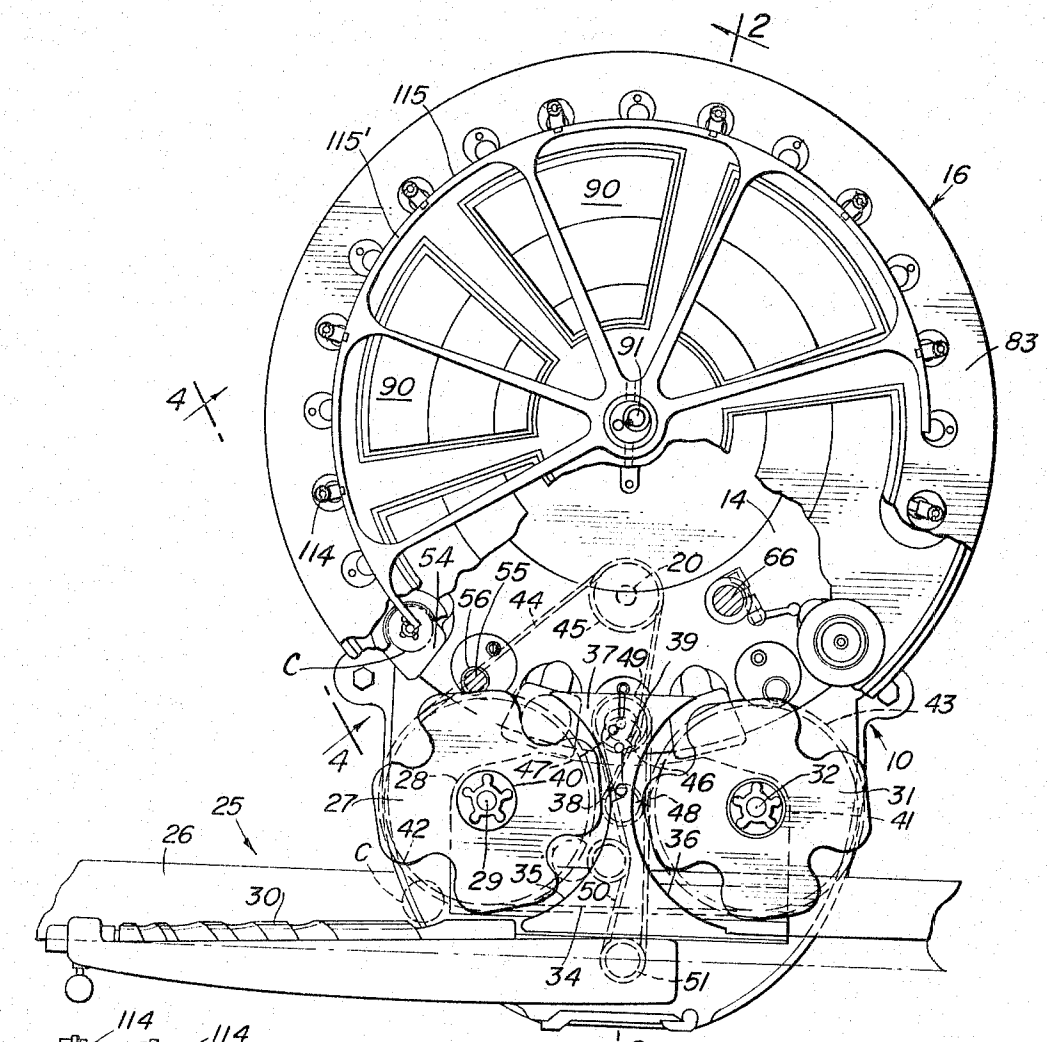
May 2, 1967 E. BRINKLEY ETAL 3,316,945

CONTAINER FILLING MACHINE

Filed Feb. 11, 1964 3 Sheets-Sheet 1

FIG. 1



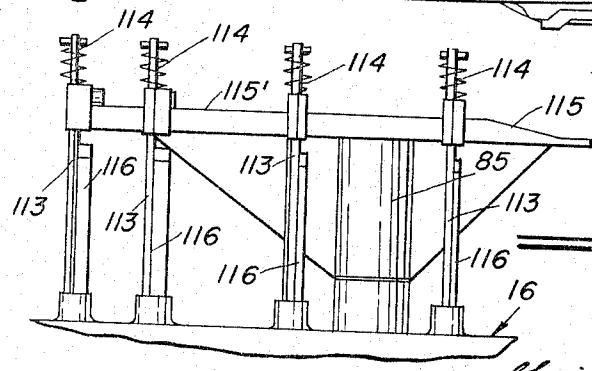


FIG. 4

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Fig. 2

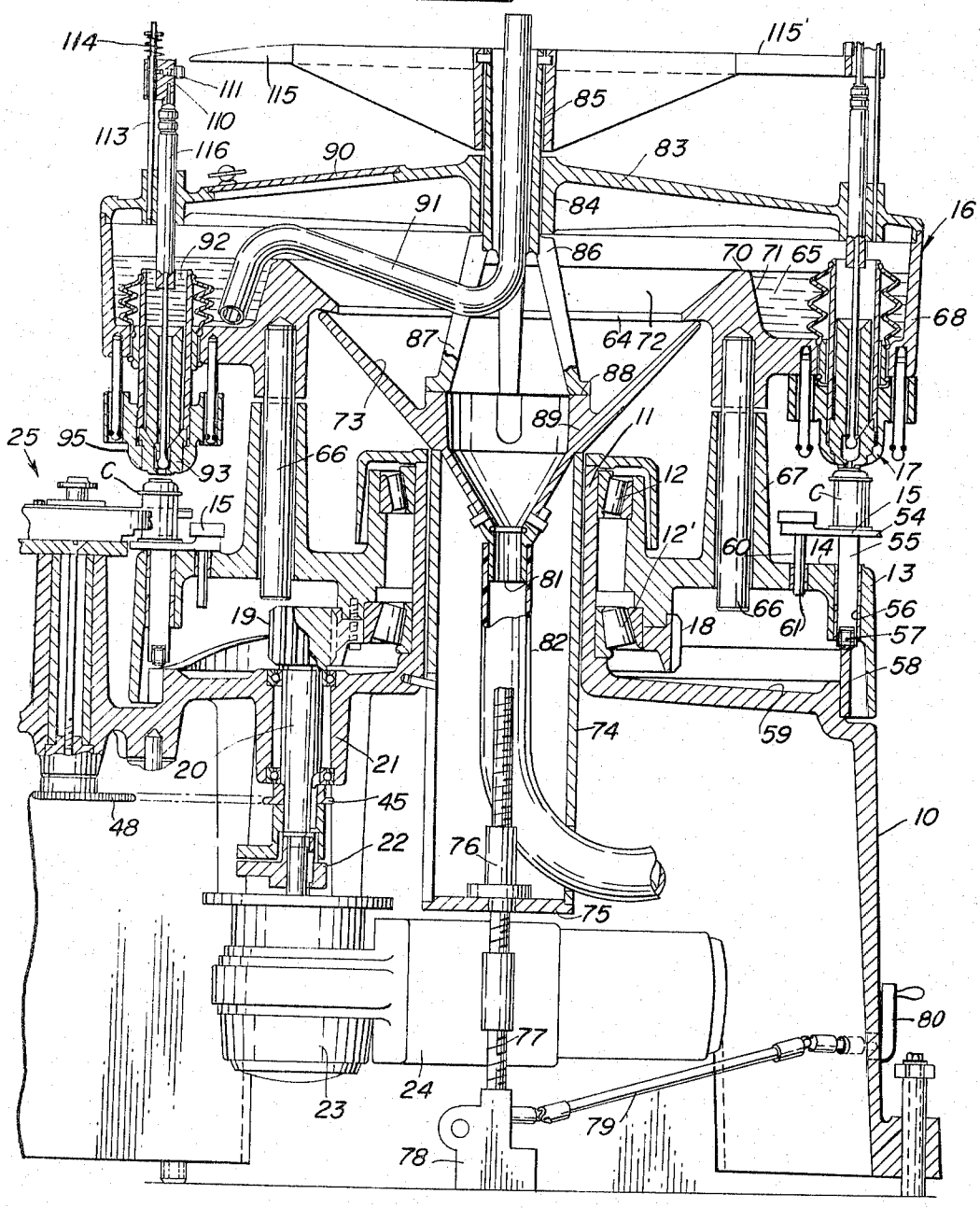

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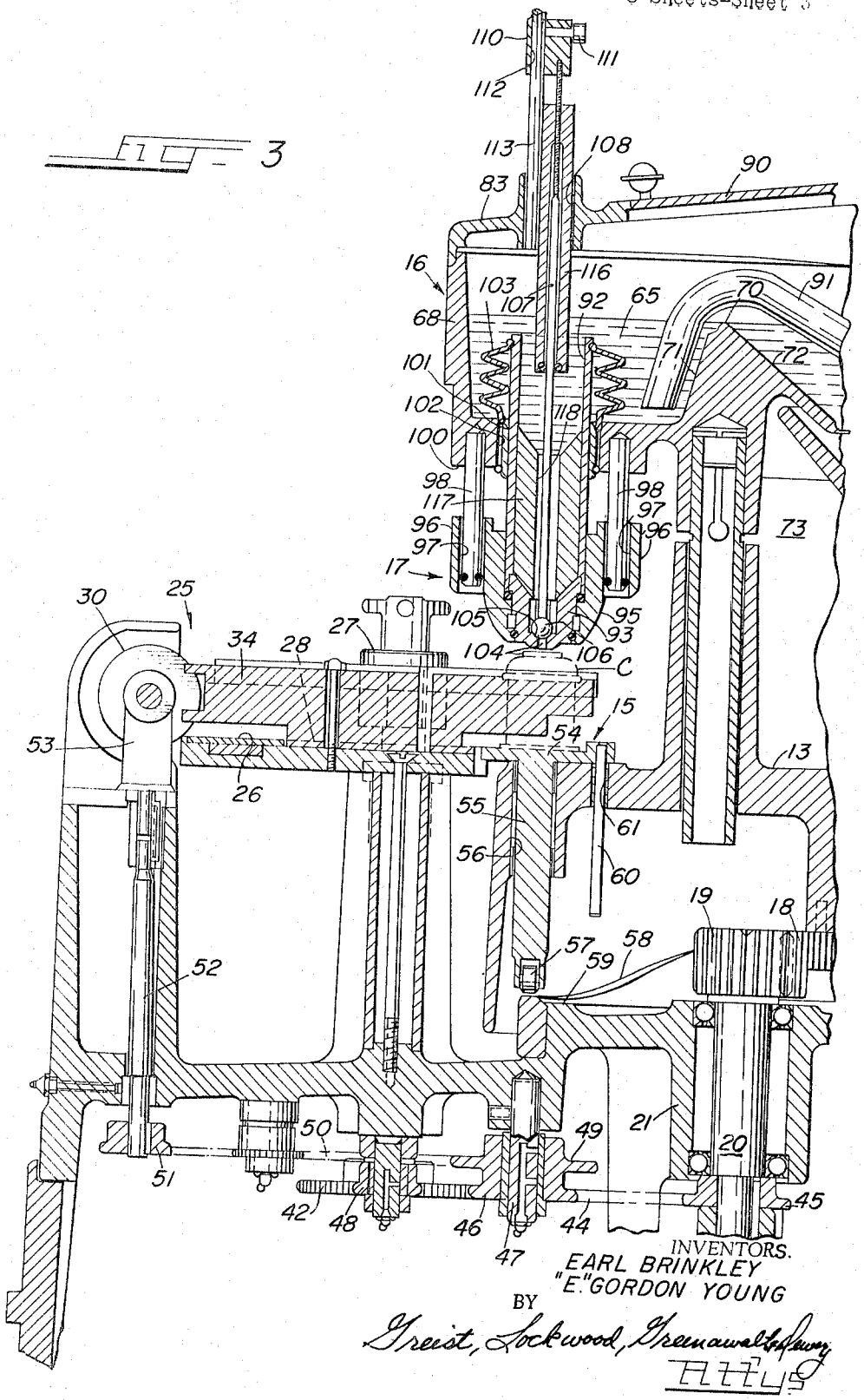
FIG. 3



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CONTAINER FILLING MACHINE

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Filed Feb. 11, 1964, Ser. No. 344,011
10 Claims. (Cl. 141—140)

This invention relates to machines for filling containers with liquid materials and is more particularly concerned with improvements in an automatic filling machine of the rotary multi-station type for sequentially filling containers with a measured volume of liquid as the containers successively pass through the machine.

