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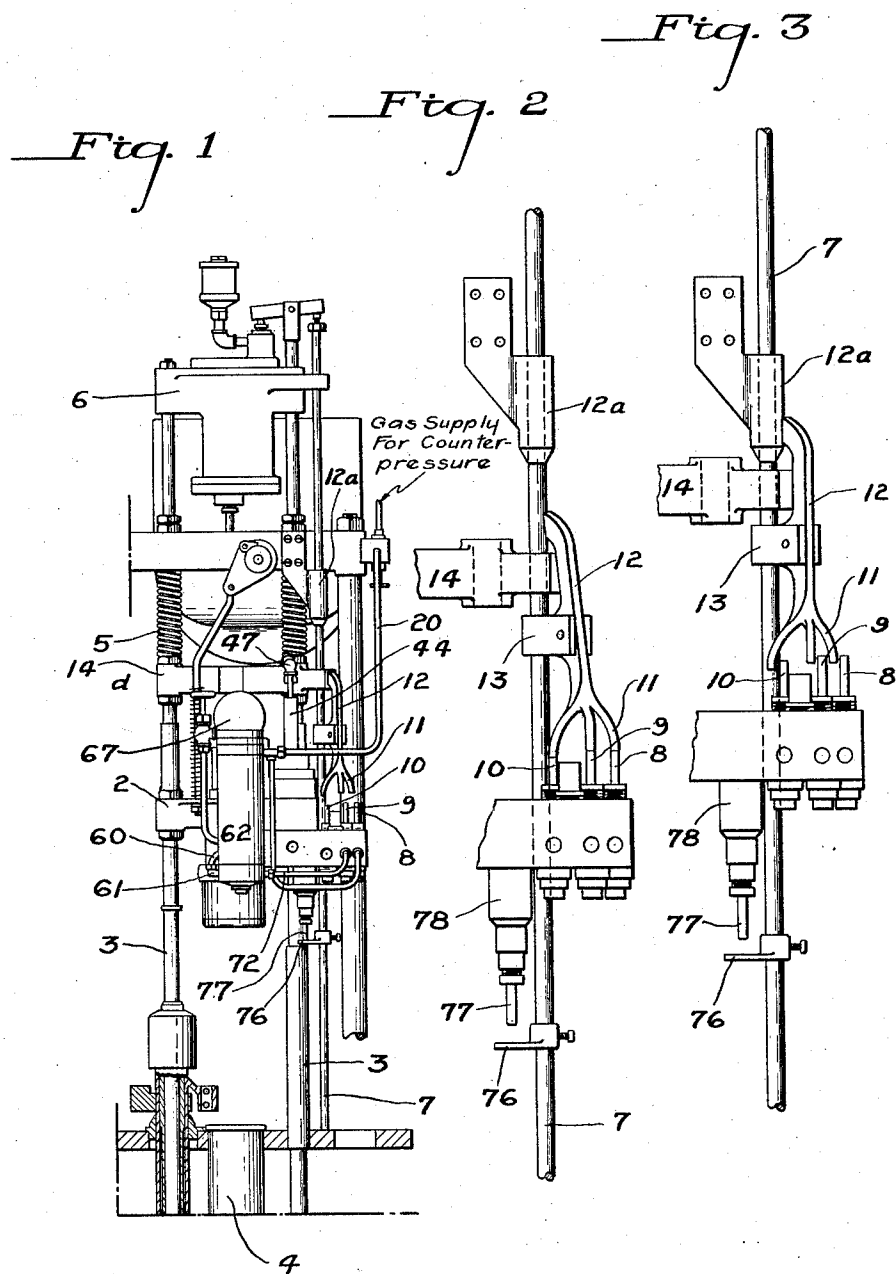
P. W. SHIELDS

