

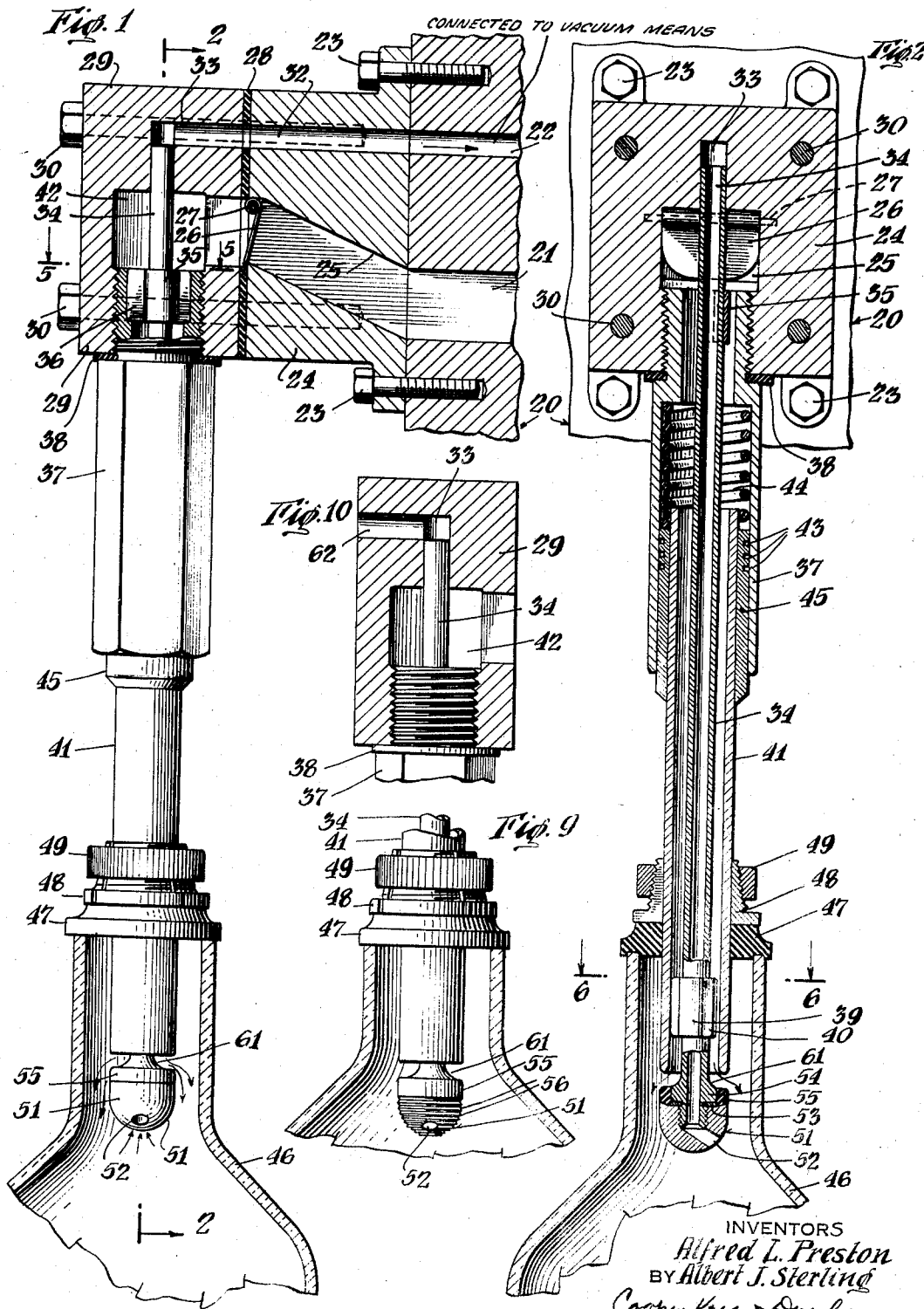
Nov. 12, 1940.

