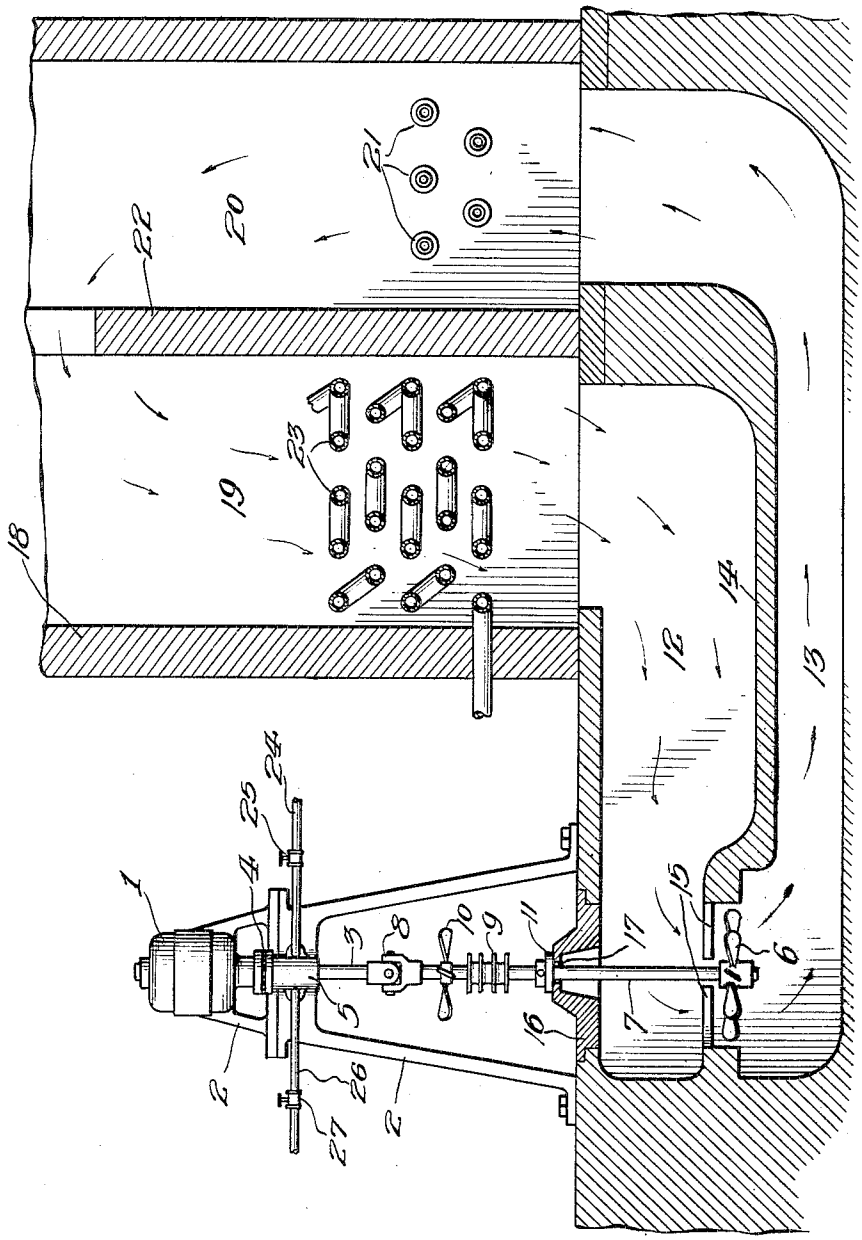
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DEVICE FOR RECIRCULATING HIGHLY HEATED GASES

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DEVICE FOR RECIRCULATING HIGHLY HEATED GASES

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The present improvements relate to a device adapted to circulate and recirculate hot gases, and more particularly to a device adapted to recirculate into a furnace partially or totally spent or used hot gaseous products of combustion.

Fans and blowers, which are forms of devices for accomplishing this purpose, are in general use and are subjected to severe temperature conditions. Bearings and such other parts that would be damaged by heat, must be kept out of direct contact with the hot gases that are being recirculated by the fan. In fans or blowers in use at the present time for the purpose specified, the shaft which rotates and supports the fan is positioned substantially in a horizontal plane. The bearings which support this shaft are on one or both sides of the fan and located outside of the housing or chamber in which the fan is positioned to avoid the hot gases.

When such fans are built on a large scale for circulating and recirculating the gases in a large furnace, the weight of the fan or rotor combined with the effects of the heat, and the strain on the fan rotating and supporting shaft in spanning the space between the bearings, will often cause the shaft to warp or bend, thus causing the fan to wedge against or strike the housing or chamber, or be otherwise rendered inoperative.

An object of the present invention is to overcome the above mentioned difficulties by rotating and suspending the fan by means of a vertical shaft.

Another object of the invention is to provide a flexible coupling in said shaft between the supporting bearing and the fan to prevent any strain on said supporting bearing by reason of any unbalanced condition of the fan or misalignment of the shaft or fan.

The utility of the invention as well as other objects, features and advantages will be more particularly apparent from the following description.

The drawing is a side elevational view, partly in vertical section of a device built according to the present invention.