1,742,288

BOTTLE FILLING MACHINE

Filed April 30, 1927

3 Sheets-Sheet 1



INVENTOR

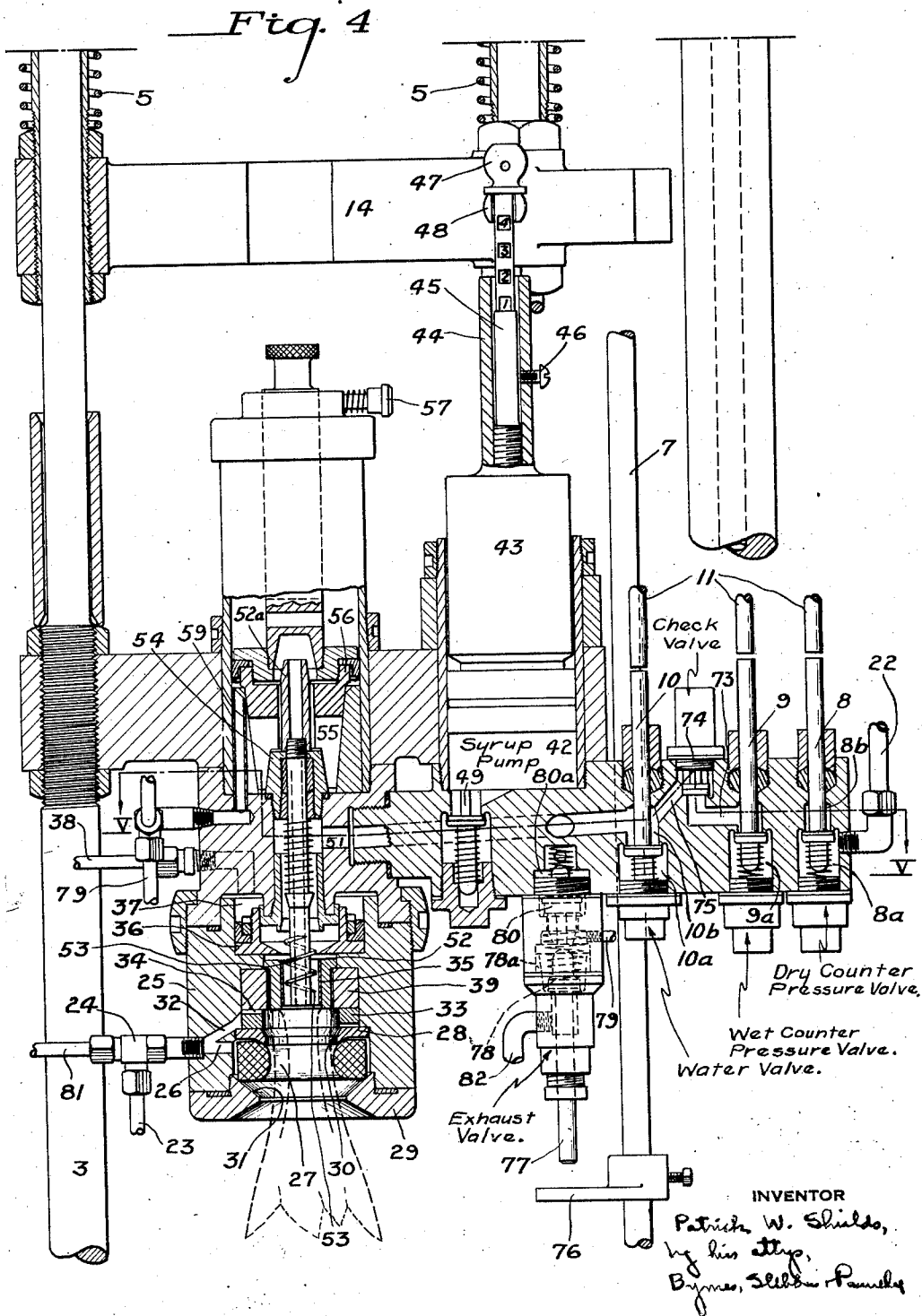
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1,742,288

3 Sheets-Sheet 2



Jan. 7, 1930.

