

[54] **PORTABLE AUTOMATIC DRUM FILLING APPARATUS**

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[52] U.S. Cl. **141/94; 137/804; 141/128; 141/231**

[51] Int. Cl.² **B65B 3/24**

[58] Field of Search 137/804, 805; 141/1, 94-96, 141/98, 128, 198, 231, 232, 363, 367, 376

[56] **References Cited**

UNITED STATES PATENTS

2,548,611	4/1951	Maslin	141/231 X
3,572,404	3/1971	Allison et al.	141/128 X
3,599,666	8/1971	Curtis et al.	141/128 X

3,680,579 8/1972 Hisada et al. 137/804

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[57]

ABSTRACT

A portable automatic drum filling apparatus including a movable cabinet and a combination filling nozzle and product level detecting assembly, wherein the cabinet includes a product control valve having an inlet connected to a product supply and an outlet connected to the filling nozzle and detecting assembly, a pneumatic actuator for driving the valve between full open, intermediate and closed positions, and a fluid logic circuit for controlling the actuator and valve and responding to a start signal to initiate a filling cycle and the filling nozzle and level detecting assembly to detect product level to end the filling cycle.

13 Claims, 9 Drawing Figures

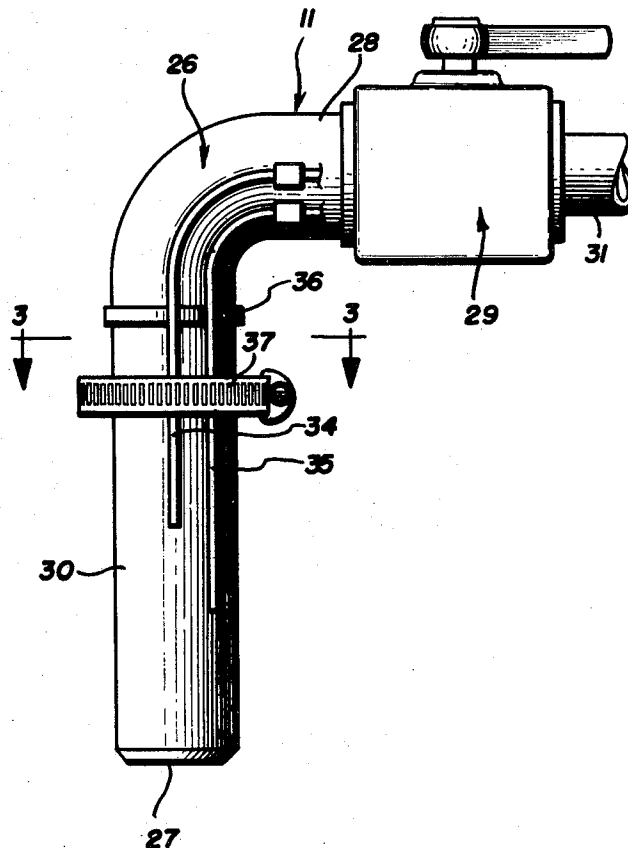


FIG. 1

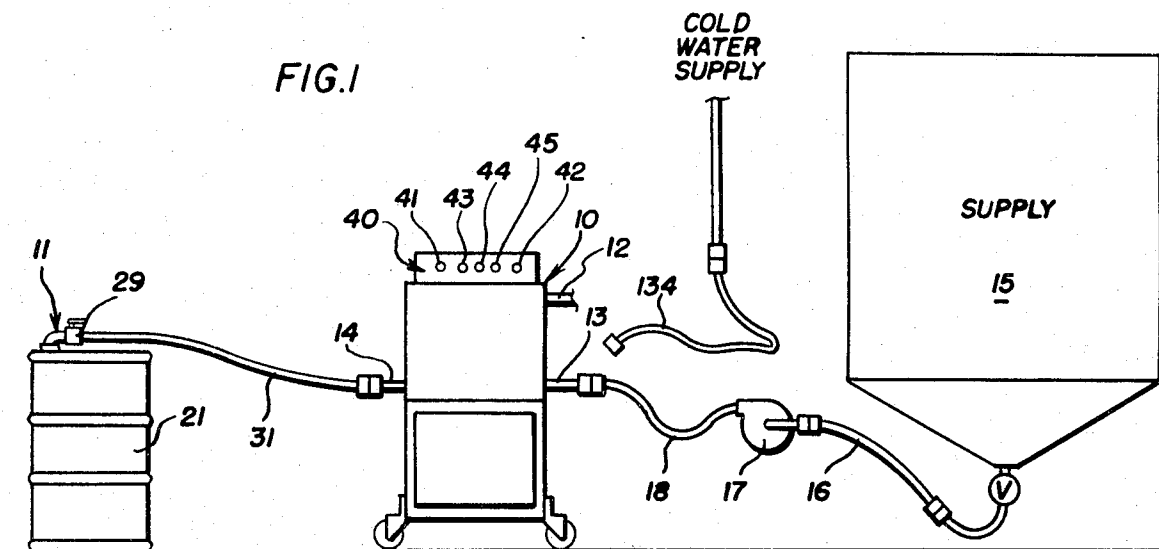


FIG. 2

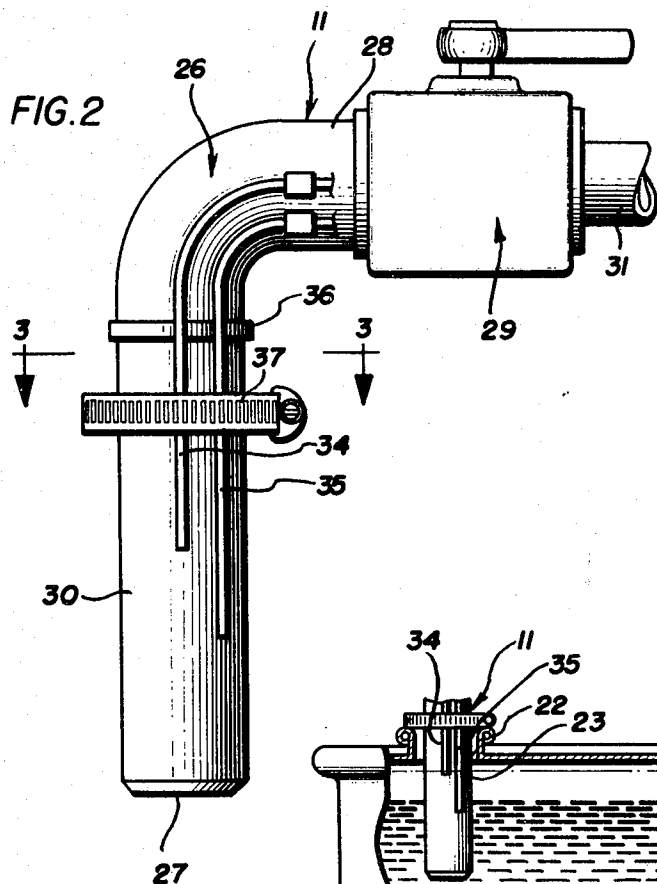


FIG. 3

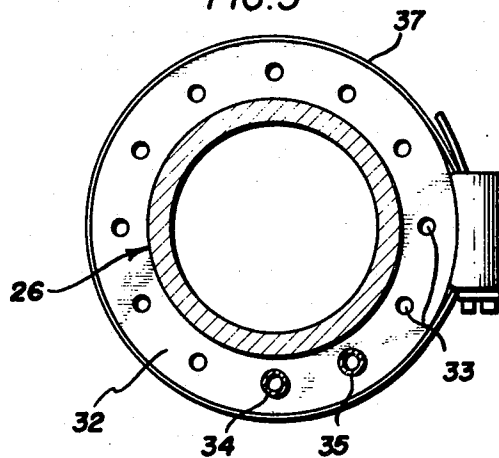


FIG. 4

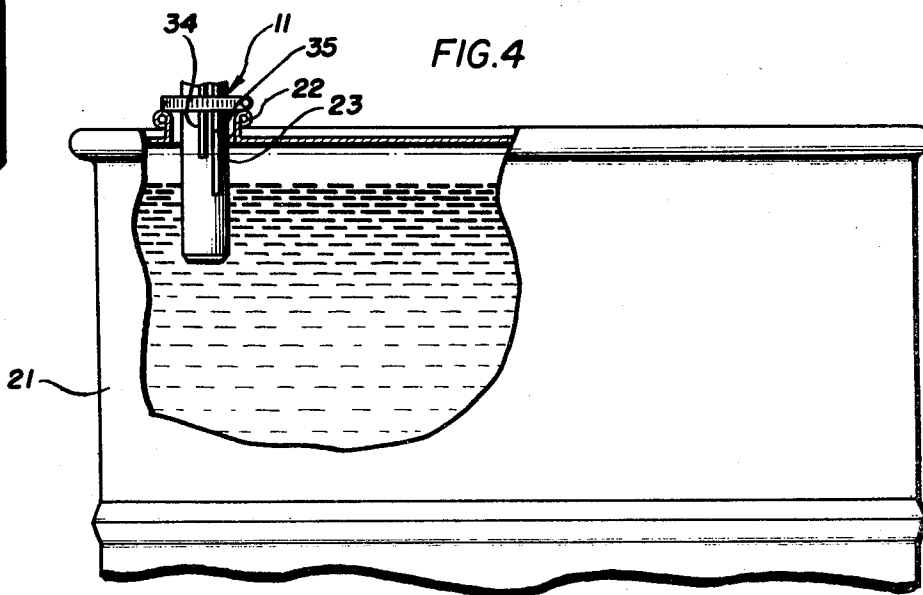


FIG. 5

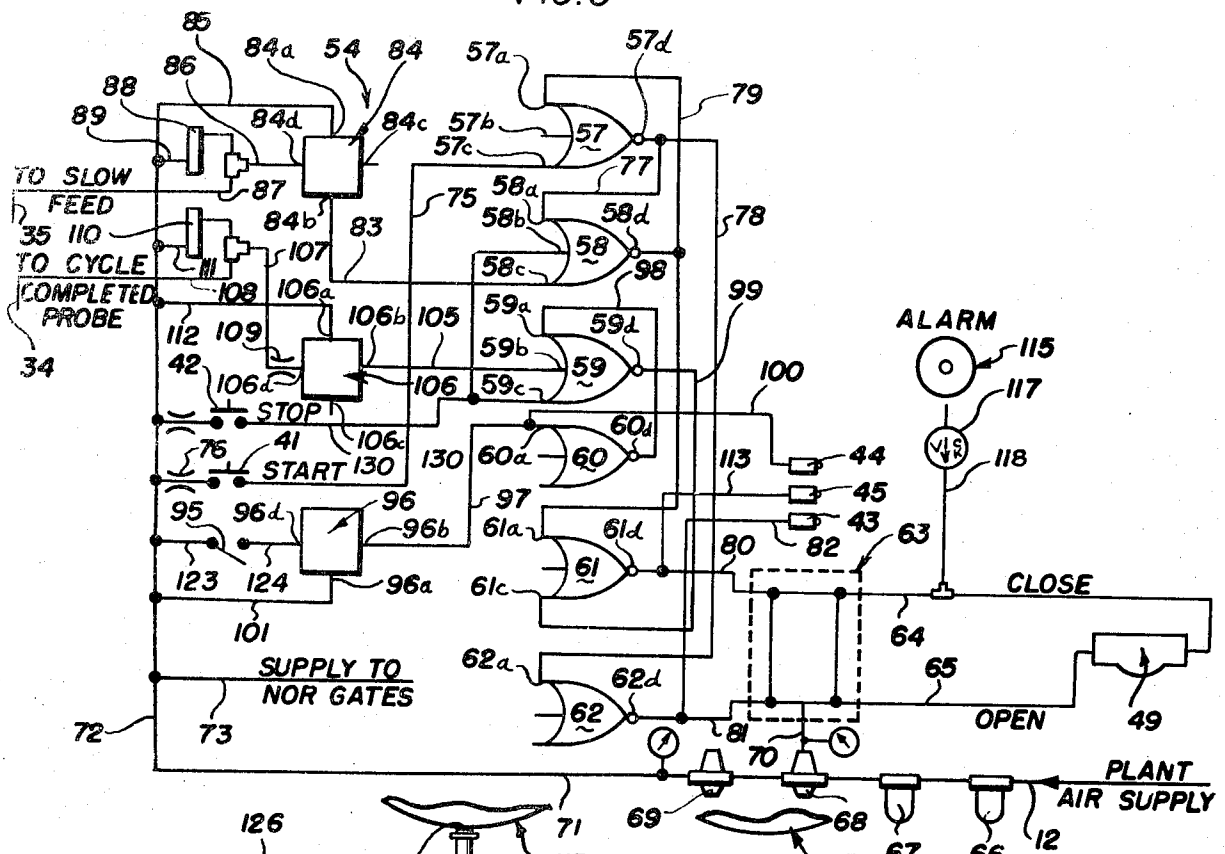
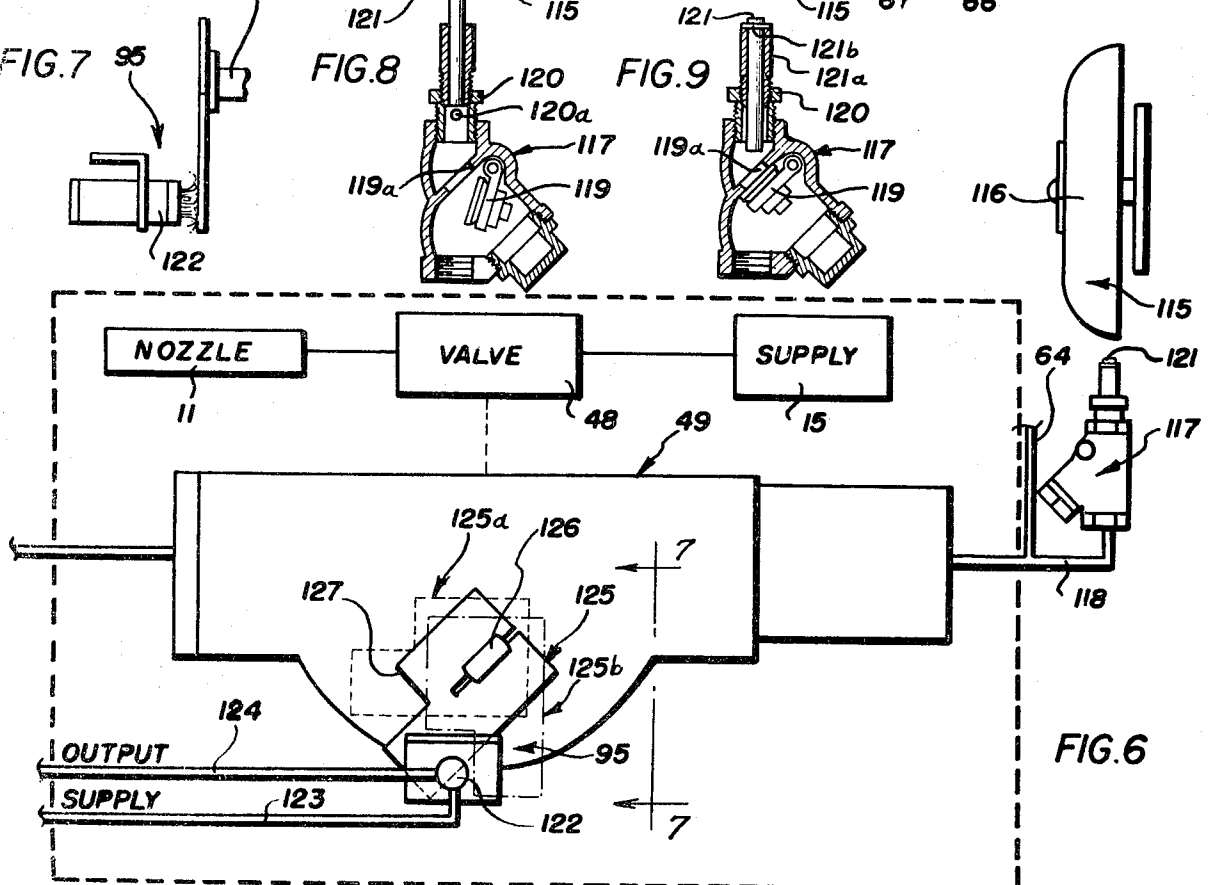


FIG. 7 95

FIG.8

FIG. 9



PORTABLE AUTOMATIC DRUM FILLING APPARATUS

This invention relates in general to an automatic product filling apparatus for filling containers with product which upon being cycled automatically completes the filling of the container to a given level.

