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W. S. BOWEN

2,115,326

DUST COLLECTOR

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Fig. 1

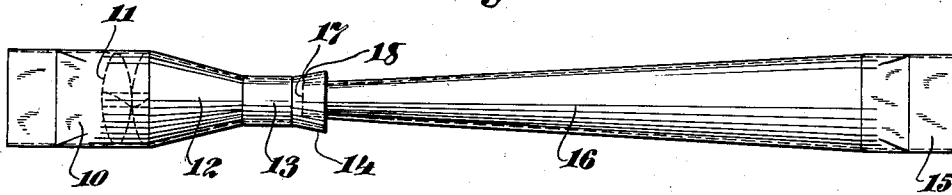


Fig. 4

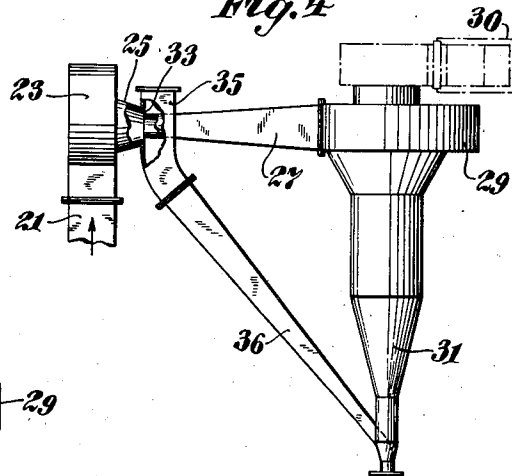


Fig. 3

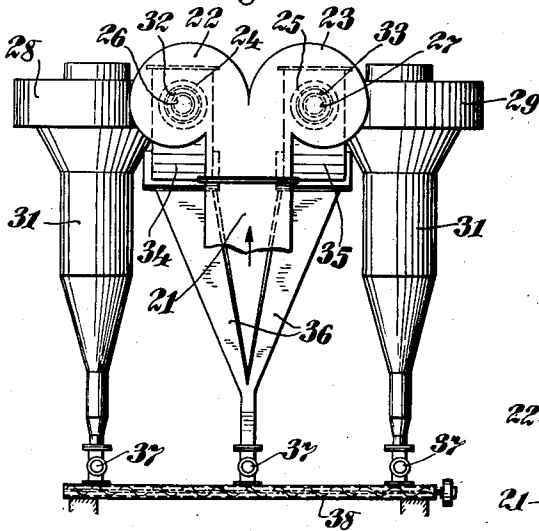


Fig. 5

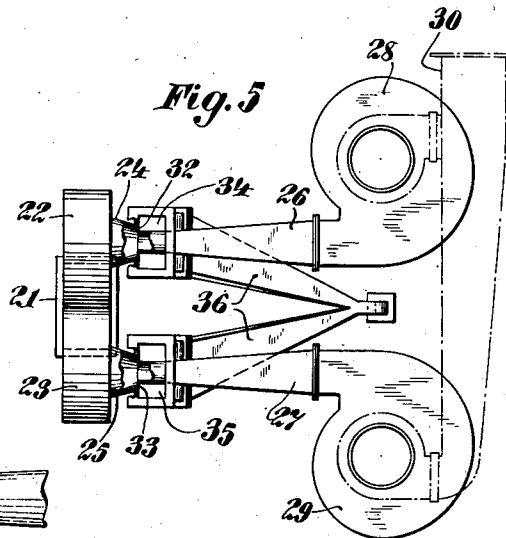
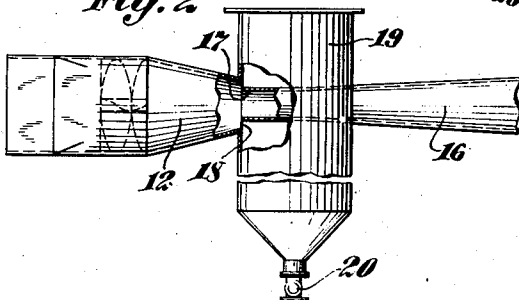


Fig. 2



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UNITED STATES PATENT OFFICE

2,115,326

DUST COLLECTOR

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Application December 2, 1936, Serial No. 113,789

