

Aug. 29, 1944.

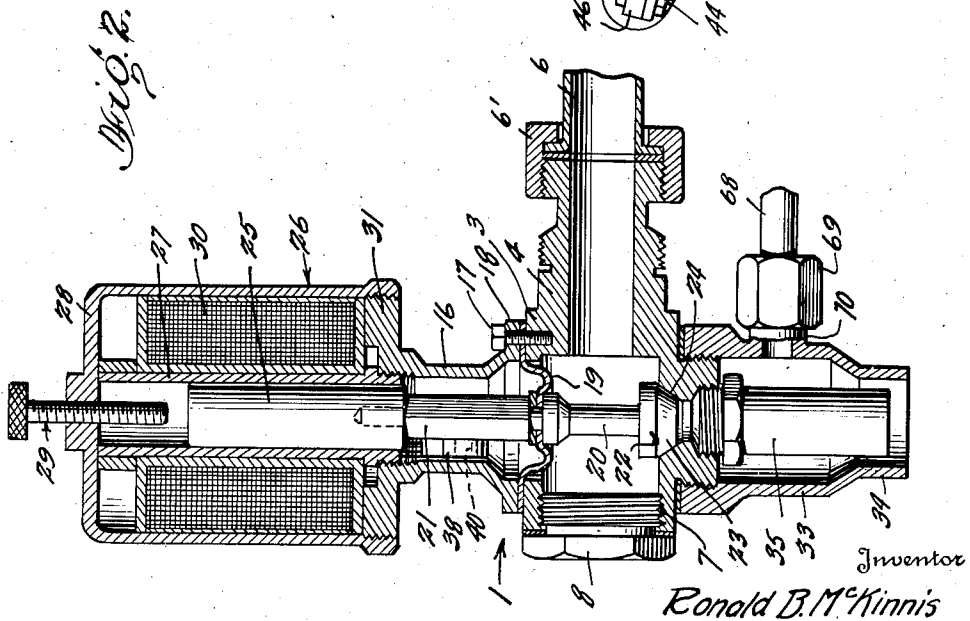
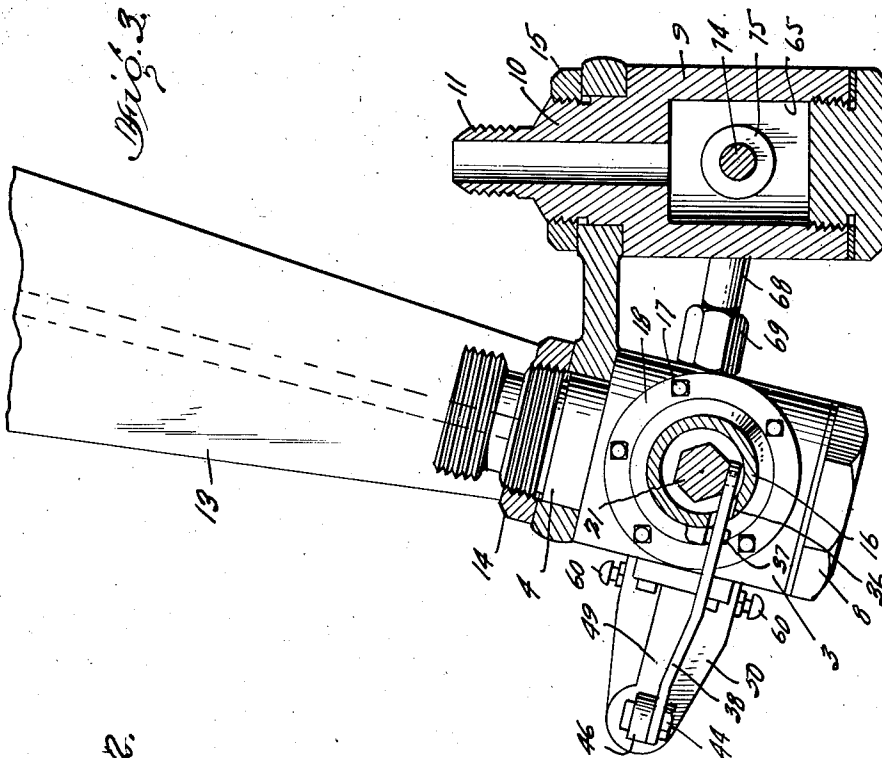
R. B. McKINNIS

2,357,013

CONTROL SYSTEM FOR FILLERS

Filed March 12, 1941

4 Sheets-Sheet 2



Inventor

Ronald B. McKinnis

By Semmes, Keegin & Semmes
Attorney

Aug. 29, 1944.

