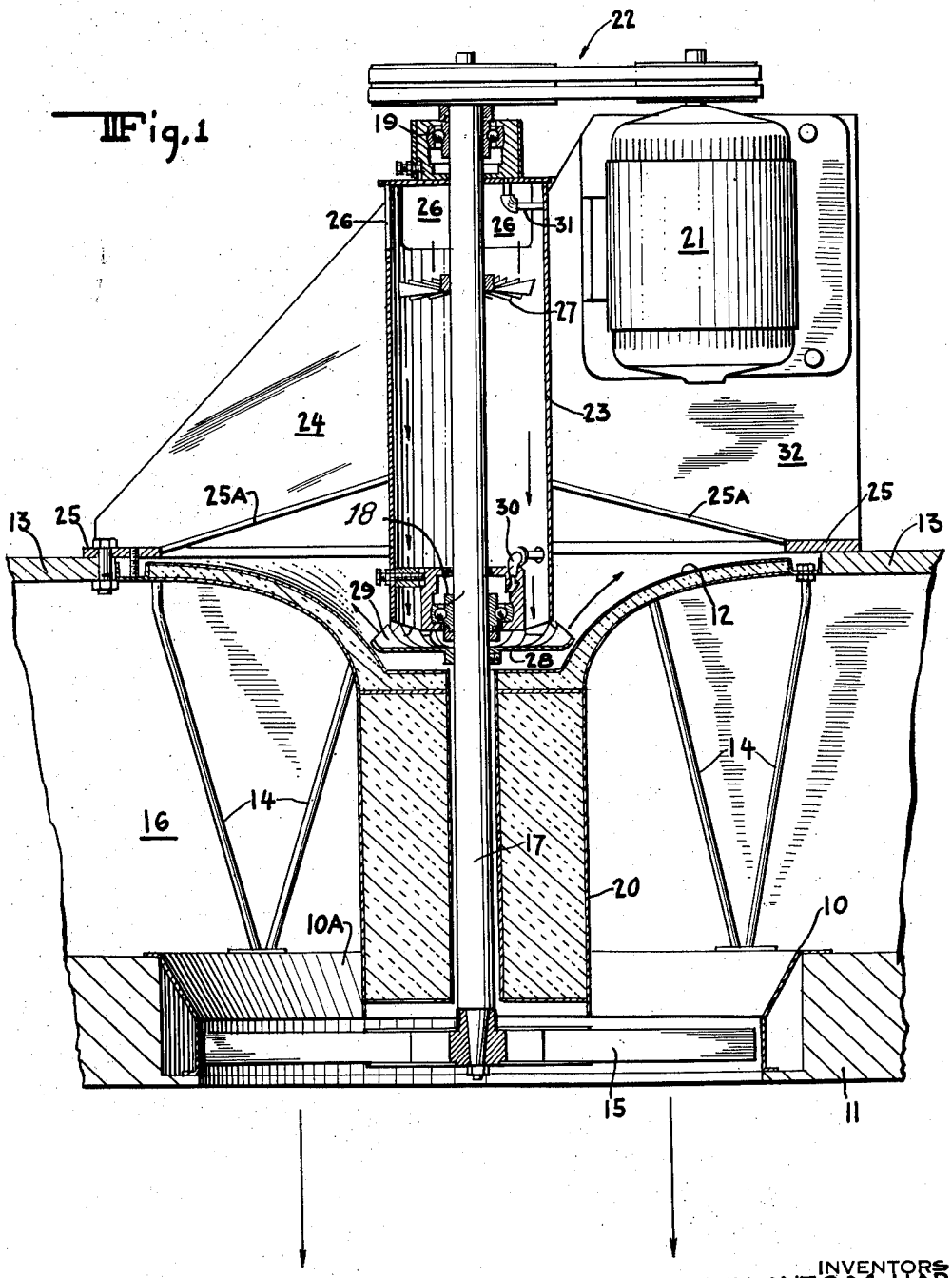
June 18, 1963 R. L. HULL ETAL 3,094,273

FAN ASSEMBLY

Filed June 25, 1959 2 Sheets-Sheet 1