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1,742,288

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3 Sheets-Sheet 3

Fig. 5

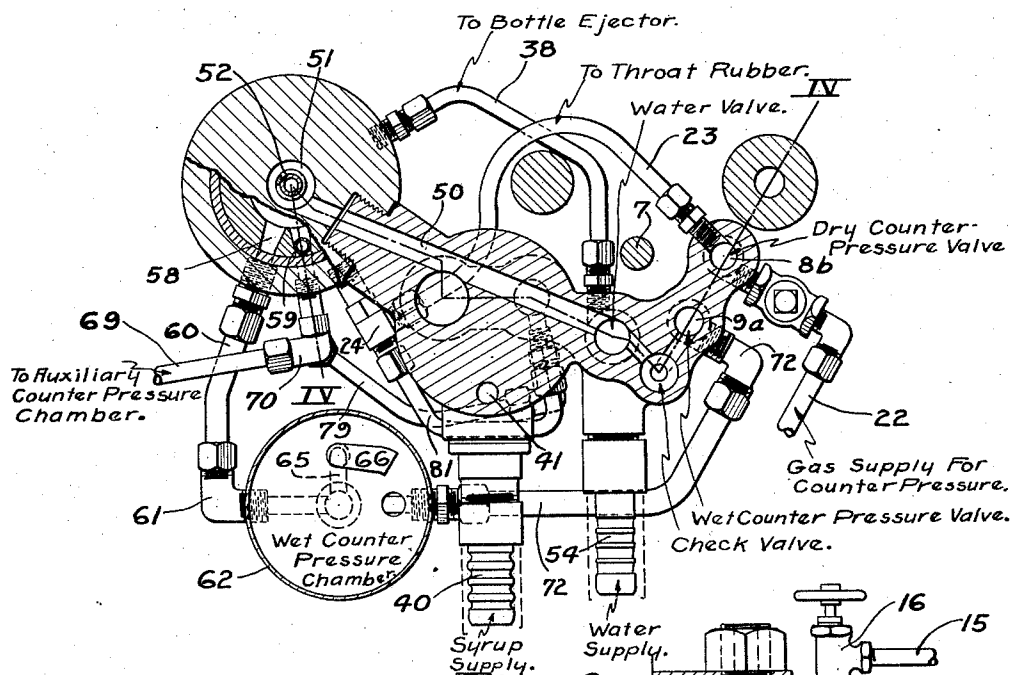
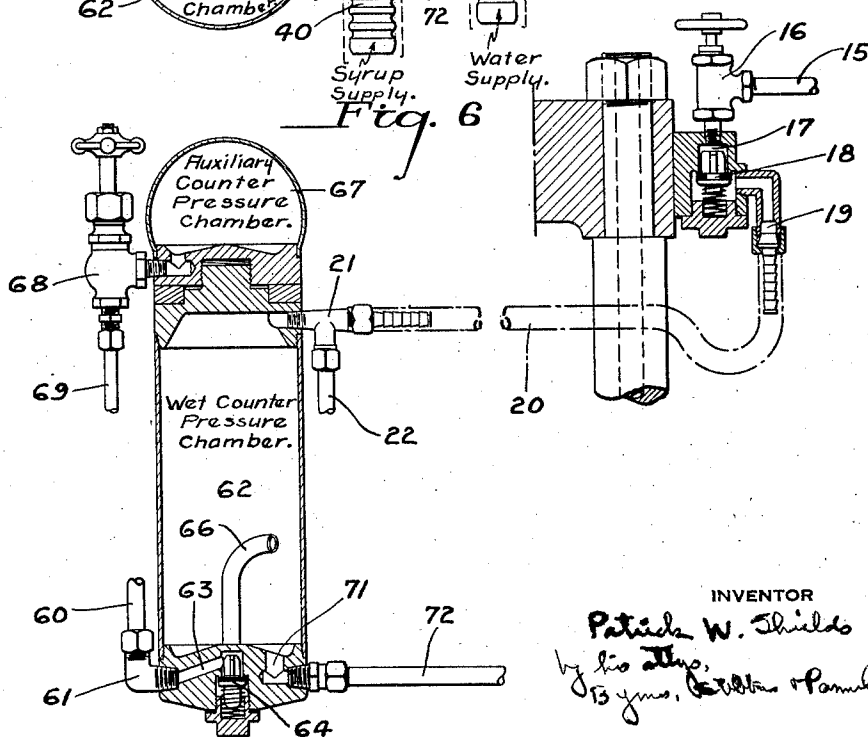


Fig. 6



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UNITED STATES PATENT OFFICE

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BOTTLE-FILLING MACHINE

Application filed April 30, 1927. Serial No. 187,831.

This invention relates to bottle filling machines, and is herein particularly described as applied to a bottle filling and capping machine of the general character illustrated in my prior Patent No. 1,599,497, dated September 14th, 1926.