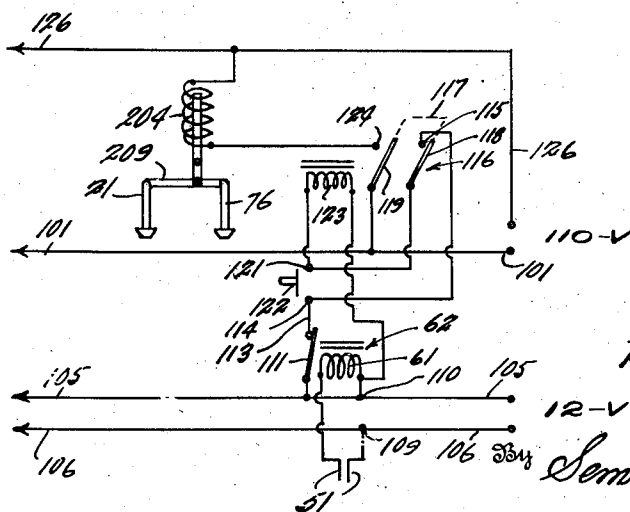
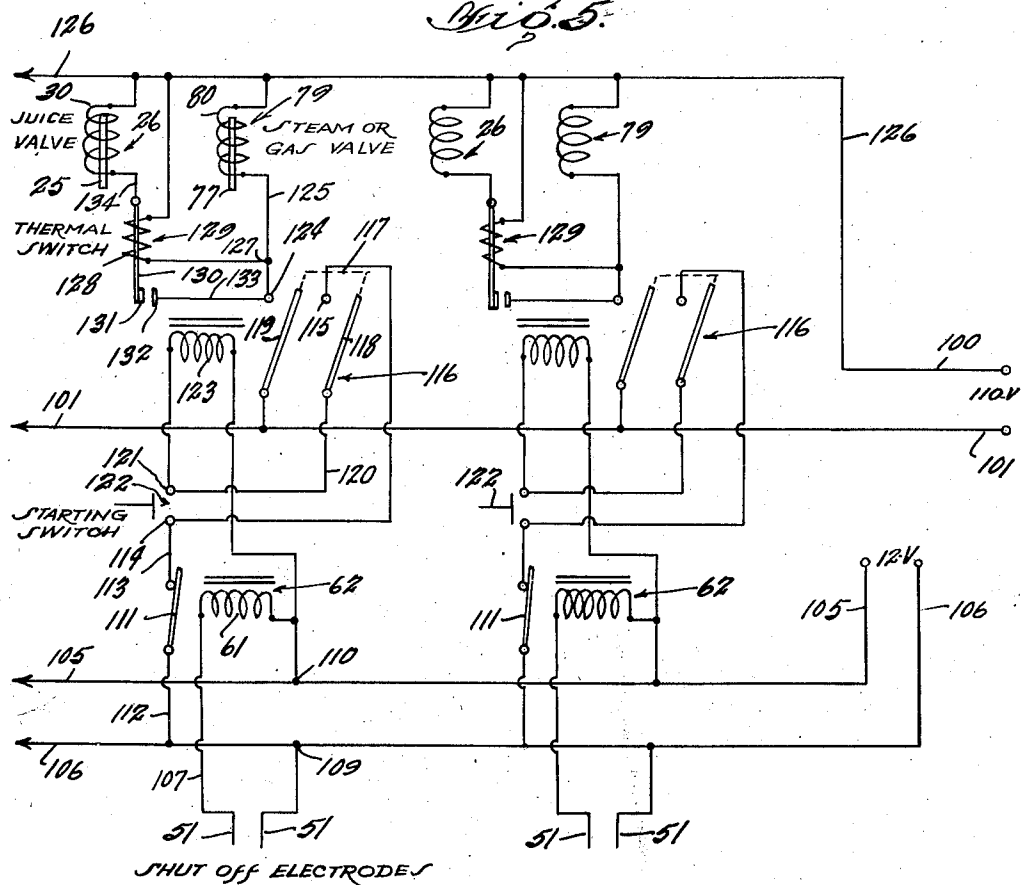
R. B. McKINNIS

2,357,013

CONTROL SYSTEM FOR FILLERS

Filed March 12, 1941

4 Sheets-Sheet 3



Inventor
Ronald B. McKinnis

Semmes, Keegin & Semmes
Attorneys

Aug. 29, 1944.

