

March 12, 1963

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3 Sheets-Sheet 1

FIG. 1

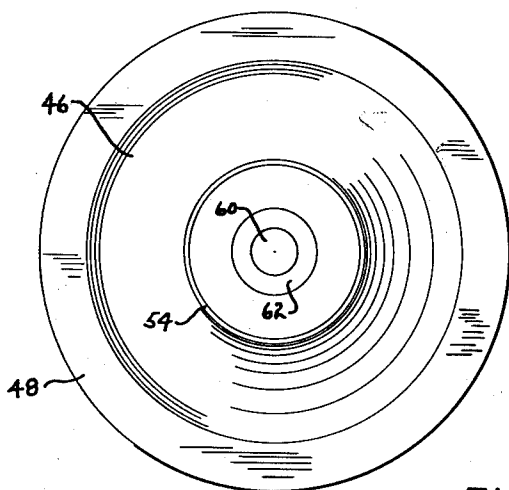
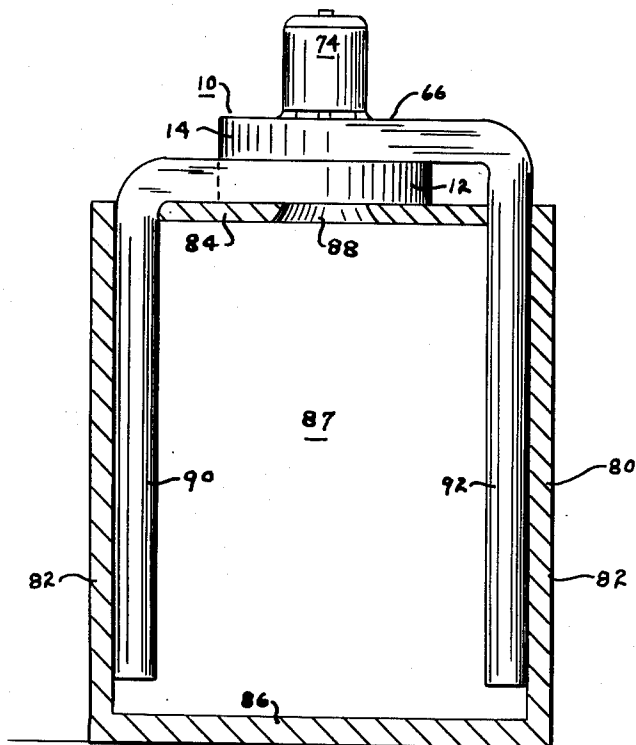


