May 13, 1969 B. G. COPPING ET AL 3,443,608

APPARATUS FOR FILLING CONTAINERS WITH BEVERAGES

Filed Oct. 22, 1965 Sheet 1 of 4

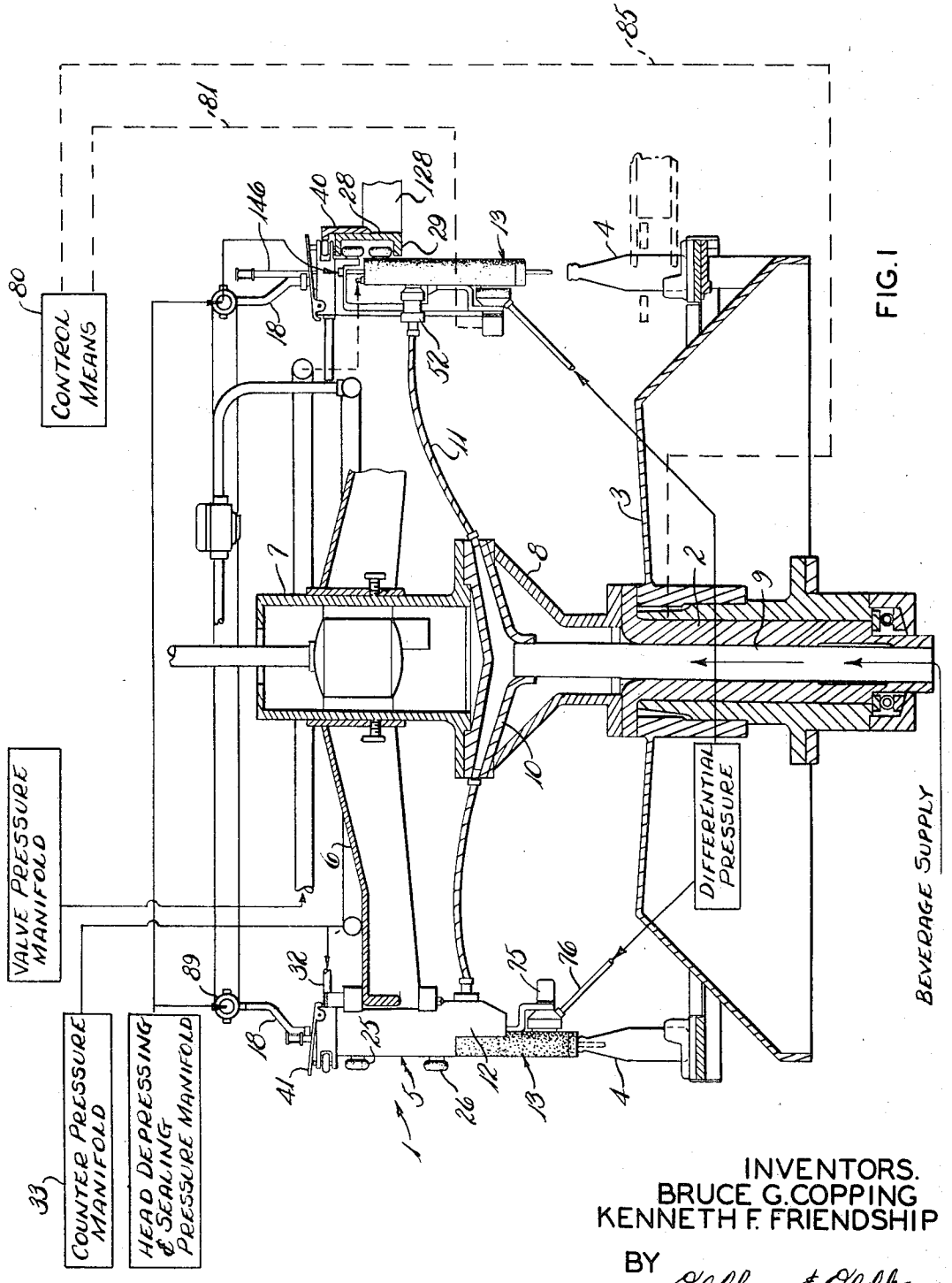

FIG. 1

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APPARATUS FOR FILLING CONTAINERS WITH BEVERAGES

Filed Oct. 22, 1965 Sheet 2 of 4

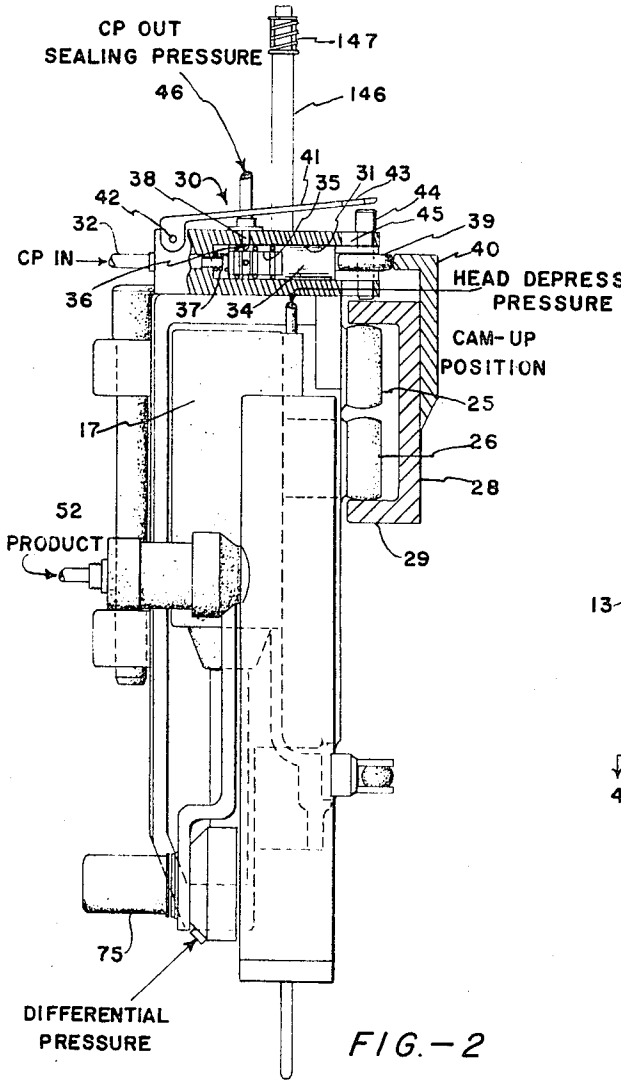

FIG.-2

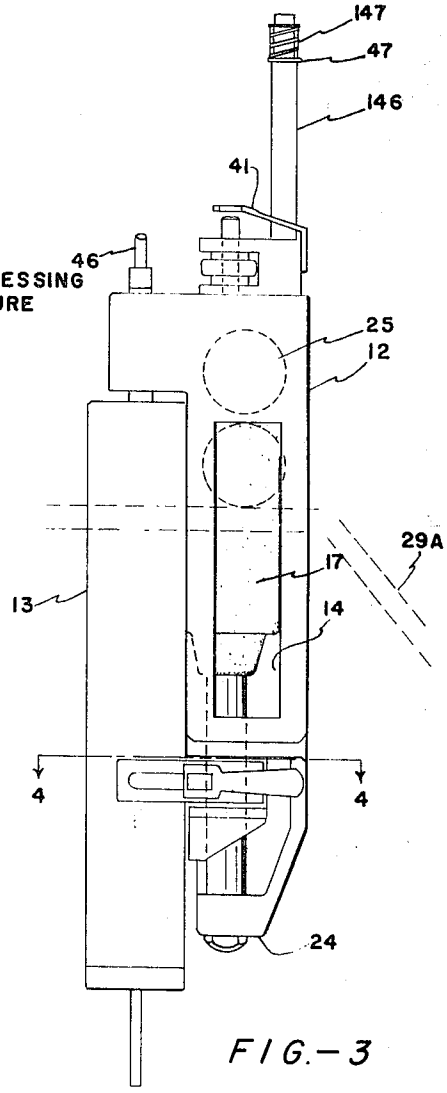

FIG.-3

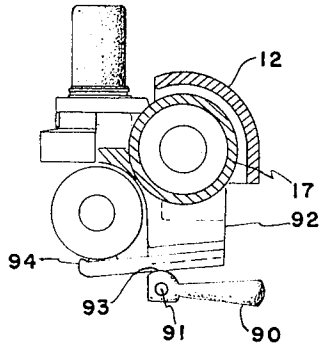

FIG.-4

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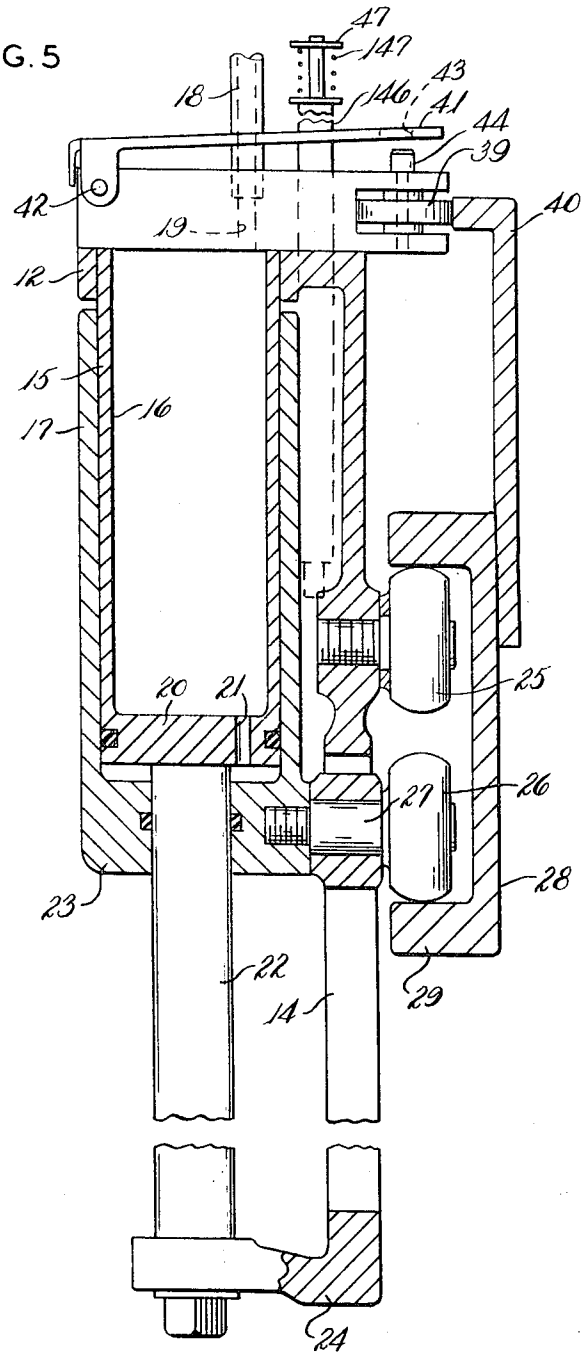
APPARATUS FOR FILLING CONTAINERS WITH BEVERAGES

FIG. 5



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APPARATUS FOR FILLING CONTAINERS WITH BEVERAGES

Filed Oct. 22, 1965 Sheet 4 of 4

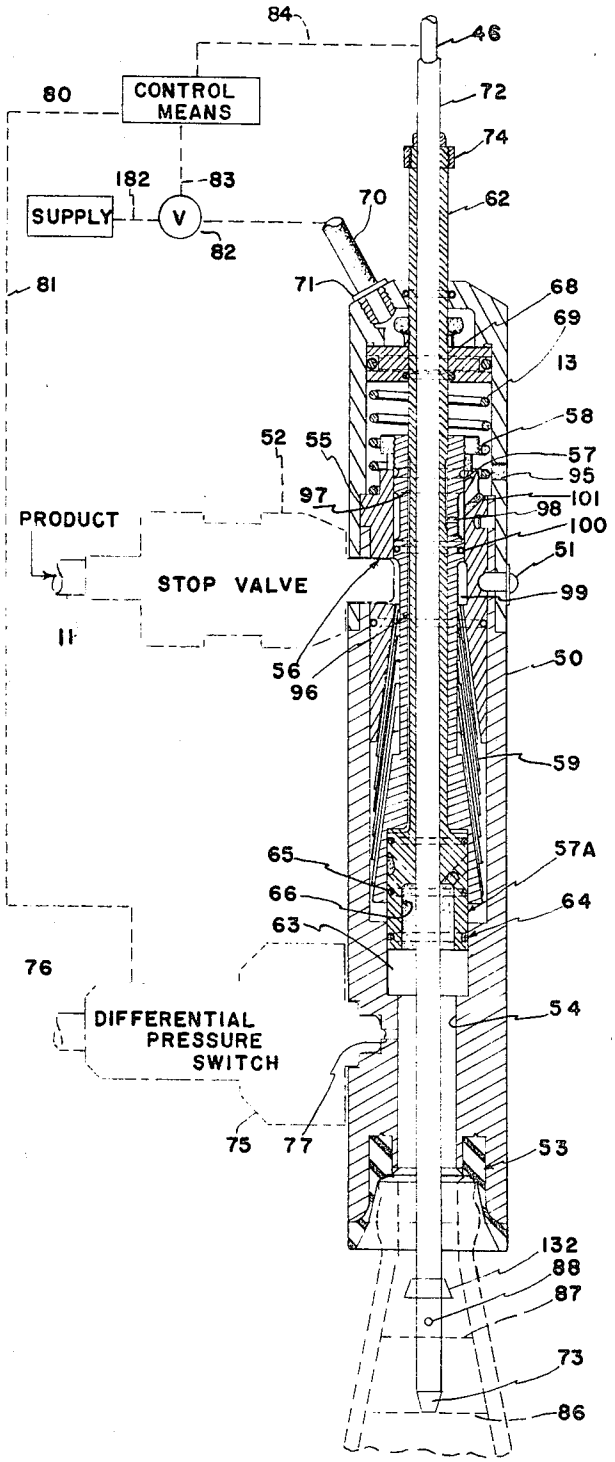

FIG.-6

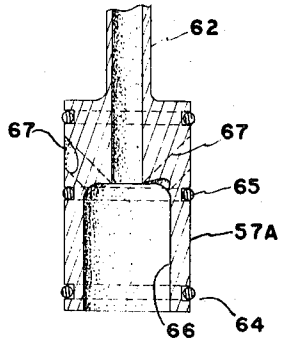

FIG.-7

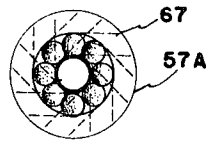

FIG.-8

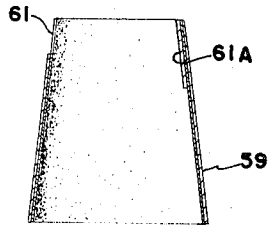

FIG.-9

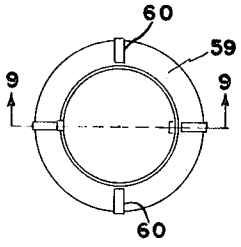

FIG.-10

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3,443,608

APPARATUS FOR FILLING CONTAINERS WITH BEVERAGES

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Filed Oct. 22, 1965, Ser. No. 500,863
Int. Cl. B65b 31/00, 57/14, 3/04
U.S. Cl. 141—46 13 Claims

ABSTRACT OF THE DISCLOSURE

A filling head for carbonated beverage container filling machines is provided and includes a cylindrical hollow frame for engaging a container by a container engaging seat at its lower end. A valve seat is provided within the frame bore and a tubular valve means is slidably positioned within the frame. Means engage the valve means to move it to open and close position and capillary passage flow restricting means for flow of beverage therethrough to reduce the pressure on the beverage with a minimum of foaming is provided while a counter pressure supply tube extends axially through the frame and extends into any container engaged by the frame seat. Control means are provided in the apparatus to regulate action of the valve means for control of beverage flow only when predetermined operating conditions exist.

