Jan. 29, 1957 P. R. FECHHEIMER ET AL 2,779,358

FILLING MACHINE INCORPORATING MEANS FOR PURGING AIR FROM CONTAINERS PRIOR TO FILLING

Filed Nov. 16, 1953 2 Sheets-Sheet 1

FIG. 1.

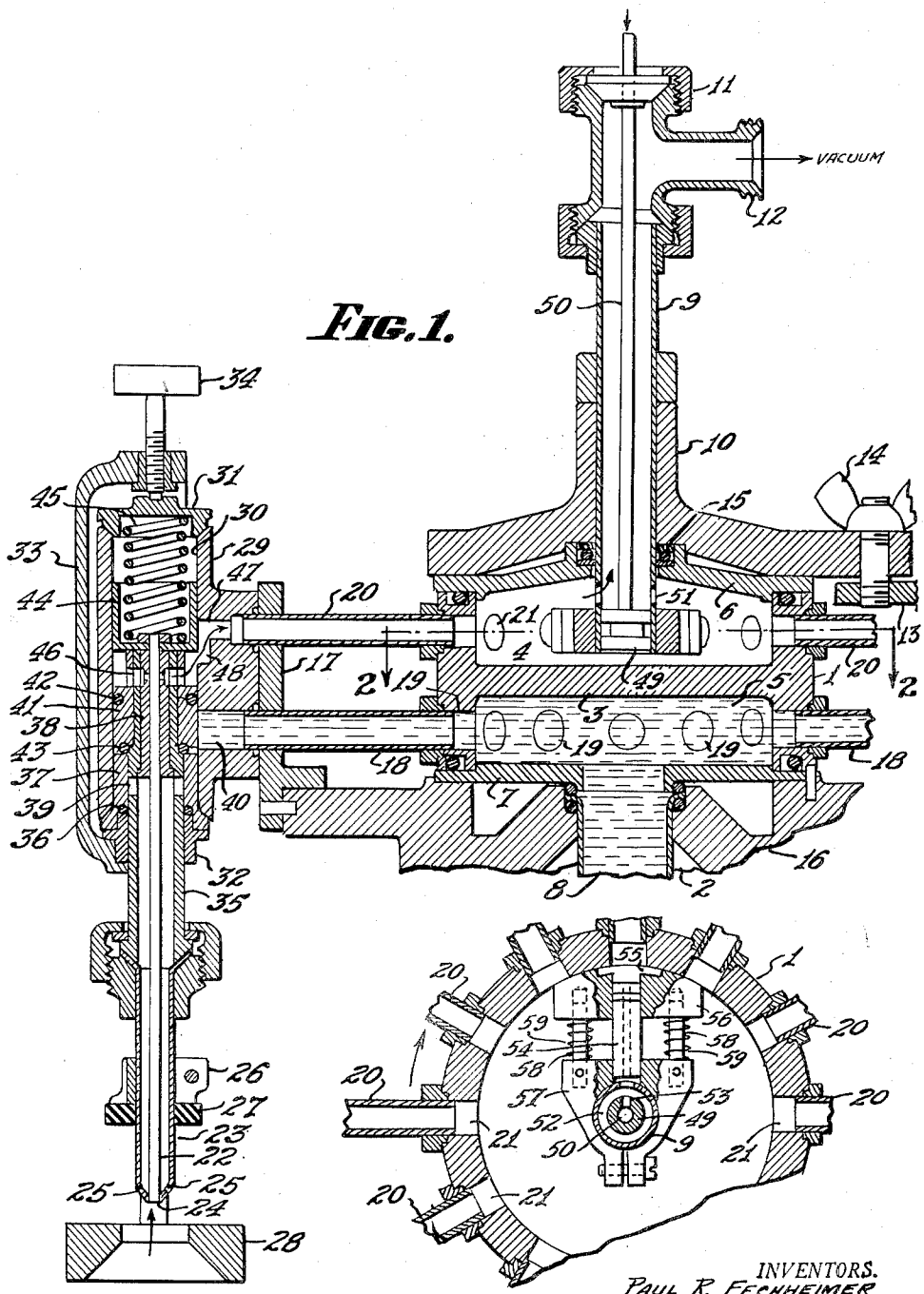


FIG. 2.