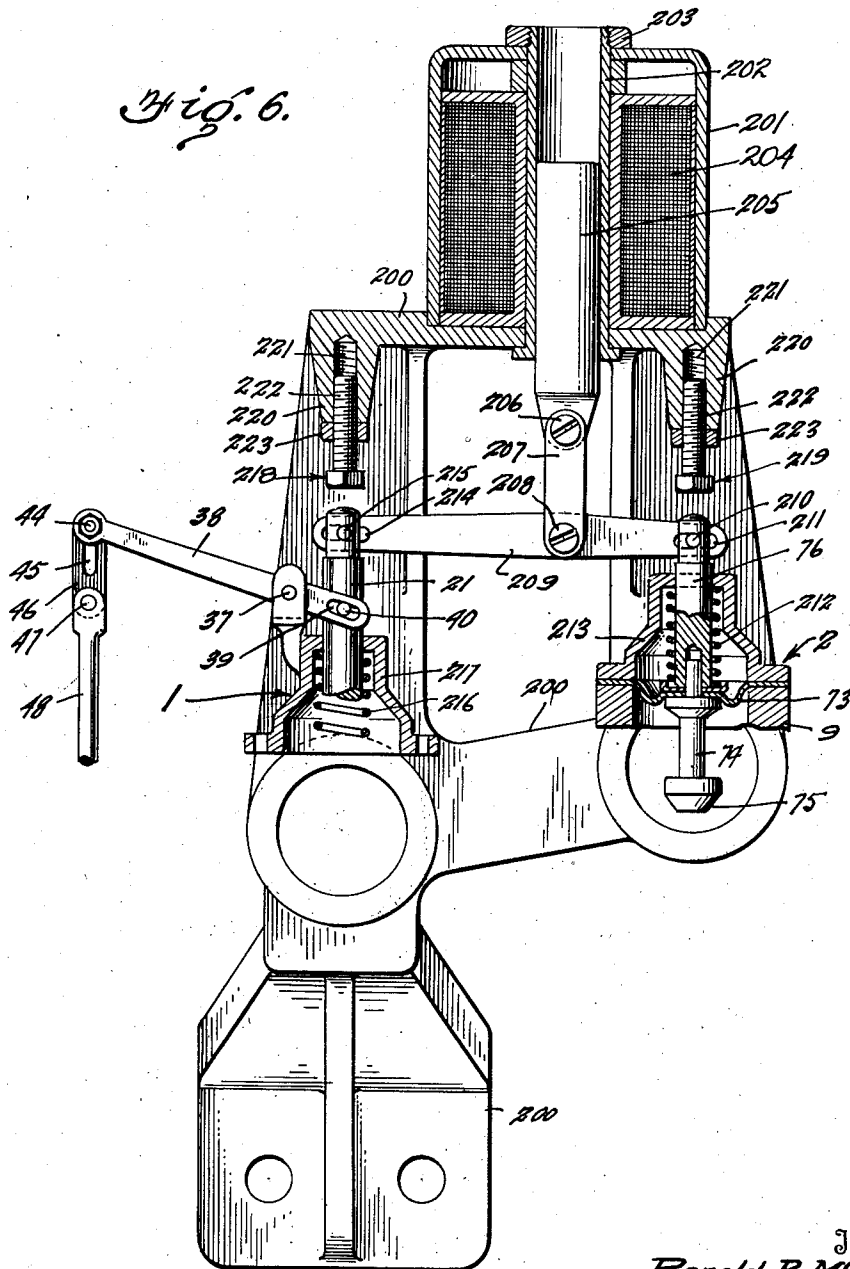
R. B. McKINNIS

2,357,013

CONTROL SYSTEM FOR FILLERS

Filed March 12, 1941

4 Sheets-Sheet 4



Inventor
Ronald B. McKinnis

By *Sommes, Keegin & Sommes*
Attorneys

UNITED STATES PATENT OFFICE

2,357,013

CONTROL SYSTEM FOR FILLERS

Ronald B. McKinnis, Winter Haven, Fla., assignor, by mesne assignments, to Ronald B. McKinnis, doing business as McKinnis Foods, Winter Haven, Fla.

Application March 12, 1941, Serial No. 383,045

8 Claims. (Cl. 226—68)

My invention relates to methods and apparatus for filling containers. The invention is particularly adapted for filling containers with liquids while preventing oxidation of the liquids, though the invention is not to be limited solely to operations of this nature.

