The present invention relates to an automatic filling apparatus particularly designed for liquids, in which the principle of arranging the suction air control ensures automatic stoppage of the filling process in any position.

In order to prevent the liquid which is drawn into the air-conduit projecting into a container during the filling of said container when the liquid reaches the open end of the air-conduit, from rising into the diaphragm chamber and impeding the operation of the diaphragm, the present invention provides for a separation or discontinuity of the air-conduit leading at one end into the container to be filled and opening at the other into the diaphragm chamber, into two major portions which open concentrically into an air suction device in a manner permitting liquid drawn into the air-conduit to be withdrawn downwardly before entering an air suction chamber therefor so that the air suction persists in the air suction chamber until the flow of the liquid is discontinued and also can freely effect the withdrawal of air from the diaphragm chamber to produce the negative pressure (vacuum) necessary for the operation of the diaphragm.

In order to prevent the negative or vacuum pressure produced in the diaphragm chamber and which normally would persist after the release of the fluid valve closing elements, from sucking liquid up into the diaphragm chamber, and thereby impeding the operation of the diaphragm, the invention provides for the control of the air-conduit by means of an air valve in a portion of said conduit communicating with the atmosphere, arranged and cooperating with the valve closing elements in such a manner that as soon as the negative pressure or vacuum produced in the diaphragm chamber has operated the diaphragm and thereby, the fluid closing elements, the air valve which had been kept in the closed position during the filling process will at the same time be opened so that air at atmospheric pressure flowing into the diaphragm chamber will at once destroy the vacuum therein, and thus prevent any liquid from being sucked thereto.

The attached drawing shows a section of a typical embodiment of the invention.

The automatic filling apparatus is arranged in a valve casing 1 on which is attached a pipe 2 for immersion in the vessel to be filled. In the valve casing 1 there is arranged a fluid passage 3 which, by means of a hose (not illustrated) may be attached to a tank not shown. This fluid passage leads from the mentioned hose to the pipe 2 and when the automatic apparatus is not used it is closed by a valve 4. The valve 4 is slidably arranged within the following casing 1 and is under the action of a spring 5, it is equipped with a co-axial pin 7 provided at its end with an annular shoulder 6, said pin cooperates in a manner later to be described with members which operate the valve 4.

Within the valve casing 1 there is pivotally mounted a manually operable lever 43 which is used for opening the valve 4. The lever 43 for this purpose is by means of elements 8 pivotally connected with the valve lifting member 48 which in the valve casing 1 is slidably guided along a rod 10 and is subjected to the action of a spring 9. A bell crank lever 11 is pivotally mounted on the valve lifting member 48 and the lever 11 is under the action of a leaf spring 12 and has two dogs 13 and 14 of which the one, namely 13, cooperates with the annular shoulder 6 and the other dog 14 cooperates with a sleeve 41 which is slidably mounted in the valve casing 1 and is under the action of a spring 155. The valve lifting member 48 is also provided with a nose 39 which is movable, and abuts a bell crank lever 36 which is pivotally mounted in the valve casing 1 about a pin 37. In the valve casing 1 there is also arranged a diaphragm 32 subjected to the action of a spring 19 which diaphragm 32 is provided with a co-axial rod 17 on which a pivotally mounted locking member 18 is positioned within the valve casing 1. The locking member 18 engages, in the position as shown in the drawing, a shoulder 42 of the sleeve 41 and maintains this sleeve against the action of the spring 155 in its tensioned position.

In that portion of the conduit 3 arranged between the valve 4 and the filling pipe 2 there is arranged a valve 19 under the action of a spring which during the passage of fluid will be opened against the action of its spring and closes again when the fluid flow ceases. The valve 19 is guided in a pipe 21 connected with the pipe 2.

The inner configuration pipe 21 is in the shape of a Venturi tube and is connected over an air suction chamber 15 and an air suction device 13 with a pipe 22 leading to the pipe 2.

The air-conduit 20 leading from the mouth 19 into the diaphragm chamber 31 is separated into two reciprocally acting air-conduit portions 20a and 20b by a section 20c in such a manner that said portions open concentrically through the section 20a into air-suction chamber 15 of the air-suction device 13. Furthermore, another portion 20d of the air-conduit leads from the diaphragm chamber 31 to the outside atmosphere. The opening 20c is opened and closed by an air valve 33. Said air valve is slidably arranged in bores 43 and provided with a shoulder ring 34 controlled on the one side by a spring 35 and on the other by a forked lever 36. Said lever swivels on pivot 37 rigidly mounted in the casing of the apparatus and is provided with a nose or boss 39.
at its end which co-operates with the valve closing elements.

The operation is as follows:

When the fluid is to be dispensed, the filling apparatus with its pipe 2 is inserted into the container to be filled and the lever 43 is rotated manually in the direction of the arrow x. In doing this the members 3 move the valve lifting member 40 against the action of the spring 9 in the direction of the arrow y parallel to its longitudinal direction. This displacement has the following result. First, the valve lifting member 40 releases with its nose 38 the nose 36 of the bell crank lever 35 so that under the action of the spring 35, the bell crank lever 35 is rotated about its axis 37 in counterclockwise direction so that the valve 32 is moved into its closed position. Immediately after the release of the bell crank lever 35, the other bell crank lever 41 moves with its dog 14 away from the range of the shoulder 42 and by means of its leaf spring 12 it is moved counterclockwise so far that its dog 13 engages the shoulder 58 of the pin 7 on the valve 4. As soon as this is accomplished, the valve 4 is raised from its seat against the action of its spring 5 so that the fluid enters the container to be filled whereby at the same time the valve 19 is opened under the pressure of the fluid.

