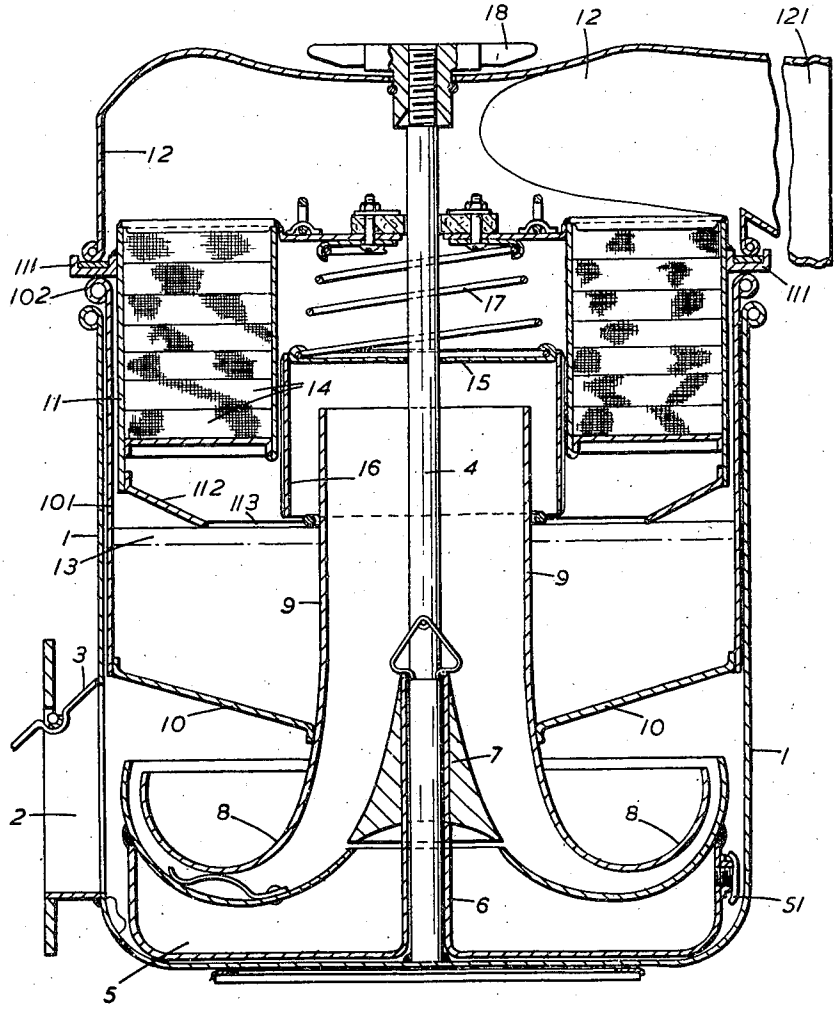
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FILTER OR CLEANER

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FILTER OR CLEANER

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A well known type of gas filter or cleaner includes means by which the gas to be cleaned is caused to impinge upon a liquid surface and to be cleaned by passing through liquid spray or mist, generally as it passes under a lip or rim extending down to a level more or less approximating to the surface level of the liquid. In many cases the liquid used is oil and these cleaners are known as oil bath cleaners. The term oil is used herein without implying that the liquid to be used is necessarily oil. As the gas rises away from the surface it carries oil mist or spray with it and a scrubbing stage of cleaning follows in an oil-wetted scrubber.

So long as the flow is substantially constant, the level at which the lip or rim should lie relatively to the oil surface level (i. e. in normal constructions the level to which the bath is filled) to give the best results can be determined. It has however been found that where there is considerable variation of gas flow the carry-over of oil tends to become excessive at maximum volume of flow if the scrubber is to be efficiently wetted at (say) half that volume of flow. This tendency is increased by tilting or splashing if the cleaner is carried on a tank or other vehicle.

