

Oct. 7, 1947.

J. E. WEAVER

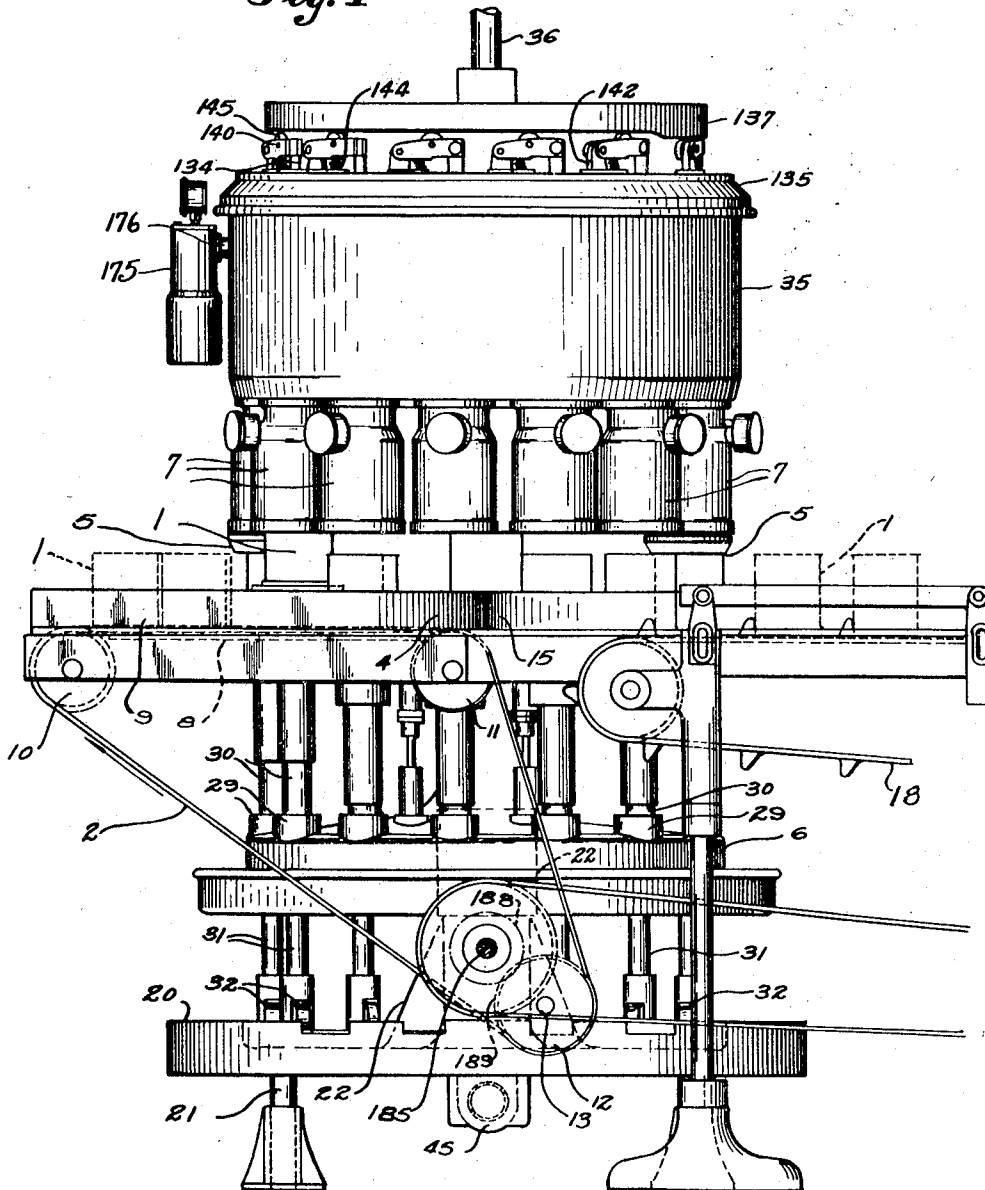
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PREVACUUMIZING FILLING MACHINE

Filed Aug. 20, 1941

8 Sheets-Sheet 1

Fig. 1



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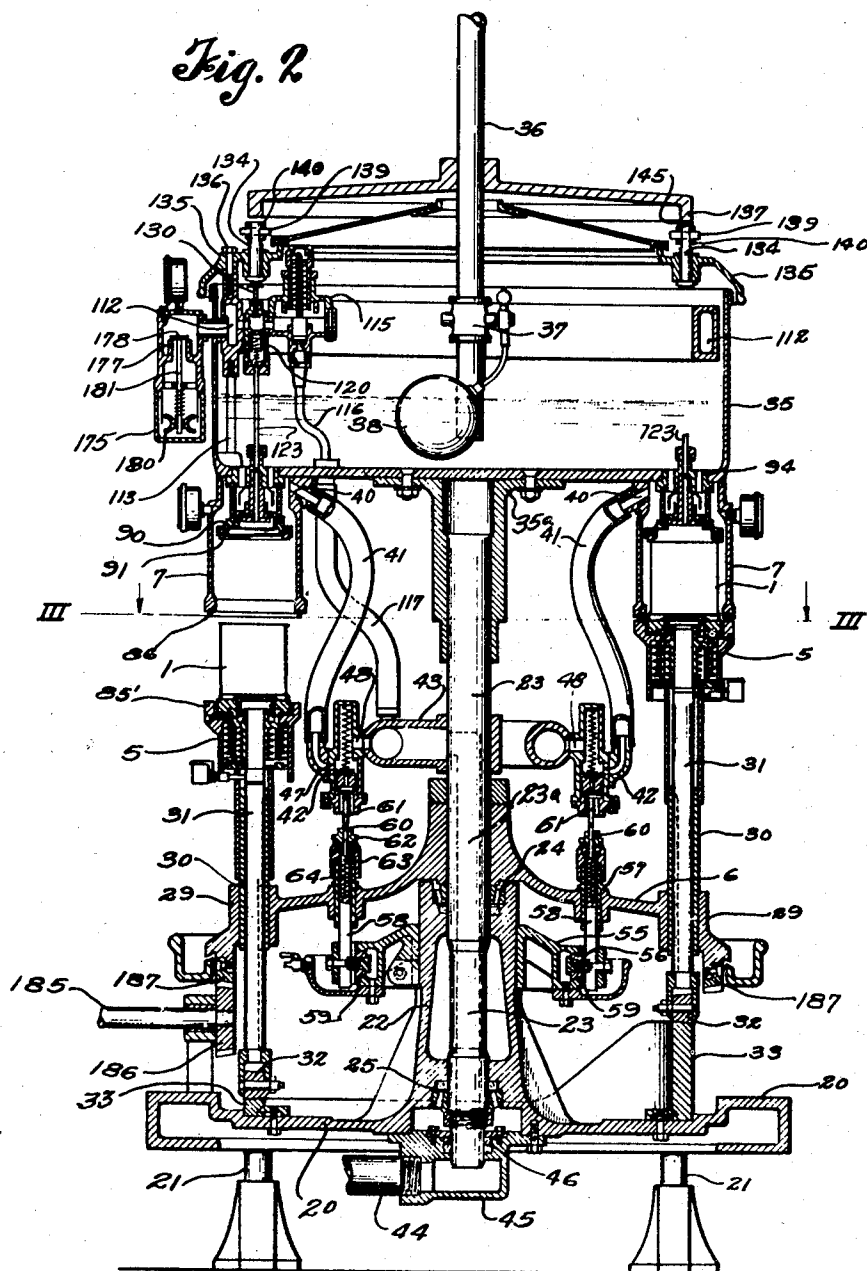
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PREVACUUMIZING FILLING MACHINE

