This invention relates to dust collectors of the cylindrical cloth gas collector type commonly known as "stocking" collectors, and in particular to anti-collapsing ring means for restricting collapse of the long bags when the internal pressure is reduced, as during a dust discharging operation.

The use of silicones for treating glass fiber cloth and other fabric for making dust collecting bags or "stockings" has eliminated the necessity for shaking the bags at intervals to remove the collected dust, because the silicone treatment prevents adhesion to the inner walls, and the collected dust or dust cake readily falls down merely by an intermittent reversal of the gas pressure in the bags breaking the dust cake by the configurational change of shape of the bags. When the long bags are suspended, with bottoms or both ends open, a reduced air pressure inside the bags, if the bag walls are not held apart, causes the bag walls to collapse and come together, and therefore the collected dust is prevented from discharging. Then, upon restoration of more positive operative pressure, the bag walls, having not been freed from the previously collected dust, a back pressure in the system builds up undesirably. This problem is solved by our invention which will be understood from the following description, reference being made to the accompanying drawing, in which:

FIG. 1 is a side elevational view of a dust-collecting bag in place, closed by a supporting cap at the top, with a break-out interior view showing the positioning of the anti-collapsing structure;

FIG. 2 is a side elevational view of the same, showing the positioning of the bag on the reverse pressure cycle with the anti-collapse rings in use;

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 1;

FIG. 4 is an enlarged vertical transverse section taken on the line 4—4 of FIG. 3;

FIG. 5 is an enlarged vertical section taken on line 5—5 of FIG. 4;

FIG. 6 is an enlarged fragmentary view of the upper portion of the assembly showing the cap and its supporting hook, for supporting the anti-collapsing ring assembly; and

FIG. 7 is a fragmentary view of a bag, similar to FIG. 1, attached to an open thimble instead of the closed cap as in FIG. 1.

Referring to the drawings, a typical dust collector bag is shown in FIGS. 1 and 2, the fabric bag 11 being suspended from an upper cap 12 to whose rim the upper end of the bag is attached by the attachment band 13. The cap 12 is provided with supporting hook means 14 whose threaded stem 15 extends through the cap 12 and is held by the nut 16. The lower end of the bag is attached by a clamp ring 17 to the thimble 18 of the cell plate 19, which covers the dust collection box 20 serving a plurality of similar bags. The lower end of the bag is positioned between the two end fastenings. When the upper end of the bag is open, an open thimble 12A is used instead of the cap 12, as shown in FIG. 7. The open thimble 12A is provided with a cross-bar 23A which has a central boss 24A, having a threaded hole 25A.

The anti-collapsing means consists of a plurality of rigid rings 22 held together in rigid spaced relation, and independently suspended inside the bag. The rings 22 are preferably made of non-corroding metal such as stainless steel, and are rounded on the outer face to avoid sharp edges which might, in use, wear through the fabric of the bag. Each ring is provided with a diametric chord member 23, which as shown is preferably of width approximately equal to the width of the ring 22. The rings 22 preferably fit a little loosely in the bag interior, being about % inch less in diameter than the fabric bag. If made too loose fitting, the fabric of the bag tends to form pleats or wrinkles, which reduce the efficiency of filtration and increase the danger of wearing holes in the fabric.

Each ring 22 is provided with a boss 24 which is attached rigidly to the chord member 23, the boss being provided with an elongated threaded hole 25 disposed axially relative to the rings 22. The boss 24 may be attached to the chord member 23 by any selected means, as for example by welding. The fixed threaded boss 24 is an important element in the structure because it holds the rings in horizontal position, and prevents a ring from canting, in which position it does not hold the bag fully open.

The rings 22 are spaced apart in the rigid linked-together assembly by spacing rods 27, whose lengths are selected so that the rings are spaced from 1½ to 3 ring diameters apart. In the preferred structure, the rings are spaced about 3 diameters apart except the lowest ring which is disposed about 1½ diameters above the collection box thimble 18. If the distances apart are greater than the range given, then the bags may collapse excessively between the rings.