One important part of the invention lies in the provision of means dependent upon the volume of gas flow to vary the height of the lip or rim relatively to the oil surface level, in order to minimise or avoid excessive carry-over. In the preferred form of the invention there is an initial stage of (preferably dry) centrifugal dust separation and easy accessibility of the parts for cleaning and maintenance becomes a matter of great importance and some difficulty. It can be arranged by using a single central assembly rod to hold the bottom part of a mushroom-like centrifugal separator (see U. S. Patent 2,406,177, dated Aug. 20, 1946) to the upper part, so that it can be removed and the intermediate air passage exposed for cleaning, as well as holding a section containing the upper part and the oil bath and a section containing the member embodying the rim over the oil bath and the scrubber to an outlet header.

Other parts of the invention are embodied in a typical form shown by the accompanying drawing which is a central vertical section. The parts

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of the invention for which a monopoly is desired are those defined by the claims.

As shown, a cylindrical outer shell 1 is formed with an inlet 2 through which air can be drawn, perhaps from a duct leading from a relatively clean position or alternative positions and perhaps controlled by a flap 3 to draw from warm or cold compartments or positions in desired proportions at will. A central rod 4 is welded to the inside of the bottom and extends right up through the whole assembly. Within and at the bottom of the shell 1 is the dry dust container 5, the top of which forms a portion of the outer part of the "mushroom" centrifugal separator. A tube 6 passes through these parts and through the somewhat conical member 7 which lies over their centre to form the dust collecting lip of the centrifuge, so that they are readily slipped over the central rod 4. The upper part 8 of the "mushroom" may be formed at the bottom of its hollow stem 9, which passes up through the centre of the oil bath which oil bath is defined by the shell 1 and the bottom 10 to a position well above oil level. The outer shell 1 fits over the cylindrical wall 101 of the oil bath 10 and makes joint against a flange or bead 102 thereon. This flange or bead may be used also to make joint against the lower side of a flange 111 on the next section 11, the upper side of which flange makes joint with the outlet header 12. The oil bath 10 is thus of annular form and may be provided with four or more radial partitions 13 forming four or more almost completely separated compartments to avoid undue variation of oil level as the result of tilting or splashing. The next or third section 11 has in its outer and upper part an annular scrubber, preferably formed of a number of superposed layers of rather deeply pleated wire gauze 14 with the edges of the pleats crossing one another to keep the layers spaced. The bottom of this section 11 has a downwardly and inwardly inclined annular part 112 running down to a level somewhat above oil level with horizontal radial webs 113 (perhaps an inch or so wide) running in from there over the partitions 13 in the oil bath till they nearly meet the stem 9 of the "mushroom." The truncated conical baffle so formed causes the oil bath compartment to partake to some degree of the nature of a non-spillable container, making it

possible to tilt the apparatus further without bringing oil into direct contact with the scrubber. Moreover, there is a tendency for the gas velocity through the scrubber in section 11 to be reduced towards the periphery and oil is conveniently drained back from the scrubber by this means. The webs 113 over the partitions in the oil bath not only help them to mitigate the effect of tilting and swaying, but prevent oil from splashing over a partition when the oil level is not far below its top and the gas is strongly disturbing the adjacent surfaces. Over the open upper end of the stem 9 of the "mushroom" is a deflecting member or hood 15 slidable on the central rod and forming a substantially closed top to an open bottomed piston like member which fits loosely in the centre of scrubber and the skirt 16 of which extends down to or nearly to the radial webs where its bottom edge forms the lip or rim over the oil bath. A compression spring 17 over the hood tends to hold it down to this position. A captive wing nut 18 over the header screws onto the central assembly rod 4. The pressure difference occurs due to the fact that air has to take a double bend before it has passed the outer rim of the skirt. The fact that the air takes a double bend results in a pressure loss. The lower pressure is thus transmitted via an annular space between the skirt and the inner skin of the oil scrubber pack, to the compartment immediately above the diaphragm. Therefore, this pressure difference on the two sides of the diaphragm causes it to move in the direction of the lower pressure.

The energy exerted by the velocity head of the gas issuing from the central tube of the mushroom separator, is also exerted on the diaphragm and assists in its upward movement.

