Feb. 23, 1937. O. HOLM-HANSEN ET AL 2,071,975

SEPARATOR

Filed Jan. 4, 1936

Fig. 1.

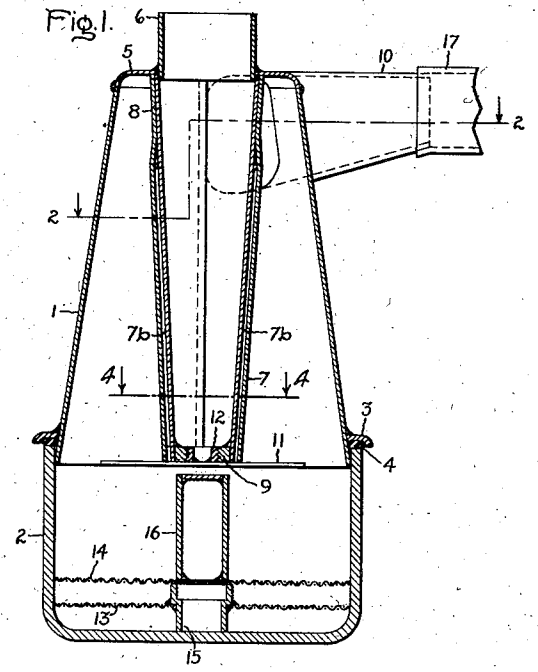


Fig. 2.

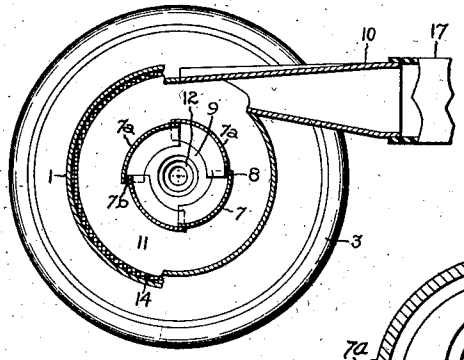


Fig. 4.

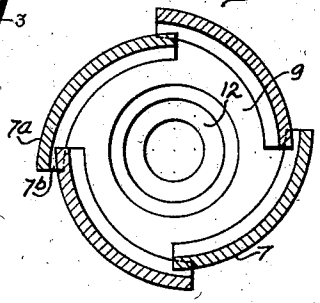
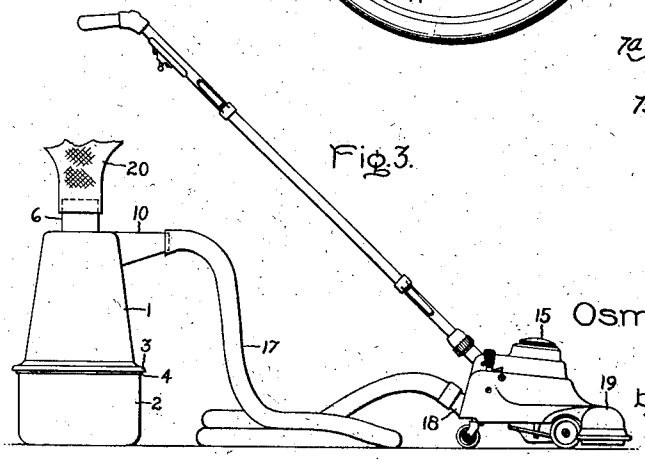


Fig. 3.



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2,071,975

SEPARATOR

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Application January 4, 1936, Serial No. 57,596

6 Claims. (Cl. 183—84)

The present invention relates to centrifugal separators for separating dust from the air suitable for use in connection with vacuum cleaners and the like.

The object of our invention is to provide an improved construction and arrangement in a separator of this type, and for a consideration of what we believe to be novel and our invention attention is directed to the following description and the claims appended thereto.

In the accompanying drawing, Fig. 1 is a sectional elevation of a separator embodying our invention; Fig. 2 is a sectional view taken on line 2—2 of Fig. 1; Fig. 3 is a diagrammatic view showing the separator used in place of the bag of the conventional vacuum cleaner; Fig. 4 is a sectional view taken on line 4—4 of Fig. 1.

