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METHOD AND APPARATUS FOR FILLING OPEN MOUTH RECEPTACLES

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Fig. 1.

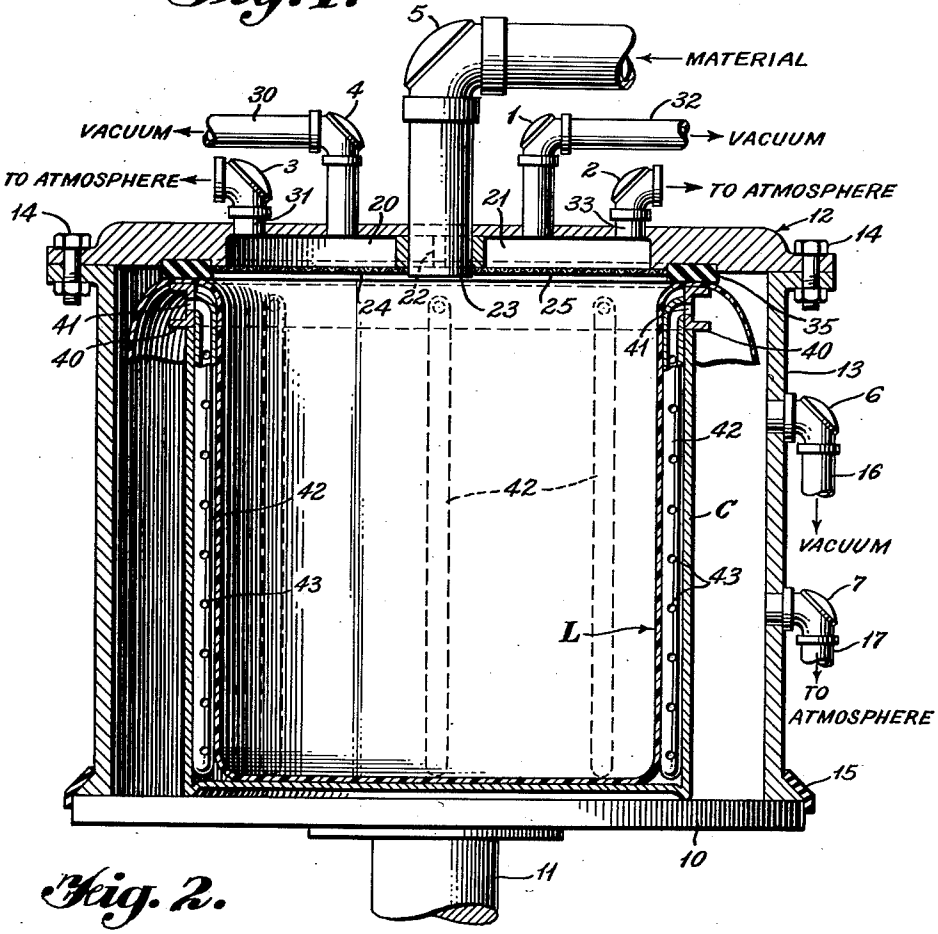

Fig. 2.

VALVE	NO.	START	FIRST CYCLE (SECONDS)								SECOND CYCLE (SECONDS)							
			1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
HEAD VACUUM - A	1																	
HEAD RELIEF - A	2																	
HEAD RELIEF - B	3																	
HEAD VACUUM - B	4																	
MATERIAL	5																	
SHROUD VACUUM	6																	
SHROUD RELIEF	7																	

▨ — VALVE CLOSED

□ — VALVE OPEN

INVENTOR

Clarence F. Carter

BY Burns, Doane, Benedict & Irons

ATTORNEYS

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METHOD AND APPARATUS FOR FILLING OPEN MOUTH RECEPTACLES

Clarence Freemont Carter, Danville, Ill.

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9 Claims. (Cl. 53—22)

This invention relates generally to a method and machine for filling open mouth receptacles with particulate material and more specifically to a method and an apparatus for use in the filling of open mouth receptacles which are provided with an impervious open top bag liner into which the particulate material is dispensed.