The present invention relates to a novel and improved apparatus for filling containers with beverages.

Heretofore there have been many different types of container filling methods and apparatus that have been proposed and many of such types of machines and methods are in wide use commercially. Obviously, it is always desirable to provide more rapid container filling action wherein carbonated beverages can be forced into or otherwise flowed into containers to fill them with such beverages with a minimum of foaming action. Also, the use of readily removable and/or replaceable filling heads with bottle filling controls therein is desirable.

Liquids of the type to which the present invention particularly relates includes all carbonated soft drinks, and beer, while wines and other conductive liquids also may be processed by the present apparatus.

The general object of the present invention is to provide a novel and improved apparatus for filling containers with carbonated beverages, which apparatus is characterized by the novel and improved construction of the filling heads in the apparatus and by the control means provided for automatic container filling and liquid supply shut-off action.

Another object of the invention is to provide new and improved lightweight filling heads for use in processing carbonated beverages rapidly for container filling action, where the entire filling head can be moved to and from engagement with a positioned container, and where novel positioning means for the filling heads are present.

Other objects of the invention are to provide a plurality of capillary size paths for rapid flow of beverages through a filling head while reducing the pressures on the beverages and with a minimum of foam being created in the processed beverage; to provide sturdy apparatus adapted to have a long service life with a minimum of maintenance, or repair thereon, to provide a novel counter-pressure gas supply means for a filling head, and a new gas shut-off means if a container is not engaged by the filling head; to provide a counter-pressure gas supply tube and an electrical contact carried thereby for termination of beverage flow through the filling head when a container is filled; to provide a simple adjustment in a filling head for

control of the amount of liquid deposited in a container by the filling head; to provide for convenient supply and control of several pressure fluids to a filling head for control of the operation thereof; to provide improved valve and flow control means in a filling head or member; and to provide a novel air spring and associated means for positioning and moving a filling head in a container filling machine.

The foregoing and other objects and advantages of the invention will be made more apparent as the specification proceeds.

The present apparatus is particularly adapted for use with carbonated beverages that have been stabilized in accordance with the invention disclosed in co-pending application Ser. No. 491,690 filed Sept. 30, 1965.

These stabilized carbonated beverages normally are supplied as a steady flowing stream ready for container filling action.

Obviously the apparatus of the invention can be used for filling any suitable container, such as cans, bottles or the like, with any beverage of the type indicated.

Attention now is particularly directed to the accompanying drawings, wherein:

FIG. 1 is a fragmentary, vertical section through a container filling apparatus embodying the principles of the invention and wherein a portion of the apparatus is shown diagrammatically or is omitted for clarity;

FIG. 2 is a fragmentary, enlarged side elevation of a container filling head assembly and associated positioning and control means, with a portion of the apparatus being broken away and shown in vertical section;

FIG. 3 is a right side elevation of the apparatus of FIG. 2;

FIG. 4 is a fragmentary, horizontal section taken on line 4—4 of FIG. 3;

FIG. 5 is a vertical section through the filling head assembly and associated positioning means;

FIG. 6 is a vertical section taken through a typical filling head embodying the principles of the invention;

FIG. 7 is a fragmentary, enlarged elevation of a portion of the valve means of the filling head shown in FIG. 6;

FIG. 8 is a bottom plan view of the lower end of the valve member shown in FIG. 7;

FIG. 9 is a vertical section taken through one of the restrictor shells used in the filling head of FIG. 6; and

FIG. 10 is a top plan of the restrictor shell of FIG. 9.

When referring to corresponding members shown in the drawings and referred to in the specification, corresponding numerals are used to facilitate comparison therebetween.

The present invention, generally speaking, as to one embodiment thereof, relates to a beverage container filling apparatus including filling means individually engageable with containers for container filling action and where the filling means each may be considered to include a carrier frame; an air spring means, including a fixed member and a movable member telescopically engaging the fixed member; means supplying air to the air spring to move said members normally into their extended telescopic relation, means engaging the movable member to move it upwardly of the carrier frame, a filling head for engaging a container to supply beverage thereto, means engaging the filling head to secure it to the movable member to move therewith, which filling head can be moved downwardly to engage the lower end of the cylinder with the upper end of the container to terminate movement of the filling head and associated air spring means, a counter-pressure gas supply means, a counter-pressure supply tube extending axially of and carried by the filling head and protruding from both ends thereof and adapted to be connected to a counter-pressure gas supply means, and

control means for the counter-pressure gas connected to the counter-pressure supply tube to regulate the supply of such gas to the filling cylinder by the relative position of the filling cylinder with relation to the carrier frame and to terminate gas supply by the position of the filling cylinder in relation to the carrier frame if it should move downwardly beyond its normal container engaging position. The invention also relates to certain sub-combinations of the apparatus broadly defined hereinabove and to novel control features for adjusting the position of the counter-pressure supply tube in the filling cylinder and to a special contact member associated with the supply tube to control the height of fill of beverage or liquid in a container, and to other novel subcombinations and portions of the filling head positioning means and elements forming the filling head of the invention.

Reference now is particularly made to the details of the structure shown in the accompanying drawings, and a bottle or container filling machine or apparatus is indicated as a whole by the numeral **1**. The apparatus **1** includes a suitable conventional fixed center support **2** which has a substantially conventional filling table **3** journalled thereon for rotary movement in a horizontal plane. The filling table **3** is adapted to have a plurality of bottles **4** or other suitable containers supplied to a peripheral portion thereof and be carried thereby through a substantially complete rotation of the table. The empty bottles **4** are supplied to the table **3** in a conventional manner and are removed therefrom after being filled for further processing in accordance with conventional bottle filling techniques. In all events, the filling table **3** is suitably driven by means (not shown) whereby a plurality of the bottles **4** will be positioned on the filling table and will be rotated therewith for bottle filling action and subsequent removal. A plurality of individual filling assemblies **5** are operatively secured to and carried by an upper support spider or disc **6** at peripheral portions thereof in circumferentially spaced relation for registering with and engaging with the upper ends of the bottles **4** on the filling table and for arcuate movement therewith, as hereinafter described. This support disc **6** is suitably secured to and moves with an upper support column or sleeve **7** that is engaged with a lower support tube **8** which in turn is suitably supported or journalled on the upper end of the center support **2** of the frame of the apparatus for rotary movement thereon.

Any conventional means, not shown, are associated with the apparatus **1** for driving the filling table **3** in timed relation to supply and remove bottles with relation thereto.

For purposes of clarity, portions of the filling apparatus **1** of the invention are either shown diagrammatically or else are eliminated from FIG. 1 of the drawings.

Beverage or other liquid to be flowed into the bottles or containers used in the apparatus **1** is supplied thereto from any conventional supply source and this beverage flows into the apparatus **1** through a center tube **9** positioned within the center support **2** and connecting to a distributor or manifold **10** secured to the upper end of the center tube **9**. This distributor **10** has a plurality of individual supply tubes or conduits **11** connected thereto and individually extending therefrom to the individual filling heads **5** as indicated in FIG. 1.