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2 Sheets-Sheet 1



INVENTORS
Alfred L. Preston
BY Albert J. Sterling
Cooper, Kerr & Dunham
ATTORNEYS

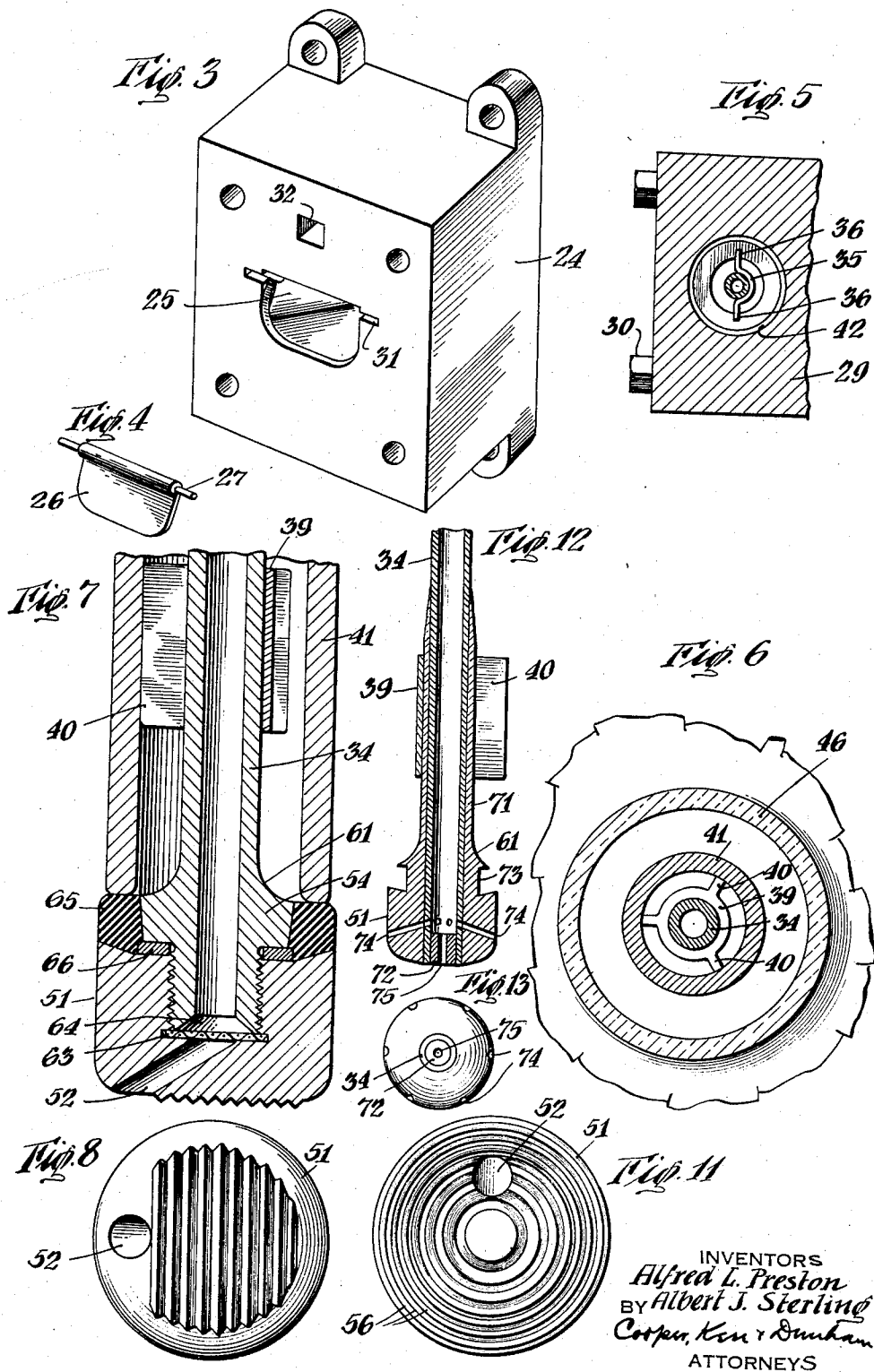
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UNITED STATES PATENT OFFICE

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CONTAINER FILLING MACHINE

Alfred L. Preston, Moorestown, N. J., and Albert J.
Sterling, Brooklyn, N. Y.