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Fig. 2



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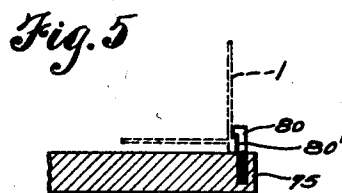
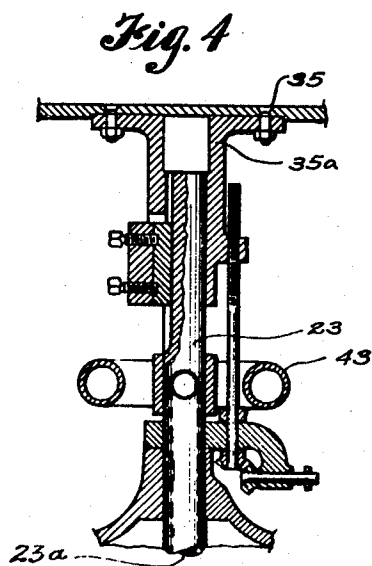
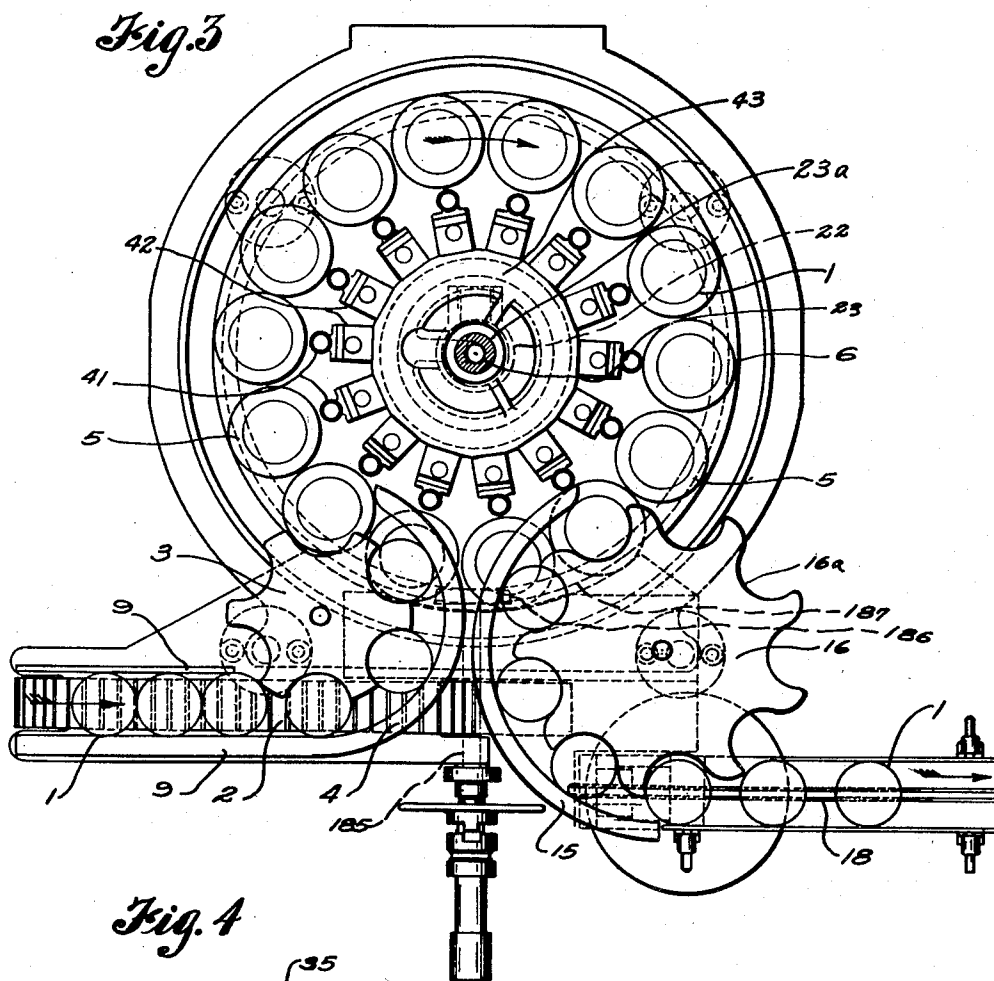
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PREVACUUMIZING FILLING MACHINE

Filed Aug. 20, 1941

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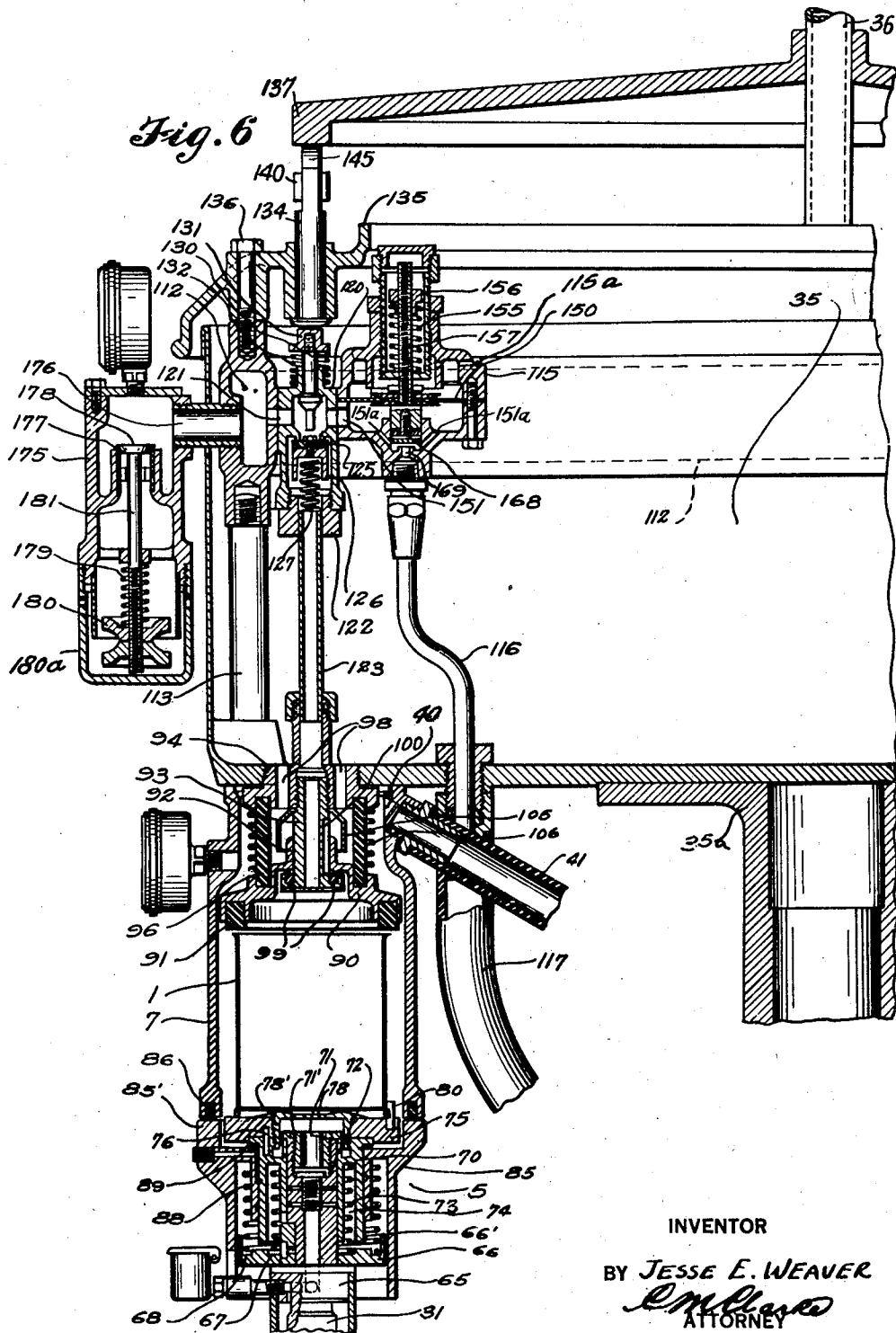
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PREVACUUMIZING FILLING MACHINE

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8 Sheets-Sheet 4



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PREVACUUMIZING FILLING MACHINE