Fig. 1



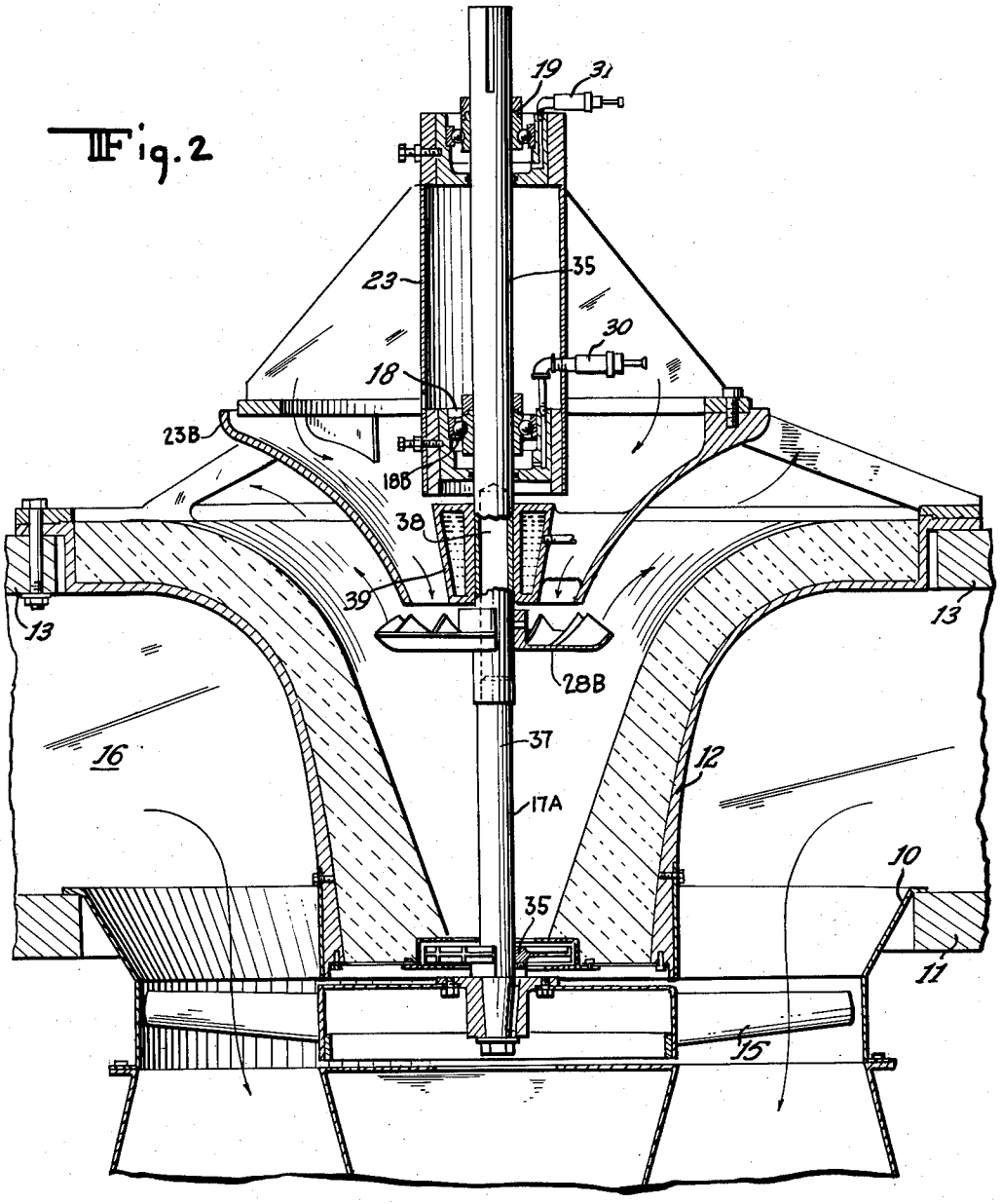
INVENTORS
ALONZO M. HARP
RICHARD L. HULL
BY
Pollard Johnston Enyeart & Robertson
ATTORNEYS