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5 Claims. (Cl. 226—124)

This invention relates generally to filling machines and has particular reference to improvements in machines for filling bottles and similar containers.

5 One object of the invention is to provide a mechanism which will fill more containers in a period of time than is possible with any prior apparatus known to the applicant. This permits the use of machines having a fewer number of
10 filling stations for the same output, thereby reducing the cost per machine, or a greater filling capacity when the machines are constructed and operated at the practical limits of size and capacity. For example, any machine constructed
15 according to the present invention will fill twenty-five percent (25%) or more containers in a period of time than is possible with comparable prior machines.

20 Another object of the invention is to provide a mechanism which will normally fill containers with a liquid without foaming or frothing, but which will, if frothing or foaming does occur because of some abnormal condition, skim off or
25 remove the froth or foam, leaving only the liquid and thereby contributing to very accurate measuring of the liquid or uniformity in filling.

Still another object is to provide a filling mechanism which will be free from dripping between filling operations, thereby contributing to
30 cleanliness and sanitation, as well as preventing loss of the liquid. It usually is not permissible to return such drippings to the main supply from which the liquid is drawn for the filling.

35 Other objects and advantages will become apparent from the accompanying drawings and the explanation contained in the following specification of the embodiments shown in said drawings. However, the explanation and drawings are not to be taken as limiting the invention to
40 what actually is shown and described, the novel features of the invention being pointed out in the claims appended to the specification.

In the drawings:

45 Figure 1 shows, partly in section, how improvements comprised by the invention may be applied to what is known in the trade as a vacuum filling machine and with parts in the position they occupy when a container is being filled;

50 Fig. 2 is a section along the line 2—2 of Fig. 1;

Figs. 3 and 4 illustrate details of parts shown in Figs. 1 and 2 including a high capacity valve adapted for use in a vacuum filling machine;

55 Fig. 5 is a section along the line 5—5 of Fig. 1;

Fig. 6 is a section along the line 6—6 of the lower part of Fig. 2;

Figs. 7 and 8 show a modification of the filling tip or nozzle;

Fig. 9 shows a mechanism similar to that which appears in the lower part of Figs. 1 and 2, but
5 adjusted so as to flow a liquid against a relatively inclined surface on the interior of a container and with the lower face of the tip corrugated;
10

Fig. 10 illustrates a modification suitable for use on machines in which the vacuum filling principle is not employed, but in which the air is allowed to escape from containers as it is displaced by liquid entering the containers;
15

Fig. 11 is a view, looking upward, of the lower end of the filler tip of Fig. 2 and shows the corrugations on the tip surface; and

20 Figs. 12 and 13 illustrate a further and, in many respects, a preferred form of construction of the filler tip.

In the drawings the invention is disclosed in connection with a single filling stem, but any number of stems constructed according to the invention may be applied to the same machine
25 just as with prior art stems. One of the arms or sections of a multiple stem machine is represented at 20, Fig. 1. This part is provided with a passage 21 leading to a source (not shown) of liquid supply and a passage 22 which leads to an
30 air evacuating mechanism of any desired type. Secured to the member 20 by bolts 23 is a member 24 containing a passage 25 connecting with the passage 21 previously mentioned and preferably inclined upwardly as shown. Hinged in
35 the outlet of the passage 25 is a one-way valve member 26 cooperating with a valve seat around the mouth of the passage 25. This valve member, it may be stated now, acts to hold the liquid
40 against backward flow and is employed where the liquid is drawn or lifted from a supply below the level of the passage 21 thereby holding the liquid at the higher level and making possible
45 quicker filling operations than if the liquid has to be drawn or lifted all the way from the supply source before the actual filling of a container can be started. This valve also, in a multiple
50 stem machine, prevents a break in the vacuum effect in other stems when no vacuum effect is created in one stem because of a broken or chipped bottle. The construction of the passages
55 21 and 25 is such that the liquid can flow freely and in considerable volume; and the valve member 26 will act without fluttering to prevent back-

ward flow of the liquid toward the source of supply.