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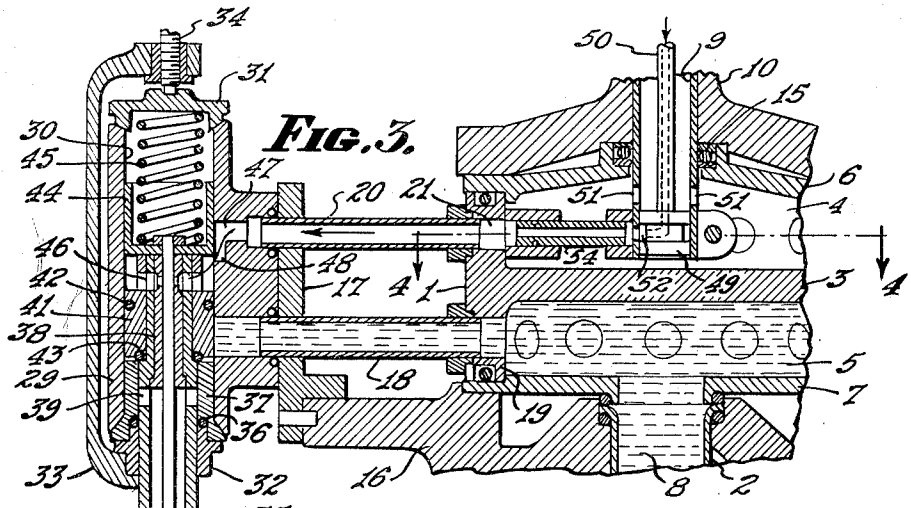


FIG. 3.

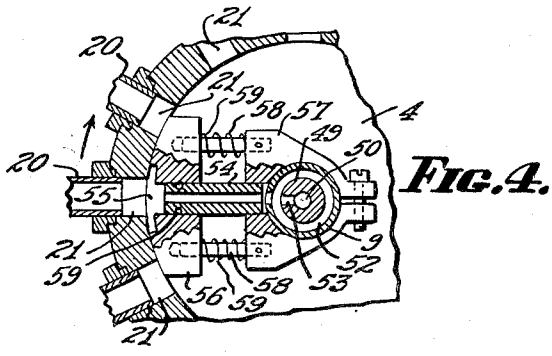


FIG. 4.

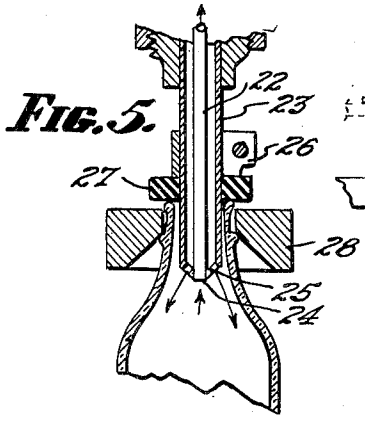


FIG. 5.

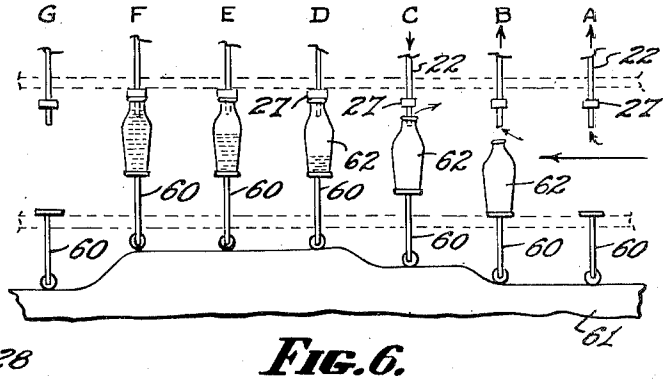


FIG. 6.

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FILLING MACHINE INCORPORATING MEANS FOR PURGING AIR FROM CONTAINERS PRIOR TO FILLING

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Application November 16, 1953, Serial No. 392,214

11 Claims. (Cl. 141—92)

Our invention relates to machines for filling containers such as bottles, and has for one of its principal objects the provision of means which will purge the air from the containers prior to filling.

It is well known to fill containers by introducing into them the filling substance through a spout or nozzle, the filling substance flowing into the container under pressure, and the displaced air escaping from the container through the mouth thereof. In the filling of bottles with liquids it is equally well known to provide a seal about the mouth of the bottle to draw a vacuum on it and to cause the filling material to be introduced into the container under the influence of the vacuum through a filling nozzle or spout which projects into the bottle. In many instances, however, the presence of air in the bottle is undesirable since it may be injurious to the contents placed in the bottle or create an undesirable admixture therewith. Under these circumstances, it is highly desirable to have the air removed from the containers prior to filling. Vacuum means alone will not satisfactorily remove the air from the containers. We have found, however, that the air can be satisfactorily removed by replacing it, immediately prior to the filling of the containers, with inert gas or other non-injurious gas or vapors. By introducing into each container a quantity of gas vapor sufficient to displace the air contained therein, the containers can be completely purged of air prior to sealing contact of the filling spouts or nozzles with the containers and the introduction of filling substance therein.