FIG. 5

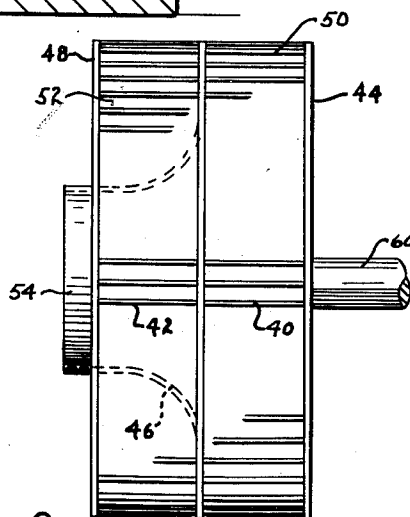


FIG. 6

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3 Sheets-Sheet 2

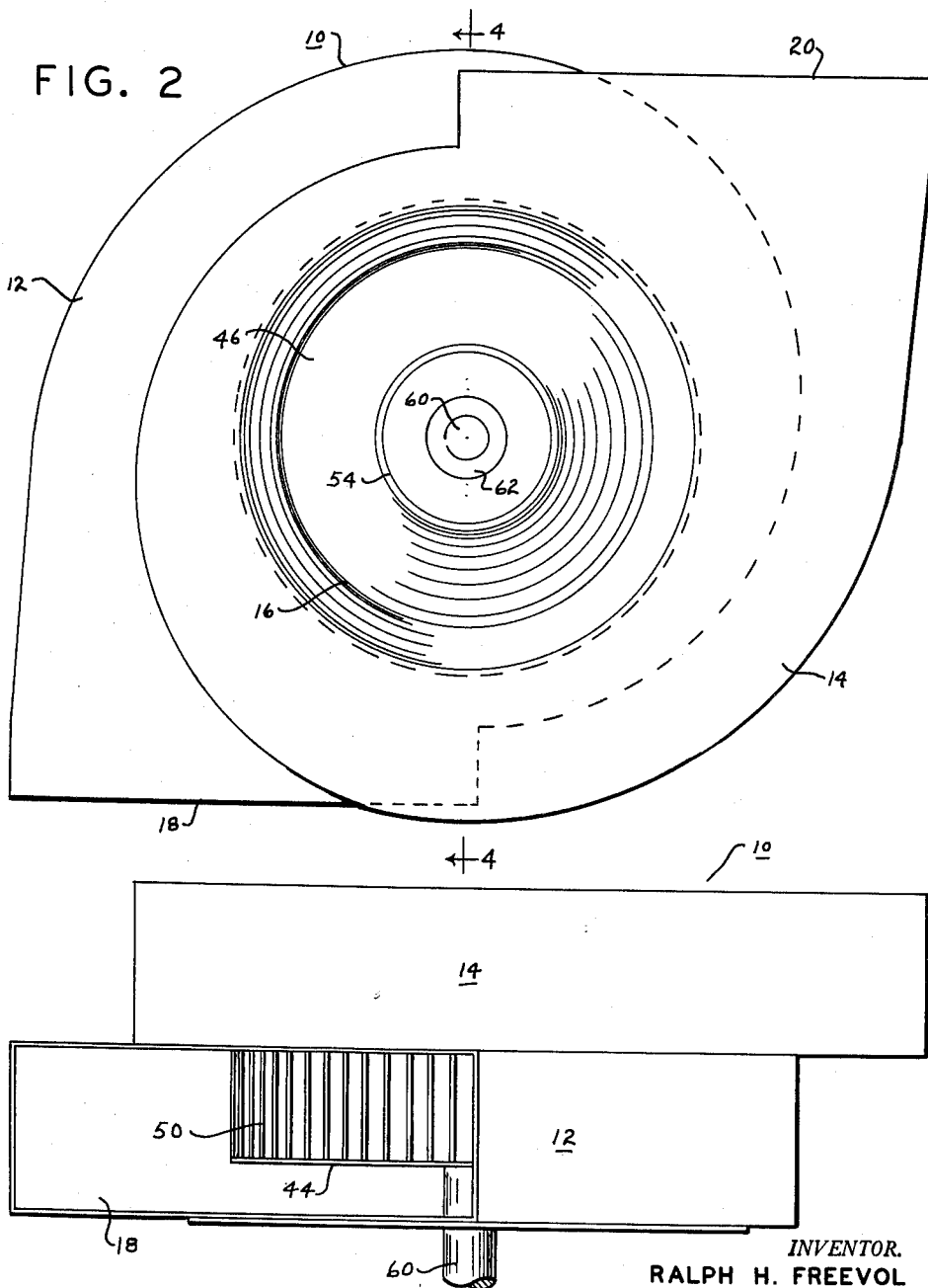


FIG. 3

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3 Sheets-Sheet 3

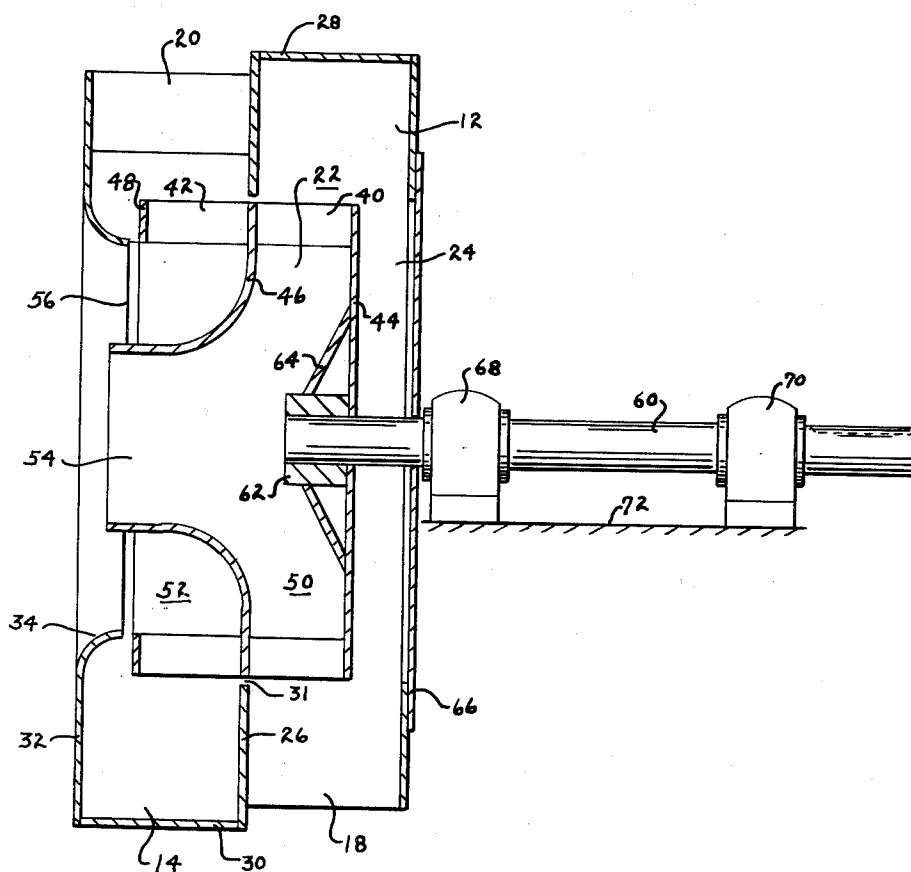


FIG. 4

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1

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3 Claims. (Cl. 230-47)

The present invention relates to fans and more particularly to centrifugal fans having a plurality of outlets.

One of the principal objects of the present invention is to provide a fan of the centrifugal type having a single gas inlet and a plurality of outlets in which the gases received through the single inlet are divided in equal amounts or in other predetermined proportions among the various outlets.

Another object of the invention is to provide a compact, relatively simple, single inlet, multiple outlet fan of the centrifugal type which contains the same number of moving parts as the conventional single inlet and single outlet fans of this general type and which is adapted for use in high temperature operations and other severe service conditions.

Still another object of the invention is to provide a multiple outlet fan or blower which is designed to operate in confined areas and which is adapted to deliver air received from a single source to a plurality of remote locations, or to return the air to the original source at a plurality of spaced points.

A further object of the invention is to provide a centrifugal fan having a single inlet and a plurality of outlets, which can be adjusted to vary the position of the outlets and controlled to vary the quantity of gas delivered by each outlet.

Another object is to provide a fan of the aforesaid type which can be constructed with two or more outlets without increasing the size of the unit appreciably over the size of the conventional fan of the same capacity.

Additional objects and advantages of the present invention will become apparent from the following description and accompanying drawings, wherein:

FIGURE 1 is a vertical cross sectional view of a heat treat furnace showing my fan installed thereon illustrating one system and use for the fan;

FIGURE 2 is a side elevational view of my fan showing the inlet thereon;

FIGURE 3 is an end elevational view of my fan showing one of the outlets thereof;

FIGURE 4 is a vertical cross sectional view of the fan shown in the preceding figures, taken on line 4-4 of FIGURE 2;

FIGURE 5 is an end elevational view of the fan wheel removed from the housing; and

FIGURE 6 is a side elevational view of the fan wheel shown in FIGURE 5.

Referring more specifically to the drawings, numeral 10 designates the fan housing having two scroll shaped passages 12 and 14 having a common inlet 16 and outlets 18 and 20, respectively, and numeral 22 designates a wheel positioned in the fan chamber 24 between the inlet and outlets. Passages 12 and 14 are separated by a common passage wall 26 joined to the external walls 28 and 30 of the respective passages 12 and 14 forming a rigid housing which in the present embodiment of my fan has outlets 18 and 20 on opposite sides and discharging in opposite directions. Wall 26 is provided with a hole 31 slightly larger than and concentric with wheel 22 and in this embodiment is positioned at the longitudinal center of the wheel.