FILLING HEAD ASSEMBLY

The filling head assembly **5** is shown in detail in FIGS. 2, 3, 4 and 5, with some operative components connected thereto being indicated in FIG. 1 of the drawings. Each of these filling head assemblies includes a suitable carrier, or frame **12** to which, in this instance, a cylindrical filling cylinder or head **13** is removably secured, as hereinafter described. These carriers or frames **12** are each individually suitably secured to and carried by the support member or spider **6** of the apparatus at properly spaced circumferential portions thereof by any conventional means. Each of these carriers **12** includes a vertically extending slot **14**, as shown in FIG. 3. Each carrier **12** also includes a cylindrical, downwardly extending section or member **15** that is positioned on a vertical axis and which has a center bore **16** provided therein. In order to provide for movement of the filling heads **13** with relation to the carriers **12**, some suitable member, such as an air spring sleeve **17**, is telescopically engaged with the peripheral portion of the cylindrical section **15** and is movable downwardly thereof. A suitable source of operative fluid pressure, such as a conduit **18**, connects to the carrier **12** and connects through a bore **19** in the carrier **12** to the upper end of the center bore **16** in the cylindrical section **15**. Preferably a piston **20** is suitably secured to, or formed as a unit with, the lower end of the cylindrical section **15** and this piston is fixedly secured to its carrier means and has at least one aperture **21** therein. A guide or piston rod **22** is secured to the piston and extends vertically downwardly therefrom. The air spring sleeve **17** has an end or cover **23** secured thereto, or formed as a unit therewith, which end or end plate slidably engages with the guide rod **22** and forms a fluid tight connection therewith. The lower end of the guide rod **22** normally is attached to a foot portion **24** provided at the lower end of each of the carriers **12**. Hence, the air spring sleeve **17** is positioned for reciprocating movement on a vertical axis. It will be seen that normally the air spring sleeve **17** is moved to its extended position with relation to the cylindrical section **15**.

As a feature of the invention, means are provided in association with the apparatus **1** to aid in controlling the positioning of the filling head **13** in relation to its individual carrier **12**. Thus, a suitable guide or roller **25** is shown journalled on a pin or shaft carried by the carrier **12** adjacent its upper end and a similar guide or roller **26** is suitably journalled on the air spring sleeve **17** by a member or shaft **27** secured to and extending laterally from the lower end thereof through the slot **14**. The position of the air spring sleeve then is controlled by an external member, in this instance shown as being a substantially flattened C-shaped cam plate or ring **28**, that is suitably associated with the apparatus **1** as by an arm **128** and associated means (not shown) to be retained in a fixed but but vertically adjustable position with relation to the support disc or member **6** and means carried thereby. The cam plate or ring **28** is obviously of suitable arcuate length in the apparatus to perform the functions stated therefor. Such cam plate **28** preferably is vertically positioned by engagement with and support by the upper rollers **25**. Hence, as the support or spider **6** is moved vertically on its support column **7** to adjust the apparatus for filling containers of different heights, the cam plate **28** automatically rides up and down with the filling heads as the spider **6** moves to maintain its correct operative position. It is seen that a lower ledge or shelf **29** on this cam **28** engages the lower guide **26**, and, by the relative arcuate movement of the support spider **6** and the associated filling head assemblies, this arcuate movement can be used to cause the lower roller or guide **26** to be moved from a normal extended position, as indicated on the left-hand side of the apparatus shown in FIG. 1, up to the telescoped upper position or limit of movement for the air spring sleeve **17** and means carried thereby, as shown on the right hand side of the apparatus in FIG. 1. Hence, during proper operative cyclic movement of the filling table **3** and bottles thereon, the different air spring sleeves **17** can be moved to their uppermost positions whereas for the primary portion of the arcuate movement of the filling table **3**, the air spring sleeves **17** will be urged to their normal extended positions, all as explained hereinafter in more detail, for proper functioning of the apparatus of the invention.

As another feature of the individual filling head as-

sembly 5, a counter pressure gas control valve 30 is provided in an upper portion of each one of these filling head assemblies. FIG. 2 of the drawings shows that a suitable bore 31 is provided in each of the carriers 12 and extends horizontally thereof thereinto from one marginal portion thereof. A source of counter pressure gas, such as a tube 32, that connects to a supply manifold 33, as shown in FIG. 1, connects to the carrier and gas thus flows to and through the carrier through a suitable bore therein to the inner end of the bore 31 in each of the carriers. A slidable valve body 34 is suitably positioned in and sealed in engagement with the bore 31 for axial movement therein. The valve body 34 has a suitable counter bore 35 formed in one end thereof and an exhaust port or bore 36 is provided in the valve body and extends radially thereof to connect the counterbore to the periphery of the valve body. Suitable means, such as a spring 37, is resiliently received between the inner end of the valve body 34 and the associated closed end of the bore 31 to urge the valve body axially outwardly of the valve normally and position the bore 36 in register with an outlet bore or port 38 provided in each of the carriers 12 at an upper end thereof. Thus, normally the counter pressure control valve 30 is in its open position. The position of the valve body 34, in proper cyclic operation as the individual filling head assemblies 5 as they are moved arcuately with the support member 6, then brings a cam roller 39, that is suitably journalled on an axially outer end of the valve body 34, into engagement with a suitable cam or control 40 that is carried by the cam 28 and extends upwardly from an upper portion thereof to engage the cam roller 39. This action forces the valve body axially inwardly to its valve closed position when the supply of the counter pressure gas is to be shut off from supply to the individual filling head 13 associated with this particular filling head assembly. This counter pressure gas valve control action particularly must be provided when the individual filling head assemblies are in their elevated positions, as indicated in FIG. 1, when a filled container is being removed from association with the individual filling head and a new empty bottle is being brought into operative association therewith for engagement thereby. As described hereinafter in more detail, it will be seen that the downward movement of the individual filling heads 13 in the different filling head assemblies is terminated by operative engagement of a lower end portion of the filling head with the upper end of a container for container filling action.

The present invention provides yet an additional control upon the supply of counter pressure gas in the apparatus dependent upon proper engagement of the individual filling head with an individual container or bottle. This additional control includes a cam or lock plate 41 that is pivotally secured at one end thereof by a suitable pin or shaft 42 to an individual carrier 12 to be positioned above the individual carrier resiliently for limited downward movement in relation thereto by any suitable means (not shown). This lock plate 41 has a suitable slot 43 provided in an end thereof that lies above but not in exact alignment with a shaft 44 on which the cam roller 39 is positioned. Such shaft 44 is itself received in a slot 45 formed in the carrier 12 so that the shaft 44 moves with the valve body 34 as controlled by the cam 40.

For a purpose as described hereinafter in more detail, each of the individual filling heads 13 has a counter pressure gas supply tube, or assembly 46 carried thereby and normally extending therethrough to protrude from both ends thereof.

As a further control feature of the invention, a control rod 146 is secured to the upper end of the air spring sleeve 17 and it extends through suitable apertures in the carrier 12 and lock plate 41. The upper end of the rod 146 normally has suitable means such as a washer 47 carried thereon as by being resiliently urged against a shoulder on the rod by a spring 147. This washer 47 normally will not move downwardly of the apparatus with the individual filling head 13 to which it is connected far enough as to contact the lock plate 41 due to interruption of the downward movement of the individual filling head by engagement with a properly positioned container. However, should no container or bottle be present in the apparatus for engagement by the lower end of the individual filling head 13, then it will move downwardly past its normal extended position and such action will bring the washer 47 into engagement with the lock plate 41 and press it downwardly of the apparatus. Such movement of the individual filling heads only occurs when the counter pressure control valve 30 is in its closed or innermost position and at such time, the slot 43 in the lock plate 41 then will be pressed down to engage with the head of the shaft 44 to retain the valve in a locked, closed position. Hence, any improper downward movement of the individual filling heads 13 in the filling head assemblies 5, as indicated by the washer 47 contacting the lock plate 41, will result in a maintenance of the control valve 30 in its closed or shut-off position and will prevent escape of counter pressure gas from the individual counter pressure gas supply tubes 46, as described hereinafter in more detail. Such lock plate 41 will retain the counter pressure gas supply valve in its shut-off position until the full cycle of operation of the individual filling head with which it has been associated theoretically occurs and then on the next elevation of the individual filling heads 13 in their carriers 12, by the cam 28 raising the individual filling head 13 to its uppermost position, the cam 40 will again engage the cam roller 39 to hold it in its innermost position. Usually simultaneously the lock plate 41 will be released from engagement with the head of the shaft 44 when the cam 40 has engaged the cam roller 39 to move or hold the valve in its closed position, and it will resiliently spring up to its released position.