Referring to the drawing, the separator comprises a conical casing 1 having its lower end extending within a dust receptacle 2. The casing is supported on the upper edge of the dust receptacle by means of a flange 3 fixed to the casing, and the joint between the flange and the dust receptacle is sealed by a suitable gasket 4. Fixed to the upper end of the casing is an annular member 5 having a sleeve 6 secured at the center thereof which forms the discharge outlet from the casing. Depending within the casing from the sleeve 6 is a tubular member 7. This member is made from four curved metal strips 7*a* which are arranged so that the adjacent edges of the strips overlap and provide longitudinal slits 7*b* between the strips. At the top, the overlapping edges of the strips are joined together as shown at 8 so that the upper end of the tubular member 7 is cylindrical in shape and may be readily secured to the sleeve 6. At the lower end, the strips are secured to the edges of a washer 9. The shape of this washer is clearly shown in Fig. 2, and is such that the longitudinal slit 7*b* is formed between the overlapping edges of the strips 7*a*. The tubular member 7 and the side walls of the casing 1 provide an annular passage which increases gradually in section from the top toward the bottom of the casing. At the top of the casing is an inlet 10 which directs the incoming dust-laden air tangentially between the casing and the tubular member 7. From the inlet 10, the dust-laden air moves spirally downward with increasing radius of gyration in the annular passage between the casing and the tubular member 7 and, as the result of the rotating motion of the air, the particles of dust are thrown by centrifugal force toward the outside layers of the whirling air. Air flows from the casing to the discharge outlet 6 through the slits 7*b* in the tubular member 7. The direction of whirling of the air is such that in order to enter these slits, the air must turn through an angle of nearly 180 degrees. Since the particles of dust are unable to make this sudden change in direction of movement on account of their mass, the particles of dust are thrown outward by centrifugal force and are prevented from flowing through the slits. The slits 7*b* may be described as openings facing in a direction opposite the motion of the whirling air.

The air within the dust receptacle will have a whirling motion. If this whirling motion were not impeded the dust within the receptacle would be continually picked up by the whirling air and by circulating air currents would be returned to the air between the tubular member 7 and the casing 1. The direction of the air flow would be spirally downward along the inner edges of the casing 1 and the inner edge of the dust receptacle 2 and upward from above the center of the dust receptacle to the inner edge of the whirling air between the casing and the tubular member 7. The upward flow of air from above the center of the dust receptacle would carry with it dust particles picked up by the whirling air within the dust receptacle. This means that the dust would not remain separated and that even although no further dust-laden air were introduced into the separator the continual running of the separator with clean air would result in the discharge of dust through the discharge opening 6.

The circulation of the dust from the receptacle is prevented in part by a disc 11 which is fixed to a stud 12 threaded into the washer 9. The disc 11 acts as a baffle which tends to prevent the upward air currents from above the center of the dust receptacle which would return dust from the receptacle to the air between the casing and the tubular member 7. The disc 11 also provides a restriction at the lower end of the annular passage around the tubular member 7 which decreases the whirling of the air within the dust receptacle and thereby facilitates the settling of the air within the dust receptacle.

In order still further to facilitate the settling of the dust within the dust receptacle, we have arranged two spaced foraminous screens 13 and 14 above the bottom of the dust receptacle. These screens may be conveniently made of wire mesh screen. The screen 13 is secured to a bushing 15 which passes through a hole in the center of the screen. The screen 14 rests on the top of the bushing 15 and is secured to the bushing by means of a cylinder 16 which is soldered to the upper end of the bushing 15. The cylinder 16 provides a handle by means of which the screens may be conveniently removed. The mesh of the screens 13 and 14 is large enough so that the particles of dust will easily pass through the screens. The screens function as baffles which reduce the whirling of the air adjacent the bottom of the receptacle and thereby keep the settled dust from being picked up and returned to the

air within the casing 1. This means that once the dust has settled below the screens that it will remain there.

The wire mesh screens 13 and 14 provide effective baffles which prevent whirling of the air below the screens and at the same time offer little resistance to the settling of the dust particles.

