Oct. 8, 1968 D. ELFORD 3,404,713

CONTAINER FILLING APPARATUS

Filed June 24, 1965 6 Sheets-Sheet 1

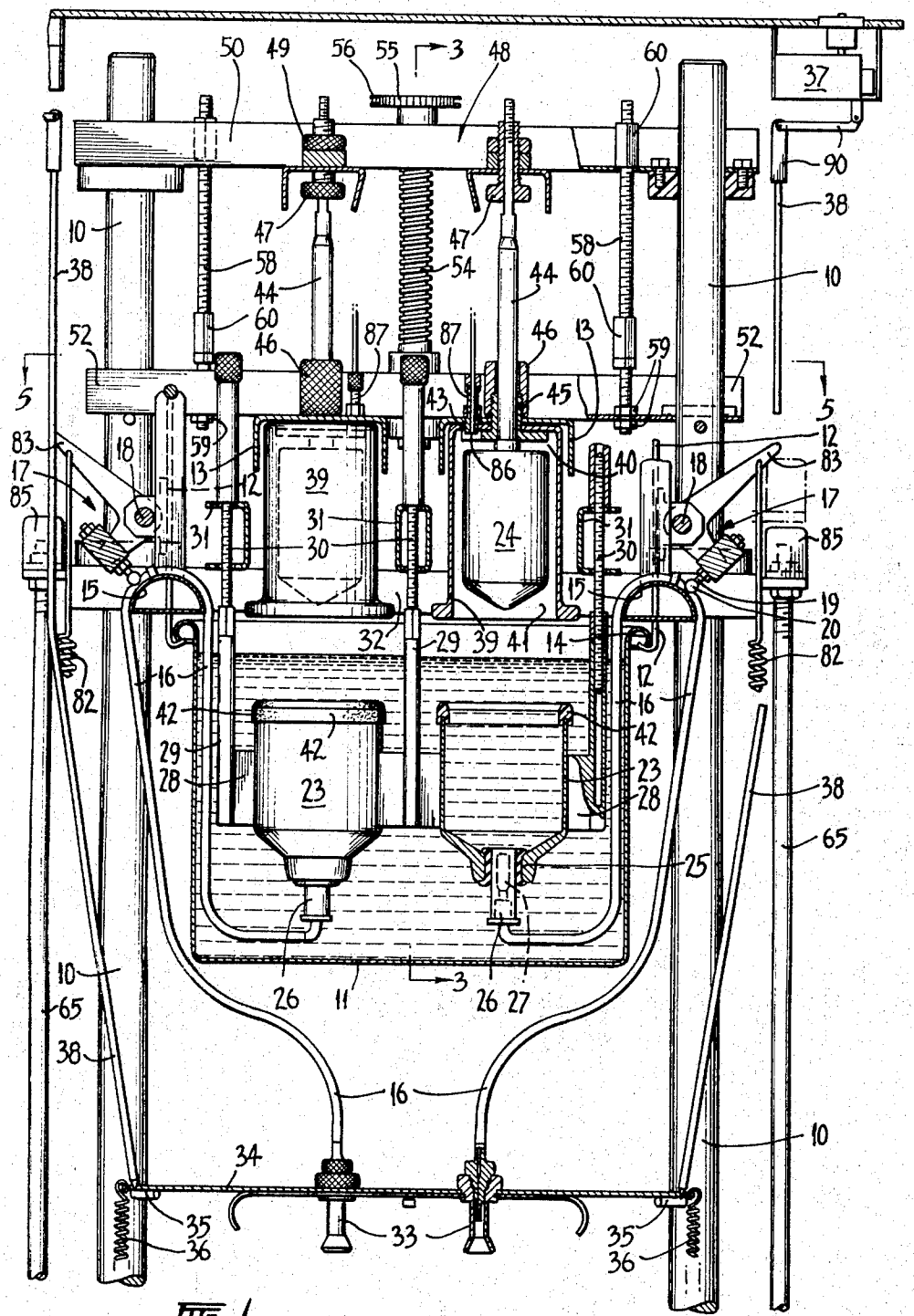

FIG. 1.