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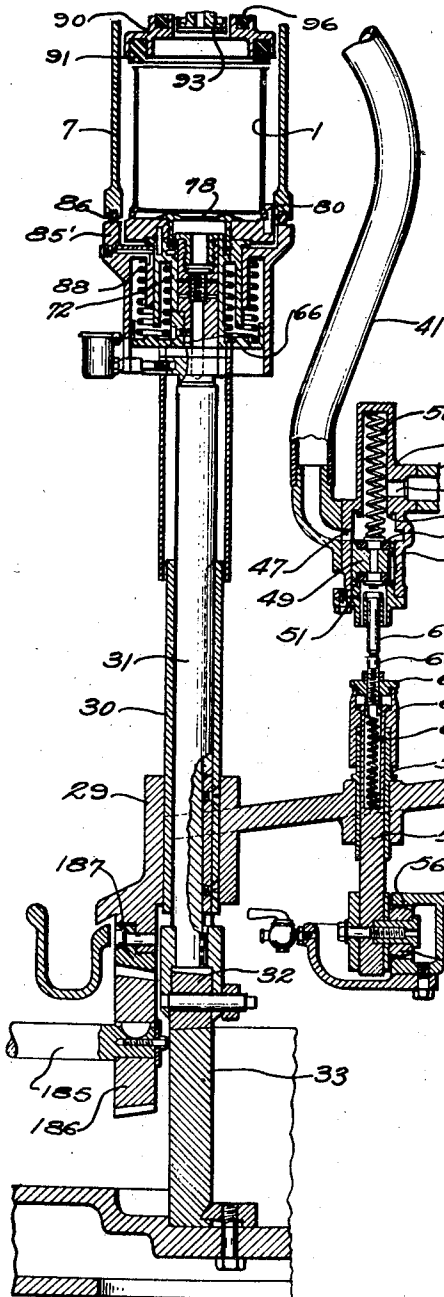


Fig. 7

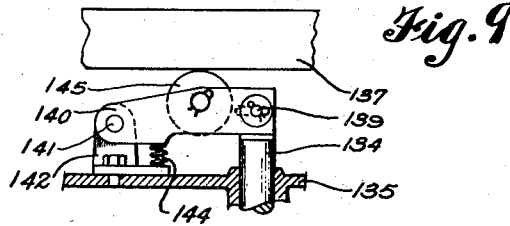


Fig. 9

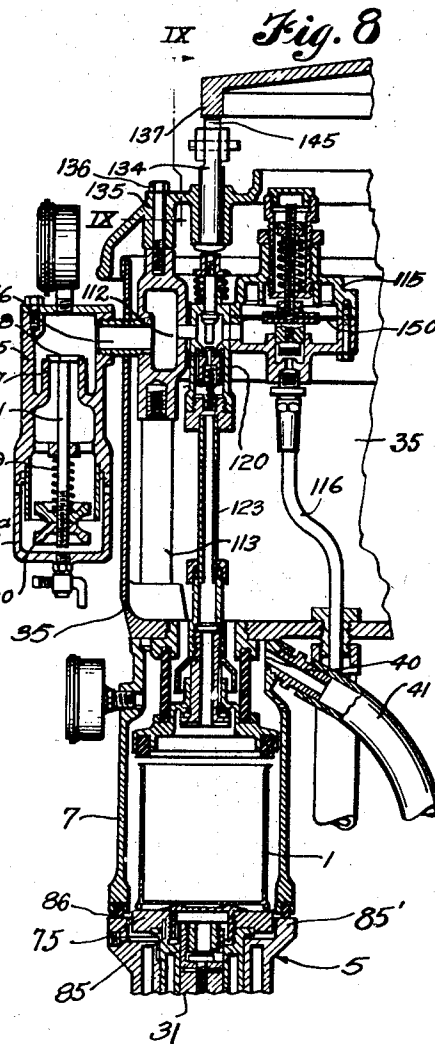


Fig. 8

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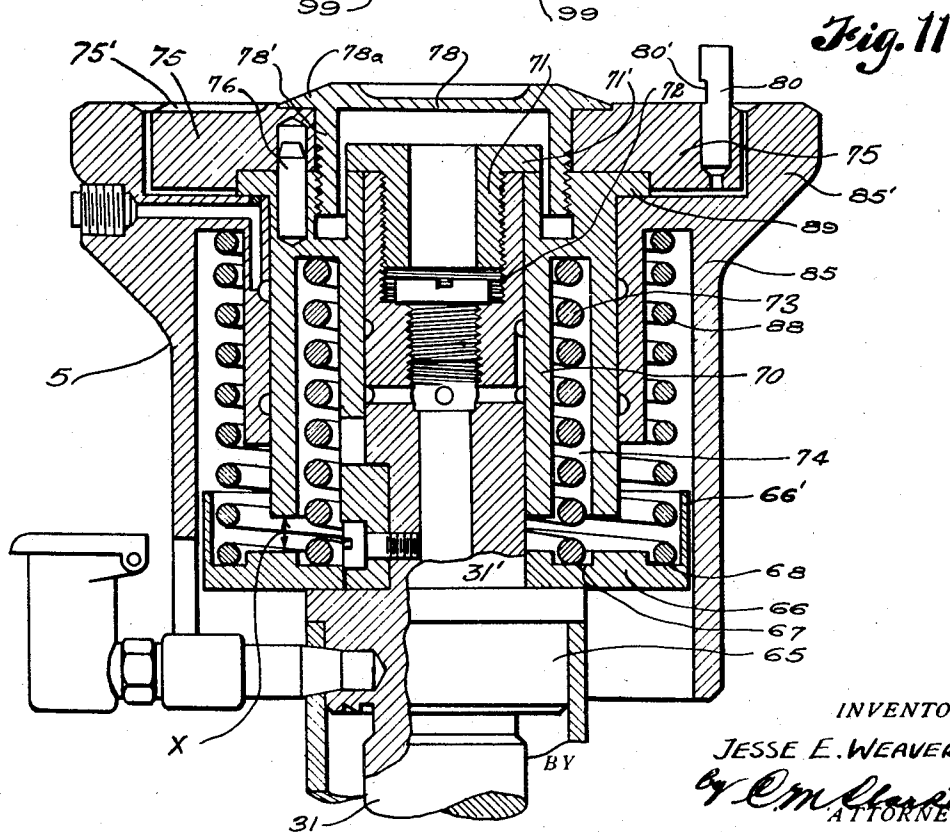
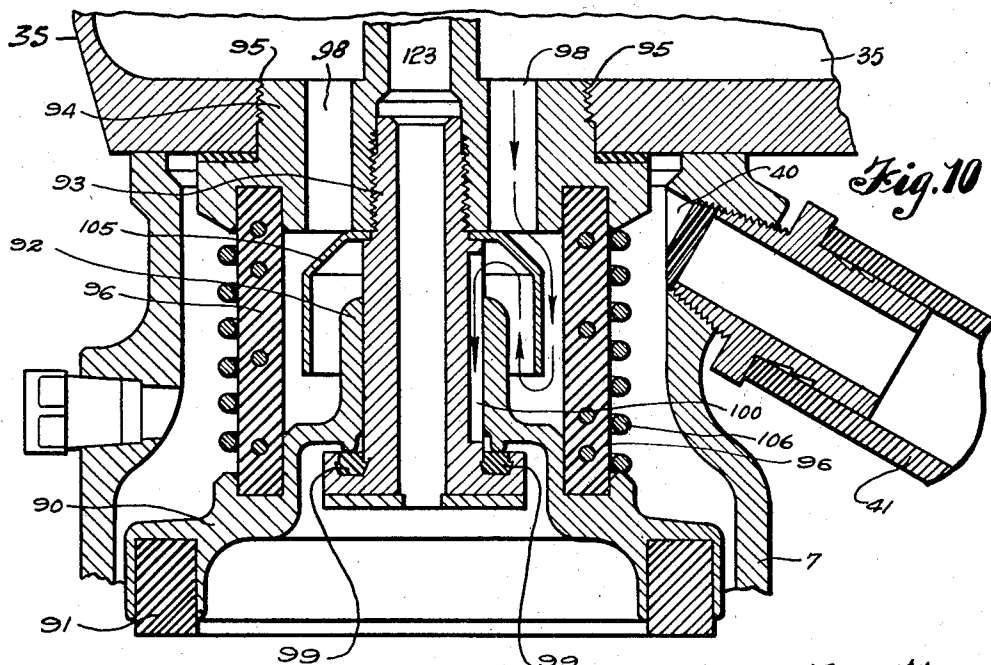
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PREVACUUMIZING FILLING MACHINE