In general, I provide a filling head adapted to receive a bottle and to charge the same with syrup and carbonated water. The filling, and the subsequent capping of the bottle, is carried out under pressure. The open end of the bottle is inserted in the filling head and is then isolated or sealed off from atmosphere by means of a throat rubber. In my prior patent above mentioned; the initial pressure in the bottle comes from the carbonated water which is supplied. When the bottle is first sealed in the head, the pressure within the bottle is substantially the same as atmosphere and in a filling head such as described in my prior patent, the carbonated water tends to release gas until a pressure has been built up in the system. This reduces the degree of carbonation of the bottled goods, and I therefore now provide for applying a preliminary counter pressure. The initial counter pressure is such that the tendency of the carbonated water to give up its gas is very materially reduced. However, as the filling progresses an additional pressure within the system is built up. This is due to the displacement of the gas and air in the bottle by the liquid. There is always a tendency for the displaced gas to carry with it a certain amount of water and foam as it leaves the bottle. I provide for reclaiming this liquid and discharging it into a succeeding bottle. To this end the throat rubber is provided with a control which is substantially independent of the connections by which counter pressure is supplied to the interior of the bottle. Further provision is made for operating the various valves in sequence so as to insure that the counter pressure will be built up in the bottle before the fluid valve is opened.

I also provide an improved throat rubber structure whereby a tighter seal is secured. The throat rubber, as ordinarily constructed, is arranged to move radially inward, so as to engage the bottle neck. This is generally satisfactory for bottles with long necks having a very slight degree of swirl, but where there is an abrupt swelling, it is found in practice that the seal is sometimes imperfect. I provide for urging the interior or working portions of the throat rubber both inwardly and axially. This means that the pressure applied by the throat rubber is more nearly perpendicular to the surface of the bottle neck and a tighter seal is secured.

In the accompanying drawings which illustrate the present preferred embodiment of the invention as applied to a filling machine of the general character set forth in my prior patent above recited,

Figure 1 is a front elevation, partly broken away, of a filling machine,

Figures 2 and 3 are views to enlarged scale showing the valve actuating lever in different positions,

Figure 4 is a developed sectional view through the filling head illustrating the various connections. In this view all of the valves are shown as lying in a single plane, but the actual section is very irregular, being taken on the line IV—IV of Figure 5.

Figure 5 is a horizontal section partly broken away, taken on the line V—V of Figure 4, and

Figure 6 is a diagrammatic view illustrating the pressure connections.

The filling machine comprises a head, indicated generally by the reference character 2, slidably mounted on vertically extending rods 3. The head is adapted to be lifted by a bottle itself, the bottle being carried upwardly by a plunger 4. The normal lift of the head is the distance d in Figure 1, but springs 5 permit of additional movement of the head so as to accommodate bottles of dif-

ferent sizes. The head is provided with an oil cylinder 6, similar in all respects to the oil cylinder shown in my prior patent, for the purpose of locking the filling head in its elevated position. The oil cylinder valve is actuated by a push rod 7 connected to a cam (not shown), corresponding to the cam 142 of my prior patent. The valve rod 7 is also effective for actuating the inlet and associated valves of my improved filling head.

The head is provided with three inlet valves numbered 8, 9 and 10 and herein referred to as the dry counter pressure valve, the wet counter pressure valve and the water valve respectively. The valves each have upstanding stems adapted to be engaged by prongs 11 on a valve actuating lever 12. The actuating lever is pivotally mounted in a block 13 mounted on the valve rod 7. When the head is in its low position, the upper arm of the valve lever 12 is engaged by a cross member 14, and the prongs 11 are thus held out of alignment with the valve stems. When the head is lifted the lever 12 is moved to a position corresponding to that of Figure 2 so that downward movement of the valve rod 7 is effective for actuating the valves. This arrangement is more fully described in my prior patent. It is effective for preventing opening of any of the valves in the event that no bottle is supplied to the machine.

A guide 12^a is secured to the frame of the machine so as to lie above the upper end of the lever 12. It sometimes happens that a bottle gets under the head but does not enter the opening provided therein for the bottle. This causes the head to lift, and it therefore permits opening of the valves. However, the lifting is considerably in excess of the normal lift, and as a result, the lever 12 is engaged by the guide 12^a, thus forcing the lever 12 to the position of Figure 3. At the worst, the opening of the valves will be only temporary.