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CONTAINER FILLING APPARATUS

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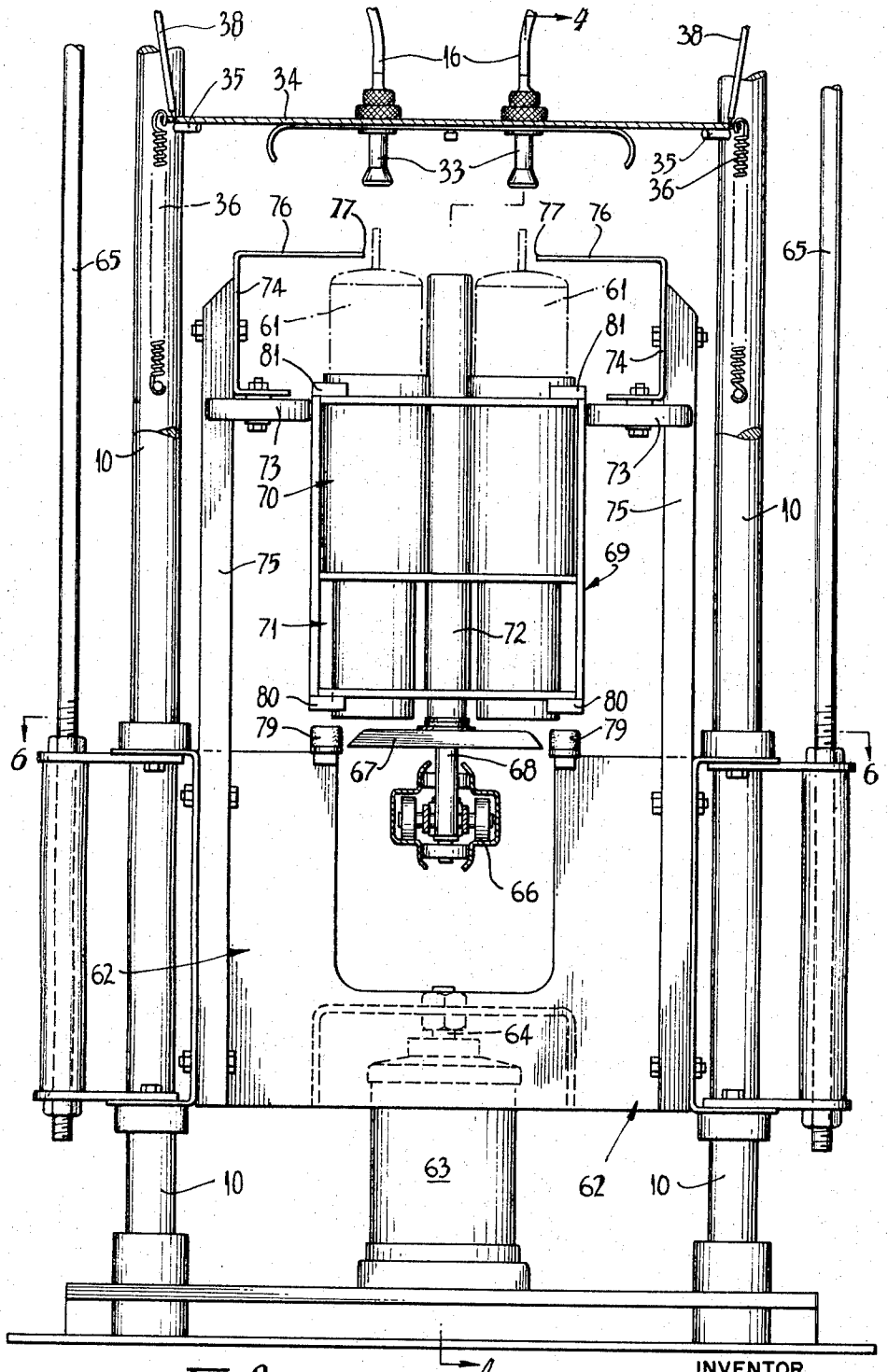

Fig. 2.