An important feature of the present invention is that it is portable and may be easily moved to a suitable position for performing automatic filling operations of containers, such as drums used for shipping liquid chemicals.

Heretofore, there have been devices for effecting the automatic filling of containers including drums used for shipping of product such as chemical liquids, but such devices have been stationary and expensive to manufacture and maintain. The stationary devices have limited their usage within a relatively small area which sometimes is inconvenient. Further, such stationary devices to be automatic have relied on weighing equipment for weighing the container and product during filling to determine when it has been completely filled or filled to a given level. Such weighing equipment is costly to build and to maintain.

It has also been well known to fill containers, such as drums, manually but such is not economical as it requires the constant presence of an operator to visually determine the product level in the drum and operate the filling equipment to prevent overflow.

The present invention obviates the above mentioned difficulties in providing an automatic container filling apparatus which may be inexpensively manufactured and maintained and which is portable to more greatly facilitate its usage. The automatic filling apparatus of the invention includes a cabinet mounted on wheels that may be easily moved by a single person to place it in the most advantageous position for filling operations, and a filling nozzle and product level detecting assembly. Within the cabinet a product control valve, having an inlet connected to a product supply and an outlet connected to the filling nozzle and detector assembly, is automatically operated pursuant to a start signal given by the operator and the product level in the container is detected or sensed by the filling nozzle and detector assembly. A pneumatic actuator drives the product valve between full open, intermediate and closed positions and is controlled by a fluid logic circuit which responds to a start signal given by the operator and to a pair of product level sensors on the filling nozzle and product level detecting assembly, whereby one of the sensors causes the valve to move from full open to intermediate position to give a slow feed of product and prevent splashing while the other sensor detects a filled level of product and causes the product control valve to close and stop the filling operation. The product level sensors on the filling nozzle and product level detecting assembly may be adjusted to vary the product levels of detection so as to provide the desired amount of product by weight or volume in the container being filled.

It is therefore an object of the present invention to provide a new and improved automatic apparatus for filling containers with a product.

Another object of the invention is in the provision of an automatic drum filling apparatus which is portable and of low cost to manufacture and to maintain.

Still another object of this invention resides in the provision of a portable automatic container filling ap-

paratus which includes fluid logic circuit means for driving a pneumatic actuator that operates a product control valve and which is easy to maintain.

Other objects, features and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is an overall somewhat diagrammatic view of the portable automatic drum filling apparatus of the invention as situated in a filling operation between a product supply and a container being filled;

FIG. 2 is an enlarged elevational view of the filling nozzle and product level detecting assembly utilized in the apparatus of the invention;

FIG. 3 is a greatly enlarged cross-sectional view taken substantially along line 3-3 of FIG. 2;

FIG. 4 is a fragmentary and broken elevational view of a container in the form of a drum with a part of the filling nozzle and product level detecting assembly in place to illustrate its operation;

FIG. 5 is a schematic diagram of the fluid logic circuit utilized in the filling apparatus of the present invention;

FIG. 6 is a partially diagrammatic and elevational view of the pneumatic actuator for the product control valve and specifically illustrating the sensing device for obtaining the intermediate position of the product control valve together with the alarm assembly for sounding an alarm when the product control valve reaches fully closed position;

FIG. 7 is a side elevational view of the sensing device for obtaining the intermediate position of the product control valve and taken generally along lines 7-7 of FIG. 6;

FIG. 8 is a vertical sectional view taken through the check valve and bell plunger assembly showing the bell plunger in actuated position; and

FIG. 9 is a view similar to FIG. 8 but showing the check valve closed and the bell plunger in its rest position.

Referring now to the drawings and particularly to FIG. 1, the portable automatic container filling apparatus of the invention is shown, which generally includes a cabinet 10 and a filling nozzle and product level detecting or sensing assembly 11. The cabinet includes a pneumatic supply inlet 12 which is suitably connected to a proper pneumatic supply, a product supply inlet 13 suitably connected to a product supply and a product outlet 14 suitably connected to the filling nozzle and product level sensing assembly 11. Since the only power supply for the apparatus is pneumatic, the apparatus is explosion-proof.

While the product supply may be obtained from any suitable source, it is illustrated in FIG. 1 that the product supply inlet 13 is connected to a supply tank 15 through hose or conduit 16, a pump 17 and hose or conduit 18. It can be appreciated that when the apparatus of the invention is to be used for filling containers, the product supply inlet 13 will at all times be connected to a product supply in a manner such as that illustrated so that the product supply is available during the container filling operations.

While the apparatus of the invention may be used to effect a filling cycle for any sort of container, it is principally applicable for filling drums used to ship or store a product such as the drum 21 illustrated in the setup in FIG. 1. The filling nozzle and product level sensing assembly 11 is shown mounted in position on the drum 21

for effecting a filling operation. Such a drum as shown in FIG. 4 includes a bung 22 defining a bunghole 23. Product is thereby discharged into the drum through the bunghole by means of the filling nozzle and product level sensing assembly 11. After the filling cycle has been completed and the filling nozzle assembly has been withdrawn, a suitable cap may then be secured on the bung.