In those cases in which liquids which are easily oxidized are filled into containers, particular precautions have to be exercised to prevent oxidation, and it is one of the objects of this invention to provide systems and apparatus for control of the filling of containers to prevent oxidation of the liquid. The old style bottom filler mechanisms have been found to be somewhat complicated and slow in operation. The present inventions contemplate filling from the top of the container, the container remaining open during the filling operation, yet by reason of proper blanketing of the surface of the liquid during the filling operation either with inert gas or steam, or some other fluid, oxidation is prevented. Among the types of liquid which are very sensitive to oxidation may be classed the juices of citrus fruit, such as oranges, and other fruit and vegetable juices.

In the system which I employ I control the operation of filling so that the open container is subjected to a blast of inert gas or steam to force out atmospheric air. After a predetermined interval of time this blast of blanketing fluid is followed by the introduction of a stream of the liquid, such as orange juice, the liquid being enclosed in a tube of moving inert gas or steam. Among the inert gases I may employ are nitrogen, carbon dioxide, a mixture of the two, or other inert gases.

In addition to the objects above indicated, another object of my invention is to provide a simple control system which is easy to operate and positive in action, and which will fill the cans to a desired depth so that the top edge of the can in effect becomes the gauge by which is determined the amount of liquid permitted to flow into the can. Thus variations in can sizes can be filled while still maintaining a constant head space in all cans.

A further object of the invention is to provide a simple valve construction which is positive in operation and easy to clean, repair and replace.

With these and other object in view, which may be incident to my improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising my invention may be varied in con-

struction, proportions and arrangements, without departing from the spirit and scope of the appended claims.

In order to make my invention more clearly understood, I have shown in the accompanying drawings means for carrying the same into practical effect without limiting the improvements in their useful applications to the particular constructions which, for the purpose of explanation, have been made the subject of illustration.

In the drawings:

Figure 1 is a vertical, transverse, sectional view through the valves;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 1, looking in the direction of the arrows;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 1, looking in the direction of the arrows;

Fig. 5 is a diagrammatic view of the electrical circuit for operation of the valves;

Fig. 6 is a vertical, transverse, sectional view partly broken away of a modified valve arrangement; and

Fig. 7 is a wiring diagram of the electrical circuit for operation of the valves shown in Fig. 6.

Referring to the drawings I have shown a valve mechanism indicated generally by the numeral 1, which is adapted to control the liquid which is fed to the containers, such as cans. I have generally indicated by the numeral 2 a valve mechanism for the control of a blanketing fluid, such as steam or inert gas, which is adapted to blanket the liquid during the filling operation. The valve 1 has a valve body 3 which has a centrally bored screw-threaded extension 4 thereon, through which juice is fed to the central aperture 5 of the valve body 3. The extension 4 is attached to a juice pipe 6 through which sterile unoxidized juice is adapted to be fed from some suitable source of supply, not shown. An interiorly screw-threaded coupling, indicated generally by the numeral 6', joins the extension 4 to the juice conduit 6. A cleaning aperture 7 is provided in the valve body 3 which is adapted to be closed by a screw cap 8.

The valve 2 is provided with a body 9 which is provided with an extension 10 which is exteriorly screw-threaded, having an exteriorly screw-threaded nipple 11 to which is adapted to be attached a conduit for steam or inert gas. The extension 4 of valve body 3 and the extension 10 of valve body 9 are adapted to fit into holding

apertures formed in a bracket 12 formed on a frame 13 of the valve supporting mechanism. The extension 4 is held in place by means of a holding nut 14 while the extension 10 is held in place by a nut 15.

Attached to the upper side of the valve body 3 is a vertical sleeve 16 which is held to the valve body 3 by means of holding screws 17 which extend through flange 18 of the sleeve 16. Between the flange 18 of the sleeve 16 and the top of the valve body 3 is held a Neoprene diaphragm 19. The Neoprene diaphragm 19 is held between a valve closer 20 and a valve stem 21. The valve closer 20 is provided with a head 22 carrying a conical face 23 which is adapted to lie against the conical aperture 24 formed in the lower portion of the valve body 3. The valve stem 21 is attached to an armature 25 of a solenoid mechanism indicated generally by the numeral 26. The armature 25 is adapted to slide in a solenoid barrel 27 carried in a cup-shaped solenoid cover 28. The upper movement of the armature 25 is limited by means of a set screw mechanism, indicated generally by the numeral 29. The solenoid 26 is provided with the usual solenoid winding 30 which upon being energized is adapted to raise the armature 25, and hence raises the valve closer 20 to open the valve. The Neoprene diaphragm prevents any liquid in the valve body 3 from coming in contact with the solenoid and its immediately associated parts. The cup-shaped cover 28 is screw-threaded on to a flange 31 formed on the sleeve 16.

