April 6, 1943. D. M. McBEAN 2,315,865

MACHINE FOR AND METHOD OF FILLING CONTAINERS

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Fig. 1.

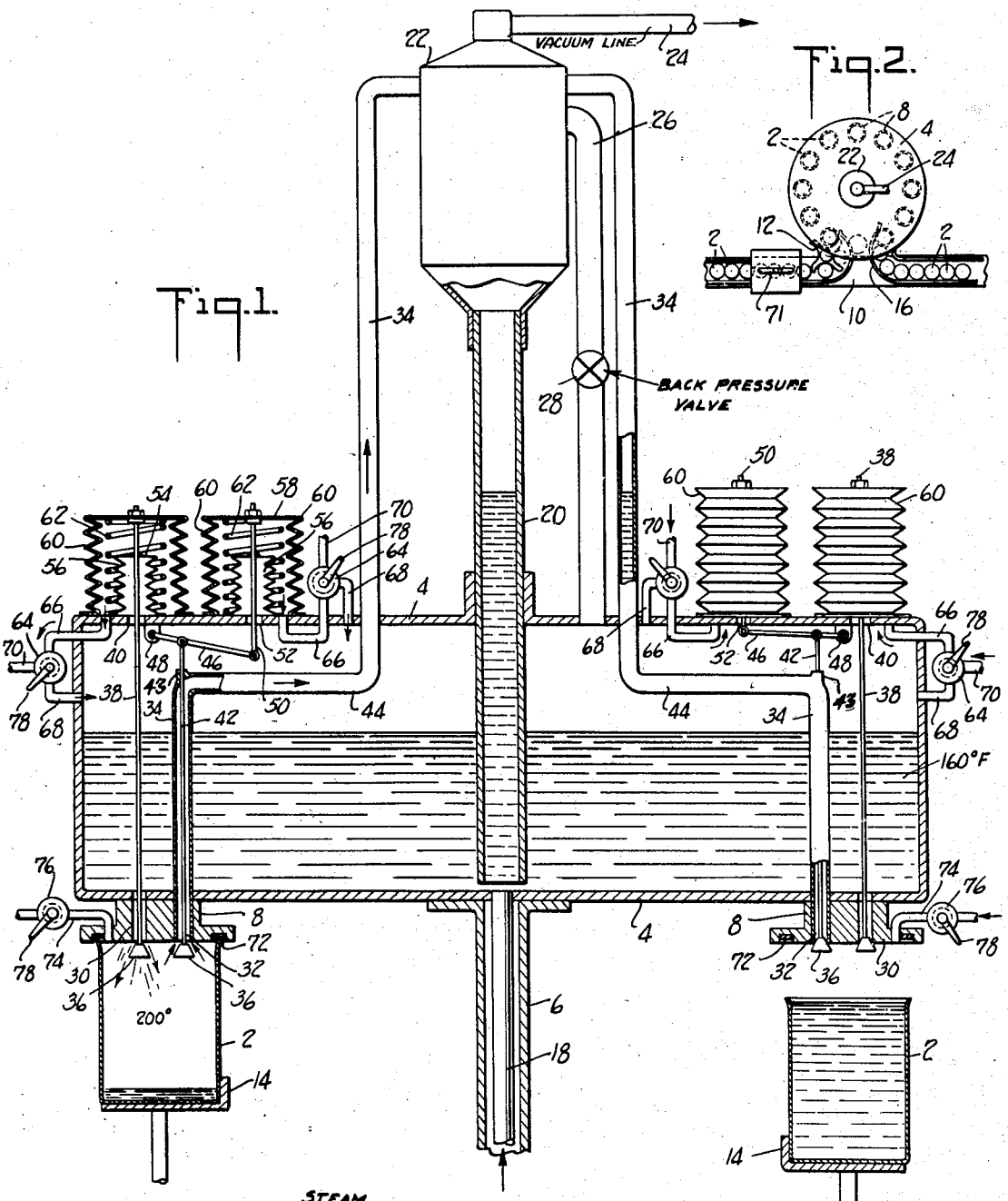
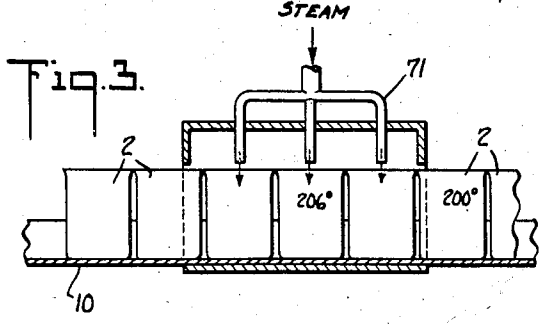


Fig. 2.