As shown particularly in FIGS. 2, 3 and 4, the filling nozzle and product level sensing assembly 11 includes a filling nozzle 26 having a nozzle end or outlet end 27. The filling nozzle 26 is simple in construction, being in the form of a conduit or pipe having a leg 28 at the inlet side connected to a manually operable shutoff valve 29, a leg 30 at the outlet side and extending at substantially right angles to the leg 28. It is the leg 30 which is insertable through the bunghole 23 of a drum during the filling operation. The inlet side of the valve 29 is suitably connected to a flexible hose or conduit 31 which connects to the product outlet 14 of the cabinet 10 and facilitates maneuverability of the filling nozzle assembly between filling cycles.

Integrally formed on the leg 30 is an annular flange or ring 32 which functions as a stop or guide to limit the insertion of the filling nozzle into the bunghole or a drum in that the stop 32 engages the bung 22 as shown in FIG. 4. The stop includes a plurality of circumferentially arranged and spaced holes 33 extending there-through along an axis parallel to that of the filling nozzle leg 30. During the filling operation, most of the holes are usable to allow the exit of air from the drum. Two of the holes are employed to retain in position product level or proximity sensors 34 and 35 which are in the form of tubes and are suitably connected to the fluid logic circuit housed in the cabinet 10. Above the ring or flange 32, a second ring or flange 36 having outwardly opening grooves serve to assist in guiding the location of the sensors 34 and 35 alongside the filling nozzle. A clamp 37 is mounted on the periphery of the ring or flange 32 for frictionally locking the proximity sensors in position. In the event it is desired to vary the tip ends of the sensors, the clamp 37 may be loosened and the sensors may be raised or lowered as desired.

The cabinet 10 includes a control panel 40 having a start button 41 for initiating a filling cycle, an emergency stop button 42 for stopping a filling cycle in the event of the need, and fluidic indicators 43, 44 and 45 for indicating the position of the product control valve. The indicators respectively indicate full open position, intermediate position for slow feed, and closed position.

As illustrated in FIG. 6, a product control valve 48 is shown diagrammatically connected between the supply 15 and the filling nozzle assembly 11. The valve 48 may be of any suitable type and is located within the cabinet 10, wherein its inlet is connected to the product supply inlet 13 and its outlet is connected to the product outlet 14. A pneumatic actuator 49 also suitably mounted within the cabinet 10 operates the valve between full open, intermediate and closed positions in a manner hereinafter explained.

Operation of the pneumatic actuator 49 is controlled by a fluid logic circuit 54 as shown in FIG. 5 in response to a start signal caused by depressing the start button 41, and the slow feed probe or sensor 35 and the stop or cycle completed probe or sensor 34.

The fluid logic circuit includes a series of NOR gates 57, 58, 59, 60, 61 and 62 interconnected between sig-

nal means for operating same and an interface valve or fluid logic control relay 63, wherein the NOR gates in response to signal means control operation of the control relay 63 to cause operation of the pneumatic actuator 49 and the product control valve 48. Each NOR gate includes three control ports, an output port, a supply port and vent and bleed ports to atmosphere. For simplicity, only the control and output ports are illustrated. A gate is "on" when no signal is applied to any of its control ports, and "off" when any one of the control ports receives a pressure signal. When a gate is "on," a pressure signal is delivered at its output port, and this pressure signal is extinguished when the gate is "off." The output ports of NOR gates 61 and 62 are connected to the control relay 63 to cause operation of the relay by respectively applying a working pressure either in close line 64 causing the actuator 49 to drive the control valve 48 toward closed position or in the open line 65 to cause the actuator 49 to drive the valve to full open position. Control relay 63 responds to low pressures from either of the NOR gates 61 or 62, while delivering at its output a high working pressure to the actuator 49.

The plant air supply is delivered to the pneumatic supply inlet 12 through filters 66 and 67 and to regulators 68 and 69. The regulator 68 delivers a working pressure through line 70 to the control relay 63. The air regulator 69 delivers a much smaller air supply through line 71 to a manifold line 72 for operation of the NOR gates and the other components of the logic circuitry including the proximity sensors. While no connections are shown, a line 73 extends from the manifold line 72 to supply working pressures to all of the NOR gates 57 to 62.

As heretofore explained, each of the NOR gates includes three control ports which are here identified together with the number applied to the gate and the suffix letters *a*, *b* and *c*, and an output port identified by the number applied to the gate together with the suffix *d*. Additionally, each gate would include a supply port not shown which would be connected to the supply line 73 and a vent port leading to atmosphere, as well as a bleed port leading to atmosphere in relation to the control ridges within the gate. It will be understood as above mentioned that the NOR gates are conventional in construction and operate such that when a signal pressure is applied to any of the control ports, a "no" or "off" condition is established where the output port is closed and no output is delivered from the gate. Conversely, when no signal pressure is applied to any of the control ports, the gate is in a "yes" or "on" condition, where the output port is open to deliver an output pressure signal. Each of the NOR gates has line connections to one or more of the control ports.