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CONTAINER FILLING APPARATUS

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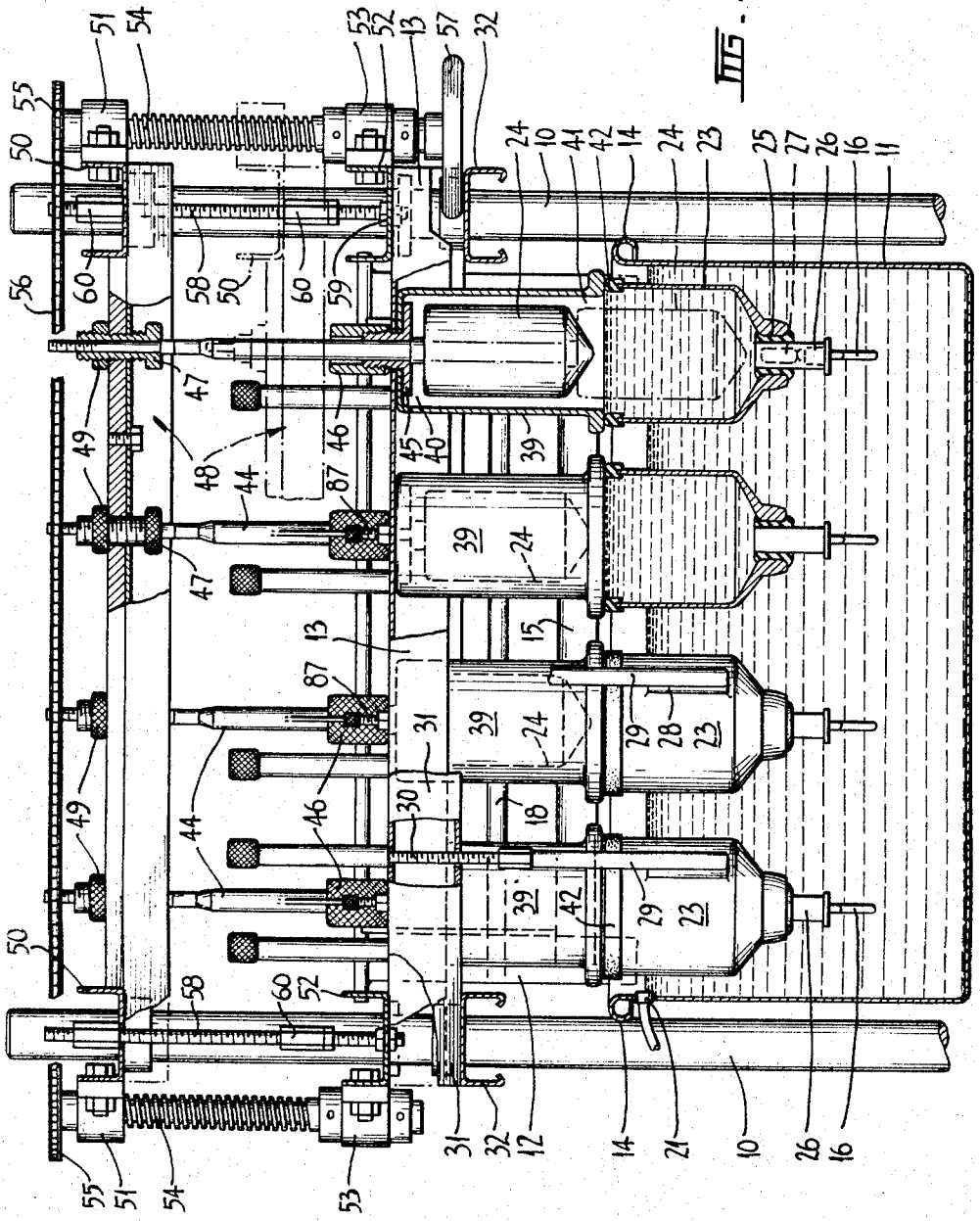
FIG. 3.