FILLING HEAD CONSTRUCTION

FIGS. 6 through 10 illustrate in detail the construction of the individual filling heads 13 or cylinders used in the apparatus of the invention. Such individual filling heads 13 each include a suitable frame means which may comprise a 2-part cylinder 50, as shown in the drawings where the upper and lower cylinder sections are telescopically engaged with each other and may be secured together as by a lock, or centering pin 51 and/or by the inner end of a beverage supply valve 52 that resiliently engage the cylinder sections. This beverage supply valve 52 connects to one of the tubes 11 for flow of beverage thereto, and preferably the supply valve 52 is of the type that automatically and instantaneously closes when the valve is removed from engagement with the cylinder 50. However, when the supply valve is in its opeartive position in engagement with the cylinder, the valve is automatically opened for flow of beverage to the interior or bore of the cylinder 50 for flow to the individual bottles for filling action.

FIG. 6 of the drawings best shows that the lower end of the cylinder 50 has a container engaging seat 53 provided at its lower end and preferably the seat 53 comprises a resilient annular member suitably positioned in a recess formed in the lower end of the cylinder 50. Such seat 53 is adapted to engage the upper end of a bottle or other container and seal thereagainst when the individual filling head is moved into container filling position. Also, the seat 53 cushions the impact that would occur if the metal cylinder would directly engage a container.

As indicated, the cylinder 50 is hollow and has a center bore 54 therein which extends down to the lower end of the cylinder and connects to the container engaging sleeve 53 for flow of beverage therethrough into an associated container.

Internally of the cylinder **50**, suitable means are provided for providing only flow of beverage downwardly in the individual cylinder or filling head and thus, for example, a restrictor sleeve **55** is received in a fixed position within the cylinder **50** intermediate the ends thereof and it has a port, or bore **56** provided therein that receives the inner end of the beverage supply valve **52** for flow of beverage therethrough to the interior of such restrictor sleeve. A guide sleeve **57** of smaller external diameter than the internal diameter of the restrictor sleeve **55** at some portions thereof, is received within such restrictor sleeve and it may be secured to the restrictor sleeve **55**, as by a lock nut **58** engaging a threaded upper end of the guide sleeve **57** to secure it in assembled relationship to the restrictor sleeve.

For pressure reducing action on the beverage flowing through the cylinder **50**, a plurality of restrictor shells, in this instance five conical shells **59**, are positioned in stacked relationship upon each other intermediate the restrictor sleeve **55** and the guide sleeve **57**, being compressed between complementary surfaces formed on said sleeves. Each of these restrictor shells **59** has any siutable longitudinally extending ribs **60**, or the like, formed on the outer surface thereof, and extending the length of the shell. A longitudinally extending short slot **61** is formed in the upper end of each of the restrictor shelves **59** as is a short internal rib **61***a* longer than the slot **61** whereby the ribs **60** will position the restrictor shells in closely spaced stacked relation, with clearance, for example, between the individual restrictor shells being of a capillary size, such as approximately .005 inch. Adjacent shells are positioned 180° out of phase with each other so that a rib **61***a* engages a slot **61** in the adjacent shell to align and axially space the shells. Hence, beverage will flow down through the stacked restrictor shells from the upper ends thereof and the pressure on the beverage can be dropped, for example, about 25 to 30 p.s.i. as the beverage flows through between the adjacent restrictor shells under these capillary flow conditions, dependent upon the pressure of the beverage at the inlet through the restrictor sleeve and the counter pressure applied to the container to be filled, as well as the number of shells used. Such pressure reduction action is secured with a minimum of foaming, or gas release in the processed beverage, as the beverage flows from the individual filling heads through the lower end of the cylinders **50**.

As yet an additional element and feature of each of the cylinders or fillings heads **50**, a hollow or tubular valve spindle **62** is slidably received in each of the cylinders. Such valve spindle preferably is received in the bore of and guided by the guide sleeve **57** with the valve spindle **62** extending down below the guide sleeve and also extending upwardly from the upper end of the individual cylinders **50**. Each of the cylinders **50** is provided with a valve seat **63** adjacent the lower end thereof in communication with the bore thereof and the container engaging seat **53** of the individual cylinders. Such valve seat in this instance is shown as being a counterbored cylindrical portion of the bore of the cylinder which is adapted to be in sealed engagement with the cylindrical lower end **57***a* of the tubular valve spindle or stem as by means of an O-ring **64** carried by the valve spindle adjacent its lower end. In the sealed or closed position of the valve spindle as shown in FIG. 6 of the drawings, an upper O-ring **65** carried by the lower end of the valve spindle **62** is in slidable but sealed engagement with a counterbore provided at the lower end of the guide sleeve **57** whereby beverage cannot flow upwardly of the individual filling head or cylinder and at that valve position, all flow of beverage through the individual filling head is thus prevented. An additional feature of the tubular valve spindles **62** is that they each have a counterbore **66** provided in their lower ends, and a plurality of discharge ports **67** are formed in the wall of the valve spindle and connect to this counterbore **66**. These discharge ports **67** are all formed so that they extend downwardly and inwardly of the individual valve spindles so as to connect tangentially to the counterbore **66**. As the beverage being forced to flow through the individual filling heads has some residual pressure, such as between about 3 to 4 p.s.i. thereon, normally, or more as desired, this beverage will flow through the ports **67** with some force and a spinning motion is effected on this liquid to retain the liquid primarily against the wall of the counterbore. When this valve spindle **62** is moved to its open position, the counterbore **66** smoothly blends into the bore of the cylinder **50** and the beverage will flow down the remaining length of the cylinder against the bore wall. Such centrifugal action or flow of the beverage continues as the beverage flows down into an associated bottle and hence flows thereinto primarily by a swirling action around the wall of the bottle. The lateral discharge action or swirling of the beverage is augmented, or alternatively provided by a conical shield **132** secured to the counter pressure supply tube below the container engaging seat **53**.

The position of the valve spindle in each of the filling heads is controlled by suitable means, such as a piston **68**, that is secured to an upper portion of each of the valve spindles adjacent the upper portion or end of the cylinder **50** and is in sealed engagement with the bore thereof. The piston normally is moved to its uppermost position abutting on an end portion of the cylinder by means, such as a spring **69**, that is compressively received within the bore of the cylinder and abuts on the upper end of the restrictor sleeve **55**, for example, and the associated end of the piston **68**. A conduit **70** is connected to the upper end of each of the cylinders **50** and it connects to a suitable source of compressed fluid, such as gas, that flows inwardly through a fitting **71** carried by the cylinder into an upper end of the cylinder bore that connects to the face of the piston **68** opposed to that engaged by the spring **69**. Hence, when operative pressure is supplied through the conduit **70** to the upper face of the piston **68**, the valve spindle **62** can be moved rapidly from its closed position to its open position with the lower end of the valve spindle normally abutting against the associated shoulder formed in the cylinder bore, and likewise can be rapidly closed.