The rod or trunnion member 27 upon which the valve member 26 swings is mounted in slots or grooves 31 (Fig. 3) in the face of the member 24 and is held in the slots by a gasket 28 (Fig. 1) and a member 29, threaded bolts 30 clamping the gasket between the member 29 and the member 24. When the member 29 and the gasket 28 are removed the valve member 26 may also be removed, thereby giving easy cleaning access to the vacuum and liquid passages.

The member 29 contains a vacuum passage 33, in line with a vacuum passage 32 in the member 24 and the vacuum passage 22, communicating with the upper end of a vacuum tube 34 slidably inserted in a hole leading from the passage 33 and extending downward to the tip of the filling nozzle or stem. The vacuum tube 34 is centered by a plate 35 secured to the tube and having wings 36 (Fig. 5) engaging in slots on the interior of a support 37 which is threaded into the member 29, this centering insuring engagement of the upper end of the tube with the hole referred to when the support 37 is screwed into position. The support 37 has a peripheral shoulder below its threaded portion which serves to compress a gasket 38 against the lower part of the member 29 when the support 37 is screwed into the position shown in Figs. 1, 2 and 3. The lower end of the vacuum tube also is provided with a member 39, Figs. 2, 6, 7 and 12, having three wings or blades 40 cooperating with the interior of a sleeve 41 to center the tube relative to the sleeve.

The member 29 also contains a chamber 42 communicating with the liquid passage 25 and above the tubular interior of the support 37, this tubular support and the interior of a sleeve 41 constituting a downwardly extending passage for the liquid. Attached to the sleeve 41 and sliding in the interior of the support 37 is a member 45 provided with circumferential grooves 43 (Fig. 2). The member 45 has a sliding fit in the interior of the support 37 which is close enough ordinarily to prevent leakage, but the grooves 43 serve to arrest or trap any liquid which might enter between the periphery of the member 42 and the interior of the support.

Seated on the upper end of the member 45 and around the upper end of the sleeve 41 is a compression spring 44 cooperating with a shoulder on the interior of the support. The purpose of this spring will become clear later on.

Surrounding the sleeve 41 is a sealing member 47 of rubber or any other material suitable for forming a substantially air-tight seal with the top of a bottle or similar container 46. The sealing member 47 may be adjusted to any point desired along the sleeve 41 and limited as to upward movement by a jaw chuck 48 gripping the sleeve 41 which may be loosened and tightened by a knurled threaded member 49 in a well known manner. This permits quick and accurate adjustment of the sealing member 47 along the sleeve 41 to accommodate containers of different heights or to vary the amount of liquid to be deposited in a container or to determine the angle at which the liquid will strike the interior of the container, and after the adjustment is once made it will be maintained indefinitely.

In the constructions illustrated in Figs. 1, 2, 7 and 9, the lower end of the vacuum tube 34 is threaded to be engaged by internal threads in

a tip member 51 containing an oblique continuation 52 of the vacuum channel through the tube 34. Compressed between the tip 51 and the lower face of a head 54 on the lower end of the vacuum tube is a star lock washer 53 to prevent the tip from working loose. Surrounding the head 54 on the vacuum tube is a sealing member 55 of rubber or other satisfactory material. In the non-filling position of the parts the lower end of the sleeve 41 is held in firm engagement with the sealing member 55 by the tension of the spring 44.

As so far described, it will be apparent that after a container 46 is brought in contact with the sealing member 47 a relative movement of the container and the filler arm or head 20 will compress the spring 44 and cause the lower end of the sleeve 41 and the sealing member 55 on the vacuum tube to become separated thereby opening the liquid passages to the interior of the container and that a vacuum effect through the tube 34 will create a sub-atmospheric pressure in the container and cause the liquid to flow from the lower end of the sleeve 41 into the container.

When the liquid entering the container rises to the intake 52 further rise of the liquid is prevented so that the filling level is definitely limited. This level may, as previously indicated, be varied by adjustment of the sealing member 47 and the clamp 48, 49 along the sleeve 41.