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CONTAINER FILLING APPARATUS

Filed June 24, 1965 6 Sheets-Sheet 4

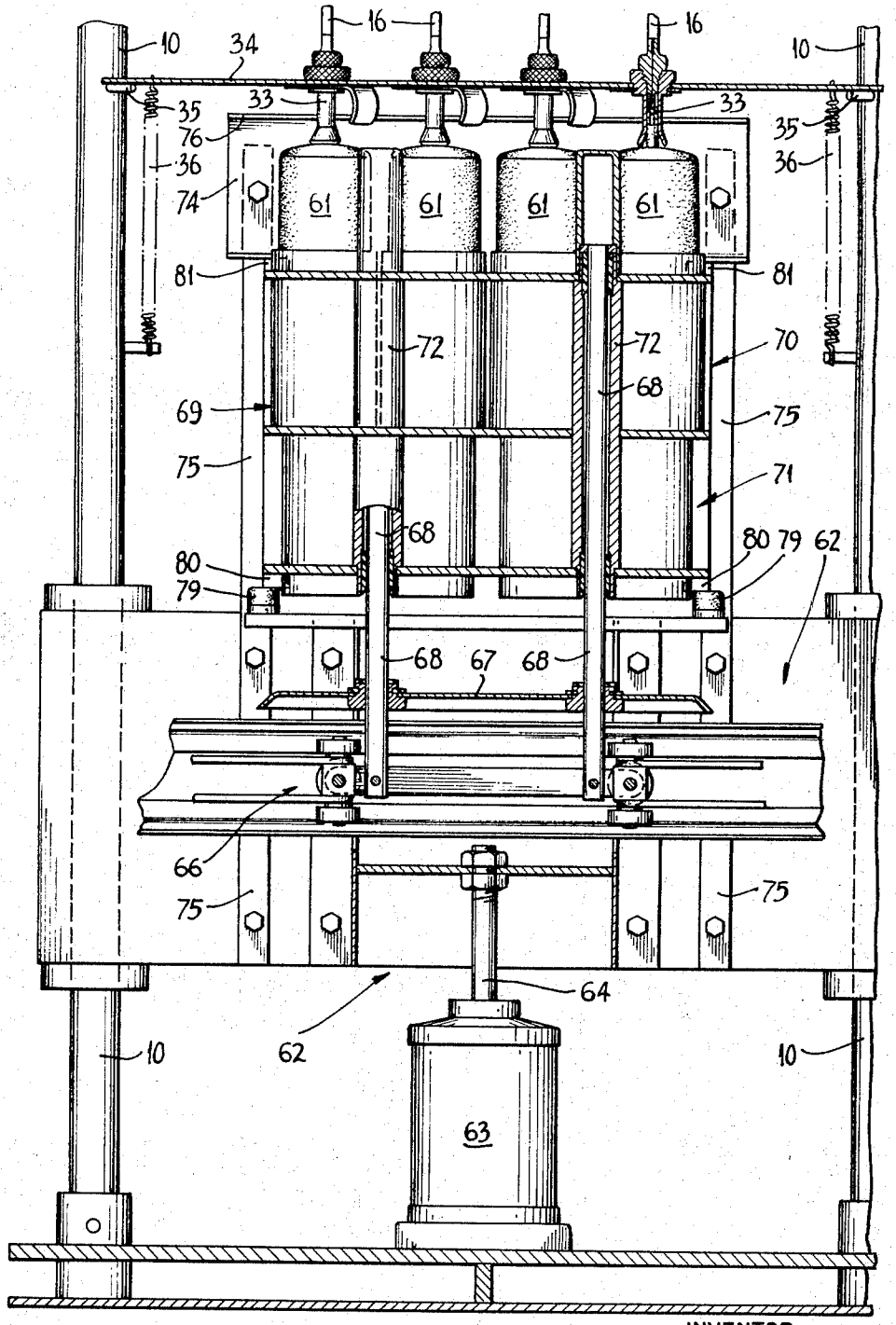

FIG. 4.

