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GAS TREATING DEVICE

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FIG. 1.

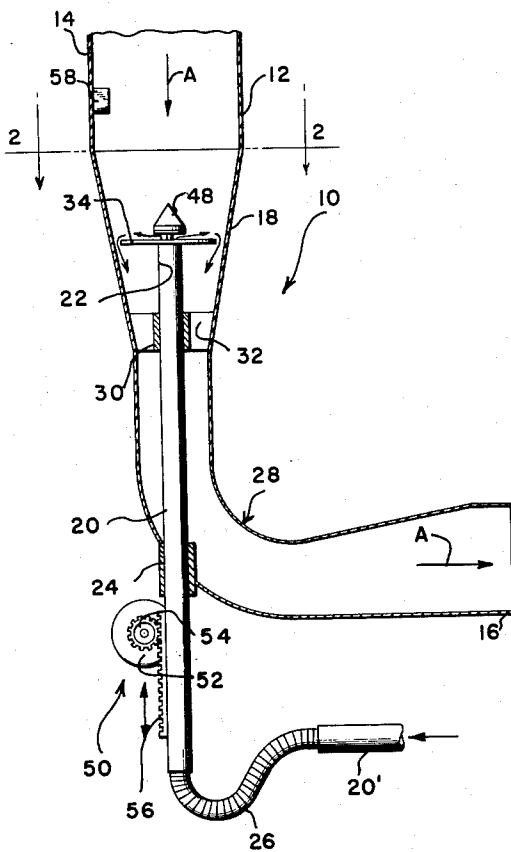


FIG. 2.

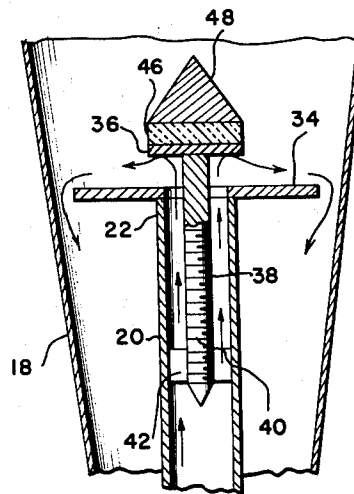
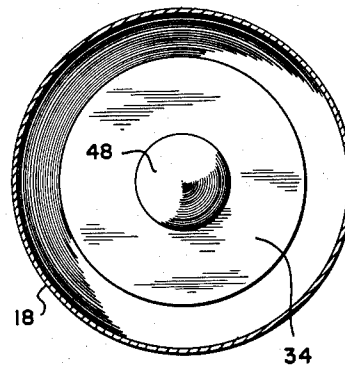


FIG. 3.

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GAS TREATING DEVICE

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1 Claim. (Cl. 261-44)

This invention relates to improvements in gas treating devices and in particular to improvements in flooded disc-type scrubbers.

It is an object of the present invention to provide means for maintaining substantially constant pressure drop in a flooded disc scrubber operating under conditions of variable gas flow.

It is a further object of the present invention to provide, in a flooded disc scrubber, means for eliminating condensation and material buildup on scrubber parts positioned upstream of the flooded disc.

A further object is to provide a flooded disc scrubber wherein surfaces, which would normally be expected to drop below the dew point of the gases to be cleaned, are maintained on the downstream side of the scrubber disc deflector.

A further object is to provide means for varying the pressure drop and the spray characteristics of a flooded disc-type scrubber.

These and other objects and advantages are provided in a gas treating device generally comprising gas flow conducting means having a wall portion converging at a relatively small angle in the direction of gas flow therethrough, a duct mounted centrally of the gas flow conducting means and having the downstream end connectable to a source of gas treating liquid and the upstream end opening into the converging gas flow passage, plate means carried about the upstream end of the duct with the extended surface of the plate means positioned generally normal to the direction of gas flow through the converging passage, transverse plate means carried at the upstream end of the duct, and a deflector member positioned at the liquid outlet end of the duct upstream of the transverse plate means.

The invention will be more particularly described with reference to the illustrative embodiments thereof wherein:

FIG. 1 is a fragmentary transverse sectional view of an improved flooded disc scrubber;

FIG. 2 is a section substantially on line 2-2 of FIG. 1; and

FIG. 3 is an enlarged fragmentary sectional view through the gas treating liquid distributing means and the converging housing therefor.

Referring to the drawings, 10 generally comprises a gas treating device which includes a conduit 12 through which the gas stream to be treated passes. In the illustrated form of the invention, the conduit 12 is circular in cross-section and the gas being treated flows therethrough in the direction of the directional arrows A.

The upstream end 14 of the conduit 12 connects to a source of gas to be treated which may comprise a gas generating means such as a furnace or the gas being treated may be directed from other forms of gas cleaning or treating apparatus. The downstream end 16 of the conduit 12 may connect to further gas treating and/or cleaning apparatus or the like.

Intermediate the upstream and downstream ends 14 and 16 is a converging section 18 having a relatively small angle of convergence in the direction of gas flow through the conduit.

The assembly also includes a duct 20 which is mounted centrally of the conduit 12 with the upstream end 22 ter-

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minating in the converging gas flow passage 18. The downstream end of the duct 20 passes through a sealing bushing 24 which permits sliding movement of the duct 20 axially of the converging gas flow passage. The duct 20 is connected to a source of gas treating fluid (not shown) by a flexible conduit 26 and a duct 20'. It will be particularly noted that for convenience in bringing the duct 20 outside of the gas flow conducting means 12, the conduit 12 is provided with a 90° bend as at 28.

The duct 20 is also supported by a bearing 30 adjacent the upstream end 22, which bearing is carried by a spider 32 suitably secured to the inner wall of the gas conveying conduit 12. Adjacent the outlet end of the duct 20 is secured a plate member 34 which plate member is positioned with its extended surfaces generally normal to the gas flow through the converging passage. The transverse plate member 34 in the illustrated form of the invention is greater in diameter than the diameter of the downstream end of the converging passage 18 whereby the passage may be completely shut off.

The duct 20 is also provided with a treating fluid deflector member generally designated 36 which deflector member is adjustably positioned at the liquid outlet end of the duct upstream of the transverse plate member 34. The adjustable mounting means for the deflector member 36 comprises a shaft 38, the upper end of which is secured to the lower surface of the deflector 36 while the lower shank portion of the shaft 38 is threaded as at 40 and mating threads are carried by a spider element 42 mounted within the duct 20. With this form of assembly by screwing the shaft 38 into or out of the cooperating threads on the spider member 42, the spacing between the deflector 36 and the upper surface of the transverse plate member 34 is effectively varied within a suitable operating range.

The upstream face of the deflector member 36 is covered with a thermal insulating material 46 of a thickness selected to meet the requirements of the particular temperatures and gases involved in the scrubbing apparatus. The purpose of this heat insulating barrier 46 is to limit conduction of heat from the deflector member 36 to such a degree that the surface of the fairing 48 will not fall below the dew point of the gases passing through the conduit 12. While in the illustrated form of the invention, the fairing 48 is formed of a material differing from the insulating barrier 46, it will be apparent to those skilled in the art that the fairing itself may be constructed of a suitable thermal insulating material.

It will be particularly noted that all of the feed pipes and the like for the liquid treating medium are downstream of the point of contact between the gas stream and the liquid, thereby effectively reducing condensation and deposition of gas-borne particles on these elements. The only element of the system presented to the gas stream above the point of contact between the gas treating liquid and the gas stream may be provided with a suitable thermal insulating means to effectively prevent the surface thereof from being cooled by the fluid treating substance to a temperature below the dew point of the gases being treated.

It is a known characteristic of turbulent flow scrubbers that the pressure loss across the scrubbers is generally proportional to the square of the gas volume passing therethrough. It is also a recognized characteristic of, particularly, flooded disc scrubbers that the efficiency of operation is related directly to the pressure drop across the scrubbers. Therefore, any variation in gas flow volume from the design value of the equipment results in a rather rapid change in pressure drop with a subsequent variation in efficiency of operation of the scrubber.

For example, a blast furnace gas scrubber designed to operate with 50,000 c.f.m. gas flow at 30 inches pressure drop, may have an outlet particle concentration of about 0.022/grain c.f. NTP. On such an installation, if the actual gas flow fell below the designed values to, for example, about 30,000 c.f.m., the pressure drop would then be only 10.8 inches and the efficiency of the scrubber would drop to a point where the outlet concentration would be about 0.05 grain/c.f. NTP or an approximate 2½ fold increase in dust load. Similarly, if the actual operating gas flow increased to 70,000 c.f.m., the pressure drop would then be 58.8 inches which substantial increases in pressure drop may not be available.

In order to compensate for varying gas flow, the duct 20 is provided with means generally designated 50 for axially varying the position of the transverse plate member 34 in the converging passage 18. The illustrated axial shifting means comprises a motor 52, the output shaft of which carries a gear 54, which gear is in mesh with a rack 56 secured to the duct.

It will be noted that as the duct 20 and its transverse plate member 34 is axially shifted within the converging gas passage 18, the spacing between the edge of the plate 34 and the tapered inner wall of the converging passage 18 may be effectively varied which, in turn, controls the pressure drop across the unit whereby the pressure drop is effectively maintained substantially constant over a wide range of gas flows thereby maintaining the scrubber at maximum efficiency.

Positioning of the disc 34 within the throat of the converging section 18 may be achieved by activation of the motor means 52, either manually or automatically. Where automatic adjustment of the axial position of the transverse plate 34 is desired, a gas flow or pressure sensing means 58 may be positioned in the conduit 12 and connected by suitable electrical conductors or pressure fluid distributing means to a conventional controller for the motor 52.

From the foregoing description, it will be seen that an improved efficient and economical system for scrubbing gases is provided whereby the aims and objects of the invention are fully accomplished. It will also be apparent to those skilled in the art that various modifications may be made in the form of the structures, without departing from the scope of the present invention.

I claim:

A gas cleaning device comprising gas flow conducting means having a wall portion converging at a relatively small angle in the direction of gas flow therethrough, a duct mounted centrally of the gas flow conducting means and having the downstream end connectable to a source of gas treating liquid and the upstream end opening into the converging gas flow passage, a transverse plate member fixed to the upstream end of the duct, a deflector member secured to the liquid outlet end of the duct upstream of said transverse plate member and in the path of liquid flow from the duct, said deflector member having a substantially flat surface against which the gas cleaning liquid impinges to deflect the liquid into said gas flow conducting means, means for axially moving the duct thereby simultaneously varying the position of the transverse plate member and the deflector member axially in said converging passage to vary the area of the air flow passage between the inner surface of the converging gas flow passage and the periphery of the transverse plate member, and further means for axially shifting only the deflector member relative to said transverse plate member to vary the flow characteristics of the gas treating liquid.

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