45 *Dry counter pressure*

The so called dry counter pressure is effective for actuating the throat rubber and for increasing the pressure in the space thereabove to a substantial pressure above atmosphere. Gas is supplied from the carbonator through a conduit 15 terminating in a needle valve 16. The needle valve is connected with a valve chamber 17 provided with a spring pressed valve 18. The pressure of the valve spring supplies a wire drawing action so that when gas is drawn through the valve 18, its pressure is reduced by a few pounds. In this way the amount of pressure in the dry counter pressure system is limited.

The space below the valve 18 is connected through an elbow fitting 19 to a flexible conduit 20 terminating in a T fitting 21. One branch of the T fitting is connected to a conduit 22 terminating in the chamber 8^a of the

dry counter pressure valve 8. When the dry counter pressure valve is opened, the gas is free to pass to the chamber 8^b of the valve and thence through a conduit 23 to a T fitting 24. The T fitting 24 is screwed into the barrel portion 25 of the filling head, and is connected to a passage 26 therein. This passage terminates behind the throat rubber 27 and when the valve is opened, the gas pressure is effective for causing the throat rubber to move inwardly and engage the neck of a bottle in the head.

The throat rubber 27 lies between a top guide 28 and a bottom guide 29. The top guide 28 has a downwardly turned internal flange 30 and the top face 31 of the bottom guide 29 is also inclined downwardly. Because of this construction, the throat rubber is given an axial component of movement when the valve 18 is opened. In other words, its inner portions move inwardly and downwardly, the combined movement being such that a pressure more nearly perpendicular to the surface of the bottle is applied. This is found in practice to give better sealing than where mere radial movement of the throat rubber is accomplished.

The passage 26 is provided with a branch 32 leading to the space above the throat rubber guide 28. The barrel 25 is provided with a washer 33 immediately above the top guide 28, but this washer is radially slotted, as indicated at 34, so as to admit the gas to the space inside the washer.

When a bottle is inserted in the head, as indicated in chain lines in Figure 4, the lip around the bottle opening engages the lower surface of a bottle ejector 35. This bottle ejector is normally urged downwardly by an ejector plunger 36. The barrel 25 has a fluid space 37 formed therein immediately above the ejector plunger 36, and this chamber always contains liquid under full carbonator pressure supplied through a conduit 38. The head contains a crowning die 39 and the washer 33 is slotted for the insertion of crowns by mechanism such as shown in my prior patent.

The dry counter pressure is therefore effective for sealing the bottle in the head and surrounding the space outside the bottle, but above the throat rubber, with gas under pressure.

Water and syrup supply

Although the wet counter pressure valve is actuated before the water valve in actual operation, the water and syrup supply system will next be described in the interest of clearness. The sequential operation of the valves is secured by varying the spacing of the valve stems from the prongs 11 (Figure 4).

The syrup supply is controlled in substantially the same manner as in my prior patent. Syrup is supplied through a hose terminat-

ing in a connection 40, past an inlet valve, not shown, and through a conduit 41 to the cylinder 42 of a syrup pump. The syrup pump has a piston 43 having an interiorly threaded extension 44. A piston rod 45 is threaded into the extension 44 and may be held in any desired position by a set screw 46. The rod 45 has a head 47. It is embraced by a fork 48 on the cross bar 14. When the head moves downwardly after a bottle has been filled, the fork engages the head 47 and pulls the piston 43 upwardly in the cylinder 42, thus effecting a suction stroke. When the head is lifted by a succeeding bottle, the fork 48 engages the upper end of the extension 44 and then effects a downward stroke of the piston 43. On this stroke, the syrup is forced past an outlet valve 49 into a passage 50. The passage 50 terminates in a central opening 51 in the filling head proper. A filling tube 52 extends downwardly in this opening. The filling tube is provided with a helical rib 53. The syrup (and later in the filling operation, the water) travels downwardly in the annulus between the filling tube and the wall of the chamber 51. The helical rib 53 imparts a swirling motion to the liquids and causes them to travel in a generally helical path adjacent the bottle wall during the filling step. It will be understood, of course, that when the filling operation is in progress the bottle ejector 35 is in elevated position, and therefore the filling tube 52 extends into the bottle.

