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BLOWER FOR ANNEALING FURNACES AND THE LIKE

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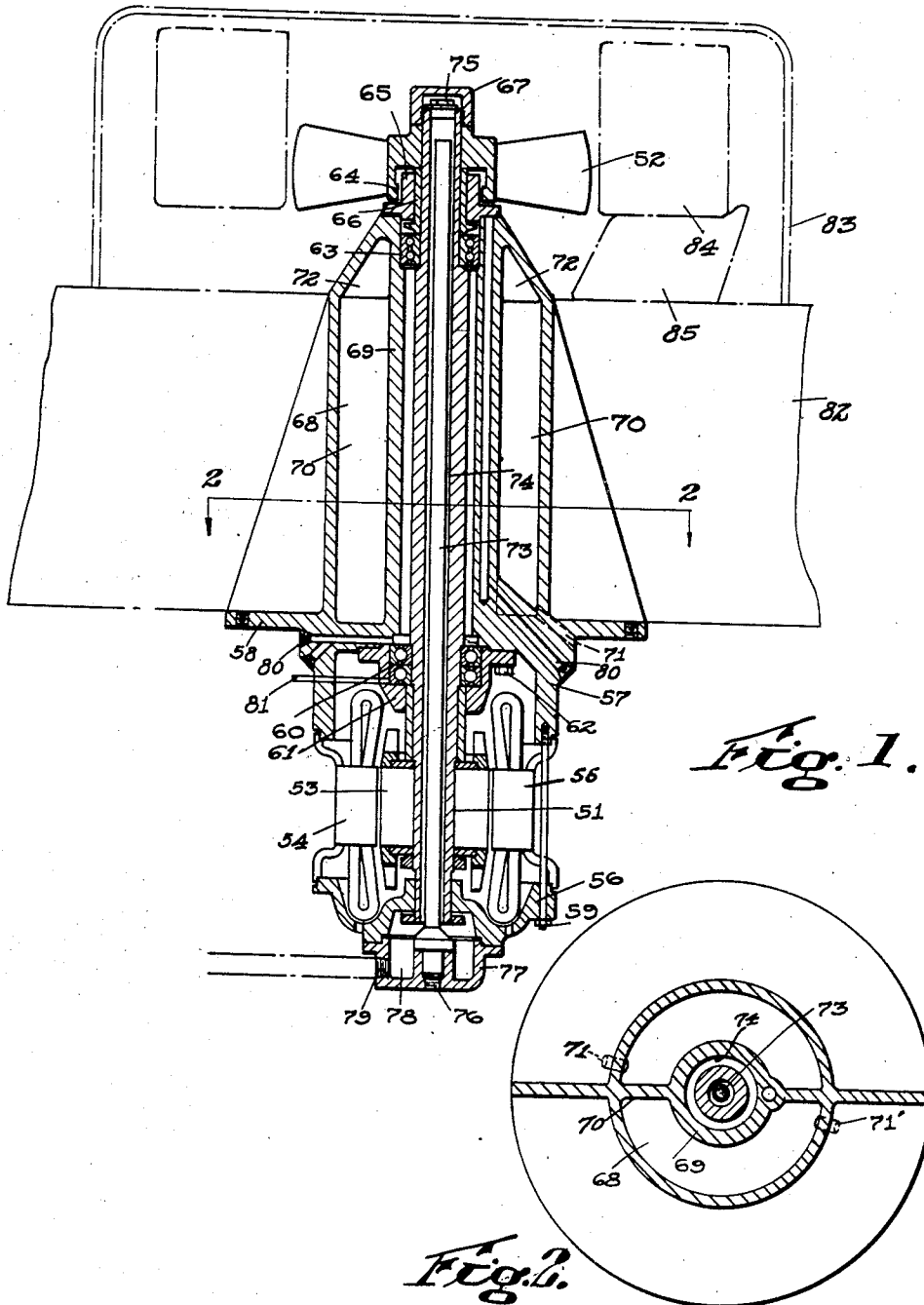


Fig. 1.

