Sept. 22, 1959 A. B. POCH 2,905,266

SEPARATORS

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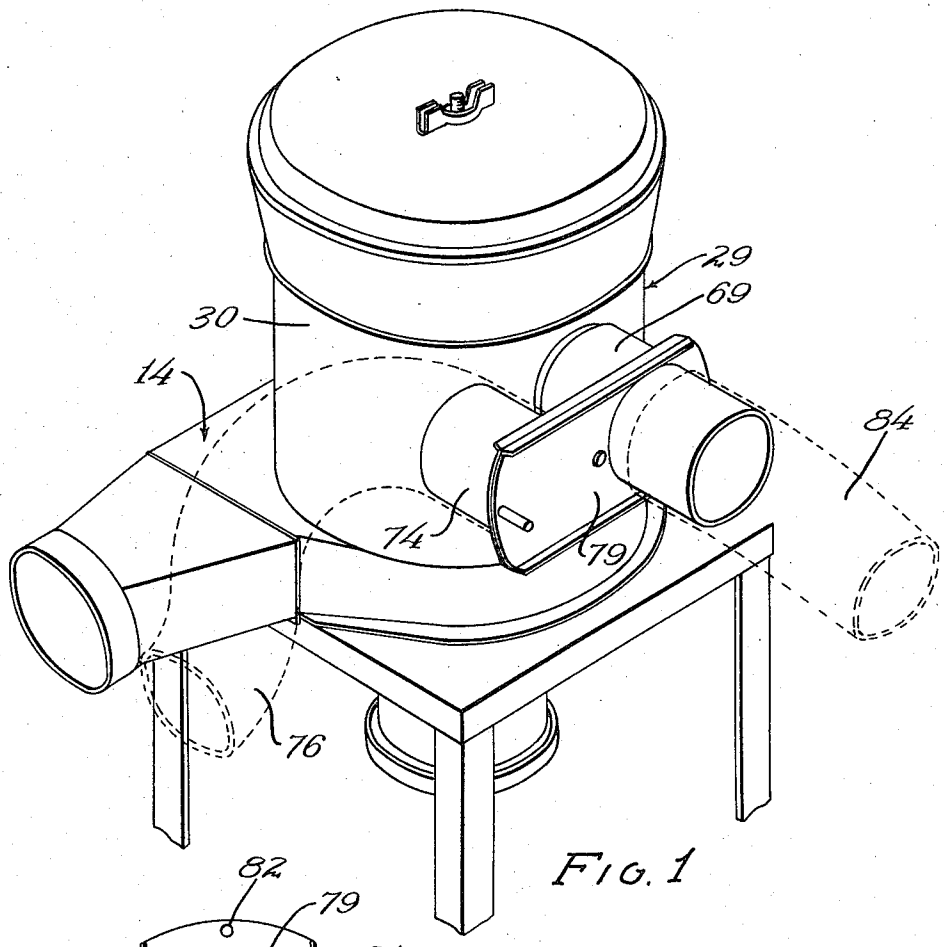