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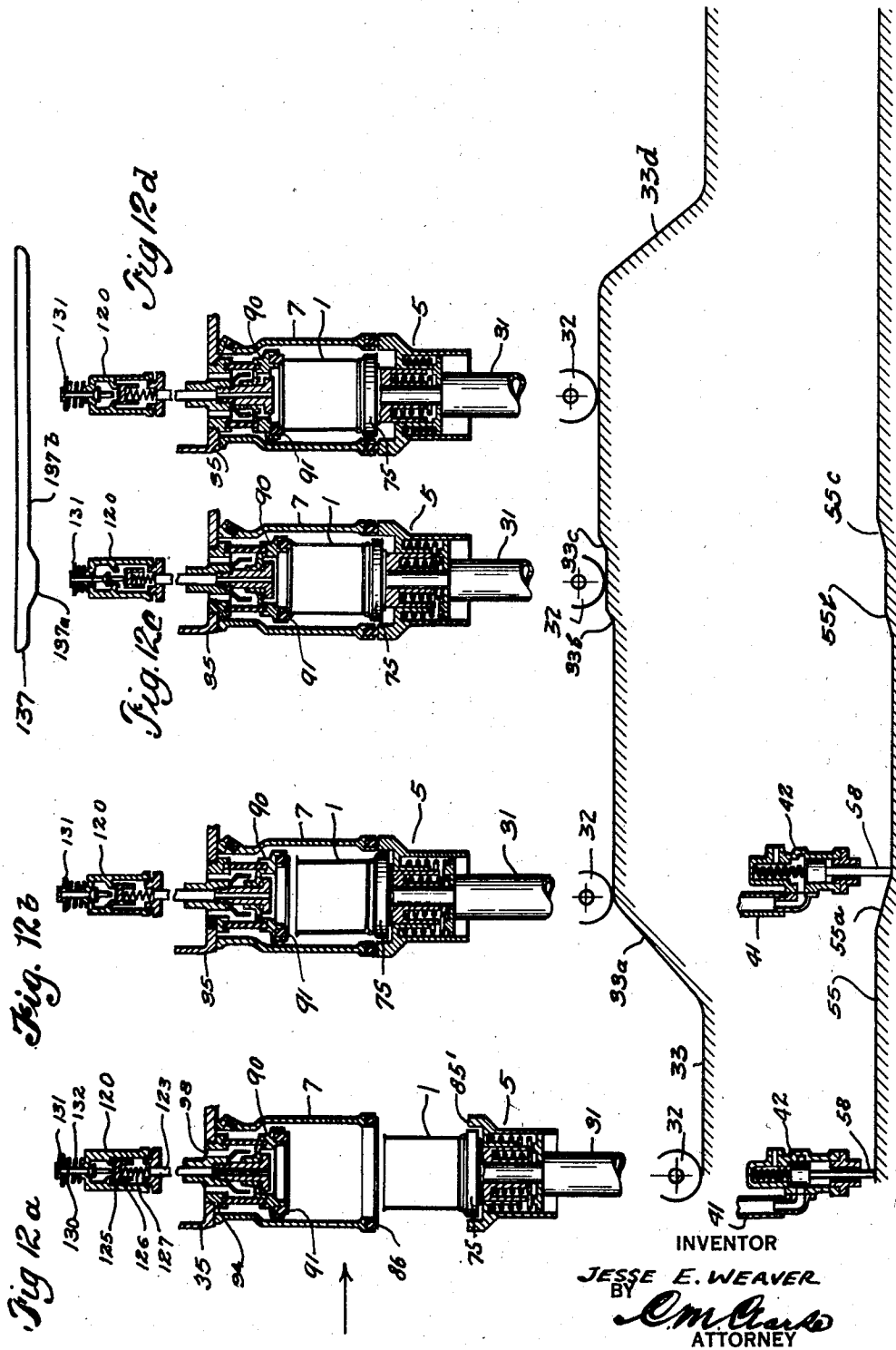
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PREVACUUMIZING FILLING MACHINE

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PREVACUUMIZING FILLING MACHINE

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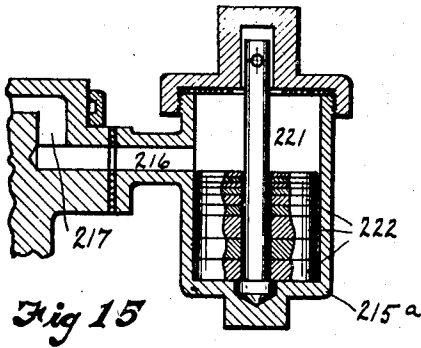


Fig 15

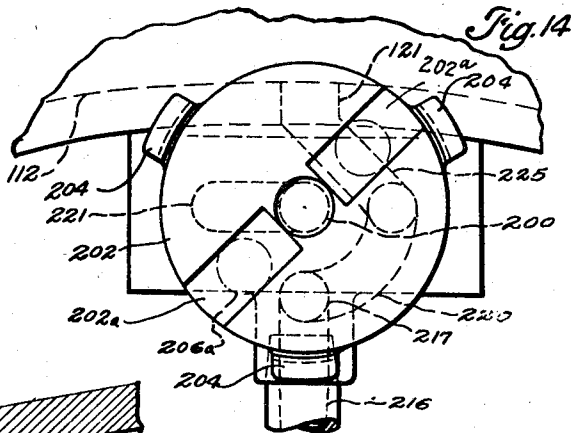


Fig. 14

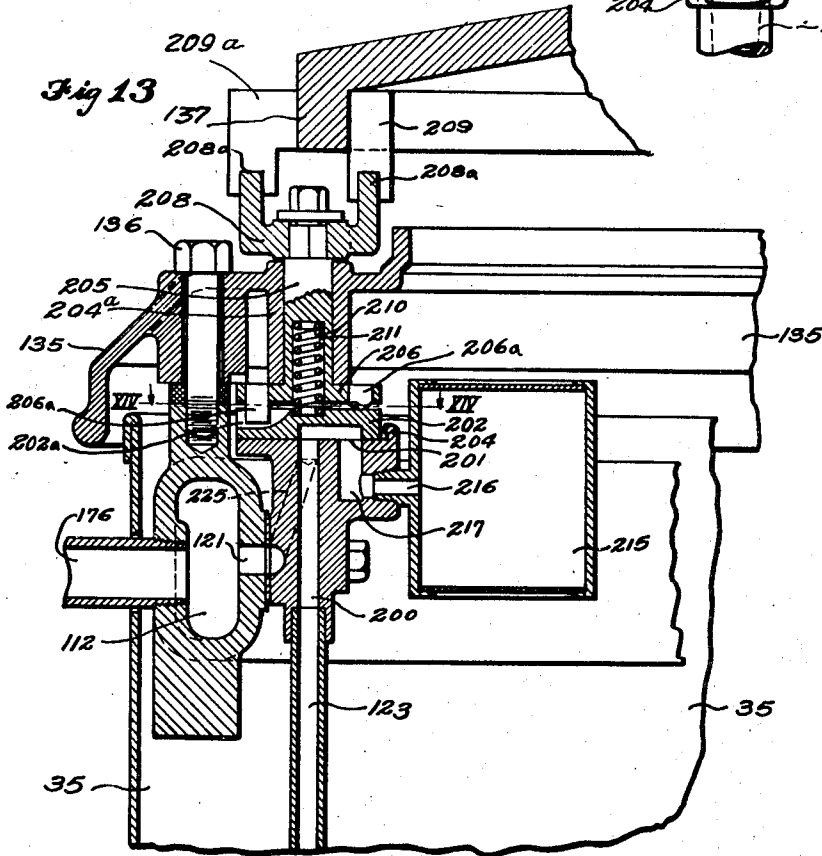


Fig 13

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UNITED STATES PATENT OFFICE

2,428,598

PREVACUUMIZING FILLING MACHINE

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Application August 20, 1941, Serial No. 407,546

6 Claims. (Cl. 228—116)

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This invention relates to prevacuuminizing machines. More particularly, it has reference to machines of that kind referred to in the canning industry as "prevacuuminizing filling machines," and whereby empty cans or cans which have been partly filled may be placed under vacuum to extract air from the can as well as from the contents thereof preparatory to completion of the filling of the prevacuuminized can with a liquid content, such as syrup.

Explanatory to the invention, it will be stated that when a container is being filled with a content that is entirely liquid, it is sometimes desirable to keep the liquid out of contact with air, thus to avoid aeration. Therefore, the containers, before being filled, are exhausted of air. This is generally referred to as "prevacuuminizing."

It is the principal object of this invention to provide a machine for the automatic prevacuuminizing of empty or partly filled containers and an automatic injection of a liquid content to fill the containers to a predetermined level.