The control port 57c of NOR gate 57 is connected by a signal line 75 to one side of the start button 41. The inlet side of the start button is connected through a resistor 76 to the manifold line 72, whereby depressing of the start button 41, which normally bleeds air received from the manifold line 72, causes a signal pressure to be delivered to the control port 57c. The output port 57d of NOR gate 57 is connected to a control port 58a of NOR gate 58 through line 77 and also to the control port 62a of the NOR gate 62 through line 78. The control port 57a of NOR gate 57 is connected in common to the output port 58d of NOR gate 58 and the control port 61a of NOR gate 61 through a line 79.

5

Once the start button 41 is momentarily depressed causing the NOR gate 57 to turn "off," that will cause NOR gate 58 to turn "on" or be in a "yes" condition, and the line 79 leading from the output port of the NOR gate 58 back to the control port 57 constitutes a latching circuit to maintain NOR gate 57 "off" or in a "no" position even when the start button 41 is allowed to be released. The "yes" condition of NOR gate 58 through line 79 causes a "no" condition on NOR gate 61, thereby removing a pressure signal through line 80 which connects the output port of NOR gate 61 and the "close" signal port of the control relay 63. The "no" condition of NOR gate 57, being transmitted through line 78 to the control port 62a through NOR gate 62, causes gate 62 to be "on" or in a "yes" condition and thereby delivers a pressure signal through signal line 81 to the open signal port of the control relay 63 and causes a working pressure to be delivered through line 65 to the pneumatic actuator 45 and causes the product control valve to move to the full open position. Accordingly, depressing of the start button 41 turns "off" NOR gate 57 which turns "on" NOR gate 58 to hold NOR gate 57 "off" and which turns "off" NOR gate 61 and turns "on" NOR gate 62 to drive the product control valve to full open position. Fluidic indicator 43 connected by line 82 to the output port of NOR gate 62 is actuated to indicate the valve is in open position.

Control port 58c of NOR gate 58 is connected through a line 83 to an amplifier 84 which delivers a pressure signal to the NOR gate 58 when the product level in the container is detected by the slow feed probe 35. Amplifier 84 includes a supply port 84a which is connected by line 85 to the manifold line 72, an output port 84b connected to the NOR gate 58 through the line 83, a vent port 84c connected to atmosphere and a signal port 84d connected in common to the slow feed probe 35 through line 86 and line 87 and to the output of a flow meter 88 having its input connected through line 89 to the manifold line 72. The slow feed probe 35 essentially bleeds air from the line 86 until the probe is covered by the product level, after which the back pressure in line 89 increases the pressure in line 86 to the extent that it triggers the amplifier 84 so that a signal pressure is discharged from the output port 84b through line 83 and to the NOR gate 58. This pressure signal turns the NOR gate 58 "off" which then removes the pressure from the line 79 to turn the NOR gate 61 "on," the NOR gate 57 "on" and the NOR gate 62 "off." Accordingly, the NOR gate 61 will deliver a pressure signal through line 80 to the close port of the control relay 63 and cause a working pressure to be delivered through line 64 to the pneumatic actuator 49. Turning the NOR gate 62 "off" removes the working pressure from the line 65. Accordingly, the actuator 49 will commence driving the product control valve toward closed position. Removal of the pressure signal from line 81 deactivates the fluidic indicator 43.

As the actuator drives the valve toward closed position, a proximity sensor is activated when the valve is in an intermediate position to de-energize the actuator and maintain the valve in a position to throttle the product supply and provide a slow feed of product into the drum. This proximity sensor is designated by the numeral 95 in FIG. 5 which causes a pressure signal to be transmitted to the signal port 96d of an amplifier 96 which delivers an output signal pressure through the output port 96b and line 97 to the control port 60a of the NOR gate 60. This signal turns the NOR gate 60

6

"off." The output port 60d of the NOR gate 60 is connected through a line 98 to the control port 59a of the NOR gate 59, thereby turning the NOR gate 59 "on." It will be appreciated that the NOR gate 59 is usually maintained "off" by means of the NOR gate 60 being "on" and delivering a pressure signal through line 98. With the NOR gate 59 turned "on," a pressure signal is delivered from its outlet port 59d through line 99 to the control port 61c of NOR gate 61, thereby turning NOR gate 61 "off." This removes the pressure signal from line 80 and shuts off the working pressure in line 64 through actuation of the control relay 63 to stop the pneumatic actuator 49 and hold the valve at an intermediate position. The slow feed fluid indicator 44 being connected through a line 100 to the line 97 is activated to indicate that the valve is in slow feed position. It may also be appreciated that the amplifier 96 includes a supply port 96a connected through a supply line 101 to the manifold line 72.

The NOR gate 59 includes a control port 59b connected through a line 105 to the output port 106b of an amplifier 106 which has its signal port 106d connected to the probe 34 through lines 107 and 108. A resistor 109 is connected in the line 107 ahead of the signal port 106b. The line 107 is connected in common to the outlet side of the flow meter 110, and the probe 34 which when covered by product indicates the filling cycle is complete and the desired product level in the container is attained. The inlet side of the flow meter 110 is connected through line 111 to the manifold line 72. The supply port 106a of the amplifier 106 is also connected to the manifold line 72 through a line 112. When the probe 34 becomes sufficiently covered with product to reduce its bleed action for line 107 and cause a back pressure in line 107, the amplifier 106 is triggered to deliver a pressure signal from the output port 106b through line 105 to the NOR gate 59 and turn the gate "off." Since the output port 59d of the NOR gate 59 is connected to the control port 61c of the NOR gate 61, it turns the gate 61 "on," thereby delivering a pressure signal through line 80 to the control relay 63 to again apply a working pressure in the closed line 64 to activate the actuator 49 to move the valve toward closed position. Since the sensor 95 no longer senses the intermediate position, it removes the pressure signal from the line 97 to turn "on" NOR gate 60 and deactivate the fluidic indicator 44. At the same time, application of a pressure signal to the line 80 activates the fluidic indicator 45 which is connected to the line 80 by a line 113 to thereafter indicate the valve is in closed position.