The valve body 3 is provided with a threaded boss 32 on which is screwed a steam or inert gas nozzle 33 having a reduced portion 34. This nozzle 33 surrounds a nozzle 35 which is screw-threaded into the valve body 3, and which communicates with the interior of the valve body 3. The nozzle 35 is a liquid nozzle, which is adapted to discharge the juice into a can or container. The nozzle 33 is a nozzle for steam or inert gas, which is adapted to discharge a blanketing layer of fluid into the can around the juice entering the can.

The valve 2 is normally closed, with the parts in the position shown in Figures 1 and 2. The vertical sleeve 16 is provided with a slot 36 having mounted therein a pivot pin 37 on which is pivoted a lever 38 which has a lost motion slot 39 in one end. This lost motion slot fits over a trunnion 40 formed on the valve stem 21. To urge the valve closer 20 into the down position, a spring 41 is provided which is attached to a supporting screw 42 mounted on the cup-shaped cover 28 of the solenoid 26. The other end of the spring 41 is attached at 43 to the lever 38. This tends to hold the valve closer in the position shown in Figures 1 and 2. The lever 38 is provided with a pivot pin 44 which is adapted to fit in a lost motion slot 45 formed in a link member 46 which is pivotally joined at 47 to an operating rod 48 which is mounted for reciprocal motion in a support member 49 attached to the valve body 3. The operating rod 48 is attached to an insulating block 50 which is adapted to carry shut-off electrodes 51.

The block 50 is attached to the operating rod 48 through nuts 52 and 53 mounted on the operating rod 48. Above the nut 53 is mounted a cup-shaped spring receiver 54 in which the end of a compression spring 55 is mounted. The other end of the compression spring 55 is adapted to

rest in an aperture 56 formed on the under side of the support 49.

The details of the shut-off electrode construction are shown in Figure 4. The insulating block 5 is shown made in two pieces. Each of the electrodes 51 is provided with screw-threads 57 and knurled heads 58 so that the distance which the tips of the electrodes protrude below the surface of the block 50 can be regulated. Electrical contact is made with the electrodes 51 through T-shaped sleeves 59 set into the interior of the block 50. Each of the T-shaped sleeves 59 carries a binding post 60 through which connection is made to a winding 61 of a relay 62, which will be later described in detail.

It is to be noted that in the lowermost position of the block 50 it is adapted to rest on the rim 63 of a can 64 into which the juice is adapted to be filled. The tips of the electrodes 51 can be made of tantalum, or any other metal which does not oxidize readily, and which is not subject to electrolytic decomposition.

The valve construction 2, which is adapted to control the flow of the steam or inert gas for blanketing the juice has a valve body 9, as has been previously indicated. This valve body 9 is provided with a central aperture 65. At the lower end of the valve is a threaded nipple 66 which, through a suitable coupling 67, is attached to a steam or inert gas pipe 68 which in turn, through a suitable coupling 69, is attached to a nipple 70 whose central aperture communicates with the interior of the steam or inert gas nipple 33 that surrounds the juice discharge nipple 35, as has been previously described.

Mounted on the upper surface of the valve body 9 is a sleeve 71 having a flange 72. Between the flange 72 and the top of the body 9, by means of screws (not shown), is held a Neoprene diaphragm 73, similar in construction to the Neoprene diaphragm 19. There is provided a valve closer 74 similar to the valve closer 20. The valve closer 74 is provided with a conical head 75 which fits into the conical aperture formed in the bottom of the valve body 9. The valve closer 74 is attached to a valve stem 76, and in turn the valve stem 76 is attached to an armature 77 which is adapted to slide in a solenoid barrel 78 of a solenoid, indicated generally by the numeral 79. The solenoid 79 is provided with a solenoid winding 80. A cup-shaped cover 81 for the solenoid is held in place by being screwed over a screw-threaded flange 82 formed on the sleeve 71.

The armature 77 is urged into its down position by means of a compression spring 83, one end of which rests on the top surface of the armature 77, and the other end of which bears against the inner surface of an extension 84 made in the cup-shaped cover 81. A set screw, indicated generally by the numeral 85, limits the upper movement of the armature 77. The spring 83 urges the armature 77 into its lowermost position in which the valve is normally closed.

Referring to Figure 5 I have shown a control system for providing for the operation of the filling cycle. In general the filling cycle comprises first the purging step in which steam or inert gas is discharged in a blast into the open receptacle 64 and atmospheric air is discharged or purged from the open receptacle 64. Next, the filling step is started in which juice is discharged in a stream into the receptacle, the juice being blanketed by a tube of inert gas or steam. The system disclosed in Figure 5 is adapted to carry out this cycle.