Fig. 2.

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BLOWER FOR ANNEALING FURNACES AND
THE LIKE

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4 Claims. (Cl. 230—209)

The present invention relates to a blower especially for use in distributing or circulating the hot gases in annealing furnaces, and is particularly directed to a blower in which the driving mechanism is kept at a suitable operating temperature by the circulation of a cooling fluid.

Where the blower operates in a high temperature, as for example, in furnaces for annealing, or otherwise treating metals, the fan is necessarily located in an atmosphere of extremely high temperature. As a result, heat from the fan is conducted along the driving shaft of the fan to the bearings which support the shaft and to the driving mechanism, which may be suitable gearing or a driving motor. It is obvious that too much heat in the bearings or driving mechanism will detrimentally affect the operation and life of the blower, and it is accordingly the principal object of the present invention to provide for so completely cooling the driving shaft for the fan, that the bearings for the shaft will not become overheated and that the driving mechanism may not be affected by the conducted heat.

In carrying out the objects of the invention the essential feature is to provide for the circulation of sufficient fluid around or through the drive shaft between the fan on the end thereof and the supporting structure, so that the heat transmitted along the shaft may be entirely dissipated and thereby keep the portions of the shaft adjacent to the bearings and driving mechanism at a relatively low temperature. This cooling action must be obtained without any connection to the interior of the furnace or oven, and the fan must be so arranged that there will be no substantial leakage of the gas from within the furnace by passing around the fan shaft or the supporting structure therefor.

Other and further objects and advantages of the invention will hereinafter more fully appear from the following detailed description taken in connection with the accompanying drawing in which—

Fig. 1 is a vertical sectional view through a device embodying the invention, showing the device in position in the wall of an annealing furnace.

Fig. 2 is a horizontal sectional view along the line 2—2 of Fig. 1.

Like reference characters refer to like parts in the different figures.

With reference to Fig. 1, the blower in this arrangement is cooled by a cooling liquid, such as water. In this figure, the driving shaft 51 for the circulating fan 52, which is secured to the

upper end thereof, has attached thereto at the lower end, the rotor 53 of a motor 54. The stator 55 of the motor is mounted between a cap 56 at the lower end thereof and a housing 57, the latter being secured in position on an annealing furnace by an outwardly projecting flange 58. Suitable bolts 59 hold the cap 56 in position and the cap has a central bore to receive the lower end of the shaft 51. Suitable anti-friction bearings 60 support the shaft 51 directly above the rotor, these bearings being held in position by a ring 61 suitably secured, as by bolts 62, to the housing. Additional anti-friction bearings 63 are located adjacent the upper end of the shaft 51 below the fan 52 and it is these bearings which must be kept relatively cool in order for the device to function satisfactorily.

The hub of the fan 52 has an inwardly projecting flange 64 which is spaced slightly from the outer cylindrical surface of a cap 65 on the upper end of the housing and the bore of the cap receives a sleeve 66 surrounding the shaft between the hub of the fan and the upper bearing 63. The passage of hot gases from within the furnace into the bearings 60 and 63 is accordingly prevented by the arrangement of the cap 65. The fan is held in position on the shaft by a threaded cap 67 which locks the fan against rotation.

Between the bearings 60 and 63 the housing 46 has an annular chamber 68, the inner wall 69 of which is spaced from the shaft 51. Radial fins 70 extending parallel to the axis of the shaft 51 are positioned in the chamber 68 so that fluid entering the chamber through an opening 71 at the lower end thereof is directed upwardly to the upper end of the chamber, passing through orifices 72 provided between the upper edge of the radial fins 70 and the upper end of the chamber to assure a circulation of cooling fluid within the chamber to a point at least as high as the bearings 63. Fluid is discharged through an exhaust connection 71', Fig. 2, also located at the lower end of the chamber 68, and on the side of the fins 70 opposite to the inlet.