5 Claims. (Cl. 183-80)

The present invention relates to devices for separating bodies of different weights from one another and embodies, more specifically, an improved form of mechanism for separating and collecting dust from air. As distinguished from various forms of mechanism now available, the present invention utilizes a straight or uni-directional flow rather than a reversal or non-uni-directional flow, which is characteristic of existing devices. In effecting a separating action upon the substance which is subjected to the uni-directional flow, the present invention contemplates subjecting the bodies to a rapidly whirling motion and directing them through a Venturi mechanism, the venturi being formed with a slot in its throat portion to effect the separation of the heavier body from the lighter one. Inasmuch as the substance is directed in an axial direction through the venturi, and while moving axially is at the same time rapidly whirling about such axis, the heavier particles are directed outwardly and away from the axis of whirl, the lighter medium being displaced inwardly and adjacent the axis of whirl.

Since all Venturi mechanisms include a converging portion, the velocity of the whirling medium is greatly increased which, translated into terms of centrifugal force, means that the centrifugal force is even more greatly increased because it varies as the square of the velocity of the medium. As a result, when the substance reaches the throat portion of the venturi, the heavier particles are maintained closely adjacent the walls of the device and are effectively separated from the lighter fluid body by means of a thin skimming slot, thus enabling highly efficient separation to be carried out.

The present application is a continuation in part of applicant's co-pending application Serial No. 609,379, filed May 5, 1932 for "Dust collector" and which matured into Pat. No. 2,082,242, June 1, 1937. The separating device is disclosed in applicant's above identified co-pending application. The present application relates in addition to collecting mechanisms, and includes the hereinafter specifically described apparatus, not shown or described in applicant's above identified co-pending application, by means of which collection is facilitated.

An object of the invention, accordingly, is to provide a separating mechanism by means of which heavier bodies may be separated from a lighter medium in a highly efficient manner and with the minimum amount of disturbance to the medium.

A further object of the invention is to provide an improved form of separating mechanism embodying the venturi principle in controlling the flow of the medium upon which a separating action is taking place.

A further object of the invention is to provide an improved collecting mechanism by means of which collection of material which has been separated by means of a uni-directional separating mechanism is facilitated.

A further object of the invention is to provide an improved separating and collecting mechanism by means of which one medium may be separated from another having a different specific weight in such fashion as to preserve conditions in the collecting mechanism which improve the operation of the separating mechanism. This aspect of the invention is attained by means of the provision of a collecting chamber wherein a partial vacuum is maintained, such vacuum being produced by the flow of the medium through the uni-directional separating device.

Further objects and advantages of the invention will be apparent as it is described in connection with the accompanying drawing, wherein:

Figure 1 is a plan view of a separating mechanism constructed in accordance with the present invention.

Figure 2 is a view showing a modified form of such mechanism wherein a collecting chamber is provided which is sealed from the atmosphere.

Figure 3 is a view in end elevation showing a separating and collecting mechanism constructed in accordance with the present invention.

Figure 4 is a view in side elevation of the mechanism shown in Figure 3.

Figure 5 is a plan view of the device shown in Figures 3 and 4.

Referring to the above drawing, an intake tube (Figure 1) receives a medium from a desired source and subjects the same to a whirling motion by means of vanes 11. From the tube 10 and vanes 11, the medium flows into a conical converging portion 12 which terminates in a cylindrical portion 13 and an outwardly flaring skirt 14. Axially disposed with respect to the intake tube 10 is an exhaust tube which may be formed with a squared end 15 and an elongated tapering tubular portion 16 having an inlet end 17 which is received within the skirt 14 and is of a diameter less than that of the cylindrical portion 13 of the tube 10. A desired overlap of the skirt and intake end 17 of the tubular portion 16 is provided, an annular slot indicated at 18 thus being provided

between the cylindrical portion 13 and the inlet end 17. It will thus be seen that the above described mechanism, shown in Figure 1, provides a Venturi mechanism, whereby the flow of fluid therethrough is uni-directional and follows the law which governs the flow of fluid through the venturis. Inasmuch as the whirling of the entering fluid is enormously increased by the converging portion 12, the slot 18 may be relatively narrow and still effectively skim off the heavier particles from the lighter medium which flows out through the extremity 15 and is restored to its original pressure and velocity state by the expanding portion 16 of the venturis. This mechanism is shown and described in applicant's pending application above identified.