FIG. 1

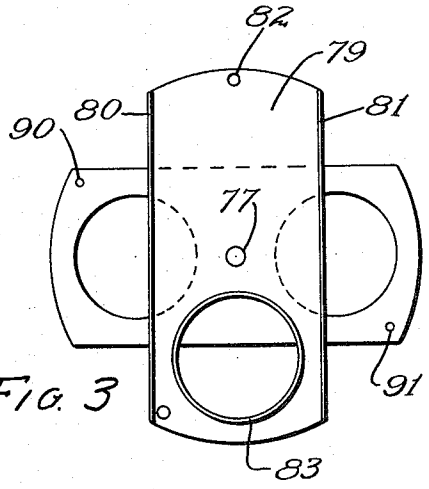


FIG. 3

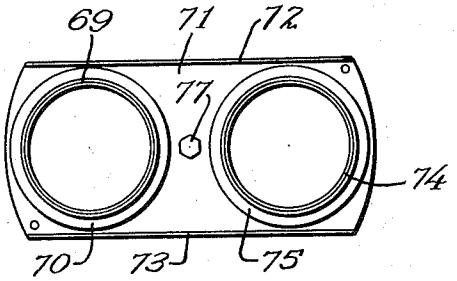


FIG. 2

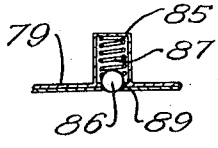


FIG. 4

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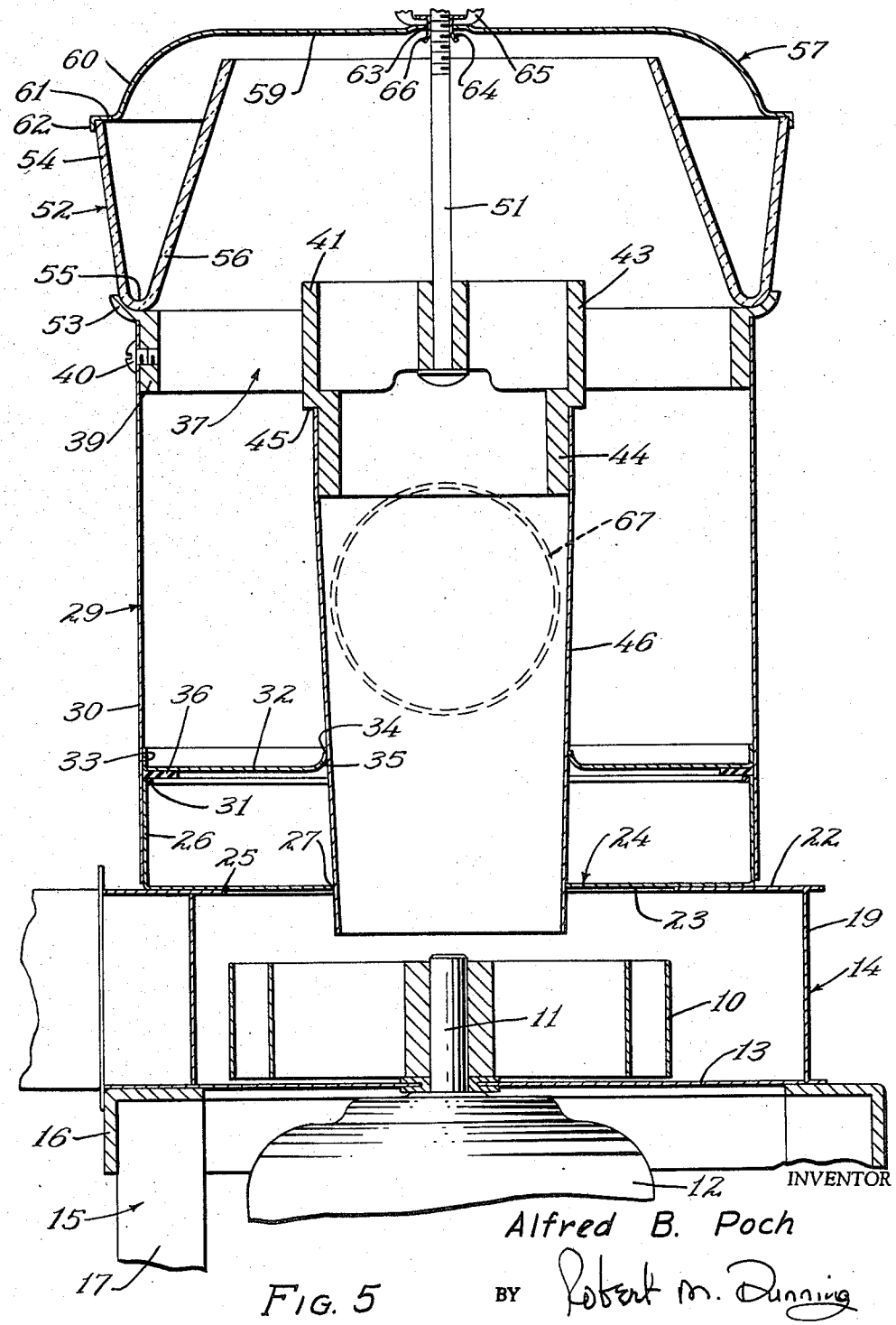