It is a general object of the invention to provide a rotary multi-station container filling machine which operates automatically upon delivery of a succession of containers thereto to deliver a pre-measured volume of liquid into each successive container as the containers move in a circular path beneath a plurality of peripherally spaced, valve controlled measuring heads which are operated by elevating the containers into engagement with the heads.

It is a more particular object of the invention to provide a rotary multi-station filling machine for dispensing into successive containers a pre-measured volume of liquid wherein a plurality of measuring cups are mounted for vertical reciprocation in apertures in the bottom of a circular bowl or tank which is filled with a liquid to a predetermined level, the cups being open at the top and being reciprocated, by engagement with the containers, between a cup filling position where the open top is below the level of the liquid in the bowl and a discharge position where the top of the cup is above the liquid level in the bowl and each cup having a discharge valve in the bottom thereof which is operated to drain the contents of the cup into the container which is in engagement therewith.

It is another object of the invention to provide a multi-station rotary type filling machine for dispensing liquid into a series of successive containers which are moved into position beneath a plurality of measuring cups which are mounted in a rotating supply tank in which the liquid is maintained at a constant predetermined level and the cups are reciprocated between an immersed position below the level of the liquid in the tank and a container filling position where the open top of the cup is above the level of the liquid in the tank, with each cup having a valve in the bottom thereof which is opened, so as to drain the contents of the cup into a container, by a segmental circular cam at the top of the tank which is engaged by a cam follower on a valve lifting stem.