It is also an object of this invention to provide a machine, including a plurality of vacuumizing chambers or bells wherein containers are adapted to be lifted and enclosed for prevacuuminization and wherein the condition of vacuum is equally applied both to the outsides and insides of the containers to avoid tendency toward collapse; furthermore, a machine wherein there is a control valve within each chamber for admittance of the liquid content to the container, and which is actuated to open position, after prevacuuminization has been completed, by a predetermined lifting movement of the container in the chamber.

It is a still further object of this invention to insure the filling of each container with its liquid contents to a predetermined level by temporarily sealing the containers and then establishing a definite degree of vacuum therein, referred to as an equalizing pressure, prior to the admittance of liquid.

Another object of this invention is to provide for the prevacuuminizing of the various chambers through passages and ports that are entirely independent of the syruping valve and its passages.

Still another object of the invention is to provide each of the filling heads with a vent passage and a valve in each passage for completing the fill after equalizing pressure has been established in the container.

Other objects of the invention are to be found in the details of construction of its various parts, in their combination, and in their mode of opera-

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tion, as will hereinafter be more fully described.

In accomplishing these and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein—

Fig. 1 is a side view of a prevacuuminizing and syruping machine embodied by the present machine as designed for cans;

Fig. 2 is a central, vertical section of the same;

Fig. 3 is a horizontal section as on line III, III, on Fig. 2;

Fig. 4 is a section detail illustrating the means for adjusting the elevation of the syrup tank, the vacuumizing chambers and valve devices relative to the can supporting pads;

Fig. 5 is a detail of a can supporting pad and a can centering pin mounted thereby;

Fig. 6 is an enlarged sectional detail on the vertical, axial line of one of the filling units;

Fig. 7 is a sectional detail of one of the can pad elevating and lowering means and a detail of the pad assembly;

Fig. 8 is an enlarged, sectional detail showing particularly the syruping and equalizing valves of a unit as associated with a can vacuumizing chamber;

Fig. 9 is a sectional detail of an equalizing valve control means, viewed from the line IX, IX, Fig. 8;

Fig. 10 is an enlarged sectional view of the syruping valve mechanism;

Fig. 11 is an enlarged cross sectional view of a can elevating pad assembly;

Figs. 12a, 12b, 12c and 12d are successive operative views diagrammatically illustrating, by a sequence of views, the positioning of a can in a vacuumizing chamber, the closing of the chamber, and the timed actuation of the vacuumizing valve, the syruping valve, and the equalizing valve; such views also illustrating corresponding developments of the various actuating cams in proper relationship to each other and to the flow control valves for the proper timing of the valves;

Fig. 13 is a cross sectional detail of a modification of the machine for a more definite application of equalizing air;

Fig. 14 is a horizontal section on line XIV, XIV, in Fig. 13;

Fig. 15 is a sectional view showing a modified construction of air measuring chamber.

Before going into a description of the machine, it is thought well to state that the canning industry has, of late years, taken up the prevacuuminizing of cans, both empty cans which receive

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a liquid fill and also cans containing fruit products, such as sliced peaches, pears, pineapple, and the like; the object of prevacuumizing being to prevent aeration of the filling liquid as much as possible and also to remove air from the cells of the fruit and from between the pieces of fruit or solid contents in a can so that these cells and voids may be filled with a prepared syrup or other liquid which it is intended shall add to the flavor of the product as well as act as a preservative therefor.

There have been certain problems encountered in development of automatic machinery for this purpose; namely, the problem of preventing inward flexure or collapse of the walls of a can incident to an application of vacuum to the inside of the can, with a resultant destruction of the can or a decrease in volume which prevented maintaining accuracy in the liquid content level. There has also been a problem in the applying of the syrup to bring it to a level that would insure that no undesirable space would be left in the can, and yet to avoid an overflow, or gushing out of syrup when the cover of the can was applied thereto.

In consideration of these and other problems, applicant has devised a machine in which prevacuumizing of the empty can or the solid content of the can is effected while the can is contained in a chamber, with the vacuum equally applied both to the inside and outside thereof so that it is not subject to any pressure tending to collapse it.

Also a machine wherein each chamber is equipped with an equalizing valve, whereby a certain predetermined condition of vacuum may be established inside the can just prior to opening of the syringing valve so that syrup may flow into the can until the pressure in the can is equal to atmospheric pressure plus the pressure of the head of syrup, thereby to establish a desired liquid level. Following which the filling valve is closed, the vacuum broken, the can unseated from the syringing valve, and the chamber unsealed and the can removed.

Briefly describing the present machine, it comprises conventional means whereby cans, either empty or partially filled with the "solid" content, are delivered successively onto a rotating turret equipped with a plurality of can lifting pads arranged circularly about the axis of rotation and directly below open bottom vacuumizing chambers, or bells. Incident to rotation of the turret, a cam actuates the pads upwardly, thereby lifting the cans into their respective vacuumizing chambers, which are incidentally sealed by the pad housing rim coming into sealing contact with the lower open end of the chamber.

The position of a pad when the can is sealed against the chamber, supports the can with its upper open end spaced from the can-sealing surface of a syringing valve assembly, and while it is in this position, vacuum is established in the chamber, thus equally prevacuumizing the can both inside and outside. Subsequently, the can is moved upwardly a predetermined distance to cause its open end to seal against a closure member, and while thus sealed, the normally closed pressure equalizing valve of this unit is momentarily opened and the vacuum within the can is reduced to that predetermined degree, which, by experiment, has been determined as that necessary to establish the liquid content later admitted into the can at a desired level. Then the syrup admitting valve is opened and the liquid content is allowed to flow into the can.

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While the following description will refer particularly to the prevacuumizing of cans, it is understood that the description would apply to various types of containers, whether cans, bottles, jars, etc., and the use of the word "can" is to be considered as including other types of containers.

Referring more in detail to the drawings—

The cans 1, of the usual type, which are filled, or partially filled with their solid content and open at their upper ends, are delivered to the machine upon the horizontal run of a belt conveyor 2 and are picked up from the belt and spaced and timed in their delivery into the machine by a horizontally disposed and rotatably driven star wheel 3, the points of which operate to move the cans along a curved guide rail 4 and to register them centrally upon the horizontal can supporting pads, designated as 75 in their assembly entires by reference numeral 5. The several assemblies are mounted by a rotating turret 6, and whereby the cans are successively elevated into and lowered from their respective vacuumizing chambers 7; the chambers also being rotatable with the turret, as presently will be described.

The belt conveyor 2, as observed best by reference to Figs. 1 and 3, operates upon a horizontal support 8 between parallel guides, or rails 9—9. The horizontal run is carried at opposite ends of the support over wheels 10 and 11 and from these it extends about a driving sprocket or drum 12 fixed on a shaft 13 which is driven by means presently described.

The cans, after being vacuumized and filled with syrup are delivered from the turret by the coaction of a circularly curved guide rail 15, as seen in Fig. 3, and a star wheel 16 which is synchronized with the rotation of the turret so that the pockets 16a of the wheel receive the cans, and the wheel then operates to push the cans along the rail 15 and deliver them onto a conveyor belt 18 whereby they are carried from the machine and usually are delivered directly to a vacuum seamer whereby the can ends are affixed to the cans under vacuum.

The frame structure of the machine, as best disclosed in Figs. 2 and 3, comprises a horizontal base, or bed, 20 supported at a desirable height by legs 21. Centrally of the base and integral therewith is a tubular standard 22 in which a vertical shaft or axis 23 is rotatably mounted through the mediacy of roller bearings 24 and 25 contained within upper and lower ends, respectively, of the standard 22.

Fixed to the shaft 23, just above the upper end of the standard 22, is the turret 6 of circular form which, about its peripheral portion, is provided with bearings 29 in which tubular guides 30 are vertically fixed; these guides being circularly arranged and equally spaced apart about the vertical axis of rotation of the turret. In the present instance there are fourteen of these tubular guides to accommodate the fourteen syringing units.

Slidably contained in each guide tube 30 is a lifter shaft 31. These shafts extend from the lower ends of their respective tubes and have rollers 32 mounted thereby for travel upon a cam ring 33 which is fixed on the base 20 concentric of the axis of rotation.

The shafts 31 also extend from the upper ends of their respective tubes and each mounts thereon a can supporting pad and housing assembly 5 for the support of a can and sealing of a can chamber. The cam 33 is so designed that, incident to rotation of the turret and travel of the

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rollers 32 along the cam, the pads, in succession, will be lowered to proper level to receive the cans from the conveyer belt 2. Then they will be elevated, thereby to dispose the cans in their respective chambers and to seal the chamber; then, in proper time after prevacuization of the can inside and out, to further elevate the can, while still sealed in the chamber, a definite distance, whereby to seal the can during the pressure equalizing period and finally, by a final upward movement of the can, to open the syring valve, to apply the syrup to the level permitted by the pressure in the can. Finally, the cam lowers the pad to bring the can to discharge level.

Mounted upon the upper end of the axial shaft 23 is a circular tank or reservoir 35 for containing a supply of syrup or other liquid which may be used as the liquid content with which the cans are to be filled. A supply of the syrup is maintained by admittance to the reservoir through a supply pipe 36, equipped with a cut-off valve 37 operated by a float 38 in a manner to maintain a desired and constant level in the reservoir; this being best illustrated in Fig. 2 of the drawings.

Supported from the horizontal bottom wall of the reservoir 35 are the vacuumizing chambers 7, each of which is axially aligned with the corresponding pad mounting shaft 31, and such chamber is slightly longer than the can that is to be located therein. These chambers are open at their lower ends and are secured in air tight joints to the reservoir, and each has a lateral port 40 near its upper end connected by a tube, or conduit 41, with a vacuum applying and cut off control valve 42. The control valves are, in turn, mounted upon and in open communication with a manifold 43 which encircles and is mounted by the axial shaft 23, as seen best in Fig. 2. These valves 42 are individually controlled, as will later be described, to effect the application of vacuum to the chambers in proper timing to effect the prevacuization of the can's contents, prior to application of syrup.

Vacuum is maintained in the manifold 43 by means of a pump, or the like, not shown, but which has a pipe connection 44 leading into a fitting 45 which is secured to the under side of the base 20 and into which the lower end of the shaft 23 extends through a packed gland 46; the shaft 23 being provided with a longitudinal bore 23a opening at its lower end into the fitting 45 and at its upper end opening laterally into the manifold 43.

It will be observed by reference to Fig. 7 that each valve 42 comprises a vertical, cylindrical housing 42a with ports 47 and 48 at different horizontal levels, communicating, respectively, with the tube 41 and with the vacuum manifold 43. In the lower end of the housing 42a is fitted a valve piston 49 that is urged downwardly by pressure of a coiled spring 50 to uncover the ports and thus provide an application of vacuum to the chamber 7. The downward travel of the piston is limited by its seating against a bushing 51 fixed in the lower end of the housing. It is limited in its upward travel by a downwardly facing annular shoulder 52 in the housing against which the upper end of the piston may be seated to close off communication through the housing. To facilitate sealing, the piston has a sealing gasket 53 of rubber or the like fitted in its upper and lower end surfaces.

The means for controlling the action of the valve pistons 49 of the various valves 42 comprises a cam disk 55 that is fixed to the standard 22 and

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which has an annular outwardly opening cam slot 56. Fixed on the turret 6, coaxially aligned with the several valves 42, are guide sleeves 57, and slidably fitted therein for longitudinal shifting, are push rods 58, which, at their lower ends, carry rollers 59, as shown in Fig. 7, adapted to follow within the cam groove. Such groove is so designed that, as the turret revolves, it will actuate the push rods upwardly and downwardly in proper timing for the desired actuation of the valve pistons of the corresponding valves 42. At their upper ends, the push rods are fitted with adjustable stems 60 adapted to be brought into actuating engagement with stems 61 of the corresponding valves 42, which latter stems are slidable in the bushings 51 of the valve housings, and are arranged for actuation of the pistons therein. As will be noted in Fig. 7, the stems 60 are adjustably fixed on caps 62 threaded into the upper ends of sleeves 63 having limited slidable movement longitudinally on the upper ends of the push rods with coiled spring 64 contained within the push rods 58 to retain the sleeves and stems yieldingly extended.

Each of the can supporting pads is vertically movable within the upper portion of the housing shell of assembly 5, of a particular construction, as will now be described; reference being directed particularly to Figs. 6 and 11: Near its upper end, each shaft 31 is formed with an annular collar 65 upon which a spring seating disk 66 is placed; such disk being equipped with an upstanding cylindrical, peripheral flange 66' and formed in its top face with concentric annular spring seating grooves 67 and 68 of different diameters.

Slidably fitted about the upper end portion of the shaft 31 above disk 66 is a sleeve like hub 70 which has limited upward and downward sliding movement on and with the shaft extension 31'; the downward movement being limited by the lower end of the sleeve 70 coming into abutment with the hub portion of disk 66 while the upward movement is limited by the upper end of the sleeve coming into abutment with the extending flange 71' of a plug 71 that is threaded into a coaxial bore 72 in the shaft extension. Normally the sleeve hub is urged to its upper limit by a coiled spring 73 that is placed under compression about shaft extension 31' within an elongated, annular, downwardly opening recess 74 in the sleeve hub 70, with its upper end bearing against the upper end wall of the recess, and its lower end seated in the groove 67 in disk 66.

Fixed upon the upper end of sleeve 70 and within the housing of assembly 5, is a concentric, annular pad 75 on which the rim of a can rests during the can filling operation. This pad is held in proper position by a dowel pin 76 and by a cap 78 that has a tubular shank 78' fitted in the central opening of the pad 75 and threaded into the upper end of the sleeve hub 70, and which also has an annular beveled flange 78a overlying the pad about its central opening. Incidentally this cap 78 serves as a support for the lower end of the can during a filling operation, as in Fig. 6.

It will here be mentioned that each of the can supporting pads 75 is equipped with can positioning studs 80 against which the cans are engaged when entering the machine to center them, and these pins are each equipped, as seen in Figs. 5 and 11 with a notch 80' to receive the double seam of the can end to insure extracting the can from the chamber, when the pad is lowered.

A groove 75' is provided in the surface of pad 75 to allow air passage between the interior of

chamber 7 and the space enclosed within the can rim when the can is at rest on the can pad 7, as in Figs. 6 and 11.

It will be understood that by action of annular cam 33 and rod 31, the assembly 5 within the surrounding housing shell will be successively elevated from the first position of Fig. 12 series to locate the container 1 in sealing relation within the vacuum chamber 7; then to further elevate the container into contact with syrup flow controlling and vacuumizing means; and then upon final upward movement to actuate such means, as hereinafter described. The pad 75 is so connected with sleeve 70 and resiliently mounted with relation to rod 31 by the spring 73 seated in groove 67 as to be moved vertically within the surrounding annular shoulder 85' of the assembly housing.

Such shoulder is in register with and adapted to be brought into sealing engagement with a compressible gasket 86 engaging a groove in the lower end of can receiving chamber 7. As shown disk 66 by its flange 66' fits slidably within the depending skirt of the housing and spring 88 seated in groove 68 tends to urge the housing rim 85' into closing engagement with the gasket 86. Thereafter further upward movement of rod 31, cushioned by spring 73, brings the container to its final stages of elevation.

When a pad assembly 5 is in its lowered position, for example, as seen at the left hand side in Fig. 12a, the pads 75 and shoulders 85' are disposed in the same horizontal level to receive the cans from the delivery belt.

The several chambers within which the cans are received, are each equipped within its upper end with a can sealing cap 90 and syringing valve mechanism which will now be described.

The cap 90 is circular, and is disposed coaxial of the chamber and has an annular downwardly extending sealing gasket 91 fitted therein against which the annular edge of the upper open end of a can is pressed to seal the can while it is enclosed within the chamber. The cap has a hub portion 92 slidably fitted on a fixed tubular stem 93 which, in turn, is threaded at its upper end into a fitting 94 that threads upwardly into an opening 95 through the base wall of the tank 35 containing the syrup.

Surrounding the hub portion of the cap 90 and providing an intermediate annular passage is a compressible sleeve 96 which at its lower end has an air and liquid tight connection with the cap 90, and at its upper end is sealed likewise in the fitting 94 that is threaded into the opening in the base of the syrup tank. The fitting 94 has passages 98 whereby the syrup from the tank may flow into the sleeve 96.

By reference to Fig. 10 it will be observed also that the stem 93 is equipped at its lower end with an annular upwardly facing valve seat 99 and that the side walls of the stem 93 have longitudinal grooves 100 leading to said seat. Also, the hub portion of the cap 90 is adapted to engage said seat in a liquid tight connection to close off flow of syrup to under side of the cap, but when the cap 90 is lifted in the clear of said seat 99, there will be a flow of syrup through the grooves 100 to the under side of the cap and incidentally to the can in the chamber.

