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(54) Improved filling valve for counterpressure filling of cans.

(57) An improved counterpressure filling valve for filling cans is disclosed which features formation of a seal between the valve and of the cylindrical inner neck portion of the can. The relative location of the O-ring forming the seal and the ball check valve terminating flow of product into the can is such that relative motion of the can with respect to the valve after filling without breaking of the seal is possible, whereby the volume of gas in the head space volume of the can is increased sufficiently that no additional snift valve is required.

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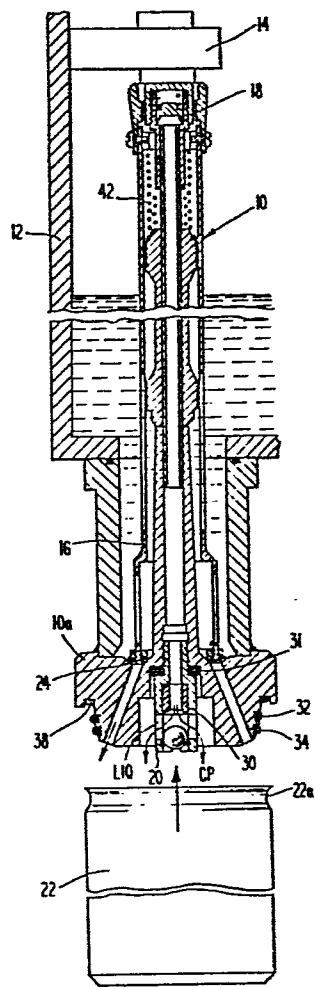


Fig. 1

IMPROVED FILLING VALVE FOR COUNTERPRESSURE
FILLING OF CANS

Field of the Invention

This invention relates to improved valves for use in connection with filling of cans with carbonated beverages or the like. More particularly, the invention relates to a
5 filling valve for use in filling of cans with carbonated beverages in which the seal between the valve and the can, which is essential for filling, is made around the inner periphery of the open end of the can rather than directly on its end, so that endloading of the can and the tendency towards
10 consequent destruction of the can is minimized.

Background of the Invention

Continued economic pressure in the marketplace for cans for the containment of carbonated beverages and the like has led to lighter and lighter weight construction of beverage
15 cans. In particular, the side walls of the cans now being manufactured are thinner than ever and are consequently less durable. Difficulty is particularly encountered in counter-pressure filling of cans, according to which the can is first filled with pressurized gas, and then with the carbonated
20 liquid, so that the carbonation of the liquid does not escape upon filling. This requires that the can be sealed to the counterpressure filling valve. This is typically done by simply pressing the open end of the can into engagement with a circular resilient sealing member. However, the endloading
25 required to effect a good seal of the counterpressure gas, which is usually at about 40 psi, is substantial, on the order of a hundred pounds. Accordingly, some percentage of the cans

is ordinarily crushed. With the trend towards lighter and lighter can construction, this percentage can be expected to increase. The substantial endloading also leads to flaws in the can flange, which can prevent a leakproof seal of the can
5 when the can end is subsequently added.

A need therefore exists in the art for a counter-pressure filling valve which will provide a good seal against the escape of the counterpressure gas and the carbonated liquid, in which significant endloading of the can is not
10 required to make the seal.

As is well understood in the art, after filling of a can with a carbonated liquid, the head space at the top of the can, i.e., that portion of the can which is not filled with liquid, is filled with compressed gas. This must be vented to
15 atmosphere in a so-called "snift" operation prior to removal of the can from the valve if excessive foaming and loss of product is to be avoided. In the valve shown in copending application Serial No. 325,289, this problem is solved by relative movement of the can with respect to the valve prior to cessation of the
20 seal therebetween, such that the head space is increased sufficiently that no snift valve or the like is required.

It is an object of the present invention to preserve this feature of the invention shown in the copending application, while forming the seal between the valve and the
25 can without excess endloading, again so that the number of cans destroyed in the canning operation is reduced.

Objects of the Invention

Accordingly, it is an object of the invention to provide an improved valve for the filling of cans with

carbonated beverages in which the frequency of damage or destruction of the cans is reduced.

It is a further object of the invention to provide an improved valve for the filling of cans with carbonated liquids in which a seal is effected between the valve and the inner wall of the can at its open end whereby endloading of the can to form a seal is avoided.

It is a further object of the invention to provide a valve for the filling of cans with carbonated liquid in which no snift valve for venting the head space of the can after filling is required.