The inlet 16 is in the side wall 32 of the housing concentric with the wheel and is provided with a bell-mouth type construction 34 of conventional design formed as

2

an integral part of side 32 and terminating adjacent the periphery of wheel 22. Passages 12 and 14 may be of any suitable cross sectional shape, those shown being rectangular throughout in the transverse direction. The inlet may receive air or other gases directly from the atmosphere or a confined space without supply ducts, preferably employing the bell-mouth construction, or it may receive the gases from a remote source through suitable supply ducts (not shown) connected directly to the inlet. In this latter system, the bell-mouth construction would normally be replaced by a straight inlet of well known design. The outlets 18 and 20 may discharge directly into a space surrounding the fan; however, they are usually connected by ducts to remote discharge points such as in the system illustrated in FIGURE 1.

Wheel 22 which forms one of the principal features of the present fan consists of two series of radially and longitudinally extending blades 40 and 42, the former being supported at one end by a disc shaped member 44 forming one end of the wheel and being secured to a bell-shaped partition 46, and the latter being supported at one end by said partition and at the other end by a ring 48. The blades of each series may be of and suitable design, either the forward, backward, or straight radial type, and the blades of one series may be different from the blades of the other series, both as to blade design and number. Partition 46 extends inwardly from the periphery of the wheel and curves outwardly to the fan inlet with a sweeping, substantially uniform radius, separating the wheel into sections 50 and 52, the former being connected with the fan inlet by a tubular shaped portion 54 and the latter being connected with the inlet by the space 56 between the walls of the inlet and tubular portion 54. The relative areas of tubular portion 54 and space 56 are such as to provide equal flow of air to the sections 50 and 52 of the wheel; the relative sizes of the tubular portion and space 56, however, may be varied to provide a predetermined unbalanced air flow between the two sides of the fan. Further, while the partition is shown in the fan illustrated as being in the center of the wheel, i.e. with the blades 40 and 42 being of equal length, the partition may be placed to either side of the center and thus increase the capacity of one section and decrease the capacity of the other. This latter modification necessitates adjusting the relative areas of tubular portion 54 and space 56 accordingly. The tubular portion 54 extends outwardly into the inlet of the fan sufficiently to minimize turbulence in the gases entering the respective inlets of the two wheel sections.

The wheel is mounted on the end of a shaft 60 supported by a sleeve 62 welded or otherwise joined to member 44 which is held rigidly in alignment by a conically shaped member 64 secured to the sides of the sleeve near the free end thereof and to the plate outwardly at a substantial distance from the sleeve. The sleeve may be secured to the end of the shaft for rotation therewith by any suitable well known means. The shaft extends through the side 66 of the fan housing and is journaled in two bearings 68 and 70 and is driven by a motor through a belt and pulley (not shown) on shaft 60, the bearing being mounted on a suitable support shown in part at numeral 72. The shaft may be modified to be driven by a direct drive from a motor 74 as shown in FIGURE 1 wherein the motor is mounted on side 66 of the housing.

In the operation of the present fan, gas is drawn inwardly through inlet 16 and divided into the respective conduits, tubular portion 54 and space 56, and is discharged by the rotating wheel into the respective passages 12 and 14 and thence through outlets 18 and 20. Once the incoming gas is divided at the fan inlet, the divided portions remain separated and are usually delivered through

3

separate ducts to remote points. A system utilizing the present single inlet, multiple outlet fan is illustrated in FIGURE 1, wherein a heat treat furnace 80 is shown, consisting of refractory side walls 82, top 84 and bottom 86 forming a space 87 heated by a suitable source of heat, such as electrical heating elements (not shown), and having the present fan mounted on the top with the inlet 16 connected by port 88 with the top of the heated space 84 and the two outlets 18 and 20 connected by ducts 90 and 92 with the lower part of the heated space. The present fan has been found particularly suitable for use in the recirculation of air or other gases in furnaces operated at high temperatures, since the bearings and motor are protected from the heated gases entering through the single inlet on the housing side opposite the motor and the gases are divided into the desired portions and returned to the heated space at a plurality of remote points.

The present fan can be constructed with more than two independent passages with separated concentric intakes in the main inlet and separate outlets by merely adding additional scroll passages similar to passages 12 and 14 and further dividing wheel 22 into additional sections. Further, the scroll passages may vary in size and capacity in a particular fan and the passages may be made rotatably adjustable so that the outlets may face in the same direction or in some position other than the one shown in the drawings.

In some installations it may be desirable to have separate ducts connected to the tubular portion 54 and space 56 so that each scroll passage receives gases from different sources. The divided wheel with one or more partitions 46 may be used to an advantage in centrifugal fans having a diffuser assembly to obtain more uniform distribution of gases in the diffuser.

Other modifications and changes may be made without departing from the scope of the present invention.

I claim:

1. A centrifugal fan having a single inlet and a multiple outlet for recirculating air and other gases, comprising two outside walls and an internal wall forming a housing having two scroll-shaped passages of equal size in juxtaposition and on a common axis and with separate outlets in said housing diametrically offset angularly from one

4

another, a bell-mouth inlet in the outside wall of the housing forming one of said passages, the wall separating said passages having an axially arranged opening aligned with said inlet and forming a centrally located wheel chamber, a shaft axially aligned with said inlet extending into said chamber, a wheel mounted on said shaft and having a plurality of blades at the periphery thereof, conduits connected to said outlets and extending in a direction axial with said wheel on the same side as said inlet opening, and a partition in said wheel for dividing the flow to said outlets in substantially equal portions, said partition having a radial portion intersecting said blades adjacent the wall separating said passages and an axial tubular portion connected with said radial portion with a sweeping curved section and spaced from the sides of and concentric with the sides of said inlet opening and projecting outwardly beyond the inner end of said bell-mouth inlet, said tubular portion forming a conduit connecting the inlet with one of said passages and the space between said tubular portion and the sides of said inlet forming a conduit connecting the inlet with the other of said passages.

2. The fan structure defined in claim 1 wherein the partition in said wheel is joined rigidly to and supported by said blades.

3. The fan structure defined in claim 1 wherein the partition divides the blades of said wheel into two equal axial portions.

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