June 18, 1963 R. L. HULL ETAL 3,094,273

FAN ASSEMBLY

Filed June 25, 1959 2 Sheets-Sheet 2

Fig. 2



INVENTORS
ALONZO M. HARR
RICHARD L. HULL
BY
Pollard Johnston Smyth & Robertson
ATTORNEYS

United States Patent Office 3,094,273 Patented June 18, 1963

3,094,273

FAN ASSEMBLY

Richard L. Hull, Davenport, Iowa, and Alonzo M. Harp, Moline, Ill., assignors to Ametek, Inc., a corporation of Delaware

Filed June 25, 1959, Ser. No. 822,951
7 Claims. (Cl. 230—211)

This invention relates to a fan assembly, and particularly to a fan assembly for moving hot gases wherein means are provided for cooling one of the bearings of the assembly.

In high temperature ovens or furnaces where the hot gases in the furnace are moved therethrough by a fan assembly, it has been found that certain of the parts of the fan assembly will not withstand the high temperature too well. This is particularly true of the bearings which rotatably support the fan wheel shaft. Various arrangements have been devised which segregate certain portions of the fan assembly, including the bearings, from the hot gases passing through the furnace. Such arrangements are not entirely satisfactory for certain types of fan assemblies, since the parts close to the high temperature furnace are subjected to high temperatures even though they are segregated from the interior of the oven or furnace.

It is an object of this invention to provide a fan assembly for moving hot gases wherein the bearings for the fan wheel shaft are segregated from the hot gases being moved.

It is another object of this invention to provide a fan assembly having cooling means for cooling the bearing nearest the hot gases.

It is a further object of this invention to provide a new type of fan assembly including a frame member supported on a shroud ring and a vane arrangement connected to the shaft for deflecting the cooling air passed through the bearing means by the auxiliary fan.

In one aspect of the invention, the fan assembly for moving the hot gases has a fan wheel, a rotatable shaft connected to the fan wheel having a portion segregated from the hot gases, and tube or passage means surrounding part of the segregated portion of the shaft. In order to prevent the undue heating of the bearing means by the hot gases, a heat resistant frame member is located between one end of the tube and the hot gases. Interposed between this end of the tube and the frame member and connected to the shaft for rotation therewith is a rotating member. The cool gases pass through the bearing means and move against the rotating means which cause the gases to move outwardly away from the tube.

In a further aspect of the invention the rotating means includes vanes mounted to form a centrifugal fan wheel. The frame member is supported by a plurality of rods secured to the shroud ring.

These and other objects, advantages and features of the invention will become apparent from the following description and drawings which are merely exemplary.

In the drawings:

FIG. 1 is a cross-sectional side elevation of one embodiment of the fan assembly of the invention; and

FIG. 2 is a cross-sectional side elevation of another embodiment thereof.

As shown in FIG. 1, a shroud ring **10**, including a flanged ring adapted to be secured to the bottom wall **11** of a high temperature oven or furnace, is attached to the outer ring of a dish-shaped, heat insulating frame member **12** by means of a plurality of rods **14**. The rods **14** are connected at one end to the shroud ring **10** and at the other end to the frame member **12**. Frame member **12** substantially closes an opening in top wall **13** to thereby insulate the air above the frame member

from the very high temperatures of the interior **16** of the furnace. Vanes **10A** may be located above the fan wheel **15**.

In the form shown in FIG. 1, the fan wheel **15** is rotated in a direction so as to move hot gases through the interior **16** of the furnace. Fan wheel **15** is secured to shaft **17** for rotation therewith. Shaft **17** itself is rotatably mounted in a pair of bearings **18** and **19**. In order to prevent the excessive heating of the portion of shaft **17** below frame member **12**, a heat insulating tubular casing **20** is provided.