It is a principal object of our invention to provide a rotary filling machine incorporating filling spout mechanisms including a filling tube and a vacuum tube, and in utilizing the vacuum or vent tube for the introduction of an inert gas or the like to replace the air in a container immediately prior to the filling thereof.

It is a further object of our invention to provide filling mechanism of the character described including valve means for disconnecting the source of vacuum and connecting a source of inert gas to the vacuum or vent tube for introduction of the gas into the containers to be filled.

These and other objects of our invention which will appear hereinafter or which will be apparent to the skilled worker in the art upon reading these specifications, we accomplish by that construction and arrangement of parts of which we shall now describe an exemplary embodiment.

Reference is now made to the accompanying drawings wherein:

Figure 1 is a vertical sectional view of a rotary filling head and one of the filling spouts associated therewith.

Figure 2 is a partial sectional view taken along the line 2—2 of Figure 1.

Figure 3 is a partial sectional view similar to Figure 1 but taken at right angles thereto.

Figure 4 is a sectional view taken along the line 4—4 of Figure 3.

Figure 5 is a partial vertical sectional view illustrating a container in sealing contact with the filling stem.

Figure 6 is a diagrammatical representation of the operating cycle of a filling machine in accordance with our invention.

The conventional rotary filling machine comprises a central rotating column which supports at its upper end a main head divided into two chambers, one for filling material under pressure and the other for vacuum or suction. The filling head also supports a plurality of radially disposed filling spouts having connections respectively with the chambers of the head. At its lower end, the rotating column is connected to a table having platform means thereon for supporting containers and for raising and lowering the containers, the containers in the raised position being juxtaposed to the filling spouts.

During each cycle of operation of the machine, containers are placed upon the platforms, the platforms elevated to juxtapose the containers to the filling spouts, the juxtaposition of the containers to the spouts actuating valve mechanism serving to connect the filling and exhaust tubes of the spouts to the chambers of the head, thereby causing the introduction of filling material into the containers, whereupon the containers are lowered away from the spouts, thereby closing the valve means and shutting off the supply of filling material.

With this general description of the filling machine as background, reference is now made to Figure 1 of the drawings wherein the main filling head 1 is supported on central rotating column 2. The main filling head is divided by the partition 3 into an upper chamber 4 and a lower chamber 5, the upper chamber being closed by a cover 6 and the lower chamber by a cover 7. The central rotating column 2 is hollow and filling material 8 under pressure is supplied to the lower chamber 5 through the hollow interior of the central column. A conduit 9 supported by bracket means 10 opens downwardly into the upper chamber 4, and the conduit is provided at its upper end with a fitting 11 having an opening 12 adapted to be connected to a source of vacuum, whereby to draw a vacuum on the upper chamber 4. The bracket 10 is fixedly secured to a support 13, as by means of wing nut 14, and the bracket holds the conduit 9 against rotation with the filling head. A packing gland or seal 15 makes sealing contact with the conduit 9 and permits rotation of the filling head relative to the conduit.

The filling head having the chambers 4 and 5 is provided with an annular supporting element 16 carrying holders 17 for the filling spout mechanism hereinafter described. Conduits such as 18 connect the lower chamber 5 with the holders, the conduits 18 opening into the annular walls of the chamber 5 through orifices 19 spaced about the periphery thereof. Likewise, conduits such as 20 connect the vacuum or exhaust chamber 4 with the holders, the conduits 20 opening into the chamber through orifices 21.

Each of the holders 17 supports a filling spout mechanism comprising concentric tubes 22 and 23 having respective orifices 24 and 25 located substantially at the same level. Either tube may be a filling or an exhaust tube as desired; and the tube assembly will preferably carry an adjustable element 26 which bears a sealing element 27 for contacting the top of the neck of a bottle to be filled.

It is frequently of assistance in filling machines of this character to provide for each filling spout a centering bell for insuring the proper positioning of the necks of the containers presented thereto. Such a centering bell is shown at 28. It is preferably mounted on rods

(not shown) which are vertically slidable in the filling spout body.