Summary of the Invention

The above mentioned needs of the art and objects of the invention are satisfied by the present invention which provides a filling valve in which the seal between the valve and a can to be filled with carbonated beverage is effected between the inner surface of the can at its open end and an O-ring disposed about a valve member. In the preferred embodiment, two concentric, axially spaced O-rings are used; one is slightly smaller than the diameter of the inside of the can, and provides a guide for the can, which is sealed to a slightly larger O-ring spaced axially along the valve body away from the smaller O-ring, so that upon bringing the can into engagement with the valve, the can end first passes over the guide O-ring and then forms a seal with the sealing O-ring. Cans are now made according to industry standard with a cylindrical neck portion of invariant diameter at their open ends. The invention utilizes this fact by providing a valve with a sealing O-ring which interacts with the inner surface of the neck portion. The fact that the cylindrical neck portion

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extends some distance axially along the can allows the can to be moved that distance with respect to the valve after filling without breaking the seal. Accordingly, the head space volume expands after filling, which eliminates the need for a snift valve or the like.

Brief Description of the Drawings

The invention will be better understood if reference is made to the accompanying drawings, in which:

Fig. 1 shows a view of the valve; and

10 Figs. 2 through 4 show the end of the valve at varying stages in the can filling operation.

Description of the Preferred Embodiment

Fig. 1 shows a cross-sectional view of the valve according to the invention. The valve 10 is shown within a tank 12 which, as is conventional in the art, is filled with the liquid to be canned; above the liquid is a gas at elevated pressure, typically, nitrogen or carbon dioxide at 40 - 45 psi. The valve 10 is operated by a conventional cam member 14. The construction and operation of the cam and of the valve are generally as described in commonly assigned U.S. Patent 4,089,353 to Antonelli. As it will be explained in further detail in connection with Figs. 2 through 4 below, the valve 10 comprises two relatively movable valve members 16 and 18. Upon actuation of the valve member 18 by the cam 14, counterpressure gas is permitted to flow down through the center of the valve, out around a check valve ball 20 and into the can 22, as indicated by the arrows marked CP. Upon actuation of the second valve member 16, by the action of compression spring 42, the seal formed between a resilient member 24 and the body 10a

of the valve 10 is broken, allowing liquid to flow downwardly around the valve member 24 and into the can 22 as indicated by arrows marked LIQ. At the same time counterpressure gas flows back upwardly through the center of the valve. When the liquid level raises the relatively buoyant ball 28 of the ball check valve 20, a seal is formed between the ball 28 and a resilient sealing member 30, preventing the expulsion of further counterpressure gas and influx of liquid into the can. As shown, the ball check valve housing 20 is threadedly connected to the body of the valve 10. The number of spacers 31 interposed therebetween may be varied to adjust the relative volume of the head space remaining in the can after the ball check valve has caused filling to cease. The remaining volume is selected so that when the can is allowed to drop away from the valve 10 after being filled, its head space volume increases proportionally so that the pressure of the gas in the head space is reduced to atmospheric or thereabouts. Since the counterpressure gas is typically at 45 psi, this requires a 3:1 increase in the volume of the head space; clearly if canning is carried out at higher altitudes this volume will typically be increased to compensate for the lower atmospheric pressure at these altitudes. The spacers are also used to set the level of product in the cans.

It will be observed from Fig. 1 and as shown in Figs. 2 through 4 that two O-ring seals 32 and 34 are provided. They are of slightly different diameter; the O-ring 34 disposed more toward the end of the valve is smaller, and acts as a guide to center the can on the valve as the can is raised into engagement therewith by conventional lifters (not shown). The other O-ring 32 is used to seal the valve to the can by fitting tightly into the generally cylindrical neck portion 22a of the

can 22. The industry standards defining the shape of the can provide that the cylindrical neck portion 22a is at least about 0.180 inches long in most industry standard cans. This cylindrical surface allows relative motion of the valve with respect to the can without breaking the seal formed therewith by the larger O-ring 32, which allows expansion of the head space after filling so as to provide equalization of the counterpressure gas to atmospheric pressure without a snift valve or the like.

As mentioned the two O-rings 32 and 34 are slightly different in diameters. The O-ring 34 located towards the nether end of the valve according to the invention is slightly smaller, typically two millimeters less in diameter than the larger O-ring 32. In this way, the smaller O-ring 34 provides a guide function, insuring that the can flange is correctly positioned, concentric with the valve, upon raising of the can into contact with the valve for filling. The smaller O-ring 34 also prevents contact of the inner surface of the can and the metal of the valve body, so that the inner sealing surface is not scratched or damaged in filling. In the preferred embodiment the O-rings are standard parts and fit into grooves in the valve body sized as specified by the O-ring manufacturers, to insure a good seal. The precise O-ring size chosen will vary in accordance with the cans to be filled.