The amount of syrup supplied is determined by varying the lost motion of the fork 48 between the head 47 and the top of the extension 44. The variation is effected by threading the rod 45 into or out of the extension 44.

Water is supplied from the carbonator through a flexible hose terminating in a connection 54, leading to the chamber 10^a of the water valve 10. When the valve 10 is opened, water is free to pass to the chamber 10^b of the valve and thence to the conduit 50. The amount of water supplied to the bottle is controlled by the length of time the valve 10 remains open and by back pressure built up during filling.

During the filling operation air and gas are displaced from the bottle. The filling tube 52 is made hollow (Figures 4 and 5) to permit of the air and gas passing off. The filling tube extends upwardly through a packing 54 which isolates the chamber 51 from a chamber 55. The filling tube 52 is provided with an extension 52^a above this packing. The chamber 55 is provided with an adjustable piston 56 whose position is controlled by a pin 57. In this manner the volume of the chamber 55 may be varied as desired. During filling the displaced gases build up a back-pressure which affects the filling rate and, therefore, the quantity of water sup-

plied for a given length of time in which the valve 10 is maintained open.

Wet counter pressure system

During the filling operation, despite the action of the helical rib 53, there is always some foaming in the bottle, and as a result the displaced gases, as they rush upwardly through the opening in the filling tube 52, carry with them a certain amount of foam and liquid. The foam and liquid are carried upwardly through the extension 52^a and then flow downwardly to collect in the bottom of the chamber 55. The chamber 55 is provided with two outlets, one of these numbered 58, terminating in the floor of the chamber (Figure 5), and the other terminating in a stand pipe 59. The opening 58 communicates with a conduit 60 terminating in a fitting 61 at the bottom of a wet counter pressure chamber 62. The fitting 61 leads to a conduit 63 terminating in the chamber of a check valve 64. The liquid in the chamber 55 flows by gravity through the conduit 60 and when sufficient pressure is built up in the chamber 55, the check valve 64 is forced open, whereupon the collected liquid and the gas pass through a conduit 65 (Figure 5) terminating in a stand pipe 66 within the wet counter pressure chamber 62. This operation continues substantially throughout the filling of the bottle. The wet counter pressure chamber 62 is in communication with the carbonator through the conduit 20 and the fitting 21. Because of the wire drawing action of the valve 18, the pressure in the wet counter pressure chamber will be below that of the carbonator, but will vary somewhat during filling, due to the supplying of displaced gas and air from the bottle.

The chambers 55 and 62 combine to give the total desired volume for determining the back-pressure which is built up by displaced gas and air.

In filling large bottles it is sometimes desirable to increase the combined volume of the chambers 55 and 62 more than is possible by mere adjustment of the piston 56. This may be done by connecting into the system an auxiliary counter pressure chamber 67. The auxiliary counter pressure chamber is connected through a hand valve 68 to a conduit 69 terminating in a fitting 70, one branch of which communicates with the stand pipe 59. The stand pipe prevents water from entering the fitting 70 and therefore there is no danger of any water or foam being carried into the auxiliary counter pressure chamber 67.

The wet counter pressure chamber 62 has an opening 71 at the bottom, communicating with a conduit 72. The conduit 72 terminates in the chamber 9^a of the wet counter pressure valve 9 (Figure 5).

Assuming that a bottle has been filled and removed from the head, it will be seen that

the pressure is locked in the wet counter pressure chamber 62 by the check valve 64 and the wet counter pressure valve 9. The connections to the fitting 21 need not be considered because the valve 18 acts as a check and the valve 8, connected to the conduit 22, is closed. The pressure in the filling head proper, the conduit 50 and the chamber 55 will, of course, be atmospheric.

Now assume that a bottle is placed in the head and the valves 8 and 9 are opened. The valve 8 will operate as above described so as to actuate the throat rubber and seal the bottle in the head, and also to build up pressure in the space within the head, but outside the bottle. There will be no material diminution in pressure in the chamber 62 because only a small amount of gas is required for operating the throat rubber, but in any event, the deficiency will be immediately made up from the carbonator through the valve 18.