FIG. 5

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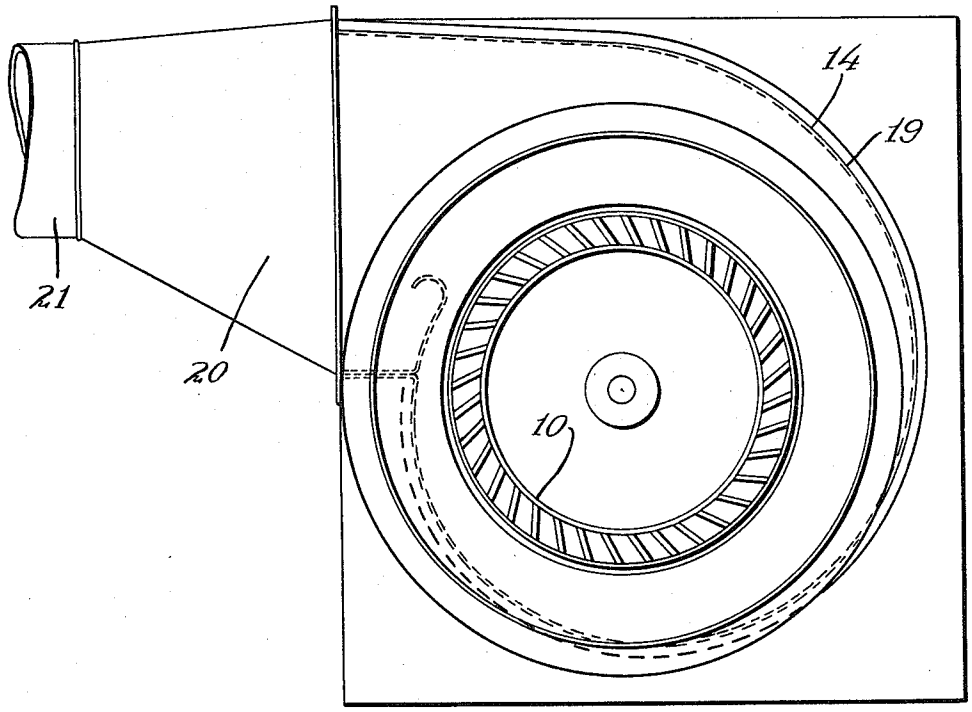


FIG. 6

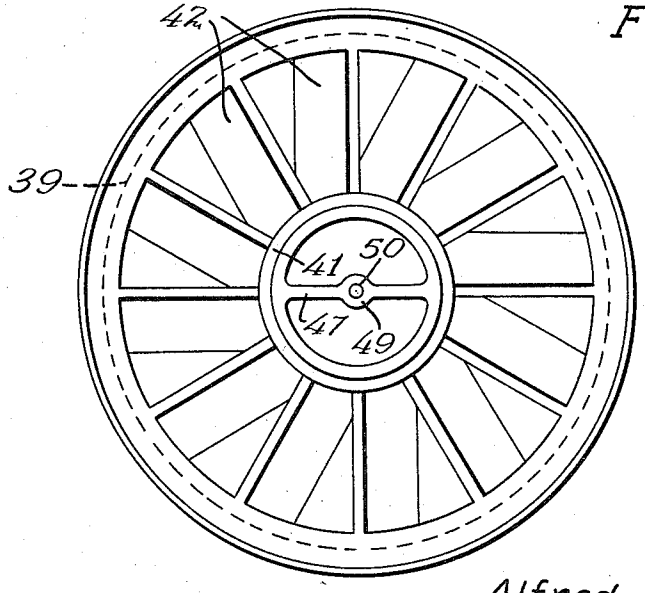


FIG. 7

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Application August 16, 1957, Serial No. 678,653

10 Claims. (Cl. 183—37)

This invention relates to an improvement in separators and deals particularly with an apparatus useful in separating airborne particles from air and particularly adapted for use in salvaging diamonds which break away from abrasive wheels and the like during grinding and cutting operations.

Small diamond particles are used in great volume in the production of abrasive wheels used in cutting and grinding operations. These diamond particles are extremely costly due to the scarcity of them. As the grinding and cutting wheels are used, the diamond particles break from the binding material used in supporting the particles in the wheel. Due to the extreme hardness of the diamonds, the particles themselves are usually intact and a considerable percentage of them can be reused if they can be collected while substantially unmixed with other foreign material.