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CONTAINER FILLING APPARATUS

Filed June 24, 1965 6 Sheets-Sheet 5

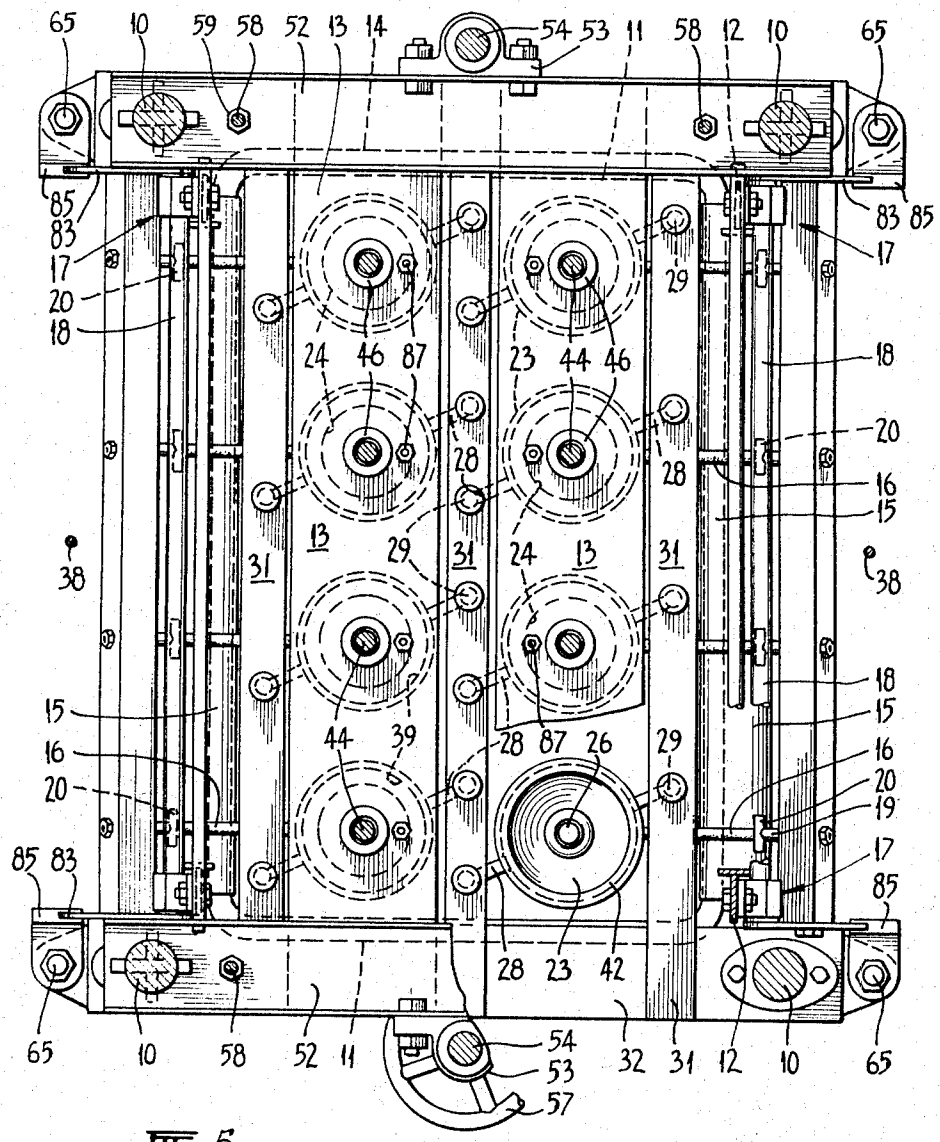

FIG. 5.