When the pneumatic actuator 49 reaches its closed position, thereby holding the valve 48 in closed position, the pressure in the close line 64 increases to the point of causing an alarm 115 to be sounded to indicate further that the drum has been filled and that the filling cycle has been completed.

While the alarm 115 may take any desirable form, the illustrated embodiment here includes a conventional bell 116, as seen particularly in FIG. 6, together with a check valve and bell plunger assembly 117 connected by a line 118 to the pneumatic actuator and the close line 64. Accordingly, the line 118 is pressurized during the slow feed cycle when the actuator drives the valve 48 to intermediate position and during the close cycle when the actuator drives the valve from the intermediate position to the closed position. As seen particularly in FIGS. 8 and 9, the check valve and bell

plunger assembly 117 includes a swing check member 119 coacting with a port 119a wherein the swing check moves to a closed position, as seen in FIG. 9 when line 118 is pressurized. Exhausting of the pressure in line 118 allows the swing check member 119 to swing to open position, as seen in FIG. 8. A bushing 120 is mounted at the outlet end of the check valve portion of the unit for receiving a bell plunger 121. A plunger guide 121a extends from the bushing 120 and provides guidance for the plunger 121. To prevent the plunger from dropping too far within the valve assembly, a retaining ring 121b is provided on the end of the plunger and engages the end of the plunger guide, as shown in FIG. 9, when the plunger is at rest. The plunger is prevented from being driven out of the plunger guide when it strikes the bell 116. In order to properly sound the bell, it is necessary that the plunger not be held on the bell when it has struck the bell. The plunger is activated by an initial short burst of air in the valve assembly prior to closing of the swing check member 119 to drive it against the bell. One or more holes 120a are provided in the bushing 120 to bleed off the air and permit the plunger to fall away from the bell so that it will sound. Accordingly, the operator will be reminded during the filling cycle by the sounding of the alarm when the slow feed cycle is initiated and when the stop feed cycle is initiated.

The proximity sensor 95 which operates to stop the actuator 49 at a given position where the valve is at an intermediate position to cause slow feed of product through the filling nozzle includes a conventional sensor unit 122, FIGS. 6 and 7, having a connection to a pressure supply through a line 123 and a connection to the amplifier 96 through output line 124. Line 123 is therefore connected to the manifold line 72. The sensor unit 122 serves to bleed the supply pressure and deliver an air stream which when interrupted applies a back pressure through the line 124 which is received by the amplifier 96 to trigger same. A plate 125 is mounted on a shaft 126 of the actuator 49 to travel therewith as the actuator is driven between its extreme positions for opening and closing the product control valve 48. The plate or flag 125 is shown in solid lines in FIG. 6 at the intermediate position, in dotted lines at the position 125a which is equivalent to the full open position, and in dot-dash lines at the position 125b which is in the full closed position. A cutout or notch 127 is provided in the plate 125 so that when the plate reaches the fully closed position 125b, the sensor unit 122 is not affected by the plate as the cutout section then aligns with the sensor unit as shown in FIG. 6. It can be appreciated that the position of the sensor unit 122 can be adjusted to vary the intermediate position of the valve in accordance with where the actuator 49 is to be stopped.

Should the logic circuit be conditioned to have the valve in fully open position where the NOR gate 57 is "off," the NOR gate 58 is "on," the NOR gate 61 is "off," while the NOR gate 62 is "on," and it be desired to close the valve and stop the filling cycle in an emergency, the emergency stop button 42 may be depressed, thereby causing a pressure signal through line 130 to the control port 58b of the NOR gate 58 and the control port 59c of the NOR gate 59 turning these gates "off." Turning "off" gates 58 and 59 turns "on" gate 61 to cause the working pressure in line 64 to drive the actuator toward closed position. Further, inasmuch as a signal is applied to a control port of gate 59, when the

gate 60 is turned "off" as the plate 125 of the sensor 95 interrupts the air flow from the sensor unit 122, turning "off" of gate 60 will not affect the condition of gate 59 whereby the actuator 49 will continue to drive the valve to closed position. The action of the gate 60 is therefore effectively overridden. Similarly, depressing the emergency stop button when the valve is in slow feed condition will cause the valve to be moved to full closed position.

The logic circuit includes a safety feature whereby it is not possible to drive the product control valve from slow feed position where the slow feed probe 35 is covered and the valve is at the slow feed position, the NOR gates 57 and 59 will be "on," while the NOR gates 58, 60, 61 and 62 will be "off." Should the start button 41 be depressed, it will turn "off" gate 57 which will not affect gate 58 since a signal is being received at control port 58c by virtue of the slow feed probe being covered. While gate 62 will turn "on," it will not cause the actuator to move since gate 61 will still be "on" since gate 58 is "off." Therefore, with working pressure in both lines 64 and 65, the actuator 49 will not move.