In Fig. 1 there is shown an additional resilient member 38, which contacts the flange of the can 22. However, it should be appreciated that according to the present invention this member 38 is not required to provide a adequate gas-tight seal between the valve 10 and the can 22, that function being provided by O-ring 32, but instead is merely provided as a bumper or travel limiter, insuring that the

O-ring 32 remains in contact with the cylindrical neck portion 22a of the can 22.

Figs. 2 through 4 show stages in the filling of a can with the valve according to the invention. Fig. 2 shows the can having been lifted into engagement with the valve of the invention; as shown the ball check valve 28 is resting downwardly and the valve member 24 is closed. As the can moves upwardly it first encounters the smaller O-ring 34 which helps guide it over the larger sealing O-ring 32 until it reaches the position shown in Fig. 2. Subsequently, when the upper valve 18 is opened by the cam 14 (Fig. 1), counterpressure gas flows down the center of the tube and out around the check valve ball 28 into the can as shown by the arrows marked CP in Fig. 2. Subsequently, the cam allows the second valve member 24 to be lifted by spring 42 (Fig. 1) as shown in Fig. 3, and liquid flows into the can, through a number of ports in the valve head 10a as shown by the arrows marked LIQ. The counterpressure gas flows upwardly out of the can as indicated by the arrow marked CP. Eventually the liquid level reaches the point shown in Fig. 3, when the buoyant ball 28 of the check valve is moved upwardly against the sealing member 30, ending the flow of counterpressurized gas upwardly up the center of the valve, which in turn prevents further liquid from entering the can. It will be understood by those skilled in the art that as the gas and liquid are in the same tank, as shown in Fig. 1, their pressures are equal and hence liquid flow stops when gas no longer can escape from the can. It will also be appreciated by those skilled in the art that this method of shutting off liquid flow is positive and accurate, as discussed in the Antonelli patent 4,089,353 mentioned above, unlike certain prior art methods of ending liquid flow in canning operations,

e.g., using the surface tension of the liquid in conjunction with a capillary screen placed in the liquid flow path, or the like.

After filling the conventional lifters (not shown)
5 allow the can the drop away from the valve. Fig. 4 shows the can moving away from the valve while the seal between the neck of the can and O-ring is maintained. At this point the upper valve 18 has been shut by the cam 14 so that the volume of the head space in the can is increased as the can moves down away
10 from the valve, as shown in Fig. 4. This allows the compressed gas confined above the liquid in the valve 10 to expand until its pressure is substantially equal to atmospheric pressure, preventing excessive foaming of the liquid when the can moves fully out of engagement with the valve, preparatory to being
15 capped in the conventional fashion. As shown in Fig. 4, the sealing member 24 has also been reseated on the valve body (by the cam 14 of Fig. 1) so as to prevent escape of the liquid upon the can being removed from the valve.

It will be appreciated by those skilled in the art
20 that there has been described a novel valve for counterpressure filling of containers with carbonated liquids and the like, in which the seal between the valve and the can, essential for proper counterpressure filling of cans, is made between the valve and a generally cylindrical inner surface of the can,
25 thus avoiding high endloads associated with end-effected seals, and minimizing can crushing and flange damage, thus tending to improve reliability of the canning operation.

While a preferred embodiment of the invention has been described, it should not be construed to be limited thereby,
30 but only by the following claims.

C L A I M S
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1. A valve for the counterpressure filling of cans with carbonated liquids, said cans being formed to have a generally cylindrical inner surface extending over at least a part of their length in the vicinity of an open end of the can, 5 wherein said valve comprises seal means sized to fit in sealing engagement with said cylindrical inner surface of said can, whereby said can may be effectively sealed to said valve for filling without excessive endloading on said can.