The problems encountered in the filling of receptacles with finely divided powdered material have been recognized for some time. The primary problem in this field results from the characteristic of this type of material to accumulate air between the powder particles so as to make the material fluffy and of low density. Such entrained air is difficult to remove so that the material will be compact and of high enough density in the shipping container such that the material will not settle to any substantial degree due to vibration encountered during shipping. On the other hand, the existence of such entrained air between the powder particles is an asset during filling in that it enables the material to flow freely, thereby simplifying the handling of the material in directing it into the receptacle to be filled.

The instant invention is directed to solving a particular problem encountered in filling lined receptacles with particulate material and in compacting the material dispensed into the receptacles. Such receptacles, as for example cylindrical walled drum containers, are provided with an impervious bag liner where the particulate material to be transported in the receptacle has a characteristic of absorbing moisture or where it is contemplated that the receptacle may come in contact with water in shipment. In the absence of an impervious liner, the walls of the receptacle may permit moisture to reach the material within the receptacle.

Where open mouth receptacles, as described hereinabove, are to be filled, with an impervious bag liner inserted thereinto to receive the material, it has been found difficult to properly position the liner within the receptacle so that a full quantity of material may be dispensed thereinto. Where the bag liner is simply positioned within a drum container with the liner mouth overlapping the upper end of the open mouth container, it has been found that air very often becomes trapped between the liner and the wall of the container so that a full measure of material cannot be dispensed into the liner. To overcome this difficulty and insure that the liner is in juxtaposition with the particular receptacle wall, the hereinafter described invention has been developed.

As a further problem solved by the instant invention, compacting or increasing of the material density is achieved so that the receptacle is rapidly filled with a full quantity of the powdered material. In comparison with prior known methods for compacting powdered materials, as by agitating the container being filled, the filling method of this invention is substantially faster in completing the filling of a particular size receptacle and also results in a more compact fill so that during shipment settling will not take place to any marked degree.

It is an object of this invention to provide a method for filling open mouth receptacles such as drum containers and bags with finely divided particulate material to produce a high degree of compacting of the material in a minimum filling time.

It is a further object of this invention to provide an improved method and apparatus for filling open mouth receptacles with particulate material, which apparatus is especially adapted for filling receptacles wherein an impervious bag liner is employed to line the inner wall of the receptacle.

It is also an important object of this invention to provide an apparatus for filling receptacles which have an impervious liner disposed therein wherein such apparatus includes a plurality of perforated conduit means positioned intermediate the liner and the inner wall of the receptacle to enable withdrawal of air from between the receptacle wall and the liner so that such liner will be juxtaposed with the interior wall of the receptacle as the material is dispensed thereinto.

Other and more specific objects, features and advantages of the invention will be apparent from the detailed description given below taken in connection with the accompanying drawing which forms a part of this application and illustrates by way of example a preferred arrangement of the apparatus for carrying out the invention. In the drawing:

Figure 1 is a cross-sectional view of a filling machine incorporating the features of and operable in accordance with the methods of the instant invention;

Figure 2 is a diagram representing the relationship of the valves on the apparatus of Figure 1 during the various stages of a filling operation.

Considering the structure of the invention as illustrated by Figure 1 on the drawing, the various valves incorporated into the filling apparatus are numbered consecutively **1** through **7**. More specific details and description of these valves and their sequence of operation will be given in connection with the description of Figure 2 on the drawing and the overall operation of the filling machine. Reference will also be had to the valves individually in connection with the description of the overall apparatus.

The filling apparatus includes a lift plate **10** which is mounted on a lifting cylinder **11**. Cylinder **11** may be associated with pneumatic or hydraulic lifting means (not shown) in a manner such as suggested in my prior Patents 2,360,198 and 2,613,864. Mounted above the lift plate **10** is a filling head **12**. A container encircling shroud **13** is bolted to the head **12** by fasteners **14** and extends downwardly beneath the head to engage with the lift plate **10** upon the raising of such plate by means of lifting cylinder **11**. A flexible seal element **15** is provided around the lower end of shroud **13** to engage with the lift plate **10** and form an air-tight seal therebetween. It will be recognized that upon the raising of plate **10** into engagement with the lower end of the shroud **13** there is formed a chamber for the container supported on plate **10** to be filled. This chamber is evacuated to assist in the filling operation as described in detail hereinafter.

