May 2, 1950 R. GRIFFEN 2,506,298

FLUID STREAM DIRECTING MEANS

Filed Aug. 9, 1947

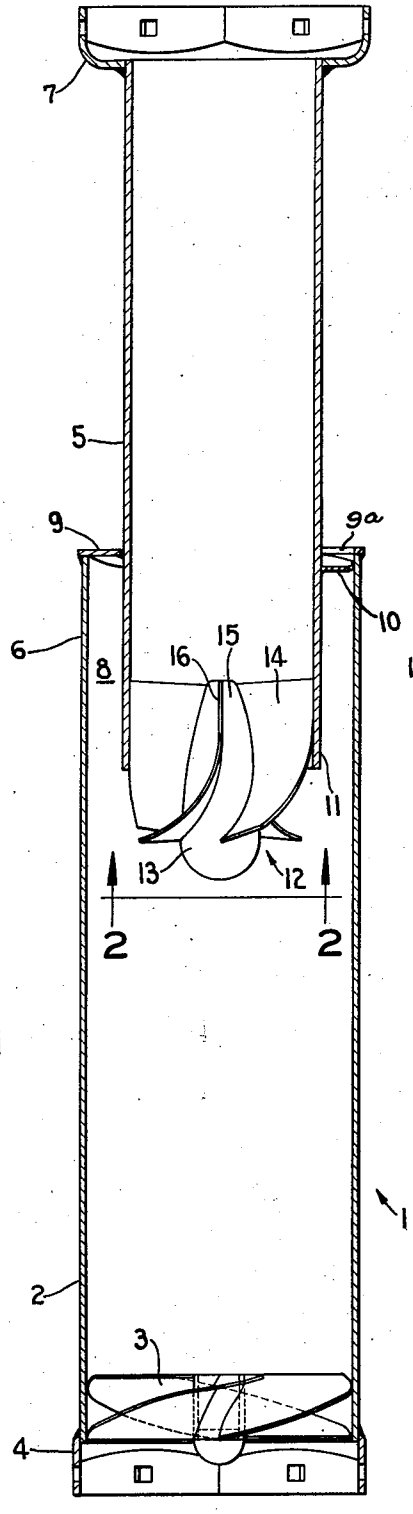

FIG. 1

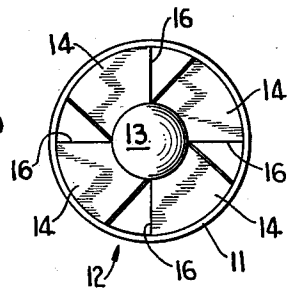

FIG. 2

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Patented May 2, 1950 2,506,298

UNITED STATES PATENT OFFICE

2,506,298

FLUID STREAM DIRECTING MEANS

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Application August 9, 1947, Serial No. 767,777

2 Claims. (Cl. 183—80)

1

This invention relates to new and useful improvements in means for changing the direction of rotary motion of a fluid stream.

An object of this invention is to provide a device for reducing the rotation of a fluid stream having a spiral motion.

Another object of this invention is to provide a device for changing the direction of motion of a rotating fluid stream from a spiral motion to a longitudinal motion.

Another object of this invention is to provide a centrifugal separator unit for removing foreign particles from a gas stream and to provide efficient reconversion of kinetic energy of the rotating cleaned gas into potential energy thereby lowering the drop in static pressure across the unit.

Other objects of this invention will become apparent from time to time throughout the specification and claims as hereinafter stated.

In the accompanying drawings, to be taken as a part of this specification there is clearly and fully illustrated a preferred embodiment of this invention, in which drawing—

Figure 1 is a view in longitudinal cross section of a centrifugal type separator or dust collector having an inlet spinner and an outlet straightening member shown in full elevation.

Fig. 2 is an end elevation of the straightening member of Fig. 1 seen from the line 2—2 of Fig. 1.