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CONTAINER FILLING APPARATUS

Filed June 24, 1965 6 Sheets-Sheet 6

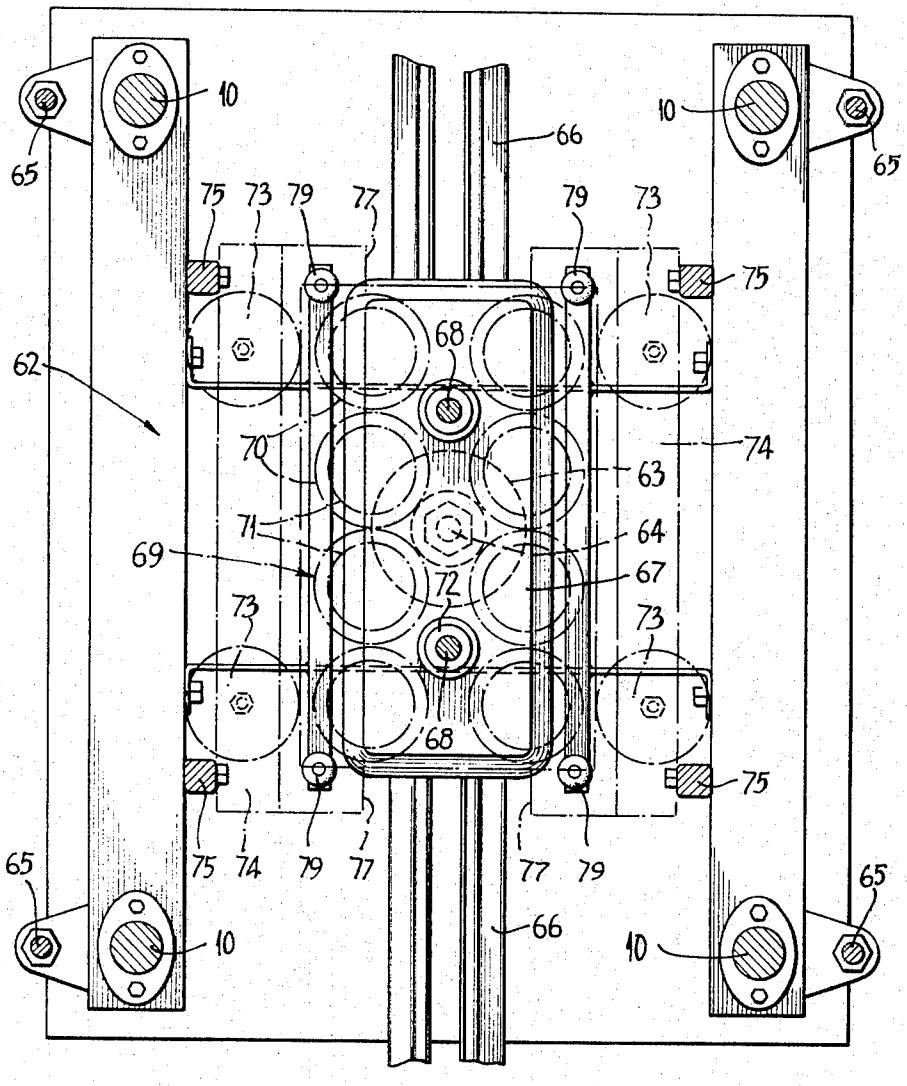

FIG. 6.

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United States Patent Office 3,404,713
Patented Oct. 8, 1968

3,404,713

CONTAINER FILLING APPARATUS

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Filed June 24, 1965, Ser. No. 466,722
18 Claims. (Cl. 141—67)

ABSTRACT OF THE DISCLOSURE

Containers are filled with liquid precisely and rapidly by raising measuring pots from a bowl of liquid into sealing engagement with air bells mounted above the pots. Air introduced to the bells ejects liquid trapped in the pots, through tubes leading from the pots into the containers, via filler nozzles on the tubes. The air flows continuously into the bells.

This invention relates to apparatus for filling containers and refers more particularly to apparatus for filling liquids into containers having very small openings such as filling intravenous infusion fluids into plastic ampoules.

These containers for solutions for intravenous infusion hold approximately one quarter litre, one half litre, or one litre of various solutions for intravenous infusion. In use, the ampoules are inverted and suspended from a base hook whereby the solution is permitted to flow freely from said ampoules. Standardization of such tubes in the medical field has necessitated a particular size of filling neck or tube on an ampoule, which neck serves the dual purpose of both filling the ampoule with a solution and subsequently discharging the solution by inverting the ampoule after connecting a delivery tube to the filling neck.

The small bore of these filling necks which, in the case of ampoules for intravenous infusion fluids, is brought about by the above dual use of the neck or for hygenic or other reasons, makes filling of the container at speed difficult. To overcome the time lag brought about by the high resistance in a small bore entry nozzle necessary for injecting solutions into such containers, it is desirable to force the solutions into the containers by means of a positive head of pressure, either from a gravity tank, a displacement piston or the like.