It is a further object of the invention to provide an automatic liquid filling apparatus comprising a rotatably mounted, upwardly opening, cylindrical tank having vertically disposed spaced walls extending about the periphery with the inner wall being of lesser height than the outer wall so that a supply of liquid may be maintained at a constant level in the tank with excess liquid spilling over the inner wall into a collecting receptacle, the tank having a plurality of measuring cups mounted in spaced apertures in the bottom wall thereof which are each vertically reciprocable between a cup filling position where the top of the cup is below the level of the liquid in the tank and a container filling position where the cup is elevated to bring the top above the level of the liquid in the tank by engaging the open top of a container to be filled with the lower end of the cup and raising the container to a predetermined position, each cup having a valve opening in the bottom thereof and a ball valve which is supported on a vertically disposed stem which stem has a cam follower on its upper end for engagement with a fixed operating cam positioned above the tank, the cam being arranged so that it is engaged by a cam follower only when there is a container positioned beneath the cup.

These and other objects and advantages of the invention will be apparent from a consideration of the machine which is shown by way of illustration in the accompanying drawings wherein:

FIGURE 1 is a plan view of the filling machine which incorporates the principles of the invention, with portions of the machine being broken away;

FIGURE 2 is a partial vertical section taken on the line 2—2 of FIGURE 1, to a larger scale;

FIGURE 3 is a partial vertical section taken on the line 2—2 of FIGURE 1, to a still larger scale; and

FIGURE 4 is a fragmentary side elevational view taken on the line 4—4 of FIGURE 1.

Referring to the drawings, there is illustrated a liquid dispensing machine which is particularly adapted for use in connection with the filling of liquid products into aerosol-type containers. The apparatus is, however, not limited to the filling of any particular type of container or to the dispensing of any particular liquid material.

The apparatus comprises a hollow base assembly **10** (FIGURES 1 and 2) of generally cylindrical shape having a vertically disposed central hub **11** on which there is rotatably mounted, by means of vertically spaced bearings **12** and **12'**, a ring-like platform support **13**. The platform support **13** has an upwardly facing, horizontally disposed annular surface **14** on which a plurality of circumferentially spaced container receiving platform support members **15** are mounted. The platform support ring **13** also carries a bowl-like liquid supply tank or reservoir **16** and associated valve assemblies **17** disposed above the platform support members **15**. The platform support ring **13** is provided with a ring gear **18** which is driven by a pinion **19** on the top end of a vertical drive shaft **20**. The drive shaft **20** is mounted in the bearing formation **21** in the base assembly **10** and at its lower end has a shear pin connection **22** with a motor **23** mounted on a bracket **24** within the base **10**. This provides a direct drive for rotating the turret-like support member **13**.

The base assembly **10** supports at one side of the machine an infeed and outfeed conveyor assembly **25** (FIGURE 1) for delivering the empty containers C to the platform support members **15** at the entry side of the supporting turret **13** and for removing them at the discharge side of the turret after they traverse the circular path of the turret and receive a charge of liquid. The conveyor assembly **25** comprises an endless belt, or chain and plate, type conveyor having an upper run **26** on which the containers C are delivered to a star wheel **27** which carries the containers C from the conveyor run **26** across a horizontally disposed supporting plate **28** to the platform supports **15**. The star wheel **27** is supported on the upper end of a vertical shaft **29**. A helical container spacing screw assembly **30** extends along the side of the conveyor run **26** for spacing the containers for delivery to the pockets of the star wheel **27**. The conveyor run **26** extends generally tangential to the path of the turret **13** and the filled containers are delivered from the turret back to the same conveyor by a star wheel **31** which is mounted on a vertically disposed shaft **32** on the opposite side of a horizontally disposed edge or side guide member **34**. The guide member **34** provides two semicircular surfaces **35** and **36** which form the outer periphery of the path for the containers as they move around the star wheels **27** and **31**. The guide member **34** has an adjustable inner section **37** which is pivotally mounted at **38** and which is adjustable by means of a rotating cam **39** for accommodating containers of different diameters so as to insure that they are properly positioned on the platform members **15** when delivered thereto by the star

wheel 27. The star wheel shafts 29 and 32 are supported in vertically disposed bearing formations 40 and 41 on a side extension of the base assembly 10 and these shafts carry at their lower ends sprockets 42 and 43 which are connected by a chain 44 with a sprocket 45 on the main drive shaft 20. The chain 44 also drives the sprocket 46 on a vertically disposed stub shaft 47 and a tightener sprocket 48. The shaft 47 has a sprocket 49 which is connected by a chain 50 with a sprocket 51 on the lower end of a vertically disposed drive shaft 52. A right angle connector 53 at the upper end of the shaft 52 provides a driving connection with the container spacing screw 30.