Fig. 3.



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MACHINE FOR AND METHOD OF FILLING CONTAINERS

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5 Claims. (Cl. 226—116)

The present invention relates to machines for and method of filling containers, and has special reference to the filling of tin cans with liquid.

One of the objects of the invention is to provide a method of filling tin cans and other containers in such a manner as to insure that the liquid in the containers when filled is uniformly free of entrained air and other gases.

Another of the objects of the invention is to provide a novel and improved filling machine that is particularly adapted for use in carrying out my improved method.

The several features of the invention, whereby the above-mentioned and other objects may be attained, will be readily understood from the following description and accompanying drawing, in which:

Figure 1 is a diagrammatical sectional elevation of the upper portion of my improved machine;

Fig. 2 is a diagrammatical plan view of the machine; and

Fig. 3 is a diagrammatical sectional elevation of a portion of the can conveying mechanism of the machine with a steam-applying device associated therewith.

My improved method is particularly adapted for use in filling cans 2 which may be of the usual tin can type.

The machine comprises a rotatable turret that carries a liquid supply tank 4 mounted upon the upper end of a rotating hollow shaft 6. The underside of the tank 4 carries a series of can-filling heads 8 which are of novel construction. The cans may be presented to the filling heads by any suitable and well-known means such as a belt-conveyor 10 having a star-wheel 12 or other means for successively removing the cans from the belt and depositing them on vertical reciprocal plungers 14 which presents them to the filling heads. As the cans are filled the plungers 14 successively lower them from the filling heads and they are redeposited upon the belt conveyor 10 by any suitable means such as a guide 16.

The liquid may be supplied to the tank 4 through a pipe 18 which extends upwardly through the hollow supporting shaft 6 and leads into the bottom of the tank, the liquid being substantially free of entrained air.

A vertical pipe 20 extends through a central aperture in the top of the tank and has its lower end open and arranged in proximity to the bottom of the tank, and its upper end opens into the lower end of a chamber 22. The upper end of this chamber 22 is connected through a pipe 24 with a suitable vacuum creating means. The upper portion of the chamber 22 is in communication with the top of the tank through a pipe 26 which has a back pressure valve 28 therein.

Each of the filling heads 8 comprises a block secured on the underside of the bottom wall of the tank 4 and provided with a passage or port 30 leading from the interior of the tank. The filling head is further provided with a port 32 in which is secured the lower end of a pipe 34 which leads from the upper end of the chamber 22. The ports 30 and 32 are adapted to be opened and closed by means of valves 36. The valve for the port 30 has a stem 38 which extends upwardly through the tank and through a clearance aperture 40 in the top wall of the tank. The valve of the port 32 has a stem 42 which extends upwardly through the pipe 34 and through a stuffing box 43 in a horizontal leg 44 of the pipe. The upper end of the rod 42 is pivotally connected with an arm 46 which has one end pivotally connected on a depending lug 48 on the under end of the top wall of the tank, and its other end pivotally connected with a rod 50 which extends through a clearance aperture 52 in the top wall of the tank.

The valve stem or rod 38 and the rod 50 each extends through an aperture in the upper end wall 54 of a sleeve 56, the rod being secured to the wall of the aperture by soldering or otherwise so as to form an airtight seal. The sleeve 56 has its lower edge welded or soldered to the top wall of the supply tank so as to provide an airtight seal therefor. Each of the sleeves 56 is made of flexible sheet metal and is provided with circumferential bellows-like corrugations so as to permit longitudinal expansion and contraction of the sleeve. With this construction the rods 38 and 50 may be moved vertically to open and close the valves 36 without danger of leakage of air into the supply tank 4.