I have shown two electrical conductors 100 and 101, which are adapted to carry, for instance, 110 volt current. In addition, two conductors 105 and 106 are adapted to carry a current of reduced voltage, for instance, 12 volts. The shut-off electrodes 51 are carried in a circuit 107 which is adapted to be closed when the liquid surface 108 rises to the proper height in the container 64. The circuit 107 is connected at 109 to a conductor 106 and at 110 to a conductor 105. In the circuit 107 is the coil 61 of the shut-off relay 62. The shut-off relay 62 comprises an armature 111 which is adapted normally to be in the position shown in Figure 5, i. e., in the normally closed position. Through the armature 111 and a lead 112 connected to the conductor 106 circuit is closed to a lead 113 which carries one contact 114 of a starting switch construction, and one contact 115 of a valve relay, indicated generally by the numeral 116.

The valve relay 116 is normally open, as indicated in Figure 5, and comprises a double arm switch 117 having a maintain arm 118 and an energizing circuit arm 119. The maintain arm 118 of the switch 117 is connected to a lead 120 which carries a contact 121 which lies adjacent the contact 114 in the starting switch arrangement which I have indicated generally by the numeral 122. In the line 120 is an enlarging coil 123 of the valve relay 116. The energizing coil 123 is adapted to move the double arm switch 117.

Adapted to contact the arm 119 of the valve relay switch 117 in its closed position is a contact 124 which is connected to a lead 125 that connects with the winding 80 of the solenoid 2. The winding 30 of the solenoid 19 is connected to a lead 126 which connects to the electrical main 100.

Connected to the lead 125 is a lead 127 which is also connected to the line 126 through a winding 128 of a thermal switch, indicated generally by the numeral 129, which is provided with a movable thermal element 130 which upon actuation is adapted to close its contact 131 with a contact 132 connected through a lead 133 to the contact 124.

The movable element 130 of the thermal switch 129 is connected through the lead 134 to line 126. In the lead 134 is the solenoid winding 30 of the solenoid 26.

In operation the receptacle or can 64 is placed underneath the valve assembly in the position shown in Figures 1 and 2. The starting switch 122 is operated, which closes the circuit between contacts 121 and 114. This energizes the coil 123 which moves the double pole switch 117 to cause arm 119 to contact the contact 124 and maintain arm 118 to contact the contact 115. Circuit is thus closed by the maintain arm 118 to maintain the current in the winding 123, and thus maintain the switch 117 in the closed position. In such closed position current flows through the winding 128 of the thermal switch 129 and through the winding 80 of the solenoid 19. Thus the steam or inert gas valve is opened, for the valve closer 74 is raised against the tension of the spring 83 and steam or inert gas is discharged downwardly into the container 64.

In the meantime the thermal switch 129 is becoming heated through the coil 128 and the movable element 130 is under the actuation of the rise of temperature causing contact 131 to approach contact 132. After a predetermined time contact 131 makes contact with contact 132,

and this closes the circuit through the arm 119 of the switch 117 through lead 133, contact 132, contact 131, movable member 130, lead 134, and winding 30 of solenoid 26 to the line 126. The solenoid 26 is therefore operated to move the armature 25 into the up position and to thus move the valve closer 20 into the up position and open the juice valve.

By the above system the valve 2, controlling the flow of steam or inert gas, is opened first to purge the container 64 of air by completely filling it with steam or inert gas. After a sufficient time interval for this purging operation, which may be controlled by adjustment of the thermal switch 129, the juice valve is opened to admit juice to the container.

The stream of juice from the nozzle 35 flows into the container surrounded by a sleeve of steam or inert gas flowing from the jacket 35 and rises in the container under a blanket of the steam or gas therein. The inert gas or steam lies on top of the rising liquid in the container 64 and prevents access of oxygen to the juice. There will be a considerable quantity of steam or inert gas which will find its way in bubbles below the surface of the juice, but since this material is entirely non-oxidizing no deleterious effects will be obtained. In fact the foam on the surface of the juice as it rises in the can also tends to blanket the main body of the juice from oxidation.

The surface of the juice rises in the can to a point such as is illustrated in Figure 1, where the circuit is closed through the shut-off electrodes 51 by reason of the completion of the circuit through the body of the juice itself. Then coil 61 of the shut-off relay 62 is energized and this attracts the armature 111 of the shut-off relay, opening the circuit. This de-energizes coil 123, and the normally open valve relay switch 117 opens, thus breaking the circuit through winding 30 of the juice valve solenoid, and also opening the circuit through the winding 80 of the steam or gas valve solenoid. Springs then return the solenoid armatures to the lowermost position, as shown in Figure 2, and the flow of juice and steam or inert gas is stopped.

