

Nov. 9, 1943.

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2,333,713

METHOD OF CLEANING BAGS

Original Filed April 3, 1940

3 Sheets-Sheet 1

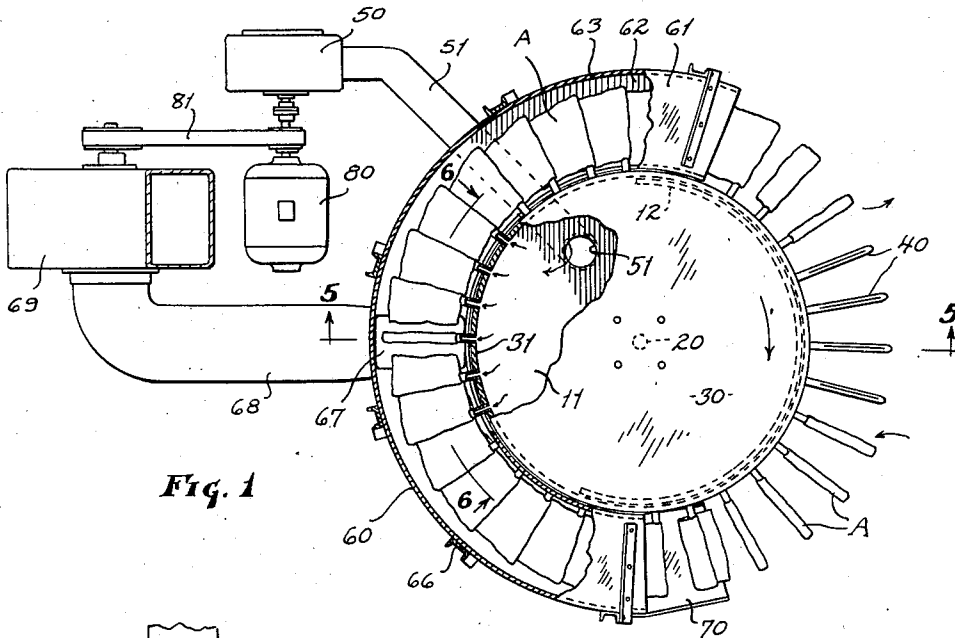


Fig. 1

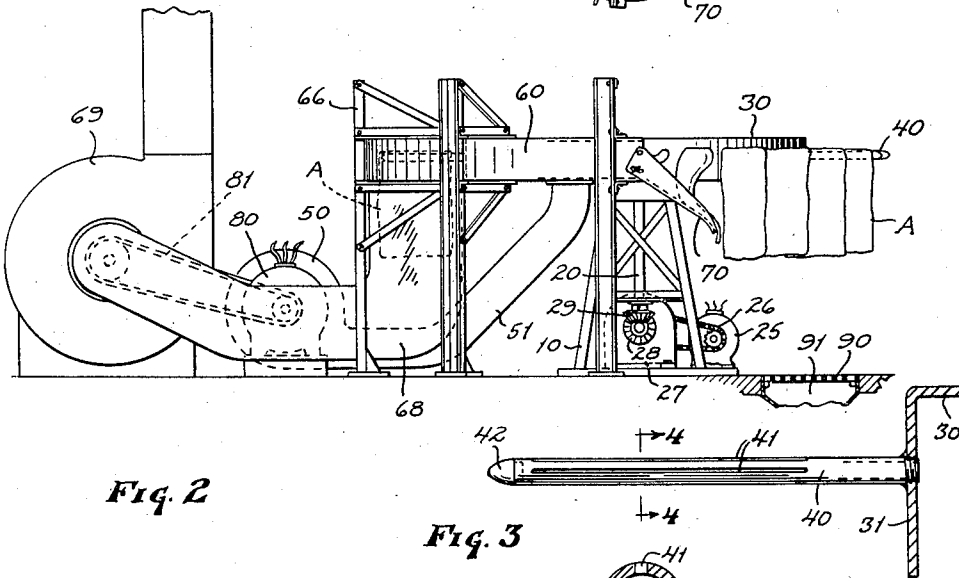
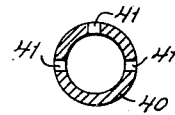