FIG. 6 of the drawings clearly shows that the counter pressure gas supply tube **46** extends the length of each of the cylinders **50** and protrudes from both ends thereof. Normally an insulated cover or sleeve **72** is suitably positioned around or secured to the metal gas supply tube **46** and extends the length thereof down to a contact **73** that is exposed at the lower end of the tube **46** for a purpose to be described hereinafter. Usually, the counter pressure supply tube **46** is referred to in the drawings by the numeral **46** even though it has the sleeve **72** thereon and such tube is secured to the upper end of the tubular valve spindle **62** in fixed engagement therewith, as by a lock nut **74** whereby when desired, the lock nut **74** can be loosened and the tube **46** and contact **73** can be changed in its vertical relationship to the valve spindle and to an associated bottle or container that is engaged by the apparatus for filling action to control or adjust the filling height. A suitable scale or indication for this adjustment may be incorporated on the upper end of this tube to facilitate the changing of liquid contents in the containers.

As yet a further feature of the invention, a differential pressure operated switch, or valve **75** is carried by each of the cylinders **50** adjacent the lower end thereof. This differential pressure switch or valve **75** has a suitable pressure supplied thereto, for example, by a conduit **76** connecting thereto, or by spring means, and the switch or valve is built to move to and from operative positions for control action dependent upon whether or not counter pressure gas is also received in this differential pressure switch or valve **75**. The switch or valve **75** connects to a port **77** formed in the cylinder **50** and the apparatus so functions that when the cylinder **50** engages a container and counter pressure gas flows through the tube **46** and

from the lower end thereof into a container or bottle, such pressure will flow back up into the lower end of the cylinder and through the bore 77 to control the action of the differential pressure switch or valve 75.

The present apparatus is particularly adapted for use with and controlled by the apparatus and method shown in detail and described in copending patent application Ser. No. 491,691, filed Sept. 30, 1965, by Kenneth F. Friendship, one of the co-inventors herein. It could, however, be equally controlled by other methods, for example; by pneumatic or mechanical means for other purposes or when operating at lower speeds. However, certain of the major control functions exercised in the apparatus of the invention may readily be considered to be a part of the present invention and will be described in general in relation to their association with and control of the apparatus of the invention and the functioning thereof.

For purposes of illustration, FIG. 1 diagrammatically shows one form of a control means 80 that is associated with the apparatus of the invention. Such control means preferably are electrically operated and includes suitable circuit means to perform the functions to be described hereinafter in more detail, and any suitable power supply means (not shown) connect to such control means 80. One or more leads 81 are shown connected to the differential pressure sensing means, usually a switch 75 and extending therefrom to the control means 80 whereby the differential pressure switch must be set in a predetermined operative condition with the proper counter pressure supplied thereto by the bore 77 from a container engaged by the filling head or cylinder 13 in order for the lead or leads 81 to transmit proper information to the control means 80 to enable it to set the filling head 13 for beverage flow therethrough. The piston operating pressure supplied to the tube or conduit 70, FIG. 6, is controlled by a member, such as a magnetically or electrically operated control valve, switch or other sensing means 82 that in turn is connected to a suitable source of operative fluid, such as compressed air by the conduit 182. Hence, when the valve 82 is properly set, as by receiving electrical energy or impulses through a lead or leads 83 that connect to such valve 82 and extend to the control means 80 which control energization of the leads 83, then the valve 82 is actuated to move to open or closed position to pass fluid to the piston 68 or to exhaust fluid therefrom, respectively. Thus, it is insured that operative pressure will only be supplied to the piston 68 when the differential pressure switch 75 has proper counter pressure supplied thereto and transmits such information to the control means 80 which thereby can then energize the valve 82 and depress the the piston 68 to open the valve ports or bores 67 in the tubular valve spindle 62 for flow of beverage through the the individual filling head 13.

Termination of flow of beverage through the individual filling head naturally must occur when the individual container or bottle engaged thereby is filled to the desired level. The contact 73 provided at the lower end of the counter pressure supply tube 46 is connected back through the metal counter pressure supply tube 46 by a lead 84 to the control means 80 and the metal frame of the apparatus 1 likewise connects back to the control means 80 by a lead 85 whereby an open circuit is provided between the leads 84 and 85. Such circuit is then completed through the contact 73 when conductive liquid received within the container or bottle 4 flows up to the level indicated by the line 86 in the bottle shown in FIG. 6 and a circuit is thereby closed between the beverage swirling into or flowing into the the bottle 4 along the walls thereof and still in contact with the metal components of the filling head or cylinder 13 whereby a shut-off impulse will then be transmitted to the control means 80 and the valve 82 will be actuated so that the valve spindle 62 will be snapped or be moved rapidly to its closed potition.

If it is desired to adjust the filling height of liquid or beverage to be supplied to the bottle 4, then one only needs loosen the lock nut 74 and move the counter pressure supply tube assembly 46 vertically of the individual filling head 13 upwardly or downwardly to its new position at which the desired shut-off action for container or bottle filling action will be provided. It will be seen that some beverage will flow down or drain from the lower end of the bore 54 when the valve spindle 62 is moved to its closed position and such amount of fluid or beverage which has already passed through the valve means of the filling head is of a predetermined substantially constant volume whereby the ultimate filled height indicated by the liquid level line 87 is obtained in the bottle when disengaged from the individual filling head. Any desired number and size of exhaust ports 88 are shown provided in the lower end of the counter pressure supply tube 46, and the insulation sleeve thereon, to permit ready exhaust or flow of the counter pressure gas to the bottle or container engaged therewith. Usually the counter pressure gas supplied in the apparatus of the invention would be in the vicinity of about 6 p.s.i. and in all events, is lower than the resultant pressure applied to the beverage flowing through the filling heads 13. It will be seen that independent control of this counter pressure and of the resultant pressure on the beverage being flowed to the bottles 4 is possible by practice of the present invention.

It will be realized that any conventional types of rotary or slip joints can be provided to form connections between fixed air pressure, fluid pressure, or liquid supply means as associated with the apparatus of the invention and which must be connected to rotary portions of the apparatus. Usually the individual air pressure supply means for supplying differential pressure to the switches or valves 75 when air pressure means are used, will be connected to a suitable manifold or other supply means from which the individual filling heads can be supplied. Likewise, the counter pressure supply gas means may comprise a manifold moving with the movable part of the apparatus of the invention and having suitable gas supplied thereto through conventional coupling means in the apparatus.

A manifold 89 is suitably secured to and carried by the support spider or disc 6 and has a suitable source (not shown) of compressed fluid secured thereto. Such manifold 89 connects to the individual filling head assemblies by the individual tubes or conduits 18 which operatively connect to the carriers 12. Air or other fluid hence is continually supplied under pressure to the bores 16 in the carriers and just flows into or out of such center bores 16 dependent upon whether or not an external force is applied to the air spring sleeve 17 by the cam 28. Some of such members are indicated somewhat diagrammatically in FIG. 1 of the drawings but in general conventional means are used for pressure supply purposes in the novel and improved apparatus of the invention.

The individual filling heads 13 preferably are formed as units that can be readily secured to, or removed from the carriers or frames 12. FIG. 4 best shows that a cam arm 90 is pivotally carried by a rod or stud 91 which is secured in a tapped hole formed in a lug 92 on the air spring sleeve 17. A cam surface 93 on the cam arm 90 engages a clamp arm or plate 94 bearing at one end thereof on the lug 92 to force the filling head against an arcuate seat on the periphery of the sleeve 17 for movement therewith but for ready release therefrom.

The various means that operatively connect to the individual filling heads 13 can be connected thereto by any conventional quick release couplings or the like.