In operation, the gas enters the space below the oil bath by inlet 2 and passes down and round between the edges of the two parts of the mushroom, dust being concentrated against the interior surface of the lower part by centrifugal force and then diverted by the lip of the extractor 7 into the dust chamber 5 before the air rises up the stem 9. Upon emerging from the top of the stem, the gas strikes the underside of the hood 15 and turns down inside the skirt 16 to strike the oil surface and turn up again outside the rim formed by the bottom edge of the skirt 16, then passing through the scrubber parts 14 which it wets with the oil mist or spray, into the header 12 and out through the outlet 121. According to the volume of gas flowing the pressure difference between the under and upper sides of the diaphragm 15 varies and the piston tends to rise more or less against the control of gravity and the compression spring 17. The strength of the spring is so adjusted that compensating movement of the piston takes place to give satisfactory operation as the volume of flow varies over a fairly considerable range. In experiments made up to the present time satisfactory oil wetting of the scrubber has taken place at half the maximum air volume and at maximum air volume there was no deleterious carry-over of oil even with the apparatus tilted at 40°. More complicated and sensitive control means could obviously be used if necessary but the above results are quite good enough for most practical applications.

The particular compensating means described in the preferred form of the invention are given by way of example, for obviously many other methods could be used without departing from the underlying idea once that is understood.

It will be noted that cleaning and maintenance do not involve any difficulty or very considerable time. By undoing the securing nut 18 all the sections become separable from the header and from one another. The scrubber elements, the oil bath and the air passage in the "mushroom" are all readily exposed and a cap or plug 51 can be unscrewed from the dust chamber 5 to empty it.

We claim:

1. A filter comprising, in combination, a casing defining a receptacle for a liquid bath, a gas inlet opening into said casing above the location of the surface of the liquid bath, a deflector in front of said inlet and including a skirt for directing incoming gas toward the surface of the liquid bath to saturate said gas, the rim of said skirt and the surface of the liquid being spaced to define a passage for the gas therebetween, an outlet in said casing for exhausting the gas flow from said passage, a wettable filter element between said passage and said outlet for scrubbing the saturated gas, and means responsive to the volume of gas flow through said casing and supporting said deflector for movement relative to the liquid surface to vary the area of said passage to regulate the speed of gas flow and saturation of the gas and consequently regulate the wetting of said filter element.

2. A filter comprising, in combination, a casing defining a receptacle for a liquid bath, a gas inlet opening into said casing above the location of the surface of the liquid bath, a deflector movably mounted in front of said inlet and including a skirt for directing incoming gas toward the surface of the liquid bath to saturate said gas, the rim of said skirt and the surface of the liquid being spaced to define a passage for the gas therebetween, an outlet in said casing for exhausting the gas flow from said passage, a wettable filter element between said passage and said outlet for scrubbing the saturated gas, a housing enclosing the back portion of said deflector and closely surrounding said skirt to form a pressure chamber subject to reaction in response to air flow from said passage, and means responsive to the variation in pressure on the front of said deflector from the volume of gas flow through said inlet and the back of said deflector in said pressure chamber and supporting said deflector for movement relative to the liquid surface to vary the area of said passage to regulate the speed of gas flow and saturation of the gas and consequently regulate the wetting of said filter element.

3. A filter comprising, in combination, a casing defining a receptacle for a liquid bath, a vertical gas inlet tube opening into said casing above the location of the surface of the liquid bath, a hood deflector over said inlet opening and including a skirt depending around said tube for directing incoming gas toward the surface of the liquid bath to saturate said gas, the rim of said skirt and the surface of the liquid being spaced to define a passage for the gas therebetween, an annular housing fixed in said casing and closely surrounding said hood deflector, an outlet in said casing above said annular housing for exhausting the gas flow from said passage, an annular wettable filter element supported by said annular housing between said passage and said outlet for scrubbing the saturated gas, a cover for the opening in said annular housing and forming with said housing a pressure chamber over said hood deflector, and means responsive to the pressure differential between said pressure chamber and the volume of gas flow through said inlet opening

and supporting said deflector for movement relative to the liquid surface to vary the area of said passage to regulate the speed of gas flow and saturation of the gas and consequently regulate the wetting of said filter element.

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