A feature of construction is found in the provision of a bell 105 about the upper portion of the stem 93 with its skirt depending about the hub 92 of the cap so that the syrup in flowing to the can must pass downwardly about the lower edge

of the bell, then upwardly, then again downwardly through the grooves 100, as shown by the arrows in Fig. 10.

Another feature of construction is the fitting of a coiled spring 106 about the sleeve 96 to give strength and added resilient resistance to compression of the sleeve.

Referring now to the equalizing valve mechanism as shown in Fig. 6: These several equalizing valves are associated with an annular manifold 112 supported within the tank 35 by a plurality of posts 113. This manifold is connected, through the mediacy of a pressure regulating valve device 115, a pipe 116 and a conduit 117 with the vacuum manifold 43, thus with the manifold 43 under a vacuum, for example of 29 inches, the vacuum in manifold 112 may be reduced to and maintained practically at any lower degree, for example an 18 inch vacuum.

For each chamber 7 there is an equalizing valve comprising a valve housing 120 that is connected by a port 121 with the manifold 112, Fig. 6. In the lower end of the housing 120 is a nipple 122 whereby the housing is connected with a tube 123 leading to the fitting 94 through which it opens to the tubular stem 93. Within the valve housing and below the port 121 is a downwardly facing valve seat 125 and seated thereagainst is a valve 126 urged to seated position by a coiled spring 127.

Extending through the upper end of the housing 120 is a vertical stem 130, equipped at its outer end with a cap 131 against which a coiled spring 132 bears to yieldably hold the stem lifted, and the upper end of the stem is arranged to be engaged by a push rod 134 to depress stem 130 and open valve 126 to equalize pressure in the can. Push rod 134 is carried in an annular support 135 encircling the tank and attached by bolts 136, as shown in Figs. 6 and 8, to the manifold 112. The push rods 134 of the various valve devices are extended for actuation, incident to rotation of the tank, by a stationary cam surface provided by a cam ring 137, supported from the pipe 36 or any other stationary support which might be a part of the main frame structure. When a valve 126 is actuated to open position, it effects a communicating passage between the manifold 112 and interior of the can, thus to reduce the degree of vacuum in the can to that of the manifold. This reduction of degree of vacuum is determined by experiment to arrive at that necessary to establish the desired level of liquid in a can.

As shown in Fig. 9, the upper ends of the push rods 134 have pin and slot connections as at 139 with horizontal levers 140, which in turn are pivotally fixed, as at 141 to brackets 142 on the annular support 135, with springs 144 urging the lever upwardly to hold a roller 145 on the lever in position for engagement with the cam surface 137 whereby the stems are actuated.

The vacuum reducing valve 115 may be of any suitable character. As here shown it comprises a housing containing a dividing diaphragm 150. Under the lower side of the diaphragm the housing has connection with pipe 116 and has a port or ports 151a in circulation with port 151 opening into manifold 112. The diaphragm is yieldingly held against inward flexing under influence of vacuum by a spring 155 acting against a nut 156 on a bolt 157 attached to the diaphragm. A valve 168 is under control of the diaphragm to open or close a port 169 in the valve for connecting the valve housing with pipe 116, thus the degree of

vacuum in the valve housing is determined by the tension of the spring and the degree of vacuum maintained in the manifold 43. The upper side of the diaphragm is subject to atmospheric pressure through vent ports 115a.

There is also shown in Fig. 6 an automatic vacuum relief valve comprising a housing 175 connected by a pipe 176 with the manifold 112. In the housing 175 is a valve seat 177 to which a valve 178 is fitted. A spring 179, or a weight if preferred, acting against a nut 180 on the valve stem 181 yieldingly holds the valve seated against admittance of outside air to the manifold 112. However, should there be an increase of vacuum in the manifold above that for which the regulating valve is set, then the valve 178 will open and admit air around and through perforated yoke 180a to compensate for such increase and bring the condition in the manifold back to that desired.

The complete cycle of the can passing through the machine for prevacuizing and filling is shown in Figs. 12a, 12b, 12c and 12d.

Fig. 12a shows the can in position preparatory to rising to the vacuumizing chamber. Lifter 31 is actuated by cam rise 33a bringing the can into position as shown in Fig. 12b. As soon as the can reaches this position which is at the top of rise 33a, the vacuumizing valve 42 is actuated by lowering step 55a which vacuumizes the chamber and can. When lifter 31 reaches step 33b, as in Fig. 12c, the can is raised within the chamber and the open end seals on the sealing pad 91. Immediately the end of rise 33b is reached, the end of rise 55b is also reached, and the vacuumizing valve 42 is in a central or neutral position; that is, the vacuum manifold 43 is closed but the vacuum in manifold 43 is held inasmuch as the passageway through the valve 42 to atmospheric pressure is not yet opened. Valve 42 is held in this neutral position until it reaches rise 55c. At the same time lifter 31 reaches the end of rise 33b, equalizing valve 120 is actuated by cam 137, and valve 120 is moved into open position by rise 137a, as in Fig. 12c. This last described position of the can is held until the start of rise 33c, at which position the rise 55c and receded face 137b are reached. While lifter 31 is being actuated by 33c, the vacuumizing valve 42 is actuated so as to allow atmospheric pressure to again be established in the chamber 7. Equalizing valve 120 is closed by receded face 137b, as in Fig. 12d, during horizontal continuation of rise 33c so that it is closed just before the syrup valve is opened by the rise 33c. After the can has been properly charged with syrup, it is then lowered from the chamber by receding cam face 33d.

The rotation of the turret 6 is accomplished by means of a driver shaft 185 that mounts a bevel gear 186 in driving mesh with a ring gear 187 fixed to the turret 6 as shown best in Figs. 2 and 7. Also, a gear 188 on shaft 185 drives a gear 189 on shaft 13 whereby the conveyer 2 is operated. It will be understood that the star wheels would be driven by geared connections with other driven parts as may be found convenient.

Another feature of construction is found in the cap 78 associated with the pad assembly and which underlies the base or bottom end of each of the cans that is placed upon the pad 75 preparatory to the vacuumizing operation. This cap is beveled about its edges so as not to interfere with the sliding of the cans into and from

position and its height is such that it will engage with and will operate to support the lower end wall of the can against outward bulging that might result from differences in pressure inside and outside the can.

Assuming the machine to be so constructed, its operation, briefly reviewed, and considered in the light of the showing of parts in Figs. 12a, 12b, 12c and 12d, is as follows:

The cans 1 filled to the desired extent with their solid content, or empty, are delivered successively to the machine upon the conveyer belt 2 and are picked up and moved in proper timing onto the pads 5 by star wheel 3.

Incident to a continued rotation of the turret upon which the assemblies 5 are supported, the rollers 32 on the lower ends of the pad supporting shafts 31 travel up the rise 33a of cam 33 and the cans are elevated into their respective vacuumizing chambers 7 and the chambers are sealed by the closing of the pad members 85' against their lower ends and sealing gaskets 86. Subsequent to the sealing of a chamber, the vacuumizing valve 42 corresponding thereto is actuated from closed position, as shown at the left in Fig. 12a, to open position, as in the next right hand view, 12b. This is effected by the drop 55a of cam 55 with the result that the can and chamber 7 are thereby prevacuized. Following this prevacuizing of the can, it is elevated slightly to bring its upper end into sealing contact with the sealing gasket 91 of the syringing valve cap 90. This slight elevation, which seals the can but does not open the syrup valve, is by reason of the cam roller 32 moving up a slight rise on cam 33, designated at 33b in Fig. 12c. Immediately following this sealing of the can, the equalizing valve 120 for that chamber is actuated through the mediacy of the corresponding push rod 134 actuated by a drop 137a of the cam 137, thereby to relieve the extent of vacuum within the interior of the can from substantially a 29-inch vacuum to an 18-inch vacuum. Immediately before the valve is actuated by cam rise 137a, the rise 55b on cam 55 lifts the plunger 49 of valve 42 to neutral position and holds it there. On closing of the equalizing valve there is another upward movement of the can effected by means of the cam roller 32 passing up another rise 33c of cam 33 and this movement unseats the syringing valve, allowing the syrup to flow into the can until the pressure within the can is equal to atmospheric pressure plus the pressure of the head of syrup, as in Fig. 12d.