Fig. 2

Fig. 3

Fig. 4



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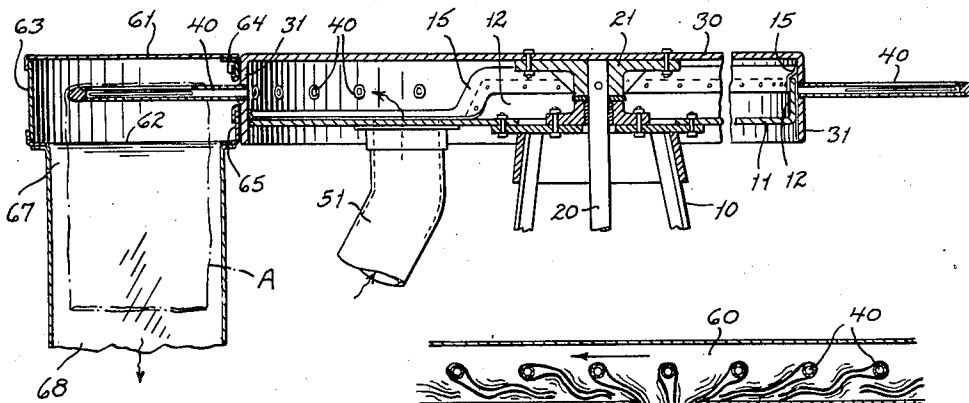


Fig. 5

Fig. 6

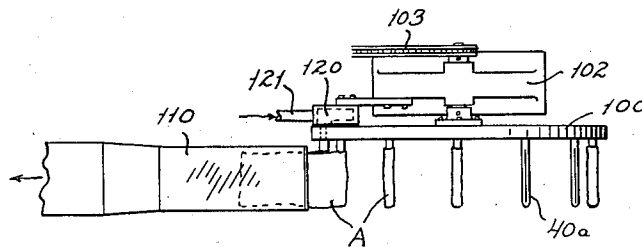


Fig. 8

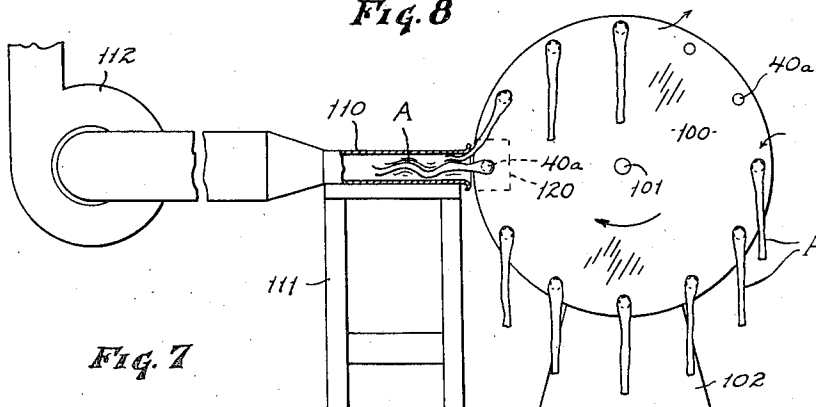


Fig. 7

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3 Sheets-Sheet 3

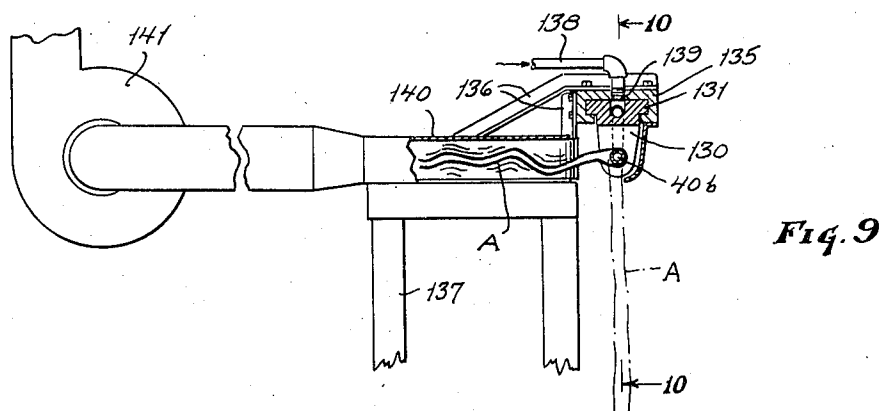


Fig. 9

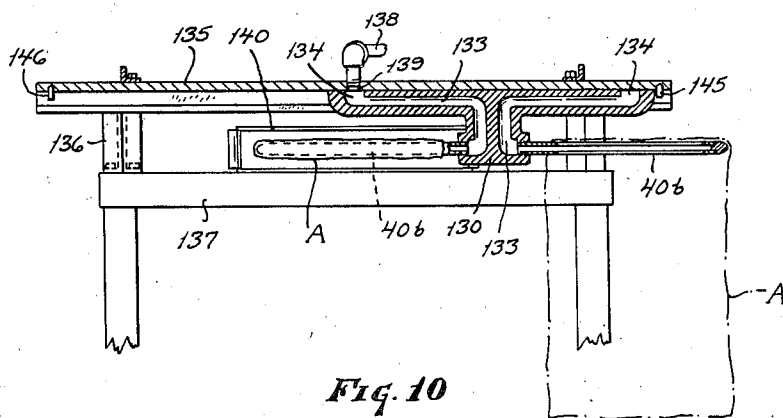


Fig. 10

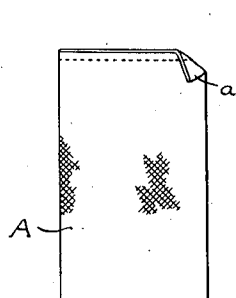


Fig. 11

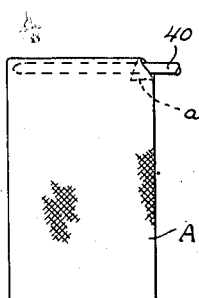


Fig. 12

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UNITED STATES PATENT OFFICE

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METHOD OF CLEANING BAGS

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Original application April 3, 1940, Serial No. 327,671. Divided and this application October 8, 1940, Serial No. 360,275

7 Claims. (Cl. 15-269)

This application is a division of my parent application, Serial No. 327,671 filed April 3, 1940, and issued July 14, 1942 as Patent 2,289,700, and relates to a method of cleaning bags, and especially such fabric bags as are designed to carry pulverized material, some of which may cling to the inner surface of the bag and require removal before the bag can be again used.

While my invention is adapted for cleaning ordinary bags which after use are open at the end, it has been especially developed to provide for the cleaning of bags of the type known as valve bags which have an opening adjacent the normal bottom of the bag which in use is closed by an internal flap. Such valve bags have been on the market since about the time of the issuance of Patent No. 623,199, granted April 18, 1899 to A. M. Bates.

As shown in the patent mentioned, the bag is originally made with the normal upper end closed. The bag is filled in inverted position by a spout entering a filling opening at one of the corners, which is to be at the bottom in use. As the filling is being completed, the flap within the bag automatically closes the filling opening. The bag then remains full until access is desired, when the top of the bag (i. e. the bottom during the filling) is opened, and the contents extracted in the usual manner. Such bags, after use, especially if made of fabric, have a value for reuse, providing they are effectively cleaned of their former contents. The present invention provides for such cleaning rapidly and efficiently.

The broad principle of the present invention is to mount the empty bag on a support (which in the case of a valve bag may extend into it through the valve opening) and then move the support along a defined path to bring the bag adjacent an opening into a conduit into which air is rapidly moving so that the body of the bag is drawn into the conduit and caused to beat violently against a surface thereof while the bag is held by the support, with the result that the contents remaining in the bag is shaken free and discharged. The air draft through the bag may be provided by suction applied to the conduit, or by compressed air applied to the interior of the bag, or both suction and compressed air may be employed.

The present application relates to the method as above outlined. In explaining such method I have illustrated apparatus I have devised for carrying out that method. Several forms of such apparatus are illustrated in the drawings hereof, and are hereinafter more fully described, and

other forms (not illustrated) are included within the terms of the appended claims. Such apparatus is claimed in my parent application above-mentioned.

In the drawings, Fig. 1 is a plan, partly in section and partly broken away, illustrating one form of apparatus for carrying out my method; Fig. 2 is a side elevation of the apparatus shown in Fig. 1; Fig. 3 is an elevation of one of the bag supports shown in Fig. 1; Fig. 4 is an enlarged cross-section of the support shown in Fig. 3, as indicated by the line 4-4 on Fig. 3; Fig. 5 is a section through the apparatus of Fig. 1, as indicated by the line 5-5 on Fig. 1; Fig. 6 is a diagrammatic vertical section taken on the curved line 6-6 on Fig. 1; Fig. 7 is an elevation of a modified form of apparatus which may perform my method; Fig. 8 is a plan of the embodiment shown in Fig. 7; Fig. 9 is a sectional elevation of another modified form of apparatus; Fig. 10 is a vertical section on the line 10-10 on Fig. 9; Fig. 11 is an illustration of a valve bag as originally formed before it is turned wrong side out; Fig. 12 is a view of such bag after using and emptying, showing it mounted on a tubular support, of any of the embodiments of my cleaning apparatus.

Referring first to the apparatus illustrated in Figs. 1-6, 10 indicates a suitable standard carrying at its upper end a horizontal disk 11 which may be a metal plate bolted to the top of the standard 10. Journalled in the standard 10 at the center of the disk 11 is a vertical driving shaft 20. At its upper end this shaft carries a downwardly facing horizontal drum 30. This drum being made of a circular metal disk for the horizontal portion, and downwardly extending cylindrical flange 31 at the edge thereof. I have shown a suitable head 21 secured to the upper end of the shaft, and bolted to the disk of the drum 30. The vertical flange of this drum extends downwardly just outside of a vertical flange 12, on the edge of the stationary disk 11. This flange will hereinafter be described in detail.

Suitable means are provided for rotating the shaft 20. I have indicated, in Fig. 2, a motor 25 connected by a sprocket chain 26, with suitable gearing in a reducer 27, terminating in a bevel pinion 28 which meshes with a bevel pinion 29 on the lower end of the shaft 20. Accordingly, when this motor is operated, the inverted drum 30 is rotated at a comparatively slow speed, due to the reducer 27.

Projecting radially from the drum 30, by being

secured to its vertical flange 31, are a number of hollow tubes 40. I have shown in Figs. 3 and 4 the hollow tube as screwed into the flange 31, and also welded thereto. The tube has several longitudinal slits in it, three being shown as indicated at 41. The end of the tube as shown is closed by a plug 43.

The space within the hollow drum above the stationary disk 11 constitutes an air chamber which may be supplied with compressed air from a compressor 50, through a conduit 51, discharging through the stationary disk 11. Standing close to the rotating flange 31 is an arcuate conduit 60, shown as carried by upright supporting bars 66. This conduit is open at its ends, and may be composed of an arcuate top-plate 61 (which may be in about the same plane with the top of the drum 30) a corresponding arcuate bottom plate 62, and a partially cylindrical outer wall 63 connected to the top and bottom plates, and two partially cylindrical inner walls 64 and 65 spaced apart a distance somewhat greater than the thickness of the radial bars 40.

The arcuate chamber described stands immediately adjacent the rotating turret with the two spaced inner walls 64 and 65 substantially in engagement with the drum flange 31, and with a number of radial bars 40 extending into the arcuate chamber by reason of the slot between the two walls 64 and 65. The arcuate chamber described preferably extends about the turret for approximately a half circumference. About midway of its length this chamber has a discharge port 67 in its bottom wall 62, and from this discharge port a conduit 68 leads to the casing 69 of a rotary suction producer.

The flange 12 heretofore referred to on the stationary disk 11 is formed for about half the circumference, and in a position opposite the arcuate conduit, but at the conduit, or at least for the greater portion thereof, this flange is omitted. The result is that there is a free passage of air from the space within the drum into those supporting tubes 40 which are well within the arcuate conduit, while those outside of the conduit have their bores closed by the flange 12.

The disk 11 and the flange 12 are preferably provided with an annular leather packing strip 15 which engages the inner surface of the drum flange 31. This engagement is below the entrance to most of the tubes 40, which are in the arcuate chamber while it is above those tubes which are outside of the chamber.

It results from the construction described that compressed air from the compressor 50, admitted through the conduit 51 to the space within the drum passes freely into the supporting tubes 40 which are within the arcuate conduit 60, but cannot pass into those tubes 40 which are outside of such conduit.

The drum 30 in the embodiment of Fig. 1 is supposed to be rotated in a clock-wise direction as indicated by the arrow. Accordingly, bags A placed on some of the projecting tubes 40 outside of the arcuate conduit 60, will be carried into this conduit over the discharge passageway 67, and finally discharged through the open end of the arcuate conduit into a position where they may be removed.

To enable convenient passage of a depending bag A into the arcuate conduit, I provide a chute 70 secured to the conduit adjacent its entrance. This chute, which is in the nature of an open trough inclined upwardly to the conduit, enables

the bag as it reaches the chute to be deflected into an approximately horizontal position.

A pronounced suction is applied by the fan device 69 through the conduit 68 and port 67 to the arcuate chamber, notwithstanding the open ends of that chamber. Accordingly, as I have indicated in the diagrammatic sectional elevation (Fig. 6) the bags A as they enter the arcuate conduit, flap violently against the bottom thereof, and then come over the down take pipe 67 where they beat back and forth against opposite walls thereof, shaking the contents loose, and finally are discharged through the open end of the arcuate conduit in a substantially clean condition.

The bag A was originally formed with its flap external by bending the corner of the tubular fabric inwardly and sewing across the remaining extreme end while the bag is wrong side out as indicated in Fig. 11. When the bag is turned right side out, this open portion becomes a flap on the inside as shown in Fig. 12. Before originally filling such a bag, the end of the bag shown in the lower extremity of Fig. 12 is sewed closed, but this sewing is removed when the bag is empty, so that the bag when received to be cleaned is entirely open at one end, and has the valve opening at the other end.

Now in cleaning such a valve bag as just described, by the apparatus of Figs. 1 to 6, the attendant stands at the right-hand side of the machine, as shown in Fig. 1, and places the bags one after the other on the projecting tubes 40 adjacent his left hand, as he faces the machine. Such bags then engage the chute 70 and pass into the open end of the arcuate conduit by reason of the suction in that conduit, and beat violently against the conduit walls, particularly the base of the conduit.

As soon as such bag-carrying tube 40, in this movement of the drum, passes beyond the end of the stationary flange 12, such tube receives compressed air from the interior of the drum, and thus the bag as it travels about in the arcuate conduit has suction acting on the exterior and compressed air on the interior which crumples or distorts the bag and beats it back and forth vigorously against the walls of the conduit, thus loosening any material remaining in the bag, so that as the bag comes over the discharge port 67, the contents is discharged into that port.

The air suction carries into the port 67 any contents which have been shaken out in passing from the open end of the conduit to the port 67. Suction also exists through the other open end of the conduit around past the clean bags so that even after they have left the port 67 they are further subjected to compressed air on the interior and suction on the exterior. Thus the bags are thoroughly cleaned by the time they emerge from the conduit. After they have emerged the attendant takes them off the projecting supporting tubes 40 beyond the arcuate conduit, leaving those tubes free to receive fresh bags for cleaning.

The discharge material from the bags while they were in the arcuate conduit is drawn by the suction from each arm of the conduit down through the port 67, and the down-take pipe 68 into the suction fan 69. The discharge from this fan may lead to a separating device similar to a dust collector (not shown) whereby the material loosened from the bags may be recovered for future use. I have illustrated in Fig. 1 a motor 80 directly coupled to the air compressor 50

and connected by a belt 81 to the suction fan but this construction is, of course, optional.

Any material that drops from the bags by gravity, or accidental shaking, as they are put in place on the projecting arms 40 for cleaning may pass through a grating 90 (Fig. 2) below such bags into a chamber 91, from which it may be removed in any desired manner.

It will be understood that the turret described rotates at a comparatively slow rate of speed, determined by the speed at which the attendant or attendants may conveniently install the soiled bags and remove the cleaned bags. Such speed gives ample time for the bags to be thoroughly cleaned in transit through the suction conduit. The compressed air supplied to each bag through the tube 40 supporting the bag need not be of very high pressure. The suction, however, is preferably quite vigorous so as to cause an effective beating of the bag against the conduit walls.

In Figs. 7 and 8, I have illustrated a simpler form of apparatus for performing the method of this invention. In this case the tubular supporting arms 40a are mounted parallel with each other in a circular course on one side of a vertical disk 100 which is carried by a shaft 101 journaled in a suitable standard 102. A sprocket chain 103 indicates means for driving this shaft to rotate the disk. At one edge of the vertical turret comprising the disk and tubes is a suction conduit 110, on a suitable support 111. This conduit is connected with a suction fan 112.

The bags indicated at A may be placed successively on the tubes 40a at the right hand edge of the machine in Figs. 7 and 8; then these tubes with their depending bags pass through the lower half circle of rotation of the disk 100 in a position opposite the mouth of the suction conduit 110, where the bag is drawn violently into the conduit, causing it to beat against the upper and under walls thereof. At the same time that this is taking place the open end of the tube 40a comes into communication with the stationary air chamber 120 behind the disk 100 so that compressed air from the conduit 121 passes into the interior of the bag at the same time that the exterior is subject to suction.

The contents of the bag loosened by the suction and compressed air in this embodiment, passes into the suction conduit and is discharged by the fan. The cleaned bags pass from the suction passageway over the upper portion of the course of the tubular supports 40a and are removed at the front or right hand end of the machine just above the location where the soiled bags for cleaning are to be installed.

Figs. 9 and 10 illustrate a still simpler apparatus which may be employed with my method. In this case, I have two tubular bag supporting arms 40b mounted in a hollow shiftable head 130. This head may be moved to carry the bag on either arm 40b into registration with the opening of a suction conduit 140, which leads to a suction fan 141. I have shown the shiftable head 130 as having ribs 131 at its front and back which occupy grooves in a stationary supporting bar 135. This supporting bar is mounted in suitable frame work illustrated by the angle bars 136 and the wooden support 137.

A compressed air pipe 138 leads through the top of the frame bar 135 to a port 139. Within the shiftable head 130 are two passageways 133 which lead from the two tubes 40b to two ports 134, either of which may register with the port

139. The ports are so spaced that when this registration is effected, the corresponding tube 40b is directly in front of the entrance to the suction conduit 140.

In operating the apparatus indicated in Figs. 9 and 10, (assuming that the head 130 is in its extreme right-hand position against a stop 145), the bag A may be placed on the projecting tube 40b, which is at the right hand in Fig. 10; then the head 130 is shoved to its extreme position at the left hand where it is stopped by engaging the peg 146. This brings the arm 40b carrying the bag directly in front of the mouth of the suction conduit 140 and at the same time brings the corresponding port 134 into communication with the compressed air port 139. Thus compressed air is supplied to the interior of the bag and suction acts on the exterior and draws it into the conduit and beats it violently, as indicated in Fig. 9.

While this beating action is taking place on the bag on the right hand support, the left hand support is projected at the left hand portion of the machine with the cleaned bag ready for removal. Thus bags are placed alternately, first on one tube 40b and then on the other, as the head is shifted back and forth and carries the soiled bag to cleaning position, and the cleaned bag to removal position.

It will be seen that each of the three forms of apparatus shown is characterized by providing a plurality of tubular supports, so that the attendant may place a bag on the support or remove a bag from the support while another bag is being subjected to cleaning action by suction applied to a conduit with which the bag carrying support at the time is in cooperation. It will likewise be seen that compressed air is automatically connected to a tubular support carrying a bag whenever such bag is opposite the mouth of the suction conduit.

In all of these cases shown in the drawings, the bag is supported by a tubular supporting bar entering the bag through the valve opening. While I consider it very desirable to have this support in this tubular form, and subjected at the proper time to compressed air, I have found that some of the advantages of my invention may be obtained without the compressed air, the support being in that case, for instance, a solid rod entering the bag through the valve opening and supporting it in position so that the bag is acted on violently by suction, as the bag is drawn from the support into the suction conduit.

I claim:

1. The method of cleaning an open-ended bag comprising suspending it on a bar which enters a side opening adjacent the closed end of the bag, and moving the bar and bag to bring the bag adjacent the mouth of a conduit into which air under suction is moved with sufficient force to cause the bag to move into the conduit and to beat against a wall thereof.

2. The method of cleaning bags closed at one end and open at the other end comprising supporting the bag by rigid means engaging it across the closed end to hold it distended and while so held bringing it into proximity to the open mouth of a conduit into which a current of air is flowing of sufficient volume and force so that the bag is pneumatically forced open end foremost into the conduit and caused to beat against a wall thereof.

3. The method of cleaning a valve bag, com-

prising supporting the bag on a hollow member entering the bag through the valve opening, supplying compressed air to said member to discharge into the bag, and moving the bag across an opening of a conduit subjected to suction of sufficient force and volume to draw the bag into the conduit and cause it to beat violently against a wall thereof.

4. The method of cleaning a bag comprising placing it about a tubular member having a discharge opening and moving the member and bag to bring the bag adjacent the mouth of a conduit into which air under suction is moved with sufficient force to cause the bag to move into the conduit and supplying compressed air to the interior of the bag through such tubular member.

5. The method of cleaning used valve bags comprising mounting them successively on individual hollow supports extending through the valve openings into the interior of the bags, moving the supports one after another into proximity to the open mouth of a conduit subjected to suction while the bags are subjected internally to compressed air admitted through their supports, the bags being caused to beat against the wall of the conduit, and moving the bags successively from the conduit to a region where

they may be effectively removed from the supports.

6. The method of cleaning bags comprising mounting them successively on individual hollow supports and moving the supports one after another into proximity to the open mouth of a conduit subjected to suction of sufficient force to cause the bag to beat against an interior surface of the conduit supplying compressed air to the support while the bags are in the conduit close enough to said interior surface thereof to beat against it and moving the cleaned bags successively from the conduit to a region where they may be effectively removed from the supports.

7. The method of cleaning bags comprising mounting them successively on individual movable supports and moving the supports one after another into proximity to the open mouth of a conduit subjected to suction of sufficient force to cause the bag to beat against a wall of the conduit and retaining the bag in such conduit while it beats against such wall, and simultaneously with the positioning movement moving the cleaned bags successively from the conduit, and thereafter removing them from the support.

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