The spacing rods 27 are provided on each end with threads 28 which engage the threaded holes 25 in the threaded bosses 24. The ring assembly structure is easily put together, and if the threads are accurately fitted, the parts do not become disconnected in use. The ring assembly in the illustrative embodiment shown in FIGS. 1 and 2 of the drawing is supported on a common nut 30 which is inside threaded at one end to fit on the threads of the stem 15 of the supporting hook 14 for the cap 12. A top connector nut 30 consists of an elongated body 31 having a threaded hole 32 which fits on the end of the threaded stem 15. The opposite end of the body 31 is provided with a threaded hole 33 which is engaged by the threaded end 28 of a spacing rod 27, whose other end is threaded into the threaded boss 24 of the uppermost ring 22.

Other means for fastening the rings in a rigid assembly may be employed, it being essential that the bags may be easily drawn over and withdrawn from the ring assembly, and also that the rings will not become canted during use. The use of removable threaded rods facilitates the assembly for any length bag.

With the preferred rigid structure described, on a collection system handling micron and sub-micron particle sized mineral dust, the bag pressure was dropped from 4 inches W.G. (water gauge) to 1 inch W.G. by discharge of collected material by means of controlled collapse and gas inflow, whereas a like system without the rings showed a pressure drop of 2.5 inches W.G. on removal of collected material due to the restriction imposed by the completely collapsed bags. The lower inside pressure, when rings were used, allowed more air to flow inwardly through the bags, and this added air flow more thoroughly discharged the collected dust. The rigid spacing rods and the non-canting ring structure maintains the assembled ring structure in the bags.

The advantages will be obvious from the above description. The objectives set forth in the beginning have been accomplished.

We claim:

1. Filter apparatus comprising: (a) upper and lower structures in vertically spaced relationship,

(b) a dust-collecting filter bag of elongated tubular
construction and made of flexible gas-pervious fiber glass material,
(c) first means attaching the ends of said bag respectively to said upper and lower structure holding said bag in tension between said ends, with at least one end of said bag being normally open to the flow of gas to be filtered into said bag and outwardly therethrough,
(d) a plurality of rigid rings having an outside diameter slightly less than the inside diameter of the bag extending annularly about the longitudinal axis of said bag and being longitudinally spaced apart between the ends of said bag,
(e) second means connected to said upper structure and extending longitudinally of said bag within the periphery of said rings for positionally attaching said rings within said bag,
(f) said bag intermediate the ends thereof being free of attachment to said rings, and
(g) said first and second attaching means (c) and (e) being operatively independent of one another;
the construction and arrangement being such that during normal filtering operation of said apparatus, with gas to be filtered flowing into said bag under pressure, said bag is substantially out of contact with said rings; and upon any reversal of the direction of gas flow through said bag, said rings engage said bag to hold the same against complete collapse.

2. Filter apparatus comprising:
(a) upper and lower annular structures in vertically spaced relationship,
(b) a dust collecting filter bag of vertically elongated tubular construction and made of flexible gas-pervious fiber glass material,
(c) first means attaching the upper and lower ends of said bag respectively to said upper and lower structure for holding said bag in tension between said ends, with at least one end of said bag being normally open to the flow of gas to be filtered into said bag and outwardly therethrough,
(d) a plurality of rigid rings having diametric chord members having an outside diameter slightly less than the inside diameter of the bag extending annularly in horizontal direction about the longitudinal axis of said bag and being longitudinally spaced apart between the ends of said bag; said rings being of rounded cross section to present a curved surface to said bag;
(e) second means connected between said upper structure and said chord members, extending longitudinally of said bag within the periphery of said rings for positionally attaching said rings within said bag,
(f) said bag intermediate the ends thereof being free of attachment to said rings, and
(g) said first and second means (c) and (e) being operatively independent of one another so that said bag is detachable from said upper and lower structure without disturbing the connection between said upper structure and said chord members;
the construction and arrangement being such that during normal filtering operation of said apparatus, with gas to be filtered flowing into said bag under pressure, said bag is substantially out of contact with said rings, and upon any reversal of the direction of gas flow through said bag, said rings engage said bag to hold the same against complete collapse.

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