Valving means are provided in each filling spout for connecting the filling and exhaust tubes to the respective filling and exhaust conduits 18 and 20, and disconnecting them therefrom, so that the bottles will actuate the valving means. Such an arrangement has the advantage that neither the filling nor the exhaust conduit will be opened up if no container happens to rest upon the platforms which juxtapose the containers to the filling spouts. Many arrangements have been suggested for valving the filling spouts, and we are not limited to any one of them. We shall herein describe a particular construction, it being understood that this construction does not constitute a limitation upon our invention.

As illustrated, each of the filling spouts comprises a body 29 connected to the holder 17 and having a vertical bore 30 extending therethrough. Upper and lower plug elements 31 and 32 are fitted in either end of the bore 30, and a C-clamp element 33 is employed to hold the plugs in the bore, the C-clamp being provided with an adjustment screw 34. An extension 35 of filling tube 23 has a sliding fit in the lower plug 32 rendered liquid-tight by a sealing ring or gasket 36 held between the plug 32 and the bushing 37 fixed in the lower end of the bore. The upper end of the extension 35 is closed by a plug 38; and openings 39 are provided in the extension immediately below the plug 38. When the filling stems are in their lowermost position, as illustrated in Figure 1, the openings 39 are covered by the bushing 37; but upon upward movement of the filling stem, as upon the contact of a container mouth with the sealing element 27 and the lifting of the container, the extension 35 is raised so as to bring the openings 39 into juxtaposition with the continuation 40 of the conduit 18, thereby permitting the filling material to flow through the extension 35 and tube 23. The continuation 40 of the conduit is normally closed by the annular member 41 fitted about the extension 38 and slidable therewith. A seal or gasket 42 is supported by the annular member 41 and makes sealing contact with the vertical bore 30; and a similar sealing member 43 is provided between the annular member 41 and the bushing 37.

At its top the extension 35 carries a cup-shaped member 44 which is slidable in the vertical bore and receives the lower end of compression spring 45 which has its upper end bearing against the upper plug 34. The spring 45 serves to normally bias the filling stem to the lowermost position and when compressed provides sufficient force to maintain the sealing element 27 in sealing contact with the mouth of the container juxtaposed thereto.

The inner or exhaust tube 22 extends through the filling tube 23 and extension 35 and is received at its upper end in the plug 38, in the manner illustrated. Openings 46 are provided in the extension 35 and plug 38 for communication with the vacuum tube 22; and upon upward movement of the filling stem, these openings are adapted to be brought into communication with extensions 47 of conduit 20. Normally the extension 47 will be closed by the cup-shaped member 44, in the manner illustrated, excepting for the by-pass channel 48 which is connected with the openings 46 at all times irrespective of the position of the filling stem. Thus, when the filling stem is in the lowermost or closed position, the vacuum tube is connected to the source of vacuum through the by-pass channel 48 which provides for a limited degree of suction. When the valve stem is raised, the openings 46 are connected directly to the extension 47 to effect full scavenging action through the vacuum tube 22.

In accordance with our invention, we utilize the by-pass connection between the vacuum tube 22 and the conduit 20 to introduce inert gas into containers immediately prior to their filling at a time when the filling stems are in the lowermost position. To this end the

conduit 9 extends downwardly within the upper chamber 4 and is provided at its lower end with a plug 49 which receives the lower end of a gas tube 50 contained within the conduit 9. The conduit 9 has openings 51 therein in communication with the chamber 4, the openings lying immediately above the plug 49. The plug 49 has an annular recess 52 to which gas introduced through the tube 50 is fed by means of port 53. From the annular recess 52 the gas is fed through tube 54 to port 55 of pressure block 56 contacting the annular walls of the chamber 4. The pressure block 56 is supported from collar 57 surrounding the lower end of conduit 9 by means of pins 58 on which the block is slidably mounted, being urged outwardly by compression springs 59. It will be understood that the pressure block has its outer face configured to conform to the annular walls of the chamber 4, which is cylindrical, and the springs serve to maintain the pressure block in snug contact therewith. It will be understood that the outer end of the tube 54 is slidable relative to the pressure block, there being a sealing ring 59 therebetween.