Upon opening of the valve 9 the pressure in the wet counter pressure chamber 62 will be released through the valve 9. The collected water in the chamber will be forced through the conduit 72 past the valve 9 into a conduit 73, past a check valve 74 and to a conduit 75 terminating in the chamber 10^b from which it is free to pass through the conduit 50 to the bottle. The liquid collected during the filling of one bottle will therefore be discharged into a succeeding bottle, and the pressure within the wet counter pressure chamber will be effective for building up an initial counter pressure in the bottle, which pressure will be below the carbonator pressure in an amount depending upon the wire drawing action of the valve 18. If desired, a regulator may be used in the conduit 15 in place of the valve 18. Each of them has been employed successfully in practice.

With the counter pressure thus established in the bottle, the filling operation proceeds as above described. The filling operation is terminated by an upward movement of the valve rod 7 which is effective for closing the valves 8, 9 and 10. The bottle is crowned while still in the head by mechanism as set forth in my prior patent, and the bottle is then ready to be removed from the head.

Exhaust valve mechanism

The exhaust valves are controlled by a foot 76 on the valve rod 7. The upward movement of the valve rod 7 for closing the valves 8, 9 and 10 is continued after the capping has been effected so as to bring the foot 76 into engagement with the stem 77 of an exhaust valve 78. The opening of the valve 78 is effective for releasing the pressure in the chamber 55. The valve chamber 78^a is connected through a conduit 79 to the fitting 70 and thence through the stand pipe 59 to the chamber 55. Only gas and air will be ex-

hausted, since the liquid in the chamber 55 will have been taken off through the conduit 60, and in any event, is prevented from escaping through the conduit 79 because of the stand pipe 59. The upper end of the valve 78 is adapted to engage the bottom of a second exhaust valve 80 and to open the same shortly after the opening of the valve 78. The opening of the exhaust valve 80 is effective for releasing the pressure behind the throat rubber. The chamber 80^a of this valve is connected through a conduit 81 to the fitting 24 and thence to the conduits 26 and 32. The gases which are thus released pass off through an exhaust conduit 82.

While I have illustrated and described the present preferred embodiment of my invention, it will be understood that it is not limited to this form alone, as it may be otherwise embodied within the scope of the following claims.

I claim:—

1. A bottle filling head comprising a throat rubber, a liquid control valve, a counter pressure control valve, means controlling the operation of the throat rubber, and a single means for engaging and actuating the valves and the throat rubber control means.
2. A bottle filling head comprising a throat rubber, a conduit adapted to transmit fluid pressure for actuating the same, a valve in said conduit, a counter pressure control valve, a liquid control valve and a single means for engaging and actuating the several valves.
3. A bottle filling head adapted to receive a bottle and comprising a bottle filling conduit, a chamber adapted to be connected to the bottle during the filling operation and to receive liquid and displaced gases, a counter pressure chamber, a connection between the first mentioned chamber and the counter pressure chamber, the connection terminating in the lower portion of the first mentioned chamber, an exhaust valve, and a connection between the exhaust valve and the first mentioned chamber, the connection terminating in the upper part of the first mentioned chamber.
4. A bottle filling head adapted to receive a bottle and comprising a bottle filling conduit, a chamber adapted to be connected to the bottle during the filling operation and to receive liquid and displaced gases, a counter pressure chamber, a connection between the first mentioned chamber and the counter pressure chamber, the connection terminating in the lower portion of the first mentioned chamber, an exhaust valve, a connection between the exhaust valve and the first mentioned chamber, the connection terminating in the upper part of the first mentioned chamber, and a connection between the counter pressure chamber and the bottle filling conduit.
5. A bottle filling head adapted to receive a bottle and comprising a bottle filling con-

duit, a chamber adapted to be connected to the bottle during the filling operation and to receive liquid and displaced gases, a counter pressure chamber, a connection between the first mentioned chamber and the counter pressure chamber, the connection terminating in the lower portion of the first mentioned chamber, an exhaust valve, a connection between the exhaust valve and the first mentioned chamber, the connection terminating in the upper part of the first mentioned chamber, a connection between the counter pressure chamber and the bottle filling conduit, and a control valve in the last mentioned connection.