Referring more in detail to the drawing, 1 designates an electric motor suitably mounted in a supporting frame 2, and adapted to rotate the shaft 3. A thrust bearing 4 and a sleeve bearing mounted in the casing 5 may be employed to support the shaft 3. The casing 5 may be adapted to permit the passage of a cooling medium to protect the bearing therein from heat. A fan or rotor 6 may be mounted on a shaft 7 which may be attached to shaft 3 by means of the flexible coupling 8. Cooling fins 9 and an air fan 10 may be mounted on shaft 7.

The fan 6 may be disposed between the discharge flue 12 and the recirculating flue 13 which may be separated by a wall 14. To prevent a turbulence of the gases adjacent the fan, which would reduce its efficiency straightening vanes 15 may be employed. Where the shaft 7 enters the hot gas flues a removable cover 16 having an opening 17 considerably larger than the shaft 7 may be employed. A sealing collar 11 may be attached to shaft 7 to prevent the escape of hot gases between opening 17 and shaft 7.

The apparatus may be attached to a furnace 18 having a heating chamber 19 and a combustion chamber 20. Suitable burners 21 may be mounted in the chamber 20 through which combustible material may be introduced into the combustion chamber 20 where it may be burned. The hot gases of combustion pass over the dividing wall 22 and heat the tubes 23 mounted in the chamber 19, and are drawn therefrom through the flue 12. The temperature of these gases may be rather high, sometimes reaching 1200° F., more or less, depending, of course, upon the conditions of the operation wherein they are given off. Such high temperatures may cause the shaft 7 to become quite hot and conduct heat to the flexible coupling 8 and the bearing supporting shaft 3, i. e. the thrust bearing 4 and sleeve bearing in casing 5.

During the operation of the device the fan 10 will rotate and cause air to circulate around the fins 9 on shaft 7, thus removing a portion of the heat from shaft 7 sufficient to prevent the flexible coupling 8 from being damaged. The bearing 4 and the bearing within the casing 5 may be protected from the heat by introducing a cooling liquid

through pipe 24 controlled by valve 25 into the bearing casing 5, from which the cooling liquid may be discharged through pipe 26 controlled by valve 27.

The shaft 7 on which is mounted the fan 6 is suspended in a balanced vertical position. and under ordinary conditions does not swing to and fro on the flexible coupling 8. In the event that the fan 6 becomes unbalanced because of a deposit of carbon or coke on it, or in the event the heat conditions warp the shaft 7 or the fan 6, the shaft 7 will be permitted by the flexible coupling to travel in an eccentric path without causing any undue strain on the bearings supporting the assembly.

It will be apparent from the above that I have perfected a device wherein there will occur a minimum of friction and a minimum of strain on the parts thereof. By means of the vertical suspension of the shaft on which the fan is mounted and the flexible coupling therein, the device is self aligning.

It is to be understood, of course, that the illustration in the drawing is a fragmentary diagrammatic view. Certain conventional details have been omitted for the purpose of clearness, for instance, it is obvious, of course, that there is provided a stack through which regulated amounts of spent or hot gases of combustion discharge. Suitable damper control is provided in the flue for the purpose of diverting, and controlling the amount of, the hot gases of combustion to the atmosphere. By obvious manipulation of such damper control more or less of said spent gases can be returned, as determined by operating conditions.

It is to be understood that I do not wish to limit the use of the device to a furnace of the type described. The device may be used for circulating or recirculating highly heated gases of combustion in any furnace in any manner as may be desired.

I claim as my invention:

1. A hot gas recirculating device comprising a vertically suspended rotatable shaft, means for rotating same, a second shaft connected to, normally in vertical alignment with and vertically suspended from said first mentioned shaft by means of a flexible coupling, and a circulating fan mounted upon said second shaft together with cooling means disposed on said second shaft.

2. A hot gas recirculating device comprising a vertically suspended rotatable shaft, means for rotating same, a second shaft connected to and vertically suspended from said first mentioned shaft by means of a flexible coupling, a fan together with radial fins mounted upon said second shaft, and said second mentioned shaft being self aligning and said fan adapted to cool said fins and shaft.

3. A hot gas recirculating device, comprising a vertically suspended rotatable shaft, means for rotating same, a fan mounted upon said shaft, a second fan mounted upon said shaft and spaced from the first mentioned fan, and heat radiating fins mounted on said shaft immediately adjacent to one of said fans effecting a cooling of said shaft through said adjacent fan.

4. A hot gas recirculating device comprising in combination, an element adapted to rotate in a heated zone, a shaft for driving said element, means for driving said shaft, and means interposed between said rotating element and said driving means for cooling said shaft to dissipate the heat and prevent transfer thereof to the driving means, said means comprising a fan carried by said shaft, and heat radiating fins on said shaft, said fan being adapted to blow a cooling current of air over said fins.

5. A hot gas recirculating device comprising a plurality of vertically suspended rotatable shafts normally in substantial alignment with each other, coupling means between said shafts maintaining said alignment, means for rotating said shafts, means for passing a cooling medium over the first of said shafts, heat radiating fins disposed on a second shaft, a fan adjacent thereto adapted to cool said second shaft and fins, and a circulating fan spacedly disposed from said cooling fan.

6. In combination with an oven, a motor supported on the top thereof, a shaft extending from said motor into said oven, a fan on said shaft within said oven, and a cooling disk carried by said shaft between said top and motor.

In testimony whereof I affix my signature.

LYMAN C. HUFF.