The pressure block 56 is fixed against rotary movement, but as will be apparent from Figure 2 of the drawings, the rotary movement of the filling head will bring the orifices 21 into communication with the port 55 one at a time as the head is rotated. It will also be apparent from Figures 2 and 4 that the pressure block is of a size such that only one of the orifices is closed at any time; and hence other than the particular orifice in communication with the port 55, the remaining orifices are open to the chamber 4 and hence to the vacuum conduit. As each of the orifices is serially brought into communication with port 55, it is cut off from the chamber 4 and hence the particular conduit 20 converted from the vacuum to gas under pressure. Since the communication of the orifices with the tube 54 is arranged to occur at a time when the filling stem is in the lowermost position, the gas is introduced into the tube 22 through the by-pass channel 46. The port 55 is, however, of a size such that it will remain in communication with the orifices for a sufficient time to supply an amount of gas effective to purge each container of the air contained therein.

The machine's cycle of operation is diagrmmatically illustrated in Figure 6 wherein the platforms on which the containers are supported are diagrammatically indicated at 60 and the cam track for lifting the containers into contact with the filling stems is indicated at 61. It will be understood that the platform means illustrated is diagrammatic only and does not constitute a limitation on our invention. In the diagram, station A represents the inoperative position of the machine in which the filling stems are in their lowermost position and the platform 60 is in its lowermost position ready to receive a container. When in position A, the filling spout mechanism will be in the position illustrated in Figure 1 wherein vacuum is drawn on the tube 22 through the by-pass channel 48, the vacuum drawn on the tube being indicated by the arrows in the diagram.

Station B illustrates the positioning of a container 62 on the platform 60; and at this time there is no change in the position of the filling spout. Subsequent to the positioning of the container on the platform 60, the platform is elevated to the intermediate position illustrated at C, in which position the filling stem is introduced into the mouth of the bottle but the sealing member 27 is spaced thereabove, as best seen in Figure 3 of the drawings. Coincident with the elevation of the platform to the station C, the orifice 21 of the filling stem introduced into the bottle is brought into communication with the port 55, thereby cutting off the source of vacuum and introducing gas from the tube 50 into the tube 22 of the filling stem. As will be clearly illustrated by the arrows in Figure 3 of the drawings, the gas introduced into the container displaces the air normally contained

therein, which flows upwardly and outwardly from the mouth of the bottle around the filling stem. It is for this reason that the sealing element 27 is maintained, out of contact with the container during the gasing operation. It will be understood that the position of the pressure block and port will be fixed to coincide with the rise of the platform to position C.

Upon passage of the orifice 21 beyond the port 55, the platform 60 is raised to position D, thereby bringing the mouth of the container into sealing contact with the sealing element 27 and lifting the filling stem to its uppermost position. At this juncture, the orifice 21 has passed beyond the pressure block 56 and hence is again in communication with the chamber 4.

Positions E and F in the diagram illustrate that portion of the filling cycle in which the filling stem is raised and the filling and exhaust tubes in communication with the respective chambers of the head. At the completion of the filling cycle, the platform 60 is lowered to position G which lowers the container away from the filling stem and hence permits the filling stem to return to its lowermost or closed position under the influence of spring 45. In this position, the vacuum tube 22 is again placed in communication with the conduit 20 by means of the by-pass channel 46. At position G the container will be removed from the platform, as will be evident.

It will be apparent from the above description that our invention provides for the purging of air from the containers during the normal filling cycle with a minimum of difficulty. With our device, the liquid coming into the containers is not exposed to air until the conclusion of the filling operation, when the container leaves the machine and the open neck can permit dissipation of the inert gas not displaced by the filling material. However, generally, the passage between the filling machine and the container capper occupies a short time interval. If desired, the containers can be conveyed to the capper under a hood so that passage between the filling machine and the capper is in an atmosphere of the same inert gas. In general, however, this expedient is not necessary since the dissipation of the gas in the head space of the container will not be rapid enough to cause difficulty.

Modifications may be made in our invention without departing from the spirit of it. Having, however, described our invention in an exemplary embodiment, what we desire to secure and protect by Letters Patent is:

1. In container filling apparatus, a head element formed to provide two chambers, one for filling material and the other for suction, a filling spout structure associated with said head, said filling spout structure including filling and exhaust tubes, a first connection between said filling chamber and said filling tube and a second connection between said suction chamber and said exhaust tube, a conduit for supplying gas under pressure, and valve means for breaking the connection between said suction chamber and said exhaust tube, and connecting said exhaust tube to said conduit, said valve means comprising a segmental valve in said suction chamber including a pressure block contacting the inner wall surfaces of said suction chamber and having a port adapted to communicate with the connection between said exhaust tube and said suction chamber, and means for urging said pressure block into contact with the walls of said second mentioned chamber.

2. In container filling apparatus, a rotatable head element having two chambers, one for filling material under pressure and the other for suction, a plurality of filling spout structures associated with said head, said filling spout structures having filling and exhaust tubes each having a connection with said head, said filling tubes being connected to said filling chamber and said exhaust tubes to said suction chamber, said connections terminating in openings in the walls of the said chambers, a conduit for supplying gas under pressure to said suction chamber, and valve means in said suction chamber for

serially connecting the openings in the walls of said suction chamber to said conduit, said valve means comprising a segmental valve having a pressure block bearing against the inner wall surfaces of said suction chamber, said pressure block having a port therein for communication with said openings.

3. The filling apparatus claimed in claim 2 wherein said suction chamber has a centrally disposed suction conduit opening therein for drawing a vacuum on the said suction chamber, and wherein said segmental valve is connected to the lower end of said conduit.

4. The container filling apparatus claimed in claim 3 wherein said suction conduit if fixed against rotation with said rotatable head element, and wherein said valve means is fixedly secured to said suction conduit.

5. The container filling apparatus claimed in claim 4 wherein the said conduit for supplying gas under pressure is contained within said suction conduit.

6. The container filling apparatus claimed in claim 5 wherein said suction conduit is closed at its lower end by a plug having an annular recess therein communicating with the conduit for supplying gas under pressure, and wherein a second tube connects said annular recess to the port in said pressure block.

7. In container filling apparatus, a rotatable head element having two chambers, one for filling material under pressure and the other for suction, a plurality of filling spout structures associated with said head, said filling spout structures having filling and exhaust tubes connected to said head, there being connections between said filling chamber and said filling tubes and connections between said suction chamber and said exhaust tubes, said connections terminating in openings in the walls of the said chambers, said filling spout structures each including a by-pass channel for connecting the exhaust tube to said suction chamber, and valve means in said filling spouts having a first position in which the filling tube is closed to the flow of filling material through the connection with said filling chamber and said vacuum tube is connected by said by-pass channel with said suction chamber, and a second position in which said tubes and connections are in direct communication, conduit means for supplying gas under pressure to said head, and means for serially connecting the openings in said suction chamber to said conduit means when said valve means are in the first named position, whereby gas under pressure will be introduced into said exhaust tubes through said by-pass channel.

8. The container filling apparatus claimed in claim 7 wherein the means for serially connecting the openings in said suction chamber to said conduit means comprises a segmental valve including a pressure block contacting the inner wall surfaces of said suction chamber, said block having a port therein adapted to communicate with the connection between said exhaust tube and said suction chamber, and wherein means are provided for urging said pressure block into contact with the walls of said suction chamber.

9. In container filling apparatus including a rotatable head mounting a filling spout structure having filling and exhaust tubes and a seal for making sealing contact with a mouth of a container to be filled, container moving means for juxtaposing a container to said filling spout, said container moving means having a first position in which said exhaust tube at least is received in the mouth of the container being filled but said seal is displaced therefrom, and a second position in which the mouth of the container makes the sealing contact with said seal, a connection for supplying filling material to said filling tube, a connection for drawing a vacuum on said exhaust tube, and a connection for supplying gas under pressure, valve means in said filling spout effective when said container moving means is in the first position to connect said exhaust tube to said vacuum connection and to prevent the flow of filling material to said filling tube, and

additional valve means operative while said container moving means is in the said first position to disconnect said exhaust tube from said vacuum connection and connect it to said connection for supplying gas under pressure, whereby gas under pressure may be introduced into the container being filled to purge the air therefrom and the air so purged may escape from the container through the unsealed mouth thereof.

10. The container filling apparatus claimed in claim 9 wherein said rotatable head is divided into two chambers, one for filling material and the other for vacuum, wherein the vacuum connection extends between said vacuum chamber and said filling spout, and wherein said additional valve means is located within said vacuum chamber and arranged to effect a connection between said vacuum connection and the connection for supplying gas under pressure during a portion of the rotative cycle of said head.

11. The container filling apparatus claimed in claim 10 wherein said vacuum connection terminates in a wall surface of said vacuum chamber, and wherein said additional valve means includes a pressure block contacting the inner wall surface of said vacuum chamber, said pressure block having a port therein adapted to communicate with said vacuum connection, and wherein means are provided for urging said pressure block into contact with the wall surface of said vacuum chamber.

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