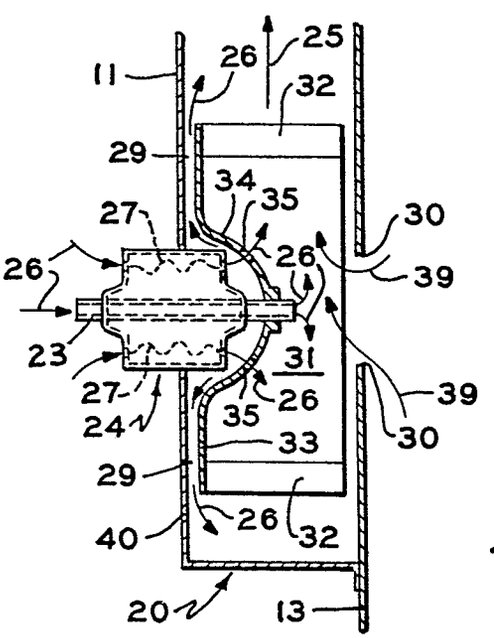
25
11
26
32
29
34
35
27
30
26
26
39
23
31
27
26
39
24
35
33
30
29
26
40
32
20
13

FIG. 2

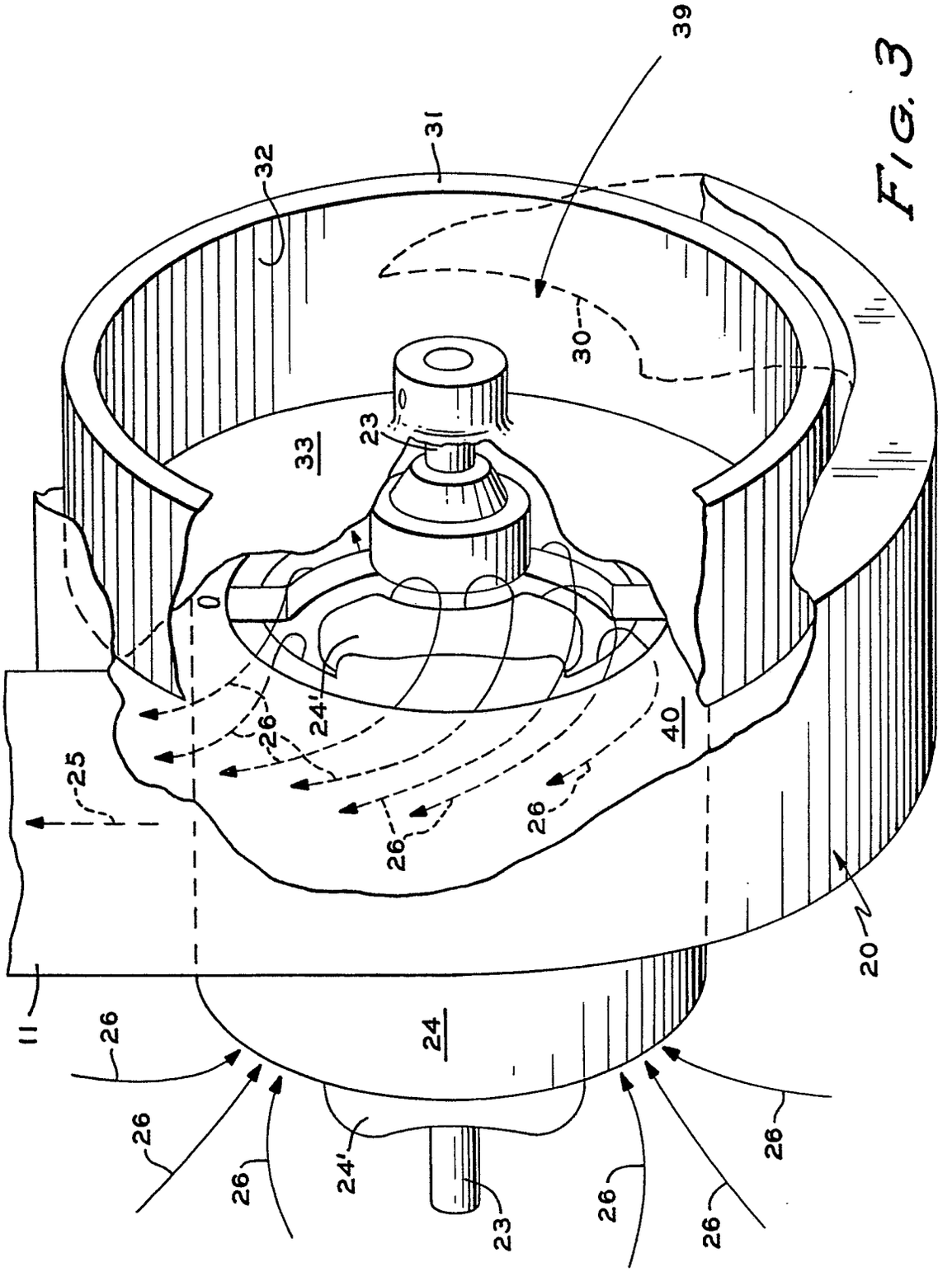

FIG. 3