As soon as the liquid level in the container being filled rises to the end of the filling pipe 2, the opening 18 of the air pipe 20-b is closed and now under the action of the Venturi pipe 21, due to the fluid in the portion 29-b of the air line, sucks in a water which comes from the diaphragm chamber 31 and the portion 29-a. Since the air line 29, 29-a and 29-d, owing to the opening of the valve 4 is closed by the valve 39, there will be produced in the diaphragm chamber 31 a vacuum under the action of which the diaphragm 31 in a manner still to be described closes the valve 4 immediately thereupon, shuts off any additional fluid flow. The fluid which has entered the air line 29-b is unable to reach the rear portion of the Venturi device and the portion 29-a arranged in the rear thereof. The fluid sucked into the line 29-b, however, is conducted in each position of the filling apparatus with safety and in view of the described arrangement of the leg 29-a into the pipe 22 and, therefore, reaches the pipe 2. During the mentioned admittance of the fluid into the air line 29-b, there takes place an automatic closure of the valve 4 in the following manner. As soon as the diaphragm chamber 31 has therein the desired low pressure, the diaphragm 32 is deflected against the action of its spring 16. This results in a release of the sleeve 41 by the locking member 16. The sleeve 41 moves quickly under the action of its spring 16a upwardly and engages the dog 14 of the bell crank lever 11 so that the latter is moved clockwise while its dog 13 releases the annular shoulder 6 of the pin 7 on the valve 4. Immediately after this release, the valve 4 moves quickly, under the action of the spring 5, in its closed position and this takes place as soon as the pressure of the fluid in the air line is reduced. The fluid line 3 is now automatically shut off so that a further flow of the fluid into the pipe 2 and into the container is interrupted.

Furthermore, during this mentioned movement of the sleeve 41, the nose 38 of the lever 35 is engaged whereby it is moved in such a manner that the lever 35 rotates clockwise and in doing this the valve 33 of the air line is moved into open position against the action of its spring 35. The discharge of the fluid is now automatically shut off even though the hand lever 43 and the valve lifting member 49 connected therewith are still in their operating position in which the discharge has begun.

As soon as the hand lever 43 is released it returns under the action of the spring 9 into the position illustrated in the drawing and the valve lifting member 49 returns into the rest position illustrated in the drawing in which the nose 36 of the bell crank lever 35 is engaged and in which the dog 14 of the bell crank lever 41 engages the shoulder 42 of the sleeve 41 after the latter has been returned to its initial position in which again the locking member 18 engages the shoulder 43 of the sleeve 41.

All parts are now in the initial position illustrated in the drawing and remain in the latter until such time as the lever 43 is again operated in order to start a new discharge cycle.

Attention is called to the fact that the air suction device inclusive of the two legs 29a, which are the diaphragm chamber and the atmosphere, being arranged diametrically opposite from the portion of the air conduit extending from said diaphragm chamber to the end of the discharge pipe.

What I claim is:

1. In a filling apparatus for liquids, a casing, a diaphragm chamber within said casing, a diaphragm defining one wall of said chamber and adapted to flex when a predetermined pressure is developed within said chamber, a liquid discharge pipe, an air conduit extending from the discharge end of the discharge pipe to said chamber, a fluid valve for controlling the flow of fluid through said discharge pipe, means for manually opening said fluid valve, and a Venturi tube connecting said discharge tube and fluid valve and being in communication with said air conduit and operable when the end of the air conduit adjacent the end of the discharge pipe becomes immersed in liquid, for drawing air out of said chamber, said diaphragm flexing when a predetermined pressure is thereby reached within said chamber, means operable by said diaphragm for automatically closing said fluid valve when the diaphragm is flexed, a portion of said air conduit additionally extending from said chamber and communicating with the atmosphere, an air valve in said last mentioned portion of the air conduit, and means for automatically closing said air valve when said fluid valve is opened.

2. In a filling apparatus according to claim 1, a bypass from said air conduit around said Venturi tube and provided with means for discharging liquid drawn up within the portion of the air conduit adjacent the end of the discharge pipe before it is drawn into the Venturi tube.

3. In a filling apparatus for liquids according to claim 1, said portion of the air conduit extending from and communicating with the diaphragm chamber and the atmosphere, being arranged diametrically opposite from the portion of the air conduit extending from said diaphragm chamber to the end of the discharge pipe.

ERNST GIGER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,550,733</td>
<td>Payne</td>
<td>Aug. 25, 1925</td>
</tr>
<tr>
<td>2,236,261</td>
<td>Piquerez</td>
<td>Aug. 10, 1943</td>
</tr>
<tr>
<td>2,354,209</td>
<td>Hammand</td>
<td>July 25, 1944</td>
</tr>
</tbody>
</table>