In the case of corrosive solutions having a limited range of desirable materials, which may be in contact with the solutions, or in the case of infusion solutions which may be tainted with trace quantities of undesirable materials, it is most necessary to limit the number of materials which the solutions may contact. It is also necessary to have these "contact" materials, which are components of the apparatus, built in such a manner as to be readily removable for cleaning. In the case of infusion fluids, the contact parts must be effectively flushed clean with pyrogen-free water before using the equipment. This is generally carried out in a highly filtered particle-free atmosphere and the equipment is desirably contained inside an enclosure or cabinet fed with such air, filtered to the desired specifications.

A further requirement of such equipment is that it should fill each container with a relatively accurate measure of fluid and that it should be adjustable to permit filling of containers of various sizes.

Now it is an object of the present invention to provide a filling apparatus which embodies these desirable features and in accordance with the invention there is provided a container filling apparatus comprising a filler bowl, means for delivering solution to said filler bowl; one or a plurality of measuring pots in said bowl, a tube

connected to the base of the or each pot, the or each said tube passing upwardly over the edge of said bowl, thence downwardly to a level below the bottom of said bowl, the or each tube having a filler nozzle connected to or associated with its lower end; a bell associated with the or each of said measuring pots, the or each said bell being adapted to seal against the top of the or each said pot, and means for delivering air to the or each said bell whereby when the or each said bell seals against its associated measuring pot the solution contained within the pot is delivered by the tube to the filler nozzle.

More particularly, each of the said bells comprises a displacement plug which is adjustable to permit any desired volume of solution to be delivered from each pot.

The invention will be more fully described with reference to the accompanying drawings illustrating a preferred form of the invention wherein:

FIGURE 1 is an elevational view, partly in section of an ampoule filling apparatus,

FIGURE 2 is an elevational view of mechanism for delivering ampoules to the apparatus of FIGURE 1,

FIGURE 3 is a cross-sectional elevational view taken along line 3—3 of FIGURE 1,

FIGURE 4 is a cross-sectional elevational view taken along line 4—4 of FIGURE 2,

FIGURE 5 is a sectional plan view taken along line 5—5 of FIGURE 1, and

FIGURE 6 is a sectional plan view taken along line 6—6 of FIGURE 2.

An ampoule filling apparatus in accordance with the illustrated preferred form of the invention has a main support comprising four rectangularly spaced vertical pillars or columns **10** of stainless steel. These columns **10** are mounted within a sterilized cabinet or the like (not shown) and are arranged to support several frames as will be hereinafter described.

A filler bowl **11** which is an open-topped container preferably lined with vitreous enamel, glass or the like, is supported by hook-like members **12**, the upper ends of which are attached to horizontal beams **13** carried between the columns **10** and supported thereby.

The hook members **12** engage the rolled upper edge **14** of the bowl **11** which is suspended therefrom. Each hook-like member **12** comprises a convexly curved plate **15** associated therewith, said plate providing a guide support for delivery tubes **16** and preventing kinking or other deformation of the tube as it passes from the bowl **11**.

Also associated with the hook-like members **12** are a series of tube pinching members **17**. Each member **17** is a substantially V-shaped lever pivoted about its centre by attachment to a horizontal shaft **18** extending lengthwise of the apparatus. The pinching members **17** are arranged, one in association with each delivery tube **16** as will be more fully described hereinafter. Each member **17** carries on its lower end an inverted T-shaped member **19**, the cross member **20** of which serves to clamp the tube **16** against the plate **15**, thus preventing flow of liquid through the tube **16**.

The filler bowl **11** is continuously fed with solution from a supply tank (not shown). The filler bowl **11** has an overflow outlet **21** which is so arranged that the bowl will be full of solution at all times with but minor variations in level as solution is fed to containers being filled. The solution is fed to the bowl **11** at a rate greater than it can be consumed for the purpose of filling containers and the excess solution is returned to the supply tank via the overflow **21**.

Although it is not absolutely necessary to maintain the level of solution in the bowl in this manner, the advantage is that no float valve or other level control device is necessary, and by being able to recycle the solution

continuously it may readily be held at a prescribed temperature with out the use of a further heating or cooling device in the filling equipment.

The bowl **11** is a simple basin which is readily manufactured and coated if desired and it may be readily removