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HIGH-TEMPERATURE FAN

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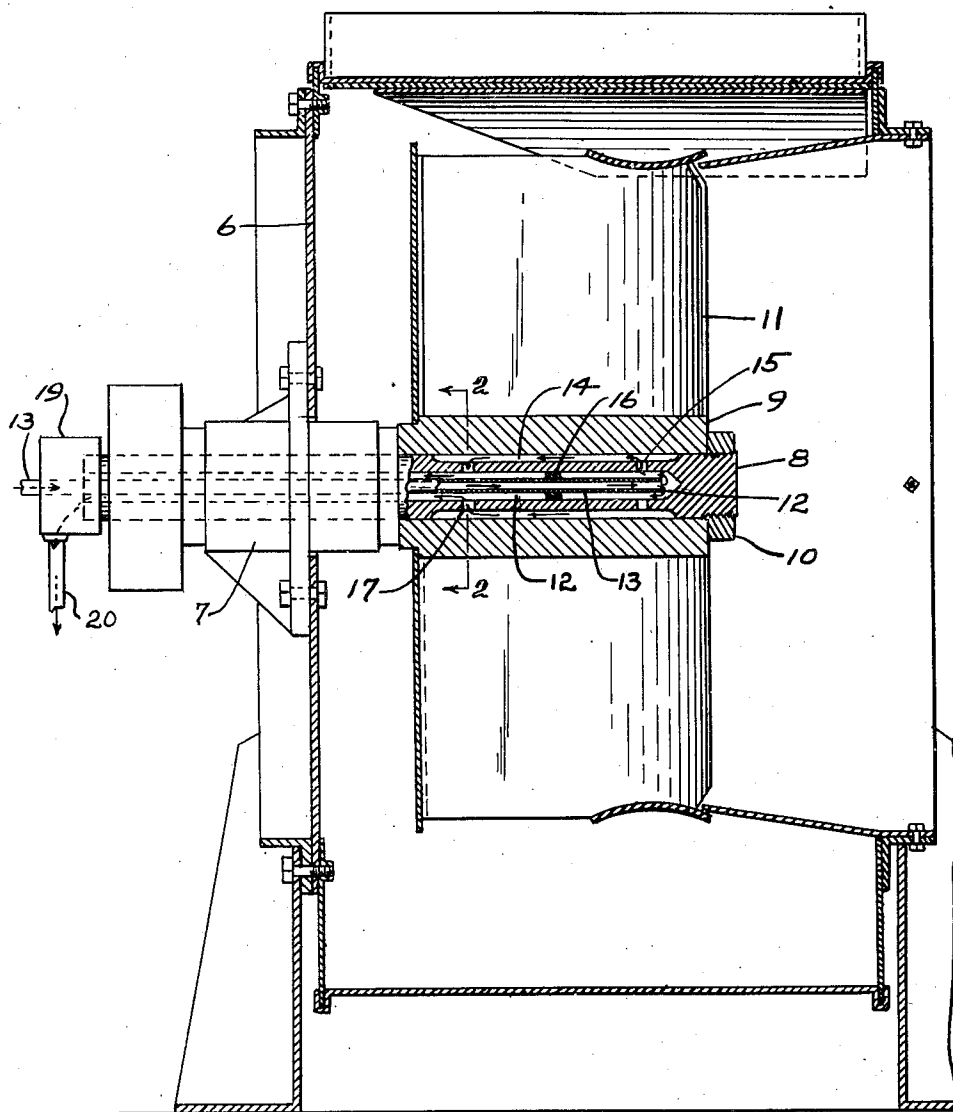


Fig. 1.

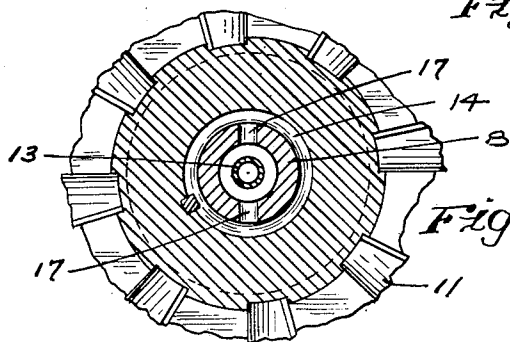


Fig. 2.

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HIGH-TEMPERATURE FAN

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2 Claims. (Cl. 230—209)

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This invention relates to the cooling of the hubs of fans used for moving high temperature gases.

Fans are used for moving gases having temperatures as high as 1600° F. The temperature of the gas in one installation may cycle between 800° and 1600° F. The blades of the fans are under mechanical stress as well as being exposed to high temperatures, and unless the hubs to which they are secured, are adequately cooled, the metal becomes brittle, and the blades and their joints to the hubs, crack and fail.

When the hubs of such fans are inadequately cooled, the hubs expand away from the shafts and take permanent sets leaving air gaps between the hubs and shafts. The characteristic of metal which resists such a permanent set is called "creep strength." The creep strength of steel decreases very rapidly when exposed to temperatures above 900° F.

Attempts have been made to cool the hubs of fans used for high temperature duties by circulating cooling water through the shafts upon which the hubs were supported, but such cooling has not been effective when the fans were first used with high temperature gases so that the hubs expanded away from the shafts taking permanent sets leaving air gaps between the hubs and shafts, which air gaps lessened the heat transfer from the hubs to the shafts with the result that as the fans continued to be used with high temperature gases, the conditions became progressively worse. The lives of such fans were relatively short for the blades soon failed.

This invention provides for circulating cooling water through the hub of a fan whereby the hub is cooled directly by the water instead of being cooled through the intermediary of a shaft as has been the practice in the past. Utilizing this invention, the hub of a fan handling gases the temperature of which cycled between 800 and 1600 degrees F., was cooled to a temperature which varied between 600 and 700 degrees F.

An object of the invention is to prevent the overheating of the hubs of fans handling high temperature gases.

Another object of the invention is to cool the hub of a fan handling high temperature gases, by circulating a cooling liquid directly in contact with the inner surface of the hub.

The invention will now be described with reference to the drawing, of which:

Fig. 1 is a side elevation, in section, of a centrifugal fan embodying this invention, and

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

The fan illustrated is of the general type disclosed in detail in the U. S. Patent No. Re. 20,409, and has the casing 6 to which is supported the bearing 7 through which the shaft 8 extends.

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The hub 9 is held in place on the shaft by the nut 10 screwed on the threaded end thereof. The fan blades 11 have their root edges joined to the hub 9 as by welding, or they may be cast integral therewith.

The shaft 8 has a central, circular opening 12 extending along the center thereof and terminating adjacent the inner end of the hub 9. The hollow, cylindrical tube 13 is supported in the opening 12 coaxial therewith, and has a substantially smaller diameter than the opening 12 whereby water can be circulated in the opening 12 around the exterior of the tube 13.

The portion of the shaft 8 within the hub 9 has an annular recess 14 formed therein providing a water flow passage between the interior surface of the hub and the exterior surface of the shaft. The circular, radially extending openings 15 connecting the shaft opening 12 and the annular recess 14, extend through the walls of the shaft adjacent the inner or air entering end of the hub 9. Similar openings 17 extend through the shaft walls adjacent the outer end of the hub.

The member 16 contacts the exterior surface of the tube 13 and the surface of the shaft around the opening 12, midway between the openings 15 and 17, and serves to support the tube in the shaft, and as a water dam as will be described.

The tube 13 extends through the packing box 19 into the shaft. The water supplied through the tube 13, after circulating through the shaft and hub, is discharged through the pipe 20.

In operation, the water supplied through the tube 13, passes out its inner end into the shaft opening 12, and then through the openings 15 into the annular recess 14 in contact with the inner surface of the hub, and then passes out of the annular recess through the openings 17 into shaft opening 12 for discharge through the pipe 20 to waste or recooling. The member 16 forms a dam across the space between the outer surface of the tube and the inner surface of the shaft, between the openings 15 and 17 for preventing the water at the end of the tube from being returned through this space.

The cooling water is seen to contact the inner surface of the hub thereby directly cooling same.

The bearings 7 as located would be water cooled but since forming no part of this invention, its cooling details have not been illustrated.

While one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not limited to the exact apparatus and arrangement thereof may be suggested by those skilled in the art without departure from the essence of the invention.

What is claimed is:

1. A fan comprising a shaft having a central,

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longitudinal opening therein, a hub on said shaft, said shaft having an annular recess within said hub, said shaft having circular openings connecting said central opening and said recess adjacent one end of said hub and having other circular openings connecting said central opening and said recess adjacent the other end of said hub, a liquid supply tube extending into said central opening at one end of said shaft and terminating adjacent said first mentioned circular openings, said tube having a smaller outer diameter than the diameter of said central opening, said tube supplying cooling liquid into said central opening and through said first mentioned circular openings into said recess for cooling the inner surface of said hub, said other circular openings returning said cooling liquid from said recess into said central opening, said shaft having means at said one end for exhausting said cooling liquid, and means forming a dam between said first men-

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tioned circular openings and said other circular openings, and in contact with the outer surface of said tube and the inner surface of said shaft.

2. A fan as claimed in claim 1 in which the dam is located at a point substantially midway between the first mentioned circular openings and the other circular openings, and supports the tube from the shaft at that point.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
723,000	Marsden	Mar. 17, 1903
1,768,486	Ogden	June 24, 1930
2,339,779	Holzwarth	Jan. 25, 1944