6. A filling head adapted to receive a bottle and comprising a bottle filling conduit, a chamber adapted to be connected to the bottle during the filling operation and to receive foam or liquid and displaced gases, a counter pressure chamber, a connection between the first mentioned chamber and the counter pressure chamber, the connection terminating in the lower portion of the counter pressure chamber, and a check valve in the connection.

7. A filling head adapted to receive a bottle and comprising a bottle filling conduit, a chamber adapted to be connected to the bottle during the filling operation and to receive foam or liquid and displaced gases, a counter pressure chamber, a connection between the first mentioned chamber and the counter pressure chamber, the connection terminating in the lower portion of the counter pressure chamber, a check valve in the connection, a connection between the counter pressure chamber and the bottle filling conduit, and a control valve in the last mentioned connection.

8. A filling head adapted to receive a bottle and comprising a bottle filling conduit, a chamber adapted to be connected to the bottle during the filling operation and to receive foam or liquid and displaced gases, a counter pressure chamber, a connection between the first mentioned chamber and the counter pressure chamber, the connection terminating in the lower portion of the counter pressure chamber, a check valve in the connection, a connection between the counter pressure chamber and the bottle filling conduit, and a control valve in the last mentioned connection, the last mentioned connection terminating in the bottom portion of the counter pressure chamber.

9. A filling head adapted to receive a bottle and comprising a bottle filling conduit, a chamber adapted to be connected to the bottle during the filling operation and to receive foam or liquid and displaced gases, a counter pressure chamber, a connection between the first mentioned chamber and the counter pressure chamber, the connection terminating in the lower portion of the counter pressure chamber, a check valve in the connection, a

connection between the counter pressure chamber and the bottle filling conduit, a control valve in the last mentioned connection, the last mentioned connection terminating in the bottom portion of the counter pressure chamber, and means for supplying gaseous pressure from an outside source to the counter pressure chamber.

10. A filling head adapted to receive a bottle and comprising a bottle filling conduit, a chamber adapted to be connected to the bottle during the filling operation and to receive foam or liquid and displaced gases, a counter pressure chamber, a connection between the first mentioned chamber and the counter pressure chamber, the connection terminating in the lower portion of the counter-pressure chamber, a check valve in the connection, a connection between the counter pressure chamber and the bottle filling conduit, a control valve in the last mentioned connection, the last mentioned connection terminating in the bottom portion of the counter pressure chamber, a connection for supplying gaseous pressure to the counter pressure chamber and pressure reducing means in said connection.

11. A filling head adapted to receive a bottle and comprising a bottle filling conduit, a chamber adapted to be connected to the bottle during the filling operation and to receive foam or liquid and displaced gases, a conduit for taking off liquid from said chamber, the conduit terminating in the bottom portion of the chamber so as to permit of collected liquid flowing from the chamber therethrough, and a separate conduit for relieving pressure therein.

12. A filling head adapted to receive a bottle and comprising a bottle filling conduit, a chamber adapted to be connected to the bottle during the filling operation and to receive foam or liquid and displaced gases, a conduit for taking off liquid from said chamber, the conduit terminating in the bottom portion of the chamber so as to permit of collected liquid flowing from the chamber therethrough, a separate conduit for relieving pressure therein, and an auxiliary chamber connected to the last mentioned conduit.

13. A filling head adapted to receive a bottle and comprising a bottle filling conduit, a chamber adapted to be connected to the bottle during the bottle filling operation and to receive foam or liquid and displaced gases, a counter pressure chamber connected to the first mentioned chamber, the connection terminating in the bottom portion of the first-mentioned chamber so as to permit of collected liquid flowing from the first mentioned chamber to the counter pressure chamber, a standpipe in the counter pressure chamber, and a conduit terminating in the standpipe for relieving pressure in the first-mentioned chamber while leaving the collected liquid undisturbed.

14. A filling head adapted to receive a bottle and comprising a throat rubber, a conduit for fluid pressure for actuating the throat rubber, a valve in the conduit, a conduit whereby counter pressure may be supplied to a bottle in the head, a valve in said conduit, an exhaust valve for relieving counter pressure, an exhaust valve for the throat rubber, and means for operating the two exhaust valves sequentially.

In testimony whereof I have hereunto set my hand.

PATRICK W. SHIELDS.

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