It will be understood that incident to the lifting operations of the can, and the sealing thereof in the chamber, the two springs 73 and 88 in the pad assembly 5 will be compressed; the outer spring 88 tightly retaining the pad shoulder member 85' against the lower end of the chamber 7 and the inner spring 73 urging the inner pad 75 upwardly. When the can is held sealed against the gasket 91, it is observed that, by reason of the spring 73 being weaker than the outer spring 88 and the compression sleeve 96 encircling the filling valve, the normal space between the lower end of the hub sleeve 70 and the spring disk 66, as designated by reference numeral X in Fig. 11, will be partially closed. The final upward movement of the shaft 31, under the influence of the cam 33, first closes the space "X" and then the closure or cap 90 is positively lifted and this compresses the sleeve 96 sufficiently to unseat the syringing valve.

When the syringing valve is thus opened, the

syrup will flow from the tank 35 through the ports 98 in the fitting 94, thence downwardly about the skirt portion of the bell 105, then upwardly into the bell over the hub portion 92 of the cap 90, then downwardly through the slots 100 past the valve seat and into the can; as will be understood by reference to the arrows along this path in Fig. 10. This particular arrangement of parts forms a passage that operates as an air trap and prevents air bubbling up through the syrup and preventing overfilling the can with syrup.

To accommodate cans of different height, the tank 35, which supports the chambers 7 and the valve devices, is bodily adjustable up or down on its supporting standard 23. This adjustment is accomplished by means shown in Fig. 4, wherein it is shown that the tank 35 has a central supporting hub 35a slidably keyed to shaft 23 and adapted to be clamped at any position of adjustment.

In Figs. 13 and 14 I have illustrated a modification of the equalizing valve construction. In this particular modification, the amount of air admitted to the prevacuimizing cans prior to the filling operation is accurately measured. Fig. 13 illustrates the vertical tube 123 leading upwardly from the can closure cap as being connected into a vertical channel 200 leading to a valve seat 201 upon which a valve disk 202 is revolvably fitted. The disk is coaxial of the passage 200, and it is mounted for rotation between lugs 204 which extend upwardly from and around the valve seat. Revolvably mounted in a bearing 204a that is located directly above each of the valve disks is a vertical shaft 205 which, at its lower end, has a disk-like flange 206 seated against the lower end of the bearing 204a, and at its upper end has a hub 208 fixed thereto. The hub 208 has upstanding teeth 208a adapted to contact with stops 209 and 209a that may be fixed to the stationary cam member 137 so as to periodically oscillate the shaft 205.

A coiled spring 210 is contained within a vertical bore 211 in the lower end of the shaft 205, and this spring bears downwardly against the valve disk 202 to hold it seated in a manner to effect an air-tight connection between the valve and its seat.

Associated with each of the valves for the several vacuumizing chambers is a measuring cylinder 215 which is connected through an outlet 216 with a channel 217 leading to the valve seat. In its under face the valve disk 202 is provided with an arcuate channel 220 which extends through an arc of 90° and is also provided with a radial channel 221. The inner end of the radial channel at all times is in communication at one end with the upper end of the channel 200, and, incident to rotation of the valve, is periodically brought into registration with the channel 217, thereby to effect a connection between the chamber 215 and the channel 200 for the reduction of vacuum in the can. There is also a channel 225 opening into the annular vacuumized chamber 112, and to the seat 201, so that periodically the arcuate channel 220 will effect a connection between the chamber 215 and the vacuumized chamber 112.

With this construction, hub 208 will effect a rotative action of the disk valve 202 through the mediacy of the studs 206a depending from flange 206 and engaging in slots 202a in valve disk 202 in such manner that, during each cycle of operation, the chamber 215 will be connected with the chamber 112 and will receive a certain amount of

air. Then, after a can has been prevacuimized and sealed, the valve 202 will effect a connection between the can and the chamber 215. This will admit a definite amount of air to the can, which is dependent upon the volume of the chamber 215 and the degree of vacuum in the chamber 112. Then, after an equalization has been effected in the can, the valve 202 will close, and finally during the operation, will again recharge the chamber 215.

It may be desirable to equip the cylinder 215 with any suitable means which would be adjustable therein to vary the effective volume of the cylinder and which might be regulated accordingly.

For such purpose I show in Fig. 15 a modified construction in which the chamber 215a is similarly connected by port 216 with channel 217, and in which the effective volume of the cylinder, as indicated at 221, may be varied at will by a series of variable depth washers 222, or other suitable fillers, as desired.

Having thus described my invention, what I claim as new therein and desire to secure by Letters Patent is—

1. In a machine of the character described, a reservoir, a vacuumizing chamber below the reservoir, a movable pad for supporting an open can in the chamber for vacuumization, a valve mechanism within the chamber comprising a mounting stem formed at its lower end with an encircling, upwardly facing valve seat and having an outer and an inner channel longitudinally thereof leading to the seat, a depending apron surrounding the stem providing circulation to the inner channel, a can closure cap formed with a hub portion slidably mounted on the stem to engage the seat as a closure for the valve, a tubular sleeve of resilient material surrounding the stem and said valve mechanism and having interior communication at its upper end with the reservoir and having sealed connection at its lower end with the cap and providing for flow of liquid from the reservoir into said channels of said stem, and means for lifting the can pad to raise the can into sealed contact with the cap and a farther distance to compress the resilient sleeve thereby to lift the hub portion of the cap from the valve shoulder for admittance of liquid to the can while it is sealed.

2. A prevacuimizing filling machine as in claim 1 wherein the said mounting stem has a channel therein opening at one end to the under side of the cap and at its outer end has connection with a source of reduced vacuum, and a valve is provided for controlling the applying of such vacuum to the interior of the sealed can through said channel.

3. A machine of the character described, comprising a base, a rotary turret, a reservoir, and a plurality of vacuumizing chambers rotatable with the turret, a source of vacuum of relatively high degree having a connection with each chamber, a pressure regulating control valve for each connection, a can closure cap in each chamber, a normally closed filling valve in each chamber connected with the reservoir and associated with the corresponding cap for operation to open position thereby, movable pads mounted by the turret on which cans may be placed, a cam fixed to the base and operable, as the turret rotates, to actuate the pads to lift the cans thereon into the chambers for vacuumization, and then a farther distance for sealing against the caps therein, and then a farther distance for actuation of their

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filling valves to open position and finally to lower the cans first to close the filling valve, then to unseal the can and then to remove it from the chamber, a manifold in which has been introduced a vacuum of lesser degree than that first mentioned, means for admitting said lesser vacuum to the cans while sealed, and before the filling valves are opened, and a cam for actuating the vacuumizing valves for the chambers.

4. In a prevacuumizing and filling machine, a vacuumizing chamber having a base opening, a can support movable to convey a can thereon into and from the chamber through said opening, means for sealing the chamber, a source of vacuum of relatively high degree, means operable to effect an application of said vacuum to the chamber to equally affect the inside and outside of the can, a source of supply of liquid, a yieldably mounted closure means for the can located inside the chamber, means for lifting the can against the closure means to temporarily seal the can, a manifold in which has been introduced a vacuum of lesser degree, means connecting said source of reduced vacuum with the can through said closure means, a valve in said connection, means operable to open said valve, a valve passage connecting the source of liquid with a can through said closure means, and operable to open position by yielding of the closure means under pressure applied through the can and can support.

5. A prevacuumizing filling machine as in claim 1 wherein the apron mounted about the stem extends downwardly and beyond the upper end of the cap hub to provide a trap to prevent escape of air from the can incident to its filling.

6. In a machine of the character described, a

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vacuumizing chamber having a base opening, a reservoir for a filling liquid, a can closure cap in the chamber, a normally closed filling valve connected with the reservoir and associated with the cap for operation to open position thereby, a resilient sleeve assembly between the reservoir and the closure cap surrounding the filling valve, a movable pad on which a can may be supported, a progressively acting cam for moving the support an initial distance to lift a can thereon into the chamber for vacuumization, and a farther distance for disposing it against said closure cap for temporary sealing, and a still farther distance for actuating the filling valve for admittance of liquid into the sealed can; said pad including means for sealing the chamber opening incident to the first lifting action of the cam.

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