It is preferred to use a continuously operating suction or vacuum effect through the passage 52 even though there may be no container in filling position. This will draw into the vacuum system liquid which might otherwise drip after a container 46 is moved away from the sealing member 47, but dripping is further minimized by giving the rounded lower surface of the tip member 51 a corrugated effect as shown at 55 in Fig. 9 with some at least of the corrugations being intersected by the vacuum opening 52. While a continuous operation of the vacuum or suction effect is preferred, this effect may be reduced or the air shut off by any of the expedients common in the art, particularly when the corrugated tips are employed.

As has heretofore been implied, the parts are shown in Figs. 1 and 2 in the positions they occupy when the spring 44 has been compressed by relative movement of the support 37 and the sleeve 41 to open a circumferential passage between the sealing member 55 and the lower end of the sleeve 41 to permit the liquid to flow into the container. When the pressure upon the spring 44 is relieved, the lower end of the sleeve 41 is firmly seated upon the sealing member 55 thereby positively shutting off further flow of liquid, but not interfering with the air intake at 52.

The curved surface 61 (Fig. 1) on the head 54 at the lower end of the vacuum tube 34 and the upper face of the sealing member 55 are so shaped as to deflect the flow of liquid outward and slightly downward, and, as there is nothing intervening to interfere with or break up the flow, the liquid assumes a substantially continuous circular sheet form against the interior of the container and flows down along the sides of the container until the container is filled. This prevents foaming or frothing.

The apparatus has thus far been described in connection with filling by exhausting air from the container, thereby introducing a flow of

liquid from the passages 21, 25, chamber 44 and down through the interior of the support 37 and sleeve 41 and out over the tip arrangement on the lower end of the vacuum tube 34. The invention may, however, be used in whole or in part in filling machines in which the liquid is caused to flow by gravity from a source of supply above the level of the tip 51 or in which the liquid is pumped from a lower level through said passages to the filler tip. With either of these two methods of causing the liquid to flow, the vacuum connection 22 is, of course, not necessary and, particularly in the case of gravity flow, the valve member 26 is not needed. It is, however, necessary to allow the air to escape from the container as the liquid enters and for this purpose the vacuum tube 34 may be used. The member 29 may be changed as shown in Fig. 10, the principal change being to permit the air to escape without having to go through a long course which would be afforded if the mechanism was unchanged and the vacuum passage 22 simply made open to the air at some point instead of being connected to an exhaust pump or the like. The modification exists in making a short passage 62 in the member 29 connecting the upper end of the air tube 34 with the outer air. Flow of liquid in the container may be arrested at any time by stopping the escape of air through the passage 62, thereby forming an air cushion in the upper part of the container which will counteract or arrest flow of liquid into the container. This stopping of the air escape may be done manually or mechanically as desired.

The construction illustrated in Figs. 7 and 8 shows a tip construction which may be used instead of the tip shown in Figs. 1 and 2. The configuration or shape of the lower surface of the tip in Figs. 7 and 8 is such that the lower face of the tip is substantially flat instead of rounded. A screen 63 is interposed between the air intake 53 and the lower end of the air tube 34, and the lower end of the air tube is cut out as shown at 64 to form a small chamber above the screen. This screen and chamber are not essential things, but they have a desirable effect in breaking up liquid drawn into the air passage and entraining it in the air current so that it may be more easily and completely conveyed to the usual trap and suitable connections for returning the liquid to the original source of supply.

The mechanism of Figs. 7 and 8, like that of Figs. 1 and 2, has a sealing member 65 which is resilient and a star lock washer 66. The lower surface of the tip in Figs. 7 and 8 has cross corrugations or ribs which, like the corrugations in Fig. 2, serve to retain any liquid which may have been caused to adhere until the seal between the neck of the container and the sealing member 47 is broken whereupon the air exhaust which, as stated before, is preferably a continuous one, will draw some of the adhering liquid into the air passages. The main effect, however, of the corrugations in both forms is to break up the tip surface in such a way as to delay or prevent the accumulation of liquid into drops.