Another feature of the filling heads or cylinders 50 is that each head has an exhaust port 95 formed therein above the upper end of the restrictor sleeve 55 and in communication with the spring engaging face of the piston 68. If liquid should leak upwardly of the filling head when operatively vertically positioned, or if fluid or air leaks downwardly by the piston 68, such fluid will ex-

haust through the port **95**. This avoids any possible contamination of the beverage by the pressure fluid. Air trapped by the head of the valve spindle **62** exhausts up along a slot **96**, FIG. 6, in the valve spindle when the valve spindle is moved up to its closed position. The slot **96** connects to an annular recess **97** formed in the upper portion of the valve spindle. A bore **98** in the upper part of the guide sleeve **57** connects the recess **97** to the periphery of the guide sleeve that is sealed from a fluid distributing chamber **99** at the upper ends of the restrictor sleeves by an O-ring **100**, or the like. The port **95** connects to the bore **98** or a chamber formed thereat by a bore **101** in the upper end of the restrictor sleeve **55**.

It will be noted that the cam **28** is of limited arcuate extent and is positioned in the apparatus at the bottle release and replacement stations thereof to move and retain the individual filling heads **13** in their upper positions at such stations. The ledge **29** has an inclined section **29***a*, indicated in FIG. 3, to engage the roller **26** when the air spring sleeve **17** is in its extended position and move, or force it upwardly after the bottle associated with such filling head is full.

The carriers or frames **12** usually are made from several special interrelated parts suitably secured together. These carriers are removably secured to the support member or spider **6**.

In general, the novel filling head assemblies can be attached to conventional, or at least substantially conventional, bottle filling apparatus and conventional bottle supply and processing machines.

From the foregoing, it is believed that it will be seen that a novel and improved container filling apparatus and control means therefor has been provided by the present invention. Such apparatus will provide a long service life, the apparatus is easily disassembled in that the individual filling heads **13** can be removed for cleaning or repair purposes, or for inspection, as desired, and only minimum effort is required to detach the individual filling heads from their supports. Furthermore, the apparatus is so constructed that all passages and surfaces therein can be cleaned and sterilized by the circulation of suitable detergent or other cleaning agent. Scouring action is further assisted to these ends by the careful regulation of ports and passageways to a size where the velocity of such cleaning agents through them is high.

While one complete embodiment of the invention has been disclosed herein, it will be appreciated that modification of this particular embodiment of the invention may be resorted to without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. In a filling head for a carbonated beverage container filling machine that has means for positioning containers for filling and where the filling head and containers are vertically aligned and engaged, said filling head comprising

a hollow cylinder means having a bore,

a plurality of restrictor shells arranged in spaced stacked relation to said cylinder means so that the flow of beverage therethrough will be around and between adjacent stacked shells under pressure reducing conditions,

means for supply of beverage connected to the bore of said cylinder means for flow of beverage only down through said restrictor shells,

a hollow valve spindle having a bore slidably positioned within said cylinder means to engage a lower portion of said cylinder means for axial movement therein, said valve spindle being movable vertically from a closed position sealing the lower ends of said restrictor shells from the bore of said cylinder means to an open position connecting the lower ends of said restrictor shells to the bore of said cylinder means for flow of beverage out through the lower of said cylinder means,

means operatively engaging said valve spindle to move it to open and closed positions, and

a counter-pressure supply tube received in the bore of said valve spindle and extending beyond the ends of said cylinder means to protrude into any container engaged by the lower end of said cylinder means for filling such container.

2. In a filling head for a carbonated beverage container filling machine that has means for positioning containers for filling and where the filling head and containers are vertically aligned and engaged, said filling head comprising

a hollow cylinder means having a bore,

a restrictor sleeve positioned within said cylinder means intermediate the ends thereof,

means for supply of beverage being connected to the bore of said restrictor sleeve,

a guide sleeve positioned within said restrictor sleeve and sealed against flow of liquid upwardly thereof,

a plurality of conical restrictor shells positioned in spaced stacked relation between a lower portion of said guide sleeve and said restrictor sleeve for flow of beverage therethrough under pressure reducing conditions,

a hollow valve spindle having a bore slidably positioned within said guide sleeve and extending from the lower end thereof to engage a portion of said cylinder means for axial movement therein, said valve spindle being movable vertically from a closed position to an open position connecting the lower ends of said restrictor shells to the bore of said cylinder means,

a piston engaging said valve spindle at an upper portion of said cylinder above said restrictor sleeve,

means operatively engaging said piston to move said valve spindle to open and closed positions, and

a counter-pressure supply tube received in the bore of said valve spindle and extending beyond the ends of said cylinder means to protrude into any container engaged by said cylinder means.

3. In a filling head for a carbonated beverage container filling machine that has means thereon for positioning containers for filling,

a cylindrical frame having a bore with a container engaging seat at its lower end,

means engaging said frame to move it down to engage said seat with a container,

a valve seat being formed within said frame bore and connecting to said container engaging seat,

a tubular valve means slidably positioned within said frame to move to and from engaging said valve seat to control flow of beverage from said frame bore to an engaged container,

control means engaging said valve means to move it to open and closed positions,

means connecting to said frame bore to supply beverage under pressure thereto,

capillary passage flow restricting means for flow of beverage to said valve means to reduce the pressure on said beverage with minimum foaming thereof,

a metal counter pressure supply tube extending axially of said frame through the bore thereof and protruding therebelow into any container engaged by said frame seat, said supply tube being adjustable vertically of said frame and valve means,

means engaging said supply tube to retain it in a given position, said tube also extending through said valve means and having a contact at its lower end,

insulating means covering said supply tube for the length thereof in said frame but exposing said contact on said supply tube, and

powered electrical circuit means connecting to said supply tube to be closed by beverage contacting

the lower end of said supply tube and operatively connecting to said control means to close said valve means when a container is filled.

4. In a filling head for a carbonated beverage container filling machine that has means thereon for positioning containers for filling,

a frame having a bore with a container engaging seat at its lower end,

a container being engageable by said seat,

a valve seat being formed within said frame bore and connecting to said container engaging seat,

a tubular valve means slidably positioned within said frame to move to and from engaging said valve seat to control flow of beverage from said frame bore to an engaged container,

control means engaging said valve means to move it to open and closed positions,

means connecting to said frame bore to supply beverage under pressure thereto,

elongate tubular capillary passage flow restricting means having a radial component in its flow path for flow of beverage to said valve means to reduce the pressure on said beverage with minimum foaming thereof, and

a metal counter-pressure supply tube operatively secured to and extending axially of said frame through the bore thereof and protruding therebelow into any container engaged by said frame seat, said supply tube extending through said valve means.

5. In a filling head for a carbonated beverage container filling machine that has means thereon for positioning containers for filling,

a hollow cylinder having a container engaging seat at its lower end,

said seat being engageable with a container for sealing with the same,

a valve seat means being formed within said cylinder and connecting to said container engaging seat,

a valve means slidably positioned within said cylinder to move to and from engaging said valve seat means to control flow of beverage from said cylinder bore to an engaged container,

control means engaging said valve means to move it to open and closed positions,

means connecting to said cylinder bore above said valve seat means to supply beverage under pressure thereto,

elongate beverage passage flow restricting means for flow of beverage therethrough to said valve means and including a flow section having a component extending circumferentially,

a counter pressure supply tube carried by said cylinder and extending through the bore thereof and protruding therebelow into any container engaged by said cylinder seat, and

a sensing means operatively engaged with said cylinder and connecting thereto to receive the counter pressure from any container engaging said container engaging seat, said sensing means being connected operatively to said control means to enable said valve means to be opened only when counter pressure is applied to said sensing means.