A pair of ducts **16** and **17** communicate with the chamber within shroud **13** and are provided with valves **6** and **7** respectively. Valves **6** and **7**, as well as the other valves illustrated on the drawing are of the diaphragm type wherein flow through the valve is controlled by the magnitude of the pressure applied to one side of a diaphragm. The application of pressure to such side of the diaphragm closes the valve and upon release of the pressure and/or upon the drawing of a vacuum on the side of the diaphragm, such diaphragm is moved away from the valve seat to open the valve. This type of valve has

been found to be particularly well suited for use in controlling the sequence of operation of the container filling apparatus of this invention. In view of the fact that the construction of this type of valve is well known, a detailed illustration and description thereof is not deemed necessary.

The duct **16**, the flow through which is controlled by valve **6**, is connected to a suitable source of vacuum or low pressure so that upon opening valve **6** the interior of the shroud will be evacuated. Duct **17**, controlled by valve **7**, communicates with the atmosphere exterior of the shroud so that upon opening of valve **7** the shroud interior will be placed in communication with atmospheric pressure.

Considering more specifically the details of filling head **12**, such head is provided with a pair of separate compartments **20** and **21** which are formed by a partition **22** which extends radially outwardly on opposite sides of a material feed inlet tube **23**. Thus, the compartments **20** and **21** are maintained separate from one another. A screen **24** is provided across the lower opening of compartment **20** and a screen **25** is provided across the lower opening of compartment **21**.

A duct **30** communicates with compartment **20** and is provided with a valve **4** interposed therein. Duct **30** is connected with a suitable source of vacuum or low pressure so that upon the opening of valve **4** a vacuum may be created in chamber **20** and, through screen **24**, within the container C to be filled. A second duct **31** communicates with chamber **20** and is provided with a valve **3**. The latter duct extends to atmosphere so that upon opening of valve **3** the chamber **20** and container interior will be coupled with atmospheric pressure.

A pair of ducts **32** and **33** are provided communicating with compartment **21** similar to the ducts **30** and **31** associated with compartment **20**. Duct **32** is provided with a valve **1** interposed therein and a valve **2** is provided to control flow through duct **33**. Duct **32** is coupled to a suitable source of vacuum or low pressure so that upon opening of valve **1** such low pressure will produce a vacuum in compartment **21** and within the container. Duct **33** is open to atmosphere so that upon opening valve **2** the compartment **21** and container interior will be placed in communication with atmospheric pressure.

Reference has been made to the material feed inlet tube **23** which in the illustrated embodiment extends downwardly through the center of the filling head **12**. A control valve **5** is provided in the flow line of this tube so that opening and closing of valve **5** may be employed to regulate the flow of material into the container to be filled. A resilient seal element **35** is mounted on the underside of head **12** outwardly of the screens **24** and **25**. This element encircles the screened area of the filling head and is positioned so as to overlie the upper edge of the mouth of the container C to be filled.

On Figure 1 container C is shown supported on rigid plate **10** in the position for filling. An impervious bag liner L is illustrated positioned within the container with the open upper edge thereof overlapping the upper edge of the container mouth. A ring-like element **40** having a channel cross section is supported on the upper edge of the container mouth and is provided with apertures **41** which communicate with conduits **42**, perforated as shown at **43**, and carried by element **40**. The conduits **42** are provided at spaced points around the circumference of element **40** communicating at their upper ends by means of apertures **41** with the exterior of the container C. Accordingly, upon the pressure exteriorly of container C being reduced, air between the liner L and the inner wall of the container will be withdrawn through conduits **42**.

It will be appreciated from the relationship of container C, element **40** and liner L to the filling head **12**, as shown in Figure 1, that the upper open mouth of liner L which overlaps the upper edge of container C and element **40** is clamped between the uppermost face of element **40** and the resilient seal element **35** carried by filling head **12**. This clamping of the open mouth of the liner L is effected when the lift plate **10** raises container C up into the filling position. The seal between the shroud **13** and lift plate **10** is also completed by the raising of the container into filling position.

The provision of a shroud **13** to enclose the container which is being filled performs a dual function in connection with the operation of the instant invention. During the filling operation the interior of the container is subjected to a relatively high vacuum to assist in drawing in the particulate material and also in withdrawing air entrained between the powder particles so that a more dense compacted filling of the container may be achieved. Where the container walls are relatively thin and lack sufficient strength to resist such a high vacuum created within the container during filling, it is desirable to also create a vacuum exteriorly of the container to diminish the pressure difference between the inside and outside of the container. Accordingly, shroud **13** provides a chamber in which the container is positioned during filling, which chamber is evacuated so that very little pressure difference exists between the pressure inside and outside the container during filling.