The tip construction shown in Figs. 12 and 13 is, as previously stated, the one which is in many respects preferred. It is easier to make, does away with some of the parts which have to be made and assembled in the other forms, and is very efficient in preventing drip. It comprises a member 71 surrounding the lower end of the

air or vacuum tube 34. The member may be held on the tube by brazing or solder or by a plug 72 driven into the lower end of the air tube so as to expand the tube sufficiently to hold the member 71 in place. Formed on its exterior is a flared portion 61 like the one in other embodiments, with a peripheral groove 73 to be engaged by a rubber sealing ring like the rings 55 (Fig. 2) and 65 (Fig. 7). Below the groove 73 the exterior of the tip is for a short distance substantially cylindrical in shape and is then rounded off to a bottom surface which is preferably nearer flat than the tips of Figs. 1 and 9. Extending from the exterior of the tip into the interior of the vacuum or air tube 34 are holes or passages 74. It is preferred to have these passages 74 somewhat inclined as illustrated, and with their outer ends adjacent the inner curve between the cylindrical wall and the bottom of the tip. Any reasonable number of such passages 74 may be used, but it is preferred to have their total intake capacity about the same as that of the tube 34. In addition, another passage 75 through the plug 72 may be employed with advantageous results.

The tip of Figs. 12 and 13 may be corrugated as an additional precaution, but it has been found that the multiple air intakes around the surface of the tip normally prevent all dripping. In operation the flared portion 61 will direct the liquid outward.

The sheet of liquid issuing from any of the tips shown and described strikes the interior of the container at an angle and flows down along the interior walls of the container. This prevents spattering such as occurs when the liquid is delivered centrally of the container and as one result the lower surface of the lower face of the tip is not subjected to the liquid unless the flow is maintained until the liquid level rises high enough to contact the lower surface of the tip. This can, if desired, be prevented by so timing the filling mechanism that the seal between the container and the sealing member 47 will be broken before the liquid reaches that level, thereby immediately interrupting the flow. When this is done the lower surfaces of the tip normally remain substantially dry. It is preferred, however, to continue the filling until the air intakes in the tips are reached by the liquid in order that any excesses may be carried off by the air stream. If the filling has been abnormal so that bubbles or foam have formed on the liquid, the surface of the liquid will be skimmed as an incident to drawing off the excess.

In Figs. 1 and 2 the sealing member 47 is shown as adjusted to give a certain clearance between the lower end of the liquid sleeve or tube 41 and the head on the lower end of the vacuum tube. The area of this clearance and consequently the volume of the liquid admitted during a period of time may be varied by the adjustment of the sealing member. No matter what the adjustment is, however, the delivery of the liquid is the same at all points circumferentially around and above the filling tip against the interior of the container, with the liquid flowing and spreading down the container walls instead of being poured down centrally of the container. This is true of the other constructions.

Also in Figs. 1 and 2 the mechanism is shown as being constructed and adjusted to deliver the liquid within the neck of a container. The mechanism may, however, be adjusted or a longer sleeve 41 and vacuum tube 34 employed to make

the delivery against an inclined surface such as that below the container neck shown in Fig. 9.

As shown in the drawings, the heads on the lower ends of the vacuum tube 34 flare downwardly and outwardly to form the curved surface 61, and this head is held centered with respect to the sleeve 41 by the member 39. While it is not an absolutely essential thing, it is preferred to have the upper face of the sealing member 55 constructed to form a continuation of the curved surface 61 during filling. By this construction, when the lower end of the sleeve 41 and the sealing member 55 are separated in filling, there is provided a liquid exit or opening between the two which is the same at all points circumferentially of the vacuum tube, and the nature of the exit or opening is such that the liquid will be delivered at a pronounced angle to the axis of the vacuum tube. If a vacuum of, for example, ten pounds is employed, the liquid will assume the form of a flat sheet radially of the sleeve 41. The shape assumed by the liquid will depend upon the amount of the vacuum. In all cases, however, there is a free and uninterrupted flow of the liquid radially of the sleeve and vacuum tube against the entire interior circumference of the container.