The platform members or assemblies 15 each comprise a horizontally disposed container supporting plate 54 having a depending stem 55 which is slidably mounted in one of a plurality of vertically disposed bearing forming bores 56 spaced about the outer margin of the turret member 13. The stems 55 each carry a cam follower roller 57 on the lower end thereof which cam follower 57 is adapted to ride on the track formed by the top edge of a cylindrical platform cam 58. The cam 58 is mounted in fixed position on the edge of the top face 59 of the base assembly 10. A guide rod 60 depends from an inner end of each of the plates 54 and is received in sliding relation in a vertically disposed guide forming bore 61 in the turret member 13.

The bowl or tank forming assembly 16 has a circular aperture 64 in the center and an outer liquid receiving annular trough 65 extending about the peripheral margin which opens upwardly. The bowl assembly 16 is connected to the turret forming support member 13 by a series of depending pins 66 which are received in sliding relation in hollow vertical posts 67, the latter projecting upwardly of the surface 14 of the turret member 13. The bowl or tank assembly 16 has an outer wall 68 which rises a predetermined distance above the top edge 70 of an inner wall 71. An inwardly extending, downwardly inclined rim section 72 extends from the inner wall edge 70 to the center opening 64 so that when liquid in the trough 65 rises above the edge 70 of the inner wall 71 it will spill over the edge 70 and down the inclined rim surface 72 for discharge through the opening 64 into the top of a funnel-like collecting member 73 which is supported on the top edge of a vertically disposed tubular post 74. The post 74 extends upwardly from the base 13 with its upper end received in the hub 11 and with its lower end closed by a plate 75 having secured on its inner face an upstanding nut-like member 76 in which a supporting rod 77 is threadedly received. The rod 77 is adapted to be rotated to raise and lower the post 74 so as to adjust the upper edge of the funnel member 73 relative to the lower edge of the flange 72 of the bowl assembly 16. The support rod 77 is supported at its lower end in a bearing box 78 and has a gear connection with a linkage 79 extending to the wall of the base assembly 10 and receiving a handle 80 for manually rotating the same so as to turn the support rod 77 and raise and lower the post 74. The funnel member 73 has a discharge opening 81 at the bottom end thereof to which a discharge hose 82 is connected for draining off the liquid which spills over into the funnel member 73 and returning it to the liquid supply. A top cover member 83 is provided for the assembly 16 which has a depending hub-like sleeve forming section 84 at the center for mounting the same on the upper post forming portion 85 of a supporting bracket 86. The bracket 86 has a plurality of outwardly and downwardly inclined legs 87 with the lower ends thereof seated on a shelf forming flange 88 defining a cylindrical section 89 at the lower center of the funnel member 73. The cover member 83 has a series of removable sections 90 providing ready access to the inside of the bowl assembly 16. The post forming portion 85 of the bracket 86 is hollow and accommodates a conduit 91 through which fluid is delivered to the trough 65 in the bowl assembly 16.

The bowl assembly 16 is provided around its periphery with a series of measuring cup and valve assemblies 17 each of which comprises a cylindrical cup member 92 having an open upper end and a plug-like member 93 in the lower end. The plug forming member 93 constitutes a part of a cap assembly 95 which is provided with a pair of oppositely disposed, radially extending protuberances 96 each having a vertical bore 97 for receiving a guide forming pin 98. The guide pins 98 depend from the bottom wall 100 of the assembly 16. The cup 92 is mounted for vertical movement within a sleeve 101 which is fixed in an aperture 102 in the bottom wall 100. A bellows forming member 103 has its lower edge clamped in the aperture 102 by the sleeve 101. The upper edge of the bellows 103 is secured about the top margin of the cup 92. The bellows member 103 may be formed of any suitable material which is resistant to the liquids with which the apparatus is employed and which is adapted to form an impervious, expansible shield between the top edge of the cup 92 and the bottom wall of the trough so that the cup 92 may be raised and lowered without liquid escaping through the aperture 102. The plug member 93 at the lower end of the cup 92 is provided with an axially extending discharge opening 104 terminating at a valve seat formation 105 for a ball valve 106 which is mounted on the bottom end of a vertically disposed rod 107. The rod 107 extends upwardly through an aperture 108 provided in the top wall forming member 83 and carries on its upper end a block 110 on which a cam follower roller 111 is mounted. The block 110 is provided with an aperture 112 for receiving a vertically disposed guide rod 113 which extends upwardly of the top surface of the cover member 83 and which carries a compression spring 114 for limiting the upward movement of the block 110. The cam follower roller 111 is adapted to ride on the track forming top edge 115' of a cylindrical plate cam 115 which is mounted on the upper end of the bracket 86. When the cam roller 111 is engaged with the cam plate 115 the ball valve member 106 is raised so as to open the discharge passageway 104 at the bottom of the measuring cup 92. When the cup assembly is not raised the cam roller 111 passes beneath the cam plate 115 and there is no valve operation so that the contents of the cup is not discharged. The valve rod 107 is provided with a sleeve member 116 which encompasses an upper portion of the rod 107 and has a threaded connection with the same so that rotation of the sleeve 116 moves the same axially on the rod 107 or raises and lowers the same thereon. The sleeve 116 functions as a fine adjustment for varying the volume of liquid which is received in the cup 92 when it is lowered to bring the upper edge below the level of the liquid in the trough 65. Preferably, removable inserts 117 are provided for the cup 92 so as to permit the volume of the cup to be adjusted by insertion or removal of the inserts 117, the latter, of course, being cylindrical in shape and permitting discharge of the liquid through the axial passageway 118 therein when the rod 107 is raised to open the valve 104.

The cam track forming plate member 115 at the top of the machine extends circumferentially of the turret from a point just beyond the entry point of the containers from the star wheel 27 to a point short of where the containers are removed by the star wheel 31. The upper edge 115' of the cam plate 115 is at a level sufficient to raise the valve ball 106 for opening the valve after the valve assembly has been elevated by upward movement of the platform member 15 and engagement of the mouth of the container C with the plug member 93 or cap 95, so as to empty the contents of the cup 92 into the container C while all the elements are in the raised position.

In using the apparatus, liquid is supplied to the trough 65 through the conduit 91 so as to fill it level with the upper edge 70 of the inner wall 71 and to maintain it in

filled condition with the excess spilling over the edge **70** and into the drainage cup or funnel **73** from which it is returned to the supply line. The containers C are delivered successively to the platform members **15** by operation of the star wheel **27** and each container is positioned under a valve assembly **17**, the latter being aligned vertically above the platform members **15**. As the turret member **13** advances, the successive platform members **15** are raised by engagement of the cam rollers **57** with the platform cam **58**. Raising the platform member **15** moves the container C upwardly to engage the open mouth thereof beneath the plug forming bottom end member **93** of the valve assembly **17**. The valve assembly **17** is normally held with the top edge of the cup **92** below the level of the liquid in the trough **65** so that the cup **92** is normally filled with liquid. As the platform members **15** are raised and the containers C are elevated so as to elevate the valve assembly **17**, the top edge of the cup **92** moves to a position above the level of the liquid in the trough **65** which results in a metered amount of the liquid being trapped in the cup **92**. As the turret **13** rotates the cam follower **111** engages on the top surface **115'** of the cam ring **115** and the valve ball **106** is lifted to allow the liquid in the cup to discharge into the container C beneath the same. As the container C is moved around the turret and approaches the star wheel **31** for discharge from the platform member **15** the cam follower **111** moves off of the end of the cam track **115** and drops the valve ball **106** to close the passageway **104**. The platform member **15** is then lowered by the configuration of the cam ring **58** so as to drop the valve assembly **17** to its lowermost position where the top edge of the cup **92** is below the level of the liquid in the trough **65** and the cup **92** is refilled for the next dispensing operation. The platform member **15** has sufficient movement relative to the bottom end of the valve assembly **17** to release the container C for removal from the turret by the star wheel **31** when the platform member **15** is lowered to its bottom position.

While particular materials and specific details of construction are referred to in describing the illustrated form of the apparatus, it will be understood that other materials and different structural details may be employed within the spirit of the invention.

We claim:

1. A machine for filling containers with a measured amount of a liquid material, said machine comprising a horizontally disposed supply receptacle mounted for rotation about a vertical axis, which receptacle is in the form of a circular tray with an upwardly opening annular trough defined by inner and outer walls of unequal height, the inner wall having a lesser height than the outer wall and the receptacle having a center aperture, means for supplying liquid to the trough so as to maintain the level of the liquid at the height of the inner wall and permitting excess liquid to spill over into the center opening of the receptacle, a receptacle beneath the center opening for receiving the excess liquid, a plurality of liquid measuring and dispensing valve assemblies mounted in peripherally spaced relation in the annular trough, each of said measuring and dispensing valve assemblies comprising a cylindrical measuring cup disposed in sliding relation in a vertically extending bottom opening in the trough, each said cup being open at the top and having a bottom cap disposed beneath the trough with a central axially extending discharge passageway and a ball valve for opening and closing the passageway, the valve ball being carried on the lower end of a vertically extending rod, an extensible bellows-type seal between the top of the cup and the bottom opening in the trough so as to close off the latter and prevent escape of liquid through the bottom opening, a series of container supporting platforms aligned beneath the measuring and dispensing valve assemblies, means for delivering containers to be filled to the platform, means for raising

the platforms to engage the tops of the containers with the lower ends of said assemblies and to raise said assemblies so as to move the open tops of the cups from a position below the level of the liquid in the trough to an elevated position above the level of the liquid in the trough, a circular cam and cam followers on the valve carrying rods for raising the valve carrying rods to open the valves for discharge of the contents of the measuring cups when the measuring cups have been raised to a position where the tops thereof are above the level of the liquid in the trough and a predetermined quantity of the liquid is trapped in each of the cups.

2. A container filling machine which comprises a turret including a liquid supply bowl having an annular trough with an inside lip which is lower than the outside wall thereof and a center opening into which liquid will spill over the inside lip when the trough is filled to overflowing, said bowl having a plurality of openings in the bottom of the trough and a plurality of measuring and dispensing assemblies mounted in sliding relation in said openings, each of said assemblies comprising a cylindrical measuring cup having an open top and a capped bottom with the bottom protruding through the bottom of the bowl, a flexible bellows-type seal in the trough which extends between the top of the cup and the opening in the bottom of the trough for preventing the passage of liquid therethrough, an axial discharge passageway in the cap on the bottom of the cup which terminates at a ball valve seat, a valve ball mounted on an axially extending rod which is supported for vertical movement in the cup, container supporting platforms aligned below each of said measuring and dispensing assemblies and cam means for raising and lowering the platforms, a conveyor for delivering containers to be filled to the turret and for taking the filled containers away, star wheels for transferring the containers from the conveyor to the turret and from the turret to the conveyor, and co-operating cam members disposed circumferentially on the bowl and on the valve rods for raising and lowering the valve balls so as to open and close the bottom discharge passageways in the cups.

3. A container filling machine which comprises a turret including a liquid supply bowl having an annular trough with an inside lip which is lower than the outside wall thereof and a center opening into which liquid will spill over the inside lip when the trough is filled to overflowing, said trough having a plurality of circumferentially spaced openings in the bottom thereof, measuring and dispensing valve assemblies mounted in sliding relation in said openings, each of said assemblies comprising a cylindircal measuring cup disposed in an opening with an open top and a capped bottom protruding through the bottom of the bowl, a flexible bellows-type seal in the trough between the top of the cup and the opening in the bottom of the trough for preventing the passage of liquid therethrough, while permitting vertical movement of the cup, a discharge passageway in the cap at the bottom of the cup which terminates at a ball valve seat, a valve ball mounted on a rod which is supported for vertical movement in the cup, a container supporting platform aligned below each of the assemblies and cam means for raising and lowering the platform, means for delivering containers to be filled beneath said assemblies on the turret and for taking the filled containers away, and cam means including a fixed cam track and co-operating cam followers on the valve rods for raising and lowering the same to open and close the valves in the cups.

4. A container filling machine which comprises a liquid supply bowl having an annular trough with an inside wall having a top edge which is lower than the outside wall thereof and a center opening into which liquid will spill over the top edge of the inside wall when the trough is filled to overflowing, said trough having a plurality of openings in the bottom thereof, measuring

and dispensing valve assemblies mounted in said openings, each of said assemblies comprising a cylindrical measuring cup disposed for vertical movement in an opening with an open top and a capped bottom which extends below the bottom of the bowl, a flexible seal in the trough between the top of the cup and the opening in the bottom of the trough for preventing the passage of liquid therethrough while permitting vertical movement of the cup, a discharge passageway in the bottom of the cup which terminates at a ball valve seat, a valve ball mounted on a vertically extending rod which is slidably supported in the cup, a container supporting platform aligned below each said assembly and cam means for raising and lowering the platforms, means for delivering containers to be filled onto the platforms and for taking the filled containers away, a circular cam mounted above the supply bowl and a cam follower on each valve rod for raising and lowering the same to open and close the discharge passageway in the cup.

5. A machine for filling containers with a measured amount of a liquid material, said machine comprising a horizontally disposed supply receptacle which is in the form of a circular tray with an upwardly opening annular trough defined by inner and outer walls, the inner wall having a lesser height than the outer wall and the bowl having a center aperture, means for supplying liquid to the trough so as to maintain the level of the liquid at the height of the inner wall and permitting excess liquid to spill over into said center aperture, a funnel-like receptacle beneath said center aperture for receiving the excess liquid and having connection with said liquid supply means for returning excess liquid thereto, liquid measuring and dispensing valve assemblies mounted in peripherally spaced relation in said annular trough, said trough having circumferentially spaced bottom openings, said assemblies each comprising a cylindrical measuring cup disposed in vertically extending sliding relation in a bottom opening in the trough, each said cup being open at the top and having a bottom closure projecting beneath the trough with a central axially extending discharge passageway and a valve for opening and closing the passageway, the valve being mounted on the lower end of a vertically extending rod, an extensible bellows-type seal within the trough and extending between the top of the cup and the opening in the bottom of the trough so as to close off the opening and prevent escape of liquid through said opening while permitting reciprocal movement of said cup, container supporting platforms aligned beneath said assemblies, means for delivering containers to be filled to the platforms, means for raising the platforms to engage the tops of the containers with the bottom closures on the lower ends of said assemblies and to raise said assemblies so as to move the open tops of the measuring cups from a position below the level of the liquid in the trough to an elevated position above the level of the liquid in the trough, a cam ring and co-operating cam members on the valve rods for raising the valve rods to open the valves for discharge of the trapped contents of the measuring cups when the measuring cups have been raised to said elevated position.

6. A machine as recited in claim 5, and removable inserts adapted to be seated in the bottom of the cups for varying the volume of the liquid trapped in the measuring cups when the cups are raised from a lowered position so as to move the open tops above the level of the liquid in the supply receptacle, said inserts having a center passageway aligned with said cup discharge passageway for accommodating the valve rod and for discharge of the liquid therethrough.

7. A machine as recited in claim 6, and a sleeve mounted for axial adjustment on the upper portion of each valve rod so that the bottom end of the sleeve may be positioned in the cup and thereby provide a fine adjustment of the volume of liquid trapped in the cup when it is raised so as to move the open top above the level of the liquid in the supply receptacle.

8. A machine for filling successive containers with a measured amount of a liquid material, said machine comprising a rotatably mounted, horizontally disposed liquid supply bowl which is in the form of a circular tray with an upwardly opening annular trough, means for supplying liquid to the trough so as to maintain a quantity of the liquid in the trough at a predetermined constant level, said bowl having a plurality of openings in peripherally spaced relation in the bottom of said annular trough, liquid measuring and dispensing assemblies mounted in said openings, each of said assemblies comprising a cylindrical measuring cup disposed in vertically extending, slidable relation in and having the bottom portion thereof extending through the bottom opening in the trough, each said measuring cup being open at the top and having a bottom forming dispensing valve assembly at the lower end thereof which has a central axially extending discharge passageway and a valve ball for opening and closing the pasageway, a vertically extending rod on the lower end of which the valve ball is mounted, an extensible cylindrical bellows seal extending within the trough between the top of each measuring cup and the opening in the bottom of the trough in which the measuring cup is slidably disposed so as to close off the latter and prevent escape of liquid through said bottom opening while permitting vertical movement of the cup to a position where the top of the cup is above the level of the liquid in the trough, container supporting platforms aligned beneath the said measuring and dispensing assemblies, means supporting said platforms for rotation with said supply bowl, means for delivering containers to be filled in upright position onto the platform, means for raising the platforms a distance sufficient to engage the tops of the containers with the lower ends of said assemblies and to raise said assemblies so as to lift the open tops of the cups from a position below the level of the liquid in the trough to an elevated position above the level of the liquid in the trough thereby trapping a measured amount of the liquid in each of the cups, and cam means cooperating with said valve rods for raising the ball valve rods independently of the cup movement once a cup is in elevated position thereby to open the discharge passageway and discharge the trapped liquid in the measuring cups into the containers while the cups are in said elevated position.

9. A machine for filling containers with a measured quantity of a liquid material, which machine comprises a horizontally disposed liquid supply bowl with an upwardly opening, annular trough for receiving a supply of the liquid, means for supplying liquid to the trough so as to maintain the level of the liquid at a predetermined constant height, measuring and dispensing assemblies mounted in peripherally spaced relation in the trough, each of said assemblies comprising a vertically disposed cylindrical measuring cup member having a top opening and a bottom forming valve assembly with an axially extending discharge passageway and an associated valve member in said passageway which is adapted to be raised to open said passageway, said cup member being mounted for vertical movement in a vertically extending bore in the bottom of the annular trough between a lowered position where the top of the cup member is below the level of the liquid with the bottom of the cup member extending below the trough and a raised position where the top of the cup member is above the level of the liquid so as to trap in the cup member a measured quantity of the liquid when the cup member is raised, container supporting members below the cup members, means for delivering open top containers to be filled to said container supporting members, means for raising the container supporting members so as to engage the tops of the containers with the bottom ends of said assemblies and to raise the assemblies a distance sufficient to bring the top openings of the

measuring cup members above the level of the liquid in the trough, and cam means operative upon predetermined upward movement of the measuring cup members for raising the associated valve members in the measuring cup members independently of cup movement while the measuring cup members are in raised position thereby to discharge the liquid trapped in the measuring cup members into the containers.

10. A machine as recited in claim **9**, and an extensible cylindrical bellows sealing means extending between the top portion of each measuring cup and the bore in the bottom of the trough in which the measuring cup is mounted for preventing leakage of liquid material through the bores.

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