Most large factories which use considerable quantities of diamond wheels, as they are usually called, are equipped with dust collecting systems designed to withdraw the various particles resulting from the grinding or cutting operations. The grinding wheels are normally hooded and connected to a suction conduit leading to an exhaust fan. During the major portion of the time, in many plants, other abrasive wheels are used for many operations, the diamond wheels being used only when necessary due to the expense involved. It is an object of the present invention to provide a device which will fit into the usual dust removing apparatus and which may be put into operation only when an individual grinding machine is being operated with a diamond wheel. It has been found in actual practice that when used in conjunction with a grinding machine employing a diamond wheel perhaps half of the time, the cost of the entire apparatus can be saved in an extremely short period of time if the swarf from the diamond wheels is collected and sold for reuse.

One of the difficulties which has been experienced in previous attempts to collect the swarf from the diamond wheels lies in this fact that the diamond wheels are only used when they are necessary and other types of abrasive wheels are used in between. As a result, if the dust from the various grinding and cutting operations is collected and saved, the percentage of diamonds is small compared to the amount of other abrasives and particles of metal removed during the grinding or cutting operation. The separation of the diamonds from this large quantity of material has been felt impractical even though the value of the diamonds was recognized. It is also normally impractical to provide two separate dust collecting systems for each individual machine, one of which could be used while grinding with diamond wheels and the other of which could be used while grinding with other abrasive wheels. However, by combining a small compact separator with the central dust collecting system and using this individual separator only while using diamond wheels, the cost of the equipment can be recovered within a period of days in many instances.

An object of the present invention resides in the provision of a separator including an exhaust fan of a size to collect the swarf from an individual grinding machine and which includes a special type of valve plate in the inlet. The flexible pipe from the grinding machine is connected to one side of this pivotal valve plate and the arrangement is such that when the valve plate is in one position the hood of the grinding machine is connected to the interior of the separator housing. When the valve plate is in the opposite position, the pipe from the grinding machine is connected to another conduit leading to the central dust collecting system. Thus, the apparatus may be set into operation by merely changing the position of the valve plate and turning on the fan.

A feature of the present invention lies in the provision of a separator having a fan enclosed in a fan chamber having its inlet on the upper surface thereof. The separator housing attaches to the fan over the inlet and includes an outer vertical housing and an inner tubular member communicating with the fan inlet. The top of the housing is provided with a removable swarf collecting unit including an outer wall and an inner substantially frusto-conical baffle or flange extending upwardly and inwardly from the lower edge of the outer wall. A removable cover panel is sealed with respect to the upper edges of the outer wall and is spaced slightly from the upper small diameter end of the frusto-conical flange. The structure is such that the air moves upwardly with a swirling motion which carries the solid particles over the top of the frusto-conical flange and into the peripheral space between this flange and the outer wall. The air must reverse direction and flow downwardly through the center tubular member and into the fan inlet.

These and other objects and novel features of the present invention will be more clearly and fully set forth in the following specification and claims.

In the drawings forming a part of the specification:

Figure 1 is a perspective view of the separator unit showing the general arrangement of parts thereof.

Figure 2 is an elevational view of the valve plate showing the rear surface thereof with the tubular connections in section.

Figure 3 is a front elevational view of the valve plate in an intermediate position.

Figure 4 is a sectional detail of a member employed to hold the valve plate in one extreme position or the other.

Figure 5 is a vertical sectional view through the separator showing the general arrangement of parts therein.

Figure 6 is a plan view of the suction fan and supporting table with the separator housing removed therefrom.

Figure 7 is a top plan view of the separator housing with the diamond collecting element at the top of the housing removed.

The general arrangement of the parts of the separator itself is perhaps best illustrated in Figure 5 of the drawings. This figure shows a rotatable fan element **10** which is mounted upon the shaft **11** of a motor **12**. The motor **12** is supported in any suitable manner with the axis of the shaft **11** extending vertically through the bottom panel **13** of the fan housing **14**. The fan housing is normally supported upon a table **15** comprising an angle iron rectangular frame **16** supported by legs **17**.

The general shape of the fan housing **14** is best illustrated in Figures 1 and 6 of the drawings. The vertical wall of the fan housing is identified by the numeral **19** and is somewhat spiral shaped in form forming a volute wedge leads to a tapered adapter **20** extending substantially tangentially to the blower **10**. This adapter **20** communicates with an exhaust pipe **21** through which

the air leaving the separator may flow to any desired location.