The upper end of each of the rods 38 and 50 extends through and is secured in an aperture in the end wall 58 of a sleeve 60. Each sleeve 60 surrounds and is spaced from the associated sleeve 56, and like the sleeve 56 is made of flexible sheet metal and is provided with circumferential bellows-like corrugations so as to permit expansion and contraction of the sleeve. The lower edge of each of the sleeves 60 is welded or soldered to the top wall of the supply tank so as to form an airtight seal. Within each of the sleeves 60 and surrounding the associated sleeve

56 is a coiled expansion spring 62 which tends to urge the rods 38 and 50 upwardly to maintain the valves 36 closed.

Associated with each of the sleeves 60 is a valve 64 having a pipe 66 leading therefrom into the interior of the sleeve 60, a pipe 68 leading therefrom into the interior of the supply tank, and a pipe 70 that is open to the atmosphere. Each valve 64 is suitably formed so that upon turning the valve the air pipe 70 may be cut off and communication established between the pipes 66 and 68 so as to permit air to be exhausted from the sleeve 60. When this occurs atmospheric pressure compresses the sleeve 60 longitudinally against the tension of the spring 62 and thus opens the associated valve 36. Also, the valve may be operated to shut off communication between the pipes 66 and 68, and open communication between the pipes 66 and 70 so as to permit air to enter the sleeve 60 and thus permit the spring 62 to close the associated valve 36.

In the operation of the machine in accordance with my improved method with a temperature of substantially 160 degrees F. in the liquid in the supply tank, I maintain automatically a pressure over the liquid of approximately 11" mercury absolute, and maintain a pressure in the flash chamber 22 of 9" absolute. As will be apparent, this difference in pressure in the filler or supply tank 4 and the flash chamber 22 is effected by means of the back-pressure valve 28. As the pressure tends to increase in the head space of the tank 4, the back pressure valve will automatically permit air or vapor to be exhausted into the flash chamber.

As the cans to be filled approach the filling head, they pass beneath a suitable spraying device 71 which sprays steam into the cans and heats the cans to a temperature of approximately 200 degrees Fahrenheit. The condensate from the steam required to heat the cans from room temperature to 200 degrees F. is sufficient so that as the cans pass to the filling heads a layer of moisture is deposited on the inner sides of the cans.

When a container, such as a tin can, has thus been subjected to the steam jets and heated, it is positioned with its open end against the underside of the filling head 8, the edge of the can engaging a gasket 72 set into the head so as to form an airtight seal therewith.

When the can is thus applied to the filling head, the valve 64 associated with the valve actuating rod 50 is operated to establish communication between the interior of the sleeve 60 and the supply tank, thus causing the valve 36 of the port 32 to open said port to establish communication between the port and the vacuum chamber 22. Owing to the temperature of the can and the degree of vacuum thus produced in the can, the moisture on the wall of the can quickly vaporizes and passes out through the pipe 34 and into the vacuum chamber, thus effectively exhausting the air from the can.

When the air has thus been exhausted from the can, the valve 36 for the port 30 is open through operation of the associated valve 64, whereupon the liquid from the tank 4 quickly flows down into the can and such flow of the liquid continues until the liquid fills the can and rises a distance into the pipe 34. During this filling operation, owing to the degree of vacuum in the can, a certain degree of vaporization takes place as the liquid enters the can and the vapor with any air admitted is drawn up through the pipe 34. Thus during the filling there is accomplished a deaeration of the liquid due to the boiling thereof as it passes through the valve of the filler 4 into the can, the pressure within the can being maintained slightly below the boiling point of the liquid. When the can has been filled the valves 36 close the ports 30 and 32. During the continued rotation of the turret, air may be admitted into the top of the can above the liquid through a pipe 74 which is controlled by a valve 76. When this has occurred, the filled can may be lowered from the filling head as shown at the right of Fig. 1 and conveyed by the conveyor 10 to the usual can closing machine.

The valves 64 and 76 may be operated in proper timed relation during the operation of the turret by any suitable means connected with the arms 78 secured to the valve stems thereof.