Shaft **17** may be suitably rotated, as shown in FIG. 1, by motor **21** through the pulley and sheave arrangement shown generally as **22** in the drawing. Surrounding the portion of shaft **17** above frame member **12** is a tube or passage means **23** held in position relative to the top wall of the furnace by plates **24**, only one of which is shown, which are connected to a ring **25** bolted or otherwise secured to the top wall **13**, said plates having flanges **25A**. In the FIG. 1 form, passage means **23** supports bearings **18** and **19** and has spaced openings **26** at its upper end. In order to move cool gases from the openings **26** through bearing **18**, which is the bearing closest to the furnace and, therefore, the bearing which is subjected to the most heat, an auxiliary fan wheel **27** secured to shaft **17** for rotation therewith may be provided. As can be seen in FIG. 1, the cool gases will be moved by fan wheel **27** downwardly through tube **23** and then through bearing **18**. However, it has been found that these gases hit the top of frame member **12**. In order to alleviate this problem, a centrifugal fan wheel **28** having a plurality of spaced vanes **29** thereon is mounted between the top of frame member **12** and the bottom of tube **23** on shaft **17** for rotation therewith. Thus, the gases which have been moved through bearing **18** by auxiliary fan wheel **27** are forced upwardly and outwardly in the direction of the arrows with the assistance of the rotating vanes **29**. Wheel **28** also helps to prevent any leakage of the hot gases upwardly from the interior of the furnace to bearing **18**.

If desired, lubricating passages **30** and **31** may be provided in bearings **18** and **19** respectively. Motor **21** may be secured to tube or passage means **23** by plate **32**.

As can best be seen in FIG. 1, the entire fan assembly may be removed from the furnace, as a unit, by merely loosening the connections between top wall **13** of the furnace and ring **25**. The assembly is adequately supported in position relative to the furnace by the flanges on frame **10**, ring **25**, plates **24**, plate **32** and rods **14**.

The modification of the invention illustrated in FIG. 2 operates in essentially the same manner as that shown in FIG. 1, and similar parts have been given the same reference numeral with the addition of a "B" thereto.

In the FIG. 2 modification, the tube or passage means **23B** is cup-shaped rather than cylindrical and the auxiliary fan **27** is omitted. In this case, the cool air flows inwardly and downwardly over the top surface of passage means **23B** adjacent bearing **18B** and against wheel **28B** which forces it upwardly and outwardly in the direction of the arrows. Thus, the FIG. 2 modification operates in the same manner as that shown in FIG. 1 to cool the lower bearing.

Shaft **17A** can be made up of a plain shaft **35** bored at one end. A shaft **37** is then pressed part way into bore **36** and welded leaving a hollow space **38** below the lower bearing. Heat traveling up the solid portion of shaft **37** will be forced to the peripheral portion of shaft **35** around bore **38**, thus increasing the total heat transfer therefrom and further retarding the heating of the lower bearing. This feature can, of course, be applied to both modifications shown.

In order to further ensure heat dissipation, a hollow

housing 39 may be provided which surrounds shaft 35. Water or other cooling liquid may be circulated through the hollow portion of housing 39 to provide cooling even when the fan is inoperative and the oven or furnace is hot.

Since the normal action of fan wheel 28B is to draw some of the hot gases from the blade 15 upwardly through the center of casing 20 (FIG. 2), a lower auxiliary fan wheel 35 may be provided on shaft 17A to act as a rotary seal to help prevent the leakage of hot air upwardly from the furnace toward the segregated portion of the shaft. If desired, this feature could also be incorporated in the FIG. 1 modification.

As can readily be seen, the fan assembly of the invention is especially useful in connection with high temperature ovens or furnaces or other applications where the parts of the assembly are subjected to the effect of gases at very high temperature. This utility is especially true in the case of the bearing adjacent the hot gases, which is adequately protected at all times by the combination of the frame member and the deflecting vane arrangement of the invention, as well as by the heat dissipating construction of the drive shaft and the auxiliary cooling jacket.

It will be understood that details of the construction can be varied without departing from the spirit of the invention except as defined in the appended claims.

What is claimed is:

1. Apparatus comprising in combination, an enclosure within which gases are adapted to be heated to a high temperature, said enclosure including a wall having an outlet therein for the escape of hot gases from said enclosure; a fan assembly including first fan means located within said outlet for moving said gases in said enclosure; a drive shaft for said first fan means having a portion extending transversely across said enclosure; spaced bearings for rotatably supporting said shaft, at least one of said bearings being adjacent said enclosure; insulating means extending transversely across said enclosure and completely surrounding and isolating from the enclosure, said portion of said drive shaft therein as well as said one of said bearings; said insulating means having a recessed portion at one end thereof, second fan means located on said shaft between said one of said bearings and said insulating means for circulating cool gases over said one of said bearings said second fan means and said one of said bearings being positioned within said recessed portion of said insulating means; and means for rotating said shaft.