As is also indicated in Figure 5, the fan casing 14 includes a top plate 22 having an inlet opening 23 extending therethrough which is substantially coaxial with the shaft 11. The top, bottom and peripheral panels are held together in any suitable manner such as by spot welding or the like.

A cup shaped member 24 is secured in any suitable manner to the top plate 22 of the fan housing. The cup shaped member 24 includes a bottom panel 25 which is secured in surface contact with the top panel 22 of the fan and includes an upwardly extending circular flange 26 which is preferably integral with the bottom plate 25. The bottom 25 is provided with a central aperture 27 extending therethrough for a purpose which will be later described more in detail.

The separator housing 29 includes a cylindrical outer wall 30 of proper diameter to encircle the flange 26 with a snug fit. A wire bearing ring 31 is welded or otherwise secured to the inner surface of the flange 26 substantially flush with the upper surface of the flange. The housing 29 is provided with a false bottom 32 which includes an upwardly extending outer peripheral flange 33 which lies in surface contact with the inner surface of the wall 30, and the false bottom also includes a central aperture 34. An upturned flange 35 encircles the aperture 34. A resilient sealing gasket 36 is positioned beneath the false bottom 32 which seals against the bearing ring 30 when the housing 29 is telescoped onto the flange 26.

An air deflector casting 37 is supported at the upper end of the cylindrical wall 30 and includes an outer cylindrical ring 39 which telescopes into the upper end of the cylindrical wall 30 with a snug fit. The casting is normally held in place by machine screws 40 or other suitable means. The casting 37 also includes a concentric inner ring 41 in spaced relation to the outer ring. As is evident from an examination of Figure 7 of the drawings, the outer ring 39 is connected to the inner ring 41 by a series of angularly spaced radially extending vanes 42. These vanes 42 are flat blades which are arranged on planes which are at an angle to the vertical and which are designed to impart a twirling action to the air moving upwardly between them. In other words, these vanes deflect the air in such a manner that it tends to move in a generally helical path as it moves toward the top of the housing.

The shape of the inner ring 41 can best be seen in Figure 5 of the drawings. From this figure it will be noted that the ring includes a slightly larger diameter upper portion 43 and a somewhat smaller diameter lower portion 44. A shoulder 45 is formed in the outer surface of the ring between the sections of different diameter. A tapered sleeve 46 encircles the smaller diameter portion 44 and abuts the shoulder 45. This sleeve forms a tubular connection from the ring 41 which extends through the aperture 34 in the false bottom 32 and through the aperture 27 in the bottom panel 25 of the member 24. The joints fit with sufficient accuracy to prevent air from being withdrawn outwardly of the sleeve 46 through the false bottom 32 and bottom panel 25.

From Figure 7 of the drawings it will be noted that a bridging strip 47 extends diametrically across the upper portion 43 of the sleeve 41 and is provided with a central enlargement 49. A vertical aperture 50 extends through this central enlargement 49. A clamping bolt 51 extends upwardly through the aperture 50 and is preferably frictionally supported in place so that it will not slide downwardly through the opening. The bolt 51 is designed to hold the housing 29 assembled with the actual separating and collecting element 52 as will be described.

The upper edge of the outer ring 39 is provided with an upwardly curved flange 53 designed to seal against the lower end of the element 52. In actual practice, the separating element is formed of clear plastic so the contents of the collector may be noted. The element 52 includes an upwardly and outwardly tapering substantially frusto-conical wall 54 which is curved at its lower extremity as indicated at 55 to form a substantially frusto-conical inner flange or baffle 56. The outer wall 54 terminates at its upper edge substantially below the upper edge or small diameter upper end of the baffle 56. The curved portion 55 between the outer wall and the inner baffle is shaped to seat against the curved flange 53 of the casting 37 to prevent any substantial air leakage.

A top closure or cover 57 closes the top of the housing. This cover 57 is somewhat dome shaped in form including a generally flat center portion 59 which is connected by curved walls 60 to a substantially horizontal or flat ring 61 designed to rest against the upper surface of the wall 54 of the element 52. A downturned peripheral flange 62 encircles a portion of the outer wall 54 to properly locate the cover with respect to the wall. The center part 59 of the cover is provided with a central aperture 63 which pivotally supports an internally threaded sleeve 64 which is threadably engageable on the bolt 51. This sleeve 64 forms a part of the wing nut 65, the sleeve being anchored to and forming a part of the wing nut and having an outwardly flared lower end 66 below the cover portion 59. This arrangement is provided merely to attach the wing nut to the center of the cover 57 so that the cover may be tightened down into place and so that the wing nut will not become separated from the cover.