It is to be noted that the insulating block 50, during the filling of the can with the liquid, rests on the upper rim 63 of the can. This gives a constant height to the juice in the filled can, since cans of different height may be employed, but the regulation of the height of the liquid in all cans is dependent on the amount that the shut-off electrodes project beyond the bottom surface of the block 50.

In Figure 6 I have shown an alternate form of valve construction. In this form of construction I have a single operating solenoid to operate both valves. The valve admitting the blanketing fluid, such as steam or inert gas, is adapted to operate mechanically at a definite time interval, previous to the operation of the liquid valve.

Referring to Figure 6, I have shown a support 200 on the top of which is carried a solenoid casing 201 having a solenoid barrel 202 held within the solenoid casing 201 by means of a nut 203. The solenoid is provided with a solenoid winding 204. Adapted to slide in the solenoid barrel 202 is an armature 205. The solenoid armature 205 is pivoted at 206 to a link 207 which is pivoted at 208 to an operating arm 209. The pivot at 208 is at an off center position on the operating arm 209, the pivot 208 being closer to

the blanketing fluid valve 2 than it is to the liquid or juice valve 1.

The closer 74 of the blanketing fluid valve 2 is attached to the valve stem 76 which is provided with a pin 210, over which is adapted to fit a slot 211 formed in the operating arm 209. The valve stem 76 and valve closer 74 are urged in the down or closed position by means of a compression spring 212 whose upper end bears against the inner upper surface of a valve cap 213 suitably attached to the valve body 9 by means of screws (not shown).

The opposite end of the operating arm 209 is provided with a slot 214 which fits over a pin 215 carried by the valve stem 21 of the valve 1. The valve stem 21 is urged into the down position by means of a compression spring 216 whose upper end bears against a valve cap 217 which is held to the valve body by means of screws (not shown). The spring 216 may overbalance the spring 212.

Positioned respectively above the valve stem 21 and above the valve stem 76 are adjustable stop members 218 and 219. Each of these members comprises a downwardly projecting lug 220 formed on the body of the support 200. Each lug 220 is provided with interior screw threads 221 into which are adapted to be fitted screws 222. Lock nuts 223 are adapted to hold the screws 222 in any adjusted position. Each of these assemblies just described comprises an adjustable stop for limiting the upper movement of the valve stems respectively of the valves 1 and 2.

In operation upon energization of the solenoid coil 204 the armature 205 is raised. Because of the off center mounting of the pivot 208 the valve stem 76 of valve 2 is raised, admitting steam or inert gas under pressure to the can being filled.

Upon contact of the upper end of the valve stem 76 with the adjustable stop 219, the further movement of the solenoid armature 205 raises the valve stem 21 of the valve 1, thus permitting liquid, such as citrus fruit juice, to flow into the receptacle being filled.

Because of the construction of the valve assembly just described, there is a definite predetermined time interval between the discharge of the blanketing fluid and the discharge of the filling liquid.

The circuit for controlling the combination valve assembly just described in connection with Figure 6 is somewhat more simple than is the circuit previously described.

Reference is made to Figure 7 wherein a circuit similar to that shown in Figure 5 is illustrated, except that the thermal switch is eliminated. Only one solenoid is employed instead of a solenoid for the steam or gas valve and a separate solenoid for the juice valve. The single solenoid for operating both valves is illustrated at 204 of Figure 7. The remainder of the circuit is similar to that shown in Figure 5 and a detailed description of such circuit is not believed to be necessary for a thorough understanding of the invention.

My process and apparatus permit of thorough purging of the cans and the introduction of non-oxidized liquid into the cans, filling them from the top and using open cans. This greatly facilitates the filling, shortening the process and saving time, and reducing the expense of the filling operation.

I desire that my invention be limited only by the showing of the prior art and the scope of the appended claims.

I claim:

1. A control system for filling containers with liquid while blanketing the liquid with a blanketing fluid comprising a fluid valve for controlling flow of blanketing fluid, a liquid valve for controlling flow of the liquid, a solenoid energizable for opening the fluid valve, a solenoid energizable for opening the liquid valve, a source of electrical energy, a circuit for connecting said source with the solenoids, a starting switch for closing the circuit to energize the solenoid for the fluid valve, and delayed action means in the circuit to energize the solenoid for the liquid valve a predetermined interval of time after the closing of the starting switch.