2. Apparatus comprising in combination, an enclosure within which gases are adapted to be heated to a high temperature, said enclosure including a wall having an outlet therein for the escape of hot gases from said enclosure; a fan assembly including first fan means located within said outlet for moving said gases in said enclosure; a drive shaft for said first fan means having a first portion extending transversely across said enclosure, and a second portion extending outwardly from said enclosure; tubular means having openings near both ends thereof and surrounding said second portion of said shaft; bearings supported by said tubular means for said shaft, at least one of said bearings being located within said tubular means adjacent said enclosure; insulating means extending transversely across said enclosure and completely surrounding and isolating from said enclosure, said first portion of said drive shaft as well as said one of said bearings; second fan means for circulating cool gases through said tubular means and over the bearing therein; and means outside of said enclosure for rotating said shaft.

3. Apparatus comprising in combination, an enclosure within which gases are adapted to be heated to a high temperature, said enclosure including a wall having an outlet therein for the escape of hot gases from said enclosure; a fan assembly including first fan means located within said outlet for moving said gases in said enclosure; a drive shaft for said first fan means having a first portion extending transversely across said enclosure, and a second portion extending outwardly from said enclosure; tubular means having openings near both ends thereof and surrounding said second portion of said shaft; bearings supported by said tubular means for said shaft, at least one of said bearings being located within said tubular means adjacent said enclosure; insulating means extending transversely across said enclosure and completely surrounding and isolating from said enclosure, said first portion of said drive shaft as well as said one of said bearings; centrifugal fan means for circulating cool gases through said tubular means and over the bearing therein; and means outside of said enclosure for rotating said shaft.

4. Apparatus as claimed in claim 1, in which a third fan means is provided between said insulating means and said first fan means for preventing hot gases from said enclosure from leaking into said insulating means around said shaft adjacent said first fan means.

5. A fan assembly for moving hot gases as claimed in claim 1, in which a hollow jacket surrounds said drive shaft and is located between said one of said bearings and said second fan means; and means for circulating cooling fluid through said jacket.

6. A fan assembly for moving hot gases as claimed in claim 1, in which said drive shaft includes two parts, one of said parts being provided with an axial bore within at least one end thereof, and means connecting the two parts together at the end including said axial bore, whereby a chamber is formed within said drive shaft between said two parts.

7. Apparatus comprising in combination, an enclosure within which gases are adapted to be heated to a high temperature, said enclosure including a wall having an outlet therein for the escape of hot gases from said enclosure; a fan assembly including first fan means located within said outlet for moving said gases in said enclosure; a drive shaft for said first fan means having a first portion extending transversely across said enclosure, and a second portion extending outwardly from said enclosure; tubular means having openings near both ends thereof and surrounding said second portion of said shaft; bearings supported by said tubular means for said shaft, at least one of said bearings being located within said tubular means adjacent said enclosure; insulating means extending transversely across said enclosure and completely surrounding and isolating from said enclosure, said first portion of said drive shaft as well as said one of said bearings; second fan means connected to said shaft and located between said one of said bearings and said first fan means; third fan means connected to said shaft and located within said tubular means; and means outside of said enclosure for rotating said shaft.

References Cited in the file of this patent

UNITED STATES PATENTS

722,875	Naef	Mar. 17, 1903
1,530,982	Coppus	Mar. 24, 1925
1,953,540	Ogden	Apr. 3, 1934
2,226,986	Wechsberg et al.	Dec. 31, 1940
2,352,206	Kendall	June 27, 1944
2,656,973	Sutherland	Oct. 27, 1953
2,694,157	Cone	Nov. 9, 1954
2,697,179	Wendel	Dec. 14, 1954
2,735,027	Formhals et al.	Feb. 14, 1956
2,770,891	Wendel	Nov. 20, 1956

FOREIGN PATENTS

346,140	Italy	Jan. 30, 1937
388,991	France	June 15, 1908
404,162	Great Britain	Feb. 28, 1933