6. In a filling head for a carbonated beverage container filling machine that has means thereon for positioning containers for filling,

a frame having a vertically extending bore having a container engaging seat at its lower end,

said seat being engageable with a container for filling the same,

a tubular valve seat means being formed within said bore and connecting to said container engaging seat,

a valve means slidably positioned within said frame bore and having a tubular section to move with relation to said tubular valve seat means to control

flow of beverage from said bore to an engaged container,

control means operatively connecting to said valve means to move it to open and closed positions,

means connecting to said bore above said valve seat means to supply beverage under pressure thereto,

beverage passage flow restricting means in said bore and having at least a section with a circumferential component in its flow for flow of beverage therethrough to and through said valve means when open while reducing the pressure on said beverage,

a counter-pressure supply tube carried by said frame and extending through the bore thereof and protruding therebelow into any container engaged by said seat to supply counter pressure to said container,

a differential pressure sensing means operatively connecting to said cylinder bore to receive the counter pressure from any container engaging said container engaging seat on one side of such valve,

means for supply of a differential pressure to the other side of said differential pressure sensing means, and

control means operatively connected to said differential pressure sensing means and to said control means to open said valve means when the counter pressure is applied to said differential pressure sensing means.

7. In a filling head for a carbonated beverage container filling machine that has means for positioning containers for filling and where the filling head and containers are vertically aligned and engaged, said filling head comprising

a hollow cylinder means having a lower end adapted to engage a container upper end,

a restrictor sleeve positioned within said cylinder means intermediate the ends thereof,

means for supply of beverage being connected to the bore of said restrictor sleeve,

a guide sleeve positioned within said restrictor sleeve and sealed against flow of liquid upwardly thereof,

a plurality of conical restrictor shells positioned in closely spaced stacked relation between a lower portion of said guide sleeve and said restrictor sleeve for flow of beverage through or between said shells under pressure reducing conditions,

a hollow valve spindle slidably positioned within said guide sleeve and extending from the lower end thereof to engage a portion of said cylinder means for axial movement therein, said valve spindle being movable vertically from a closed position to an open position connecting the lower ends of said restrictor shells to the bore of said cylinder means, said valve spindle having a counterbore in its lower end and a plurality of downwardly and inwardly directed bores in its wall at such counterbored end connecting to said counterbore substantially tangentially thereof to spin beverage tangentially out of said counterbore to flow into a container along the sides thereof, and

means engaging said valve spindle at an upper portion thereof to move it to open and closed positions.

8. In a filling head for a carbonated beverage container filling machine that has means thereon for positioning containers for filling,

a frame having a vertically extending bore with a container engaging seat at its lower end,

means connecting to said frame bore to supply beverage under pressure thereto,

capillary passage flow restricting means in said frame bore for flow of beverage therethrough under pressure reducing conditions,

a metal counter pressure gas supply tube extending axially of said frame through the bore thereof and protruding therebelow into any container engaged by said frame seat, said supply tube being adjust-

able vertically of said frame and having gas discharge means in its lower end,

means engaging said supply tube to retain it in a given position, said supply tube having a contact at its lower end,

insulating means covering said supply tube for the length thereof but exposing said contact on said supply tube and said gas discharge means, and

powered electrical circuit means connecting to said supply tube to be energized by beverage contacting said contact to act on a flow control means to terminate beverage flow through said frame when a container has a predetermined amount of beverage therein whereby the amount of beverage passed to a container can be varied by adjusting the vertical position of said supply tube with relation to said frame.

9. In a filling head for a carbonated beverage container filling machine that has means thereon for positioning containers for filling,

a cylindrical frame having a bore with a container engaging seat at its lower end,

a valve seat being formed within said frame bore and connecting to said container engaging seat,

a tubular valve means slidably positioned within said frame to move to and from engaging said valve seat to control flow of beverage from said frame bore to an engaged container,

control means engaging said valve means to move it to open and closed positions,

means connecting to said frame bore to supply beverage under pressure thereto,

capillary passage flow restricting means for flow of beverage to said valve means to reduce the pressure on said beverage with minimum foaming thereof,

a metal counter pressure supply tube extending axially of said frame through the bore thereof and protruding therebelow into any container engaged by said frame seat, said supply tube extending through said valve means and having a contact at its lower end,

insulating means covering said supply tube for the length thereof in said frame but exposing said contact on said supply tube, and

powered electrical circuit means connecting to said supply tube to be closed by beverage contacting the lower end of said supply tube and operatively connecting to said control means to close said valve means when a container is filled.

10. In a filling head for a carbonated beverage container filling machine that has means thereon for positioning containers for filling,

a frame having a bore with a container engaging seat at its lower end,

means engaging said frame to move it down to engage said seat with a container,

a valve means being operatively positioned within said frame bore for controlling flow of beverage therethrough,

means connecting to said frame bore to supply beverage under pressure thereto,

a metal counter pressure supply tube extending axially of said frame through the bore thereof and protruding therebelow into any container engaged by said frame seat, said supply tube being adjustable vertically of said frame and valve means,

means engaging said supply tube to retain it in a given position, said tube also extending through said valve means and having a contact at its lower end,

a control circuit operatively connected to said frame and to said valve means to regulate the position of said valve means, and

insulating means covering said supply tube for the length thereof in said frame but exposing said contact on said supply tube, said supply tube being connected to said control circuit to complete the control circuit by beverage in a container contacting the contact on said supply tube to close said valve means when a container is filled.

11. In a filling head for a carbonated beverage container filling machine that has means thereon for positioning containers for filling,

a frame having a vertically extending bore with a container engaging seat at its lower end,

means connecting to said frame bore to supply beverage under pressure thereto,

elongate capillary passage flow restricting means in said frame bore to form the beverage into at least one radially thin substantially tubular stream for flow of beverage therethrough under pressure reducing conditions,

a valve for controlling flow of beverage from said frame,

a counter pressure gas supply tube extending axially of said frame through the bore thereof and protruding therebelow into any container engaged by said frame seat, said supply tube having gas discharge means in its lower end,

means engaging said supply tube to retain it in a given position, and,

electric powered circuit means operatively connecting to said valve and to said supply tube to be actuated by beverage contacting a lower portion of said supply tube to terminate beverage flow through said frame by actuation of said valve when a container has a predetermined amount of beverage therein whereby the amount of beverage passed to a container can be varied by adjusting the vertical position of said supply tube with relation to said frame.

12. In a filling head for a carbonated beverage container filling machine that has means thereon for positioning containers for filling,

a hollow cylinder having a bore with a resilient container engaging seat at its lower end,

a valve seat means being formed within said cylinder bore and connecting to said container engaging seat,

a valve means slidably positioned within said cylinder bore to move to and from engaging said valve seat means to control flow of beverage from said bore to an engaged container,

control means engaging said valve means to move it to open and closed positions,

means connecting to said cylinder bore above said valve seat means when said cylinder is operatively positioned to supply beverage under pressure thereto,

capillary passage flow restricting means in said cylinder for flow of beverage therethrough to said valve means to reduce the pressure on said beverage with minimum foaming thereof, said flow restricting means including at least one elongate device to divide the beverage into at least one radially thin stream and with the device having a relatively high ratio of wetted area to stream thickness, and

a counter pressure gas supply tube operatively secured to and extending axially of said cylinder through the bore thereof and protruding therebelow into any container engaged by said cylinder seat.

13. A filling head as in claim **12** where an exhaust port is formed in said cylinder above said beverage supply means, a fluid distributing chamber is formed above said flow restricting means, and means are present in said cylinder for communicating said fluid distributing chamber with said exhaust port for flow of any beverage

leaking up to said fluid distributing chamber to said exhaust port.

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141—198, 286, 301

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,443,608 May 13, 1969

Bruce G. Copping et al.

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

Column 14, line 9, after "flow", first occurrence, insert -- path --.

Signed and sealed this 25th day of November 1969.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents