

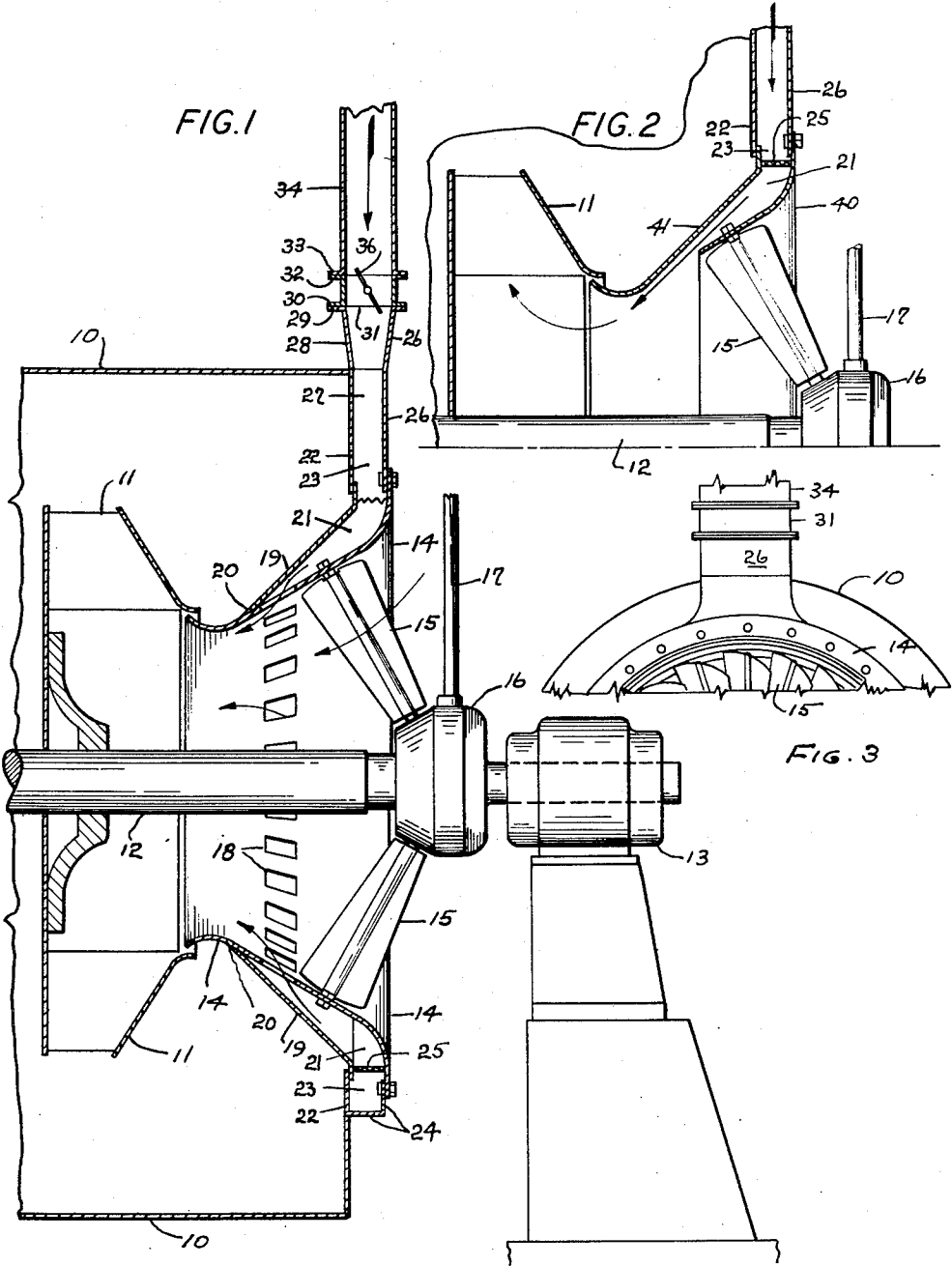
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This invention relates to fans having axial inlets, and relates more particularly to duct connections at the axial inlets of such fans for admitting secondary air thereinto without adversely affecting the performances of the fans.

For maximum performance, the axial inlet of a fan must be nicely streamlined with no obstructions to gas flow extending thereinto. However, for some duties, it is necessary to supply secondary air into a fan inlet through a supply duct; and, in the past, such supply ducts, when not used for supplying secondary air have extended into the fan inlets and have obstructed the flow thereinto. An example of such a duty is the supply of air through an air heater for the combustion chamber of a steam-power plant. The air supplied by a fan is drawn from the apparatus room in which the fan is located, and blown through the interiors of heat-exchange tubes, over the exteriors of which, the flue gases of the plant pass. At low plant loads, the temperature of the inlet header sheet of the air heater may fall below the dew point temperature of the corrosive vapors in the flue gases, resulting in the condensation of such vapors on the header sheet with resulting corrosion. Accordingly, it has been the practice at low plant loads to recirculate heated air from the outlet of the air heater into the inlet of the fan for maintaining a large volume of heated air through the heater. Recirculation ducts have extended into the inlets of the fans and have interfered with the flow of air thereinto when no recirculation was required.

The Geissler et al. Patent No. 2,476,543 discloses one efficient method of supplying secondary air into the axial inlet of a fan without affecting the performance of the fan when the supply of secondary air is discontinued, but requires a special form of duct for accomplishing this, such a duct usually having to be fabricated and installed after installation of a fan.

This invention provides duct connections for supplying secondary air efficiently into the axial inlet of a fan, which are built into the inlet of the fan at the time it is fabricated, requiring only the connection of an ordinary duct when the fan is installed. This invention is particularly suited for use with centrifugal fans having spin vanes such as are disclosed in the H. F. Hagen Patent No. 1,989,413.

An object of this invention is to provide in the axial inlet of a fan, a duct connection for secondary air which does not interfere with the flow of primary air thereinto.

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

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

Fig. 2 is a partial view, in section, illustrating a modification of the fan of Fig. 1, and

Fig. 3 is a partial view looking into the inlet of the fan of Fig. 1.

The fan illustrated is a centrifugal fan having the scroll casing 10 containing the fan wheel 11 mounted on the rotary shaft 12 which is supported in end bearings 13, only one of which is illustrated.

The fan has the inlet shroud 14 forming an axial inlet passage which converges towards the wheel 11. The spin vanes 15 are pivoted in this passage on pivot rods which are rotatably supported at their outer ends in the shroud 14, and at their inner ends within the housing 16 around the shaft 12, and which contains vane rotating mechanism for rotating the vanes through the adjusting rods 17, as disclosed in detail in the E. L. Richardson Patent No. 2,100,489.

The fan described so far with reference to the drawing, is conventional. This invention adds to such a fan the constructions shown by the drawing for providing a secondary air passage into the fan inlet.

Referring first to Figs. 1 and 3 of the drawing, the outer end of the sheet 19 is connected to the casing wall 22 which is the inner wall of an annular, secondary air passage 23 extending around the inlet of the fan, and which has therearound the sheet 24 having a portion extending along horizontal lines connected to the sheet 22, and having another portion extending along vertical lines connected to the shroud 24. The passage 23 has the circular perforated sheet 25 between same and the passage 21 for providing uniform distribution of air from the passage 23 into the passage 19, the perforations in the sheet serving as constrictions causing pressure to be built up in the passage 23.

The upper portion of the casing 10 has the duct sheet 26 spaced from the wall 22 and connected to the shroud 14, and forming with the walls 22 and 37, an inlet duct 27 for secondary air, which discharges into the passage 23, the horizontally extending portion of the sheet 24 being omitted at the duct 27.

The walls 26 and 28 extend above the casing and terminate in the flange 29 which is secured to the lower flange 30 of the damper duct 31, the upper flange 32 of which is secured to the flange 33 of the duct 34 which is connected to a source of secondary air such as the air heater referred to and illustrated in said Geissler et al. patent. The damper duct contains a damper 36

which may be adjusted to regulate the volume of secondary air.

The walls of the secondary air passage 21 do not protrude into the fan inlet, and do not, therefore, interfere with the flow therethrough of primary air.

Fig. 2 of the drawing illustrates another embodiment of the invention in which the inlet shroud 43 in which the spin vanes 15 are pivoted, terminates short of the inlet of the fan wheel, and the sheet 41 spaced therefrom extends past the inner end thereof into the inlet of the fan wheel. The space between the inner edge of the shroud and the sheet 41 performs the function of the slots 13 of Fig. 1 in admitting gas from the secondary air passage 21 into the fan wheel. The inner portion of the sheet 41 also performs the function of the inner portion of the shroud 14 of Fig. 1 in that it guides the primary as well as the secondary air, smoothly into the fan wheel.

It should be apparent that in both the illustrated embodiments of the invention, the secondary air passage, where it terminates in the fan inlet, offers no obstructions to the flow of primary air into the inlet, nor impedes in any way the action of the spin vanes in causing the primary air to spin when they are adjusted toward closed position as described in said Hagen patent. The secondary air passages can be built into the fan when the latter is fabricated with but slight additional cost, and eliminates the necessity for fabricating and installing duct terminations of the type disclosed in said Geissler patent at the installation site of the fan.

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

What I claim as my invention, is:

1. In a centrifugal fan having a casing, a fan wheel in the casing, and a shroud sheet forming a converging, axial, primary gas passage into said wheel, said shroud sheet having an outwardly turned portion at the inlet to said passage, ex-

tending substantially perpendicular to the axis of said wheel, the combination of an inner sheet, substantially conical in section, within said casing and extending around a portion of said shroud sheet and forming therewith a converging secondary gas passage discharging into said primary passage, said inner sheet having an outer end spaced from said outwardly turned sheet portion and forming therewith a circumferentially extending inlet into said converging secondary gas passage; means including spaced-apart sheets extending substantially perpendicular to said axis and connecting with said outer end of said inner sheet and said outwardly turned portion of said shroud sheet and forming an annular secondary gas chamber around said circumferentially extending inlet; a secondary gas duct extending within said casing and connected to said annular chamber, and connections outside said casing for connecting an external secondary gas duct to said duct.

2. The invention claimed in claim 1 in which a circular perforated sheet extends between said circumferentially extending inlet and said annular chamber.

3. The invention claimed in claim 1 in which the inner end of the inner sheet contacts the shroud sheet, and in which a plurality of spaced-apart slots are provided in the shroud sheet adjacent the contact therewith of said inner end of said inner sheet but outwardly thereof, and through which secondary gas is discharged into said primary passage.

4. The invention claimed in claim 3 in which a circular perforated sheet extends between said circumferentially extending inlet and said annular chamber.

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