2. The valve of claim 1, wherein said seal means is an O-ring.

3. Apparatus for the filling of cans of the type having a generally cylindrical inner surface disposed near an open end thereof, comprising:

5 seal means having a circular sealing surface sized to engage said cylindrical surface of said can;

means for moving said can into a filling position in sealing engagement with said seal means;

first valve means for supplying counterpressurizing gas to said can;

10 second valve means for admitting carbonated liquid to said can;

means for terminating flow of said liquid into said can when a predetermined level of liquid in the can has been reached;

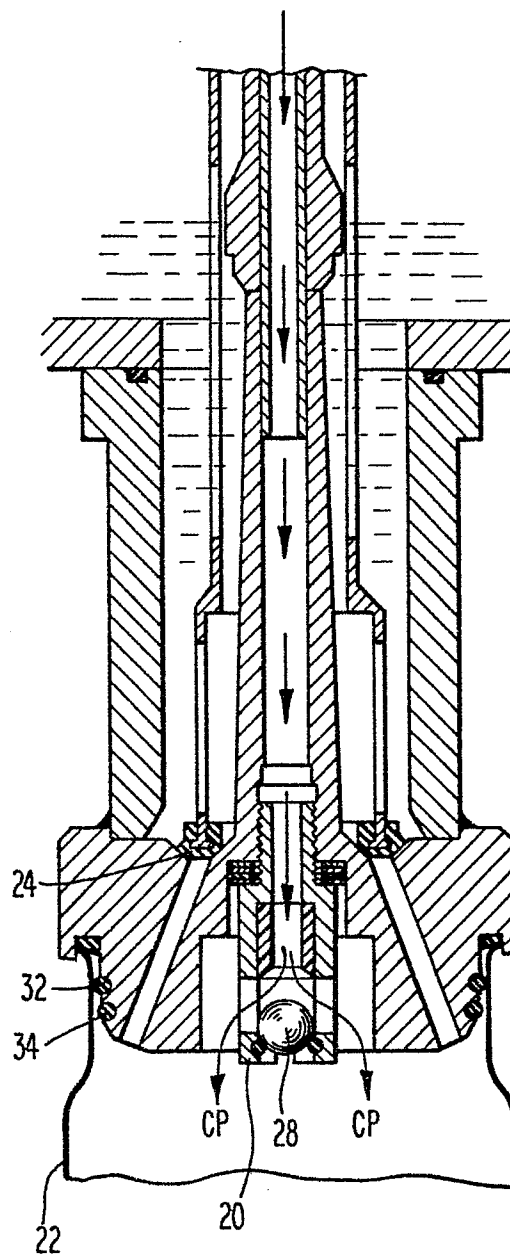
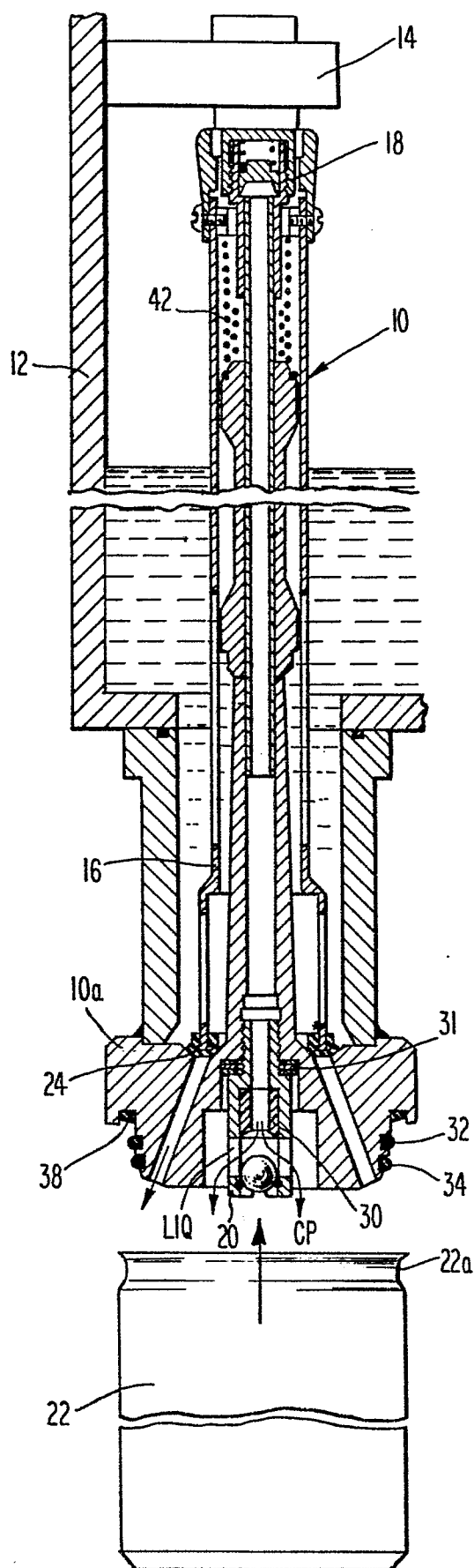
15 means for removing the can from the seal and valve means when said level has been reached;