The shroud **13** also provides a means for withdrawing air trapped between liner L and the inner wall of container C when the liner is loosely positioned within the container for filling. Removal of such trapped air is facilitated by the provision of the ring-like element **40** which carries the perforated conduits **42**. It will thus be seen that upon reducing the pressure within the shroud **13** by opening valve **6**, with valve **7** closed, the liner L will be sucked outwardly to lie in close contact with the inner wall of the container C. In this position the liner is disposed to receive a full complement of the particulate material as dispensed into the container through tube **23**.

Where the structure of the container being filled is sufficiently rigid to withstand the vacuum created within its interior during filling, the container enclosing shroud may be omitted. Where the shroud is not provided, other suitable means may be provided to couple the perforated conduits **42** to a source of low pressure so that air may be withdrawn from between the liner and container wall through conduits **42** and element **40**.

It will be appreciated that element **40** will have an annular configuration when employed with cylindrical wall containers so that the element can be supportingly engaged with the upper edge of the container. Likewise, where the container wall has a configuration other than that of a cylinder, the element **40** will be provided with a configuration generally conforming to the configuration of the container wall so as to be supported on the upper edge of the container wall in the manner as shown by the illustrated embodiment on the drawing. Likewise, the seal element **35** carried by the filling head **12** will be made to permit effective clamping of the liner mouth against the upper surface of the element **40** so as to preclude seepage during filling of material outwardly between the filling head and the impervious liner.

Having described in detail the structure of the specific embodiment illustrated by Figure 1, reference will now be had to the method preferably employed in connection with filling through utilization of such apparatus. Preferably, the method of filling where relatively large containers are involved and wherein very finely divided material is to be dispensed into such containers will be in accordance with the generic method principles described and claimed in my co-pending application, Serial No. 490,942, filed February 28, 1955. Generally in the method of this prior application, the particulate material is dispensed into the receptacle in separate individual increments with the pressure within the receptacle being continuously maintained under vacuum. By this method of filling, the vacuum, continuously existent over the material, tends to encourage withdrawal of air entrained between the

powder particles while at the same time assisting in or effecting drawing of the material into the receptacle. It has been found that this incremental filling, wherein a low pressure is maintained within the receptacle, results in very effective compacting or increasing of the material density so that the final quantity of material within the receptacle will be substantially greater than that which could normally be dispensed into such receptacle by prior known methods.

Figure 2 on the drawing illustrates the relationship between the various valves during a filling operation wherein the hereinabove described apparatus is operated in accordance with the method of the instant application. As evidenced by the legend provided for Figure 2, the shaded blocks on the diagram indicate that the particular valve is closed while the unshaded blocks represent the valve in its open condition. The diagram is plotted against time so that each block represents one second in the filling cycle. It may be further pointed out that the two cycles shown on the diagram would not normally constitute a complete filling operation but rather the cycles would be repeated in sequence a number of times until the container is completely filled.

The first column of the diagram lists the name designation of the individual valves and the second column lists the number given to each valve as applied to the structure shown on Figure 1. The third column is provided to illustrate the condition of the various valves when at rest or prior to commencing a filling operation.

With the valves in the condition as shown in the column identified "Start," the container C with the liner L positioned therein and element **40** supported on the upper edge of the container wall will be raised on plate **10** up into the shroud **13** to assume a position as shown on Figure 1 of the drawing. At this time the valves **1** and **4** which control communication of vacuum with compartments **21** and **20**, respectively, are closed while valves **2** and **3** which relieve the compartments **21** and **20** to atmospheric pressure are opened. Likewise, the valve **6** is closed and valve **7** opened so that the shroud interior exists at atmospheric pressure. At the same time the material valve **5** is closed.

Upon initiation of the 1st cycle of the filling operation, valve **1** opens and valve **2** closes so that a vacuum is drawn within the container through screen **25**. For the initial second of the 1st cycle, valve **3** remains open thus permitting a momentary flow of air into compartment **20** and through screen **24** as air is withdrawn through duct **32**, compartment **21** and screen **25**. This momentary flow of air through screen **24** serves to clean the screen of any powdered material that may have collected thereon in the last cycle of the previous filling operation. Valve **4** which controls communication of compartment **20** with the vacuum source and the material valve **5** remain closed during this initial portion of the 1st cycle. As for the shroud control valves **6** and **7**, valve **6** opens to initiate reducing the pressure exteriorly of the container C while valve **7** is maintained open for the first second of this 1st cycle.

After the first second of the 1st cycle, valves **3** and **7** close and are maintained closed during the rest of the cycle. The closing of valve **3** terminates the flow of cleaning air through screen **24** and thereafter the pressure within the container and liner diminishes under the action of vacuum being applied through duct **32** with valve **1** open. At the same time, with the communication to atmosphere for the shroud cut off by the closing of valve **7**, the pressure within the shroud exteriorly of the container diminishes. As this pressure decreases, the air which may be trapped between the liner L and the inside wall of the container C is withdrawn through perforated conduits **42** so that the liner will be juxtaposed with the interior wall of the container.

The opening of valve **5** which admits material into the container through pipe **23** is preferably controlled in response to the pressure within the container being filled. Thus, during the initial stage of the cycle, valve **5** remains closed. When the pressure within the container has decreased to the setting of the control for valve **5**, the control is actuated and after a delay of one or two seconds the valve **5** opens to admit the powder to flow into the container through tube **23**. As shown on Figure 2, the opening of valve **5** takes place after the fourth second of the cycle. The valves remain in this state for the remainder of the 1st cycle during which time an increment of material flows into the container so as to partially fill such container. As the increment flows into the container, air is withdrawn through screen **25**, compartment **21** and duct **32**. Such outflow of air as powder flows in through tube **23** causes powder to collect on screen **25** as filtered from the air being drawn out of the container.

After eight seconds the 1st cycle is terminated with an increment of material having been dispensed into the container. As the 2nd cycle commences, valve **1** is closed and valve **2** opened. Valve **3** remains closed whereas valve **4** is opened to place compartment **20** in communication with the vacuum source through duct **30**. With valve **2** open for the first second of the 2nd cycle, air flows into compartment **21** and back through screen **25** to reverse flush the screen of any powder which collected thereon during the 1st cycle of the filling operation. The material valve **5** closes and does not there again open until after the pressure within the container has again been reduced to the point at which the control for valve **5** responds. This point of opening of the material valve is shown as occurring at about the fifth second of the 2nd cycle similar to the response which took place during the 1st cycle. Valve **6** remains during the 2nd cycle while valve **7** is opened only for the first second of the 2nd cycle so that the pressure exteriorly of container C is diminished commensurate with the pressure drop within the container caused by the opening of valve **2**.

The action which takes place in the 2nd cycle of the filling operation is similar to that which occurred during the 1st cycle except that air is being withdrawn through duct **30**, compartment **20**, and screen **24** by reason of valve **4** being open. Thus, in the 2nd cycle, when the material valve **5** opens, powder tends to accumulate on screen **24** as air is withdrawn from the container interior through duct **30**. At the end of the 2nd cycle a second increment of powdered material will have been dispensed into the container. For the third, fourth and subsequent increments which are to be dispensed into the container to complete filling, the 1st and 2nd cycles will be repeated in sequence until such time as the number of increments dispensed into the container fills such container to the desired degree.

It will be appreciated that the diagram of Figure 2 is merely exemplary of one particular valve timing relationship which may be employed and that in any specific case the time for opening and closing the various valves may vary from that shown on Figure 2. The size and therefore number of increments required to fill the container with a desired weight of material may be varied depending upon the particular size container and/or material which is being dispensed. For a particular size of container the density of the powdered material dispensed thereinto may be increased by employing a larger number of increments, thus operating with shorter cycles in the filling operation and likewise may be decreased by employing a longer cycle which results in fewer increments being required to fill the container. Also the magnitude of the vacuum used in the filling operation may be varied to give a lesser or greater density in the final product dispensed.

After the material to be transported by the container has been dispensed into the liner, the repetition of the 1st and 2nd cycles of the filling operation will be terminated and the valves returned to their condition as shown by

the column "Start" on the diagram of Figure 2. This will return the pressure, both within the container above the material therein and exteriorly of the container, to atmospheric pressure. Thereafter, lift plate **10** will be lowered by means of cylinder **11** to remove container C from within the shroud **13**. The upper free end of liner **11** can then be folded across the top of the material contained therewithin and sealed or otherwise closed to exclude the entrance of moisture into the impervious bag liner. A cover is then applied to the container C and such container prepared for transportation or storage as desired.

In filling, the repetition of the cycles to complete a filling operation will be set to fill the container with the desired weight of material, with the sum total of the increments providing the desired degree of container fill as to weight and volume. Thus, it will be appreciated that for a particular size drum or open mouth bag container the desired weight to be dispensed into the container will be employed in determining the number and density of increments for which the machine will be set in performing the filling operation.

As shown on the drawing the receptacle to be filled takes the form of a rigid cylindrical walled drum container C. It will be appreciated, however, that this illustration is merely by way of example and that within the scope of this invention the incremental filling method as set forth in the hereinafter appended claims may be employed in filling a variety of types of open mouth receptacles.

Having thus described my invention, what I claim is:

1. A method of filling open mouth receptacles with finely divided particulate material employing a filling head having a pair of separate screened openings including the steps of withdrawing air from the receptacle to be filled through one screened opening to produce a vacuum within the receptacle, admitting a limited quantity of air into the receptacle through the other screened opening while continuing to withdraw air through said one screened opening to maintain a vacuum within the receptacle, introducing an increment of material into the receptacle while continuing to withdraw air from the receptacle and from between the material particles to compact the material, withdrawing air from the receptacle through said other screened opening, admitting a limited quantity of air into the receptacle through said one screened opening while continuing to withdraw air from the receptacle and from between the material particles to compact the material, and repeating the above recited steps until the increments of material fill the receptacle to the desired degree.

2. A method of filling open mouth receptacles with finely divided particulate material employing a filling head having a pair of separate screened openings including the steps of withdrawing air from the receptacle to be filled through one screened opening to produce a vacuum within the receptacle, admitting a limited quantity of air into the receptacle through the other screened opening while continuing to withdraw air through said one screened opening to maintain a vacuum within the receptacle, introducing an increment of material into the receptacle while continuing to withdraw air from the receptacle and from between the material particles to compact the material, terminating the withdrawal of air through said one screened opening, withdrawing air from the receptacle through said other screened opening, admitting a limited quantity of air into the receptacle through said one screened opening while continuing to withdraw air through said other screened opening to maintain a vacuum within the receptacle, introducing an increment of material into the receptacle while continuing to withdraw air from the receptacle and from between the material particles to compact the material, terminating the withdrawal of air through said other screened opening, and repeating the above recited steps until the increments of material fill the receptacle to the desired degree.

3. A method of filling open mouth receptacles having a flexible open top bag liner with finely divided particulate material and employing a filling head having a pair of separate screened openings including the steps of withdrawing air from betwen the wall of the receptacle to be filled and the liner to position the liner in juxtaposition with the receptacle wall, withdrawing air from the lined receptacle through one screened opening to produce a vacuum within the lined receptacle, admitting a limited quantity of air into the lined receptacle through the other screened opening while continuing to withdraw air through said one screened opening to maintain a vacuum within the lined receptacle, introducing an increment of material into the lined receptacle while continuing to withdraw air from the lined receptacle and from between the material particles to compact the material, withdrawing air from the lined receptacle through said other screened opening, admitting a limited quantity of air into the lined receptacle through said one screened opening while continuing to withdraw air from the lined receptacle and from between the material particle to compact the material, and repeating the above recited method steps two through six until the increments of material fill the lined receptacle to the desired degree.

4. A method of filling open mouth receptacles having a flexible open top bag liner with finely divided particulate material comprising the steps of subjecting the space between the wall of the receptacle to be filled and the liner to a pressure lower than the pressure interiorly of the liner to open the liner and position it in juxtaposition with the receptacle wall, creating a vacuum within the lined receptacle, admitting material into the lined receptacle while continuing to maintain a vacuum within the lined receptacle, terminating the admission of material into the lined receptacle, relieving the vacuum within the lined receptacle, and thereafter closing the open tops of the receptacle and liner.

5. An apparatus for filling open mouth receptacles with particulate material wherein an impervious bag liner is disposed within the receptacle prior to filling which comprises a support member for holding the receptacle during the filling operation, a filling head positioned above said member to cooperate with the open mouths of the receptacle and liner to be filled, a material inlet carried by said filling head, a ring-like element, a plurality of conduit means carried by said element to extend downwardly therefrom to be disposed along the inner wall of the receptacle to be filled between such inner wall and the bag liner, said conduit means providing apertures adjacent the lower portion of the receptacle for withdrawal of air through said conduit means from between the inside wall of the receptacle and the bag liner, and means for connecting the upper ends of said conduit means with a source of vacuum.

6. In an open mounth bag lined container filling machine including a container supporting member and a filling head positioned thereabove with means for drawing a vacuum within the container through said head, a seal element carried by said head to cooperate with the mouth of the bag liner to preclude escape of material from around the mouth of the liner during filling, and a shroud carried by said head for enclosing the container during filling, the improvement which comprises a ring-like element having a configuration generally conforming to the shape of the open mouth of the container and supportable on the upper edge of the mouth of the container to be filled with the mouth of the bag liner overlapping the upper surface of said element, a series of conduit means carried by said element opening outwardly at their upper ends to the space exterior of the container and extending downwardly along the inner wall of the container between such wall and the bag liner.

7. A device for use with a machine adapted to fill open mouth containers employing a flexible bag liner comprising a ring-like element having a configuration

generally conforming to the shape of the open mouth of the container to be filled and supportable on the upper edge of the mouth of the container with the mouth of the liner overlapping the upper surface of said element, a series of conduit means carried at peripherally spaced points on said element with the upper end of each of said conduit means communicating with the outer periphery of said element, said conduit means extending downwardly from said element so as to be disposed along the inner wall of the container when said element is positioned on the upper edge of the mouth of the container being filled, said conduit means providing apertures adjacent the lower portion of the container between the container and the bag liner to enable withdrawal of air through said conduit means from between the container wall and bag liner.

8. An apparatus for filling open mouth containers with particulate material wherein an impervious bag liner is disposed within the container prior to filling which comprises a support member for carrying the container during the filling operation, a filling head positioned above said support member to receive the container to be filled between said support member and said filling head, a feed inlet tube carried by said filling head for dispensing material into the container carried by said support member, duct means carried by said filling head and having valve means therein for connecting the interior of the container being filled with a source of vacuum, a ring-like element having a configuration generally conforming to the shape of the open mouth of the container and supportable on the upper edge of the mouth of the container to be filled with the mouth of the bag liner overlapping said element, a plurality of perforated conduit means carried by said element to extend downwardly therefrom to be disposed along the inner wall of the container when said element is supported on the edge of the mouth of the container, said conduit means communicating at their upper ends with the exterior of said element, seal means carried by said filling head to clamp the portion of the bag liner which overlaps said element against the upper surface of said element, and means for connecting the upper ends of said conduit means to a source of low pressure whereby air will be withdrawn from between the container wall and the impervious bag liner to draw the liner into juxtaposition with the container wall.

9. An apparatus for filling open mouth containers with particulate material wherein an impervious bag liner is disposed within the container prior to filling which comprises a support member for carrying the container during the filling operation, a filling head having separate screened openings therein positioned above said support member to receive the container to be filled between said support member and said filling head, duct means communicating with said screened openings and having valve means therein for connecting the respective screened openings alternately with a source of vacuum and atmospheric pressure, a feed inlet tube carried by said filling head and having a valve therein for controlling the admission of particulate material into the container to be filled, a ring-like element having a configuration generally conforming to the shape of the open mouth of the container and supportable on the upper edge of the mouth of the container to be filled with the mouth of the bag liner overlapping said element, a plurality of perforated conduit means carried by said element to extend downwardly therefrom to be disposed along the inner wall of the container when said element is supported on the edge of the mouth of the container, said conduit means being in communication at their upper ends with the atmosphere exterior of the container, a shroud interposed between said plate and said filling head to provide a chamber enclosing the container to be filled, duct means communicating with the interior of said shroud and having valve means therein for connecting the shroud interior alternately with a source of vacuum and atmospheric pressure whereby air will be withdrawn from between the container wall and the impervious bag liner upon reduction in pressure within the shroud to draw the liner into juxtaposition with the container wall, and seal means carried by said filling head to clamp the portion of the bag liner which overlaps said element against the upper surface of said element.

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