The concave undersurface of the cover assists in guiding the particles carried by the air entering the cleaner into the ring shaped space between the wall 54 and the baffle 56. The air travels upwardly in a generally helical path and must suddenly reverse its direction and pass downwardly through the sleeve 41. In making this sudden change in direction, the major portion of the airborne particles move over the upper edge of the baffle 56 and are removed from the air. This type of separator element has proven to be extremely effective for its purpose, particularly in the collection of diamonds.

The air inlet 67 to the separator may be seen in dotted outline in Figure 5 of the drawings and is visible in Figure 1. The inlet 67 is slightly above the false bottom 32 and extends radially from the cylindrical wall 30. A cylindrical sleeve 69 projects radially from the housing 30 to connect inlet 67 to the flexible conduit 84 leading from a grinding machine when the device is being operated. This sleeve is provided at its outer end with an outwardly turned flange 70 which is secured in surface contact with a valve mounting plate 71. This plate 71 is elongated in a lateral direction and is provided with parallel marginal flanges 72 and 73 extending along its upper and lower edges. The plate 71 also includes a second tubular member 74 which is anchored thereto by means of a peripheral flange 75 at an end thereof. This second tubular member 74 is designed to accommodate the end of a tubular connection 76 which normally leads to the central dust collecting system of the establishment.

A pivot 77 extends through the center of the valve mounting plate 71 between the tubular members 69 and 74. This pivot 77 supports the valve plate 79 which is usually similar in outline to the valve mounting plate 77. The valve plate 79 includes a central body portion and parallel flanges 80 and 81 extending along its upper and lower edges. A projecting peg or handle 82 is provided on one end of the plate 79 by means of which it may be rotated about its axis.

A tubular sleeve 83 projects forwardly from the valve plate 79 at one end of the plate, while the other end of the plate is imperforate. The tubular member 83 is so positioned that it may be swung into registry either with the tubular member 69 or with the sleeve 74. The sleeve

83 is designed for connection with the flexible conduit 84 leading to the hood of the grinding machine. Thus, when the valve plate 79 is in the position illustrated in Figure 1 of the drawings, the hood of the grinding machine is connected to the interior of the housing 29. However, when the valve plate 79 is rotated 180 degrees from the position shown, the hood of the grinding machine is connected to the conduit 76 leading to a central dust collecting system thus by-passing the separator when not in operation for collecting swarf.

A thimble 85 is secured to one corner of the valve plate 79 and accommodates a ball 86 which is urged toward the open end of the thimble by a spring 87. The ball 86 is confined from leaving the thimble by the size of opening 89 through the valve plate 79. However, the ball 86 projects sufficiently to selectively engage in apertures 90 and 91 provided in opposite corners of the valve mounting plate 71. Thus, the ball normally holds the valve plate in a fixed position.

The operation of the apparatus is quite apparent from the previous description. The present apparatus is usually added to the conventional dust collecting systems by cutting the flexible connection leading to the hood of the grinder or the like at any convenient point and attaching one end 84 of the conduit to the sleeve 83 of the valve plate 79 and attaching the other end of this conduit, which is designated by the numeral 76, to the sleeve 74. When diamond wheels are being used in the grinding machine, the valve plate 79 is turned to the position shown in Figure 1 of the drawings and the fan 10 is started into operation to draw the air from the hood of the grinder into the separator. As the particles of material are separated during the separating process, the outlet 21 of the fan need not be directed to the dust collecting system.

As the air enters the casing it is drawn upwardly through the vanes 42 which give it a swirling action tending to throw any foreign or heavy particles outwardly. This motion apparently is accentuated by the frusto-conical undersurface of the flange or baffle 56. When the direction of the air is suddenly changed at the top of the separator, the foreign particles are thrown over the top of the partition 56 and are collected while the air is drawn downwardly through the sleeve 41 and sleeve 46 into the fan.

In accordance with the patent statutes, I have described the principles of construction and operation of my improvement in separators, and while I have endeavored to set forth the best embodiments thereof, I desire to have it understood that changes may be made within the scope of the following claims without departing from the spirit of my invention.

I claim:

1. A separator for pneumatically carried particles including a fan, a fan housing encircling said fan having an upper surface, with an inlet therein, said housing also having an outlet, a housing mounted upon the upper surface of said fan housing and including an inner vertical tubular conduit communicating with said fan inlet and having an open upper end, a baffle of frusto-conical shape extending upwardly and inwardly from the side walls of said housing, and a removable cover plate closing the top of said housing and sealed with respect to the upper edges of the housing walls, said cover plate being spaced above the upper small diameter end of said baffle, and an air inlet connection extending through the walls of said housing below said baffle.

2. The structure described in claim 1 and in which the small diameter end of said baffle extends above the level of the upper edges of the housing walls, and in which the cover plate is provided with a concave undersurface.

3. The construction described in claim 1 and in which said baffle and the upper portion of said housing walls are integral and are removable from the lower portions of the housing walls.

4. The construction described in claim 1 and including means extending between said vertical tubular conduit and said housing walls above said inlet for deflecting air passing upwardly into a generally helical path.

5. A separator for pneumatically carried particles including a fan, a fan housing encircling said fan having an upper surface with an inlet therein, said housing also having an outlet, a housing mounted upon the upper surface of said fan housing and including an inner vertical tubular conduit communicating with said fan inlet and having an upper open end, a removable separating and collecting unit mounted upon the upper edges of said housing and sealed with respect thereto, said separating and collecting unit including an outer wall and a frusto-conical baffle connected at its lower large diameter end to said outer wall with said locus of connection freely bearing against said upper edges of said housing, a removable cover plate overlying said separating and collecting unit and sealed with respect to the outer wall thereof, said cover bearing against the outer wall of said unit and being in spaced relation to the upper end of said baffle, and detachable fastening means extending between said cover and said tubular conduit to maintain the sealing relationship of said unit with the upper edges of said housing and the sealing relationship of said cover with respect to the outer wall of said unit.

6. The construction described in claim 5 in which said separating and collecting unit is of clear plastic material.

7. The construction described in claim 5 and in which said outer wall of said separating and collecting unit tapers outwardly and upwardly.

8. The construction described in claim 5 and in which said baffle extends above the level of said outer wall of said separating and collecting unit and in which said cover plate is substantially concave in its undersurface.

9. A separator for pneumatically carried particles including a separator housing, means connected to said housing for drawing air therethrough, said housing having an inlet and an outlet, means in said housing for separating air and solid particles carried thereby, a tubular connection extending from said inlet, an elongated valve mounting plate having one end connected to said tubular member, a flexible tube adaptor secured to the other end of said valve mounting plate in parallel reltion to said tubular member, a valve plate pivotally connected to said valve mounting plate along an axis located between the axes of said tubular member and said adaptor, a flexible tube adaptor secured to said valve plate near one end thereof, said last named adaptor being registrable selectively with said tubular member and with said first named adaptor, said valve plate closing said first named flexible tube adaptor when said last named adaptor is registered with said tubular member.

10. A separator for pneumatically carried particles including a fan, a fan housing encircling said fan having an upper surface with an inlet therein, said housing also having an outlet, a housing mounted upon the upper surface of said fan housing and including an inner vertical tubular conduit communicating with said fan inlet and having an upper open end, a removable separating and collecting unit mounted upon the upper edges of said housing and sealed with respect thereto, said separating and collecting unit including an outer wall and a frusto-conical baffle connected at its lower large diameter end to said outer wall, a cover plate overlying said separating and collecting unit and sealed with respect to the outer wall thereof, said cover being in spaced relation to the upper end of said baffle, a tubular air inlet communicating with the interior of said housing, a valve mounting plate secured to the end of said tubular member and encircling said tubular member, a flexible tube

adaptor secured to said valve mounting plate, a valve plate including a flexible tubing adaptor extending therethrough, and means intermediate said tubular member and said adaptor connected to said valve mounting plate pivotally connecting said valve mounting plate and said valve plate, said adaptor on said valve plate being selectively engageable either with said tubular member or with said flexible tube adaptor on said valve mounting plate.

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