A further arrangement for cooling the shaft is provided by positioning a vertical pipe 73 within a central bore 74 which extends the entire length of the shaft 51, the bore being closed at its upper end by a plug 75. The upper end of the pipe 73 is spaced from the plug 75 so that cooling fluid entering the pipe through a connection 76 provided in a small cap 77 which supports the pipe 73, and is secured to the cap 56, will be discharged from the upper open end of the pipe and will pass downwardly between the pipe and the

inner surface of the hollow shaft to be discharged into a chamber 78 within the cap 77 and thence through an exhaust connection 79.

To assure a positive lubrication of the bearings 60 and 63 suitable grease connections 80 are provided in the housing 57 and a grease overflow connection 81 is also desirable to avoid the possibility of grease reaching the driving motor.

In operation, a cooling fluid is pumped into the connection 71 to pass upwardly through the chamber 68 and by way of orifices 72 downwardly again through the chamber and out the exhaust connection, thereby maintaining the temperature of the housing 57 adjacent both bearings 60 and 63 at a relatively low point. The shaft 51 is also kept at a low temperature adjacent the same bearings by a circulation of water upwardly through the pipe 73 and thence downwardly between the pipe and the shaft. By this arrangement the bearings 60 and 63 are both kept at such a temperature as to permit satisfactory operation of the blower without the possibility of damage to the bearings or other parts of the device.

The bottom wall 82 of the furnace or oven has an opening to receive the housing 57, and the circulating fan 52 is located beneath a hood 83 in which coils of wire 84, or other material to be annealed, are positioned on suitable supports 85 which will permit a circulation of air around the coils. The fan shown is a propeller type but any other type may readily be substituted.

From the foregoing it will be apparent that the device provides for cooling of the driving shaft and associated structure of a vertical blower for use especially in the circulation of gases at extremely high temperatures. The arrangement is such that both the shaft and the housing are kept cooled at least to a point above the uppermost bearing for the driving shaft for the fan, thereby avoiding the possibility of injury to any of the bearings, with the resultant breakdown of the device.

We claim:

1. A vertical blower comprising a housing adapted to be positioned in the wall of a chamber, a shaft in said housing and extending vertically with its upper end within the chamber, a fan on said upper end, bearings provided by the housing for the shaft, and an annular chamber provided by the housing and extending toward the fan at least as near as the adjacent bearing, said

chamber having a provision for the circulation of cooling liquid therethrough to keep the bearing cool, the lower end of the shaft being accessible from the outside of the chamber wall and being hollow at least to a point between the fan and the adjacent bearings to provide for a circulation of a cooling fluid through said shaft from the lower end thereof.

2. A blower, comprising a housing adapted to be positioned in the wall of a chamber within which hot gases are located, a shaft journaled in said housing with its inner end extending into the chamber, a fan on said inner end, bearings provided by the housing for the shaft, the bearing adjacent the fan being positioned within the chamber, a water jacket provided by said housing, said jacket surrounding the shaft between the bearings and extending toward the fan at least as near as the adjacent bearing, and inlet and exhaust connections to said water jacket.

3. A blower, comprising a housing adapted to be positioned in the wall of a chamber within which hot gases are located, a shaft journaled in said housing with its inner end extending into the chamber, a fan on said inner end, bearings provided by the housing for the shaft, a water jacket provided by said housing and extending toward the fan at least as near as the adjacent bearing, and webs in said water jacket to assure a circulation of the cooling fluid throughout the length of the jacket.

4. A blower, comprising a housing adapted to be positioned in the wall of a chamber within which hot gases are located, a shaft journaled in said housing with its inner end extending into the chamber, a fan on said inner end, bearings provided by the housing for the shaft, said shaft being hollow from the end opposite the fan to a point between the fan and the adjacent bearing, a pipe extending within said hollow shaft from the open end thereof to a point between the fan and the adjacent bearing for directing a cooling fluid throughout the entire hollow portion of the shaft, a water jacket provided by the housing, said jacket surrounding the shaft between the bearings and extending toward the fan at least as near as the adjacent bearing, and webs in the water jacket to assure a circulation of cooling fluid throughout the length of the jacket.

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