By operation of the machine in accordance with my improved method as above described, it will be apparent that when each can is applied to a filling head, the moisture in the heated can is quickly vaporized and together with the air is quickly exhausted from the can previously to the entrance of the liquid into the can. As the liquid enters the can the liquid is thoroughly deaerated and degasified so that when the can is filled the liquid is substantially free of entrained air and other gases.

As will be evident to those skilled in the art, my invention permits various modifications without departing from the spirit thereof or the scope of the appended claims.

What I claim is:

1. The method of filling a container with liquid of the class described, which comprises spraying steam into the open end of the container to heat the wall thereof to a temperature of approximately 200 degrees Fahrenheit, permitting the steam to condense on the inner side of the wall of the container, while the container is in such heated condition closing the open end thereof, then establishing communication between the upper end of the container and vacuum creating means to reduce the atmospheric pressure within the container to approximately 9 inches mercury absolute to cause the moisture therein to vaporize and to be exhausted with the air from the container, when the air and vapor has thus been exhausted admitting the liquid into the container at a temperature of approximately 160 degrees F. to cause flashing of the liquid as it enters the container, when the container has been filled with the liquid shutting off the admission of liquid thereto and shutting off the air and vapor exhaust and then admitting air to the top of the container above the liquid.

2. The method of filling a container with liquid of the class described which comprises supplying steam into the interior of the container to heat the wall thereof, permitting the steam to condense on the inner side of the wall of the container, while the container is in such heated condition, closing the open end of the container, reducing the atmospheric pressure within the container to a point to cause the moisture therein to vaporize and to be exhausted with the air from the container, when this has been effected admitting the liquid into the top of the container while maintaining the atmospheric pressure within the container slightly below the boiling point of the liquid so as to cause vapor to rise from the liquid and be exhausted from the container, and when the

container has been filled with the liquid shutting off the admission of liquid and the exhaust.

3. In a machine for filling containers of the class described, the combination of a liquid supply tank, means for supplying liquid thereto and maintaining the level of the liquid a distance below the top of the interior of the tank, a flash chamber above the tank, a conduit leading from the bottom of the tank to a point above the upper level of the liquid in the tank, vacuum creating means leading from the top of the flash chamber for maintaining a predetermined atmospheric pressure within the chamber, means comprising a conduit leading from the upper end of the flash chamber to a point in the tank above the level of the liquid therein for reducing the atmospheric pressure in the tank to a predetermined point above the atmospheric pressure in the chamber, a filling head in communication with the interior of the tank adapted to close the open end of the container when the container is applied thereto, controllable means for regulating the flow of liquid from the filling head into the container when the container is applied to said head, and controllable means for establishing communication between the upper end of the container and the upper portion of said flash chamber.

4. In a machine of the class described, a liquid supply tank having a discharge port in the bottom thereof, means for reducing the atmospheric pressure in the tank above the liquid therein, a valve for said port, means for operating the valve to open and close the port comprising a rod extending upwardly through an aperture in the top wall of the tank, a sleeve surrounding said rod and having an upper end wall provided with an aperture through which said rod extends, the wall of said sleeve aperture being secured to said rod to provide an air tight seal, the lower edge of said sleeve being secured about said aperture in the top wall of said tank to provide an airtight seal, and said sleeve being made of flexible sheet metal provided with bellows-like corrugations to permit said sleeve to be longitudinally extended and contracted as the rod is moved longitudinally, to open and close the valve, and means for thus moving the rod.

5. A structure according to claim 4 in which a second sleeve surrounds the first sleeve and is provided with an upper end wall which is secured to the upper end of said rod, the lower edge of this sleeve being secured to the top wall of the tank to provide an airtight seal, said sleeve being made of flexible sheet metal and provided with bellows folds to permit longitudinal expansion and contraction of the sleeve, spring means tending to move said rod upwardly, controllable means for establishing communication between the interior of the second-mentioned sleeve and the upper portion of the tank whereby air is exhausted from the interior of the sleeve to permit atmospheric pressure to compress the bellows to move said rod downwardly against the tension of said spring means, and for shutting off communication between the interior of the sleeve and said tank and for admitting air to the interior of the sleeve so as to allow said spring means to move said rod upwardly.

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