While the embodiments of the invention shown and described are admirably adapted to fulfill the purposes primarily stated, it is apparent that those embodiments are capable of various modifications and changes all coming within the scope of the claims which follow.

What is claimed is:

1. In an apparatus of the character described, the combination of a sleeve constituting a passage for liquid, a vacuum tube supported within said sleeve and having its longitudinal axis coinciding with the axis of the sleeve, a head on the lower end of the vacuum tube having an upper face symmetrical around the axis of the vacuum tube constructed to flow liquid outwardly at substantially a right angle to the axis of the tube and means on said head normally sealing the lower end of the sleeve, relative movement of the sleeve and vacuum tube causing separation and reengagement of the sleeve and sealing means in filling a container, means for regulating the extent of the separating movement, and a tip below said head having a corrugated exterior and containing an air inlet communicating with the interior of the vacuum tube.

2. In an apparatus of the character described, the combination of a sleeve constituting a passage for liquid and a vacuum tube supported within the sleeve in such manner that the longitudinal axes of the two substantially coincide, a head on the lower end of the tube curving outwardly to constitute a flow surface concentric with and symmetrical around the axis of the vacuum tube, a sealing portion on said head normally sealing the lower end of the sleeve, separation of the sealing portion and the end of the sleeve opening a passage of uniform area and shape concentrically of the vacuum tube, and a tip on the vacuum tube below said head having a corrugated lower exterior and containing an air inlet communicating with the interior of the tube.

3. In an apparatus of the character described, a hollow support containing a passage for liquid,

a sleeve slidably supported at its upper end in the support and containing a passage for liquid communicating with the passage in the support, a vacuum tube supported centrally of the liquid passage in the sleeve and carrying a sealing member on its lower end cooperating with the lower end of the sleeve, a spring within the support normally holding the lower end of the sleeve against the sealing member, relative movement of the support and sleeve compressing the spring and separating the sleeve and sealing member to afford an uninterrupted clearance of equal area at all points between the lower end of the sleeve and the vacuum tube and sealing member, and a tip on the vacuum tube below the sealing member having its lower exterior corrugated and containing an air inlet communicating with the interior of the tube.

4. In a vacuum filling machine having a source of liquid supply and an air evacuator mechanism, a filling stem or nozzle comprising in combination a tube for the liquid, a vacuum tube supported centrally of the liquid tube and having a downwardly and outwardly flared head on its lower end, the tube for the liquid and the vacuum tube being relatively movable, a sealing member mounted around the head on the vacuum tube and having its upper face constructed as an extension of the flare on said head, a spring between the liquid tube and the vacuum tube normally holding the sealing member in sealing engagement with the lower end of the liquid tube, relative movement of the two tubes tensioning said spring and separating the sealing member and the end of the liquid tube to form a liquid outlet of uniform area at all points between the end of the liquid tube and the vacuum tube, a tip below said head having a corrugated exterior and containing one or more air passages at an angle to and communicating with the interior of the vacuum tube, connections from the upper end of the liquid tube to the source of liquid supply, a pivoted valve in said connections above the liquid tube, and connections from the vacuum tube to the air evacuator.

5. In a container filling apparatus having a source of liquid supply and a suction device, a hollow support containing a passage for the liquid, a member slidably mounted in said passage and having a plurality of circumferential liquid arresting grooves in its sliding face, a liquid supply tube integral with and within said member and having its end extending above the member to provide a spring seat between the end of the tube and the inner wall of the hollow support, a suction tube extending centrally of the liquid supply tube and carrying a sealing member on its lower end, a spring mounted in the aforesaid spring seat and normally holding the lower end of the liquid supply tube in sealing engagement with the sealing member, upward movement of said tube compressing the said spring and affording an uninterrupted clearance of equal area at all points between the lower end of the tube and the sealing member, and a tip on the suction tube below the sealing member having a flattened lower surface and containing a plurality of air inlets communicating with the interior of said suction tube.

ALFRED L. PRESTON.

ALBERT J. STERLING.