Fig. 3 is a diagrammatic view showing the separator used to replace the bag of a conventional vacuum cleaner 15. In this use, the inlet 10 of the separator is connected by means of a flexible hose 17 to the discharge conduit 18 of the vacuum cleaner. The dust laden air which is drawn through the suction nozzle 19 of the cleaner is forced through the inlet 10 causing the air to be whirled spirally downward about the tubular member 7. The dirt is thrown by centrifugal force to the outside and settles through the screens 13 and 14 into the bottom of the dust receptacle. The cleaned air is discharged through the tubular member 7 to the discharge outlet 6. If desired, a bag 20 or other filter may be secured to the discharge outlet 6 to filter the particles of dust which are not separated from the air.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In a separator for vacuum cleaners and the like, a casing having an inlet for dust-laden air and a dust receptacle at the lower end thereof, means producing a whirling annulus of air within the casing for centrifugally separating the dust from the air, a foraminous baffle above the bottom of the dust receptacle for preventing whirling of the dust within the receptacle, whereby settling of the dust in the rceptacle is facilitated, and a discharge outlet from the casing for the cleaned air comprising a tubular member extending axially within the center of the whirling annulus of air, said member being open at its upper and closed at its lower end and having openings in its side walls exposed to the rapidly whirling air above said baffle and being placed with respect to the direction of the whirling air so that the air entering the openings must turn through an angle of at least 90 degrees.

2. In a separator for vacuum cleaners and the like, a casing having an inlet for dust laden air, means for producing a whirling annulus of the air within the casing which centrifugally separates the dust from the air, a discharge outlet from the casing including a hollow member extending through the center of the whirling air, said member having openings in the side walls thereof through which the air flows, said openings being exposed to the rapidly whirling air and being placed with respect to the direction of the whirling air so that the air entering the openings must turn through an angle of at least 90 degrees, and a baffle at the lower end of said member below said openings for preventing whirling of the air within the dust receptacle whereby settling of the dust is facilitated.

3. In a separator for vacuum cleaners and the like, a casing having an inlet for dust-laden air and a receptacle at the lower end thereof, means for producing a whirling annulus of the air within the casing which centrifugally separates the dust from the air, a baffle over the center of the dust receptacle and spaced from the edges thereof, a foraminous member between said baffle and the bottom of the receptacle for preventing whirling of the dust in said receptacle whereby settling of the dust in the receptacle is facilitated, and an outlet from the casing for the cleaned air comprising a tubular member extending axially within the center of the whirling annulus of air, said member being open at its upper and closed at its lower end and having openings in its side walls exposed to the rapidly whirling air above said baffle and being placed with respect to the direction of the whirling air so that the air entering the openings must turn through an angle of at least 90 degrees.

4. In a separator for vacuum cleaners and the like, a casing having an inlet for dust-laden air and a dust receptacle at the lower end thereof, means producing a whirling annulus of air within the casing for centrifugally separating the dust from the air, means including a baffle above said receptacle for preventing whirling of the dust within said receptacle whereby settling of the dust in said receptacle is facilitated, and a discharge outlet from the casing for the cleaned air comprising a tubular member extending axially within the center of the whirling annulus of air, said member being open at its upper and closed at its lower end and having openings in its side walls exposed to the rapidly whirling air above said baffle and being placed with respect to the direction of the whirling air so that the air entering the openings must turn through an angle of at least 90 degrees.

5. In a separator for vacuum cleaners and the like, a casing, a tubular member depending within the casing, said member and said casing cooperating to form an annular passage which increases in section toward the lower end of the tubular member, said member being closed at its lower end and open at its upper end, an inlet at the top of the casing for directing dust-laden air tangentially between said member and said casing, a dust receptacle at the lower end of said casing, a baffle over the center of the dust receptacle for providing a restricted annular passage through which dirt may settle into the receptacle, and means including openings in the side walls of said tubular member exposed to the rapidly whirling air above said baffle and being placed with respect to the direction of the whirling air so that the air entering the openings must turn through an angle of at least 90 degrees for providing an outlet for cleaned air.

6. In a separator for vacuum cleaners and the like, a casing, a tubular member depending within the casing and providing an annular passage between said member and said casing, said member being closed at its lower end and open at its upper end, an inlet to said casing for directing air tangentially between said member and said casing, a dust receptacle at the lower end of said casing, baffle means providing a relatively restricted annular passage through which dust may settle into the receptacle, and means including openings in the side walls of said tubular member exposed to the rapidly whirling air above said baffle means and being placed with respect to the direction of the whirling air so that the air entering the openings must turn through an angle of at least 90 degrees for providing an outlet for cleaned air.

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