2. A control system for filling containers with liquid while blanketing the liquid with a blanketing fluid comprising a fluid valve for controlling flow of blanketing fluid, a liquid valve for controlling flow of the liquid, a solenoid energizable for opening the fluid valve, a solenoid energizable for opening the liquid valve, a source of electrical energy, a circuit for connecting said source with the solenoids, a starting switch for closing the circuit to energize the solenoid for the fluid valve, and a thermal switch in the circuit to energize the solenoid for the liquid valve a predetermined interval of time after the closing of the starting switch.

3. A control system for filling containers with liquid while blanketing the liquid with a blanketing fluid comprising a fluid valve for controlling flow of blanketing fluid, a liquid valve for controlling flow of the liquid, a solenoid energizable for opening the fluid valve, a solenoid energizable for opening the liquid valve, a source of electrical energy, a circuit for connecting said source with the solenoids, a starting switch for closing the circuit to energize the solenoid for the fluid valve, delayed action means in the circuit to energize the solenoid for the liquid valve a predetermined interval of time after the closing of the starting switch, and means for de-energizing both solenoids when liquid in a container has reached a predetermined level.

4. A control system for filling containers with liquid while blanketing the liquid with a blanketing fluid comprising a fluid valve for controlling flow of blanketing fluid, a liquid valve for controlling flow of the liquid, a solenoid energizable for opening the fluid valve, a solenoid energizable for opening the liquid valve, a source of electrical energy, a circuit for connecting said source with the solenoids, a starting switch for closing the circuit to energize the solenoid for the fluid valve, a thermal switch in the circuit to energize the solenoid for the liquid valve a predetermined interval of time after the closing of the starting switch, and means for de-energizing both solenoids when liquid in a container has reached a predetermined level.

5. A control system for filling containers with liquid while blanketing the liquid with a blanketing fluid comprising a fluid valve for controlling flow of blanketing fluid, a liquid valve for controlling flow of the liquid, a solenoid energizable for opening the fluid valve, a solenoid energizable for opening the liquid valve, a source of electrical energy, a circuit for connecting said source with the solenoids, a starting switch for closing the circuit to energize the solenoid for the fluid valve, delayed action means in the circuit to energize the solenoid for the liquid valve a predetermined interval of time after the closing of the starting switch, shut-off electrodes

adapted to have the circuit closed between them by the surface of the liquid in the container, and means operated by the closing of the circuit through the shut-off electrodes to de-energize both solenoids.

6. A control system for filling containers with liquid while blanketing the liquid with a blanketing fluid comprising a fluid valve for controlling flow of blanketing fluid, a liquid valve for controlling flow of the liquid, a solenoid energizable for opening the fluid valve, a solenoid energizable for opening the liquid valve, a source of electrical energy, a circuit for connecting said source with the solenoids, a starting switch for closing the circuit to energize the solenoid for the fluid valve, a thermal switch in the circuit to energize the solenoid for the liquid valve a predetermined interval of time after the closing of the starting switch, shut-off electrodes adapted to have the circuit closed between them by the surface of the liquid in the container, and means operated by the closing of the circuit through the shut-off electrodes to de-energize both solenoids.

7. A control system for filling containers with liquid while blanketing the liquid with a blanketing fluid comprising a fluid valve for controlling flow of blanketing fluid, a liquid valve for controlling flow of the liquid, a solenoid energizable for opening the fluid valve, a solenoid energizable for opening the liquid valve, a source of electrical energy, a circuit for connecting said source

with the solenoids, a starting switch for closing the circuit to energize the solenoid for the fluid valve, delayed action means in the circuit to energize the solenoid for the liquid valve a predetermined interval of time after the closing of the starting switch, shut-off electrodes adapted to have the circuit closed between them by the surface of the liquid in the container, and a shut-off relay normally closed which is opened by the closing of the circuit through the shut-off electrodes to de-energize both solenoids.

8. A control system for filling containers with liquid while blanketing the liquid with a blanketing fluid comprising a fluid valve for controlling flow of blanketing fluid, a liquid valve for controlling flow of the liquid, a solenoid energizable for opening the fluid valve, a solenoid energizable for opening the liquid valve, a source of electrical energy, a circuit for connecting said source with the solenoids, a starting switch for closing the circuit to energize the solenoid for the fluid valve, a thermal switch in the circuit to energize the solenoid for the liquid valve a predetermined interval of time after the closing of the starting switch, shut-off electrodes adapted to have the circuit closed between them by the surface of the liquid in the container, and a shut-off relay normally closed which is opened by the closing of the circuit through the shut-off electrodes to de-energize both solenoids.

RONALD B. MCKINNIS.