Referring to the drawings by characters of reference there is a centrifugal type separator or dust collector 1 having an inlet conduit 2 and an inlet spinner member 3. The inlet conduit 2 has an end portion 4 for attachment to a gas or air supply. The inlet conduit 2 is operable to receive a dust or particle laden air or gas which passes through the spinner member 3 and is given a rotary motion thereby throwing the particles toward the walls of the conduit 2. An outlet conduit 5 is positioned in the outlet end portion 6 of the conduit 2 and has an end portion 7 for attachment to another conduit. The annular space 8 between the conduit 5 and the conduit end portion 6 is closed by an annular plate or cover member 9 having a plurality of apertures 9a therethrough for removal of the particles thrown toward the walls of the conduit 2. Each of the aforementioned apertures has a helical vane member 10 leading to it for directing the particles for removal with a minimum amount of turbulence. The cover member 9 and apertures therethrough perform the additional function of restricting the flow of gas through the annular space 8 so as to prevent diversion of clean gas

2

thereto from the inlet portion of the conduit 5. In the inlet end portion 11 of the conduit 5 there is a vaned member 12 for changing the spiral motion of the gas to a longitudinal motion. The vaned member 12 has a streamlined body member 13 which is rounded at the end facing gas flow and tapers toward its rear end portion 15. A plurality of curved vanes 14 are carried by the body member 13 and are affixed thereto at their inner peripheries. The outer peripheries of the vanes 14 lie substantially on the surface of a cylinder of approximately the same diameter as the inside diameter of the conduit end portion 11 and fit tightly thereagainst when the member 12 is inserted therein. The vanes 14 are helically curved toward the rounded end portion of the body member 13 for intercepting the spirally moving gas substantially tangential to the spiral path of motion of the gas and gradually reduce in curvature toward the rear end portion 15 so that they terminate in plane portions 16 running in the plane of the axis of the conduit 5. The vaned member 12 is positioned in the inlet end 11 of the conduit 5 with a substantial portion thereof extending out from the end portion 11. The ends of the vanes 14 facing gas flow terminate substantially in a plane transverse to and at the point of maximum diameter of the body member 13 so that the rounded end of the body member 13 extends beyond the ends of the vanes. The amount of curvature of the vanes 14 and the distance from their ends to the end portion 11 of the conduit 5 will vary slightly with the contemplated conditions of operation. If the member 12 is intended to be used with a gas having a high spiral velocity the helical angle of the ends of the vanes 14 will be sharper to intercept the gas stream with maximum efficiency and the distance from the ends of the vanes to the end portion 11 will be less. If the member 12 is to be used with a gas having a low spiral velocity, the angle of the vanes and distance to the end portion 11 will be greater. The vanes 14 in changing the direction of motion of the gas stream passing therethrough from a spiral motion to a longitudinal motion perform the additional function of increasing the head pressure on the gas stream and simultaneously reducing turbulence so that some of the power lost in forcing the gas stream through the inlet spinner 3 is thereby regained.

In operation, a particle laden gas stream enters the conduit 2 through the spinner 3 which imparts a spiral or rotary motion thereto. The spiral motion given the gas stream operates to throw the particles by centrifugal force towards

the walls of the conduit 2 and to concentrate the particles there thus dividing the gas stream into a clean central portion and a concentrated particle laden outer portion. The particle laden outer portion of the gas stream passes into the annular space 8 between the conduit end portions 6 and 11 and is directed by the helical vane members 10 to the outlet apertures in the cover member 9 for removal. The clean central portion of the gas stream (still having a spiral motion) is intercepted by the helically curved portion of the vanes 14 of the member 12 which extend out from the end portion 11 of the conduit 5 and is directed by the vanes 14 into the conduit 5 and straightened in its motion by the described change of curvature of the vanes 14. Thus it is seen that a gas stream is given a spiral motion for separating foreign particles upon admission to this separator and by the use of the straightening member 12 is restored to its longitudinal movement upon emerging therefrom. It should be further noted that when the incoming gas passes through the inlet spinner 3 it is accelerated and the potential energy of the gas is transformed into kinetic energy of rotation resulting in a pressure drop across the spinner 3. The rotating gas upon intercepting the vaned member 12 is restored to a longitudinal motion with the result that the kinetic energy of rotation is transformed into potential energy of static pressure and a considerable amount of the pressure lost in passing the spinner 3 is regained, thereby decreasing the drop in static pressure across the unit as a whole.