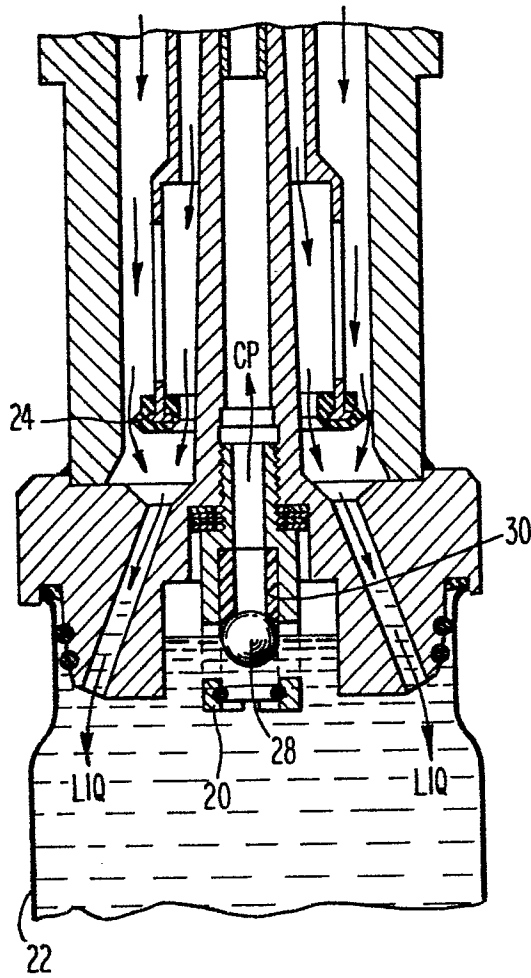
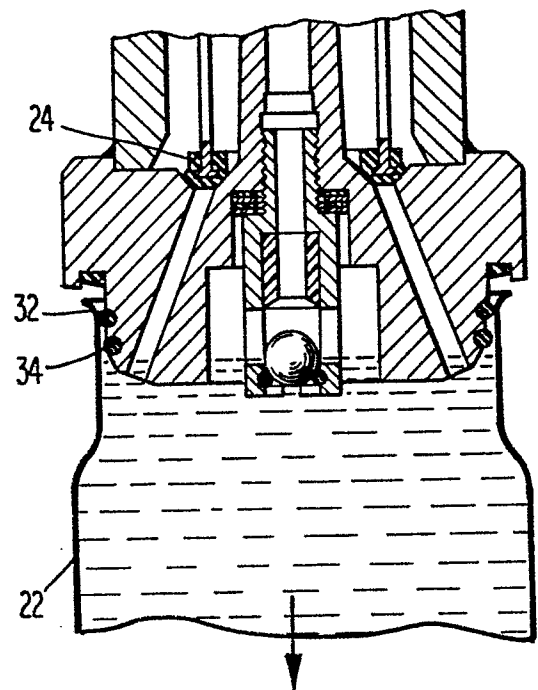
means defining the internal volume of the head space of said can upon filling to said predetermined level; and

20 wherein said means sealing said valve to said cylindrical inner surface of the can is situated with respect to said cylindrical surface when the can is in said filling position such that said can may be moved while remaining sealed to said valve a distance such that the head space volume is increased sufficiently that the pressure of gas in the head
25 space volume is substantially equal to atmospheric pressure.

4. The apparatus of claim 3 wherein said seal means is an O-ring.

5. The apparatus of claim 4 comprising a second O-ring smaller than the O-ring providing the seal between said can and said valve, said second smaller O-ring being spaced axially along said valve body and concentric with said larger
5 O-ring whereby said second O-ring provides a guide for said can upon being raised upwardly into engagement with said first larger O-ring, and prevents scratching of the cylindrical inner surface by the body of the valve, in which said O-rings are carried.

**Fig. 2****Fig. 1**

***Fig. 3******Fig. 4***



DOCUMENTS CONSIDERED TO BE RELEVANT			EP 84201799.8
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	EP - A2 - 0 080 774 (CROWN CORK & SEAL COMPANY, INC.) * Page 13, line 34 - page 14, lines 7,26-36; fig. 5a,5b *	1-4	B 67 C 3/08
Y	--	5	
Y	FR - A - 1 016 065 (BUROTT0) * Page 1, right column, paragraph 6; fig. 1,3 *	5	
A	AT - B - 18 495 (FILTER- & BRAU-TECHNISCHE MASCHINENFABRIK ACT.-GES.) * Claim 2; fig. 1-3 *		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			B 65 B 3/00 B 65 D 53/00 B 67 C 3/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 30-04-1985	Examiner TROJAN
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	