In the construction shown in Figure 2, the converging Venturi inlet portion 12 terminates in a collecting chamber 19 having an outlet valve 20 formed at the bottom thereof in order that the interior of the chamber may be enclosed and not subject to atmospheric pressure. The Venturi outlet tube 16 is received within the chamber 19 and the inlet end 17 thereof spaced adjacent the outlet of the converging portion 12 in order that the annular slot 18 may be formed between these elements. In the drawing, this annular slot is shown as being much larger than it is in actual practice in order that the invention may be understood more readily. Since the chamber 19 is an effective enclosure, the flow of the medium through the Venturi device maintains a partial vacuum within this chamber and facilitates separation of the heavier body from the lighter one. This condition exists by reason of the fact that the heavier bodies move into the region of low pressure within the chamber 19 more readily than they would move into a region of higher pressure.

In the construction shown in Figures 3, 4, and 5, fluid is introduced into the mechanism through a conduit 21 which terminates in oppositely extending scrolls 22 and 23 which impart a whirling motion to the two fluid streams thus formed. The scrolls 22 and 23 discharge the medium into converging Venturi portions 24 and 25 respectively. Venturi outlet portions 26 and 27 carry the lighter medium away and deliver it to receiving scrolls 28 and 29, respectively, which may be in the form of cyclone collectors which are now well known in the art. These cyclone collectors may discharge the lighter medium through a discharge manifold 30 and return heavier medium which has escaped the initial separating stage by means of cyclone outlets 31.

The initial separating action which takes place between the converging Venturi inlet portions 24 and 25 and the diverging Venturi outlet portions 26 and 27 is effected by means of annular slots 32 and 33 in the respective venturis. These slots are formed in the same manner as described in connection with the construction shown in Figures 1 and 2 and cause the heavier particles to be skimmed off and received within collecting chambers 34 and 35, respectively. From the collecting chambers, the heavier bodies are de-

livered through ducts 36 to a common discharge valve 37 which supplies the medium to a conveyor 38. Cyclone outlets 31 may also supply the returned heavy particles to the conveyor 38 through similar valves 37.

While the invention has been described in connection with the specific structure shown in the accompanying drawing, it is not to be limited save as defined in the appended claims.

I claim:

1. A separating and collecting device comprising an inlet chamber having a converging portion forming a venturi, an outlet chamber forming the expansion chamber of the venturi and having an inlet portion adjacent and of lesser diameter than said converging portion thereby forming an opening between said converging and inlet portions, a hopper communicating with said converging portion through said opening, only, and means for sealing the hopper from communication with the atmosphere to maintain a reduced pressure in the hopper.

2. A separating and collecting device comprising an inlet chamber having a converging outlet portion, a coaxial outlet chamber having a tapered inlet portion of smaller diameter than the outlet portion of said inlet chamber, defining an opening between the outlet and inlet portions, and a collecting hopper communicating with said outlet portion through said opening, only, and means for sealing hopper from the atmosphere to maintain a reduced pressure in the hopper.

3. A separating and collecting device comprising an inlet chamber having a converging outlet portion, a coaxial outlet chamber having a tapering inlet portion adjacent to, in alignment with and of lesser diameter than said outlet portion whereby an opening is formed between said outlet and inlet portions, a collecting hopper communicating with said outlet portion through said opening, only, and a valve for sealing the hopper from the atmosphere.

4. A separating and collecting device comprising an inlet chamber having a tapering venturi portion, an outlet chamber having a tapering inlet of lesser diameter than said Venturi portion aligned with and spaced from said Venturi portion whereby an opening is formed between said venturi portion and said inlet portion, a collecting hopper communicating with said Venturi portion through said opening, only, and a valve for sealing the hopper against communication with the atmosphere to maintain a reduced pressure in the hopper.

5. A separating device comprising an inlet chamber having a converging portion, an outlet chamber having a tapered inlet portion adjacent to and in alignment with said converging portion, said inlet portion being of less diameter than said converging portion and defining an annular opening therebetween, a collecting hopper communicating with said converging portion through said annular opening, only, and means for sealing the hopper from communication with the atmosphere.

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