What is claimed and is desired to be secured by Letters Patent of the United States is:

1. In a centrifugal separator, a conduit for receiving a gas stream laden with foreign particles, a spinner member for imparting a rotary motion to said gas stream to throw said foreign particles towards the walls of said conduit to cause said particles to concentrate in the portion of said gas stream adjacent the walls of said conduit thereby dividing said gas stream into a central clean portion and a concentrated particle laden outer portion, a second conduit of smaller diameter having its inlet end extending concentrically into the outlet end of said first-named conduit and operable to receive said clean central portion of said gas stream, a vaned member positioned in the inlet end of said second conduit for reducing the rotation of said gas stream central portion, said vaned member having a plurality of vanes for receiving and directing the movement of said gas stream central portion, said vanes being helically curved from their lines of initial contact with said gas stream and reducing in curvature toward the discharge end of said vaned member within said second conduit, the change of curvature of said vanes being such that said gas stream central portion will be substantially free from rotation and turbulence upon emerging from said vaned member, a plate member fitting around said second conduit and joined to said first-named conduit and having at least one aperture for the discharge of particle laden gas from the annular space between said conduits, said plate member having a vane portion leading to said aperture, said vane portion being operable to intercept said particle laden gas portion substantially tangential to its direction of motion so that said particle laden gas portion may be discharged with little turbulence, and said plate member being operable to restrict the flow of gas through the annular space between said conduits thereby to prevent said clean central portion of gas from being deflected into said annular space by said vaned member.

2. In a centrifugal separator, a conduit for receiving a gas stream laden with foreign particles, means for imparting a rotary motion to said gas stream to throw said foreign particles towards the walls of said conduit to cause said particles to concentrate in the portion of said gas stream adjacent the walls of said conduit thereby dividing said gas stream into a central clean portion and a concentrated particle laden outer portion, a second conduit of smaller diameter positioned into the outlet end of said first-named conduit and operable to receive said clean central portion of said gas stream, a vaned member positioned in the inlet end of said second conduit for reducing the rotation of the gas stream passing therethrough, said member having a body portion of streamlined construction having a rounded frontal portion facing the gas stream and tapering longitudinally in the direction of gas flow, a plurality of vanes for directing the movement of said gas stream central portion, said vanes being affixed to said body portion along their inner periphery and fitting tightly against the walls of said second conduit at their outer periphery, said vanes being helically curved at the end of said body portion facing gas flow and intercepting the gas stream central portion substantially tangential to the direction of motion of the same and decreasing in curvature longitudinally in the direction of gas flow terminating in straight portions running in the plane of the axis of said second conduit, and said body portion and the helically curved portion of said vanes extending outside the inlet end of said second conduit to receive and direct said gas stream central portion into said second conduit and to change its direction of movement from a spiral motion to a motion substantially parallel to the axis of said second conduit, a plate member surrounding said second conduit and extending across the annular space between the ends of said conduits and having at least one aperture for the discharge of particle laden gas, said plate member having a helical vane portion leading to said aperture, said vane portion being operable to intercept said particle laden gas portion substantially tangential to its direction of motion so that said particle laden gas may be discharged with little turbulence, and said plate member being operable to restrict the flow of gas through the annular space between said conduits thereby to prevent said clean central portion of gas from being deflected into said annular space by said vaned member.

RALPH GRIFFEN.

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