The unit may be easily maintained by replacement of malfunctioning components in the fluid logic circuit. In the event that the hollow sensing probes 34 and 35 become clogged, they may easily be cleaned by insertion of a wire or sharp instrument to remove the clogged material. Additionally, the product control valve and associated attachments including the filling nozzle and flexible hose 31 may be cleaned by attaching a cold water supply 134 to the product supply inlet 13, as shown in FIG. 1. Running of cold water through the valve and line will effect cleaning of same. It can be further appreciated the filling nozzle and product level detector assembly may be easily transferred manually from a filled drum to an empty drum for another filling cycle. While not shown, a universal connection may be provided between the shutoff valve 29 and the filling nozzle 26 to enhance handling procedures.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention, but it is understood that this application is to be limited only by the scope of the appended claims.

The invention is hereby claimed as follows:

1. An automatic container filling apparatus for filling a container comprising, a valve having an inlet and an outlet, means connecting the inlet to a product supply, a filling nozzle and product level detecting assembly including a filling nozzle and a pair of fluidic product level sensing probes for detecting different product levels during the filling of the container with product, means connecting the valve outlet to the filling nozzle, a pneumatic actuator for driving the valve between full open, intermediate and closed positions, means for producing a start signal, and fluid logic circuit means responding to the start signal to cause the actuator to drive the valve to full open position and to the product level sensing probes to cause the actuator to drive the valve to intermediate and closed positions as the product level rises and successively covers the probes, said circuit including means preventing the actuator from driving the valve to full open position in response to the start signal if the valve is in intermediate position.

2. The combination as defined in claim 1, wherein said filling nozzle includes means adjustably mounting the probes on the nozzle to control the product levels sensed thereby, and means for setting the position of

9

the nozzle relative the container.

3. The combination as defined in claim 1, wherein said fluid logic circuit means includes alarm means activated when the actuator drives the valve to intermediate and closed positions.

4. The combination as defined in claim 1, wherein said fluid logic circuit means includes visual indicating means for indicating valve position.

5. The combination as defined in claim 1, wherein said fluid logic circuit means further includes visual indication means for indication valve position, and alarm means activated when the actuator drives the valve to intermediate and closed position.

6. A portable automatic filling apparatus for filling drums with a product, wherein the drums include a bung defining a bunghole, which apparatus comprises, a movable cabinet and a filling nozzle and product level sensing assembly, said filling nozzle and product level detecting assembly including a filling nozzle and a pair of fluidic product level sensing probes adapted for insertion in a drum bunghole, said cabinet supporting a valve having an inlet connected to a product supply and an outlet connected to the filling nozzle, a pneumatic actuator for driving the valve between full open, intermediate, and closed positions, means producing a start signal, and fluid logic circuit means controlling operation of the actuator in response to the start signal to drive the valve to full open position and the level sensing probes to drive the valve to intermediate and closed positions, said circuit including means preventing the actuator from driving the valve to full open position in response to the start signal if the valve is in intermediate position.

7. A portable automatic drum filling apparatus as defined in claim 6, wherein said filling nozzle and probe assembly includes means on the nozzle adapted to coact with the bung to set the position of the sensing probes for detecting product level.

8. A portable automatic drum filling apparatus as defined in claim 7, wherein said filling nozzle and probe assembly further includes means adjustably mounting the probes on the filling nozzle to vary the sensing levels thereof.

9. A portable automatic drum filling apparatus as defined in claim 8, wherein said fluid logic circuit means includes fluidic indicators for indicating the valve position.

10

10. A portable automatic drum filling apparatus as defined in claim 9, wherein said fluid logic circuit means includes alarm means activated when the actuator drives the valve to intermediate and closed position.

11. A portable automatic drum filling apparatus for filling drums having a bunghole with a predetermined amount of liquid product, said apparatus comprising, a combination filling nozzle and product level probe assembly and a movable cabinet, said combination filling nozzle and product level probe assembly including a filling nozzle sized to be adapted to be insertable in a bunghole, a slow feed probe and a stop feed probe mounted on and extending along the filling nozzle adapted to be insertable with the nozzle into a bunghole and to sense different product levels, said probes being in the form of fluidic proximity sensors, means on the filling nozzle limiting the insertion of the filling nozzle and probes in the bunghole, said cabinet housing a product control valve, a pneumatic actuator for driving said valve between full open and full closed positions, said valve having an inlet adapted to be connected to a product supply and an outlet connected to one end of a flexible hose having the combination filling nozzle and product level probe assembly at the other end thereof, and fluid logic circuit means connected to and controlling operation of the actuator, said circuit means including a start switch for commencing a filling cycle by opening the valve full and conditioning the circuit means, means responsive to the slow feed probe for causing the actuator to drive the valve to an intermediate or partially open position to provide slow product feed, means responsive to the stop feed probe for causing the actuator to drive the valve to full closed position and end the filling cycle, and means preventing the actuator from driving the valve to full open position in response to the start signal if the valve is in intermediate position.

12. The combination as defined in claim 11, wherein the circuit means further includes an emergency stop switch for causing the actuator to drive the valve to full closed position from either full open or intermediate positions.

13. The combination as defined in claim 12, wherein the circuit means further includes fluidic indicators for indicating valve position, and alarm means responding to the actuator driving the valve into intermediate and closed positions.

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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,920,056
DATED : November 18, 1975
INVENTOR(S) : John A. Piecuch

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 9, lines 10 and 11, both occurrences, change "indication"
to --indicating--;
Col. 10, line 10, change "prove" to --probe--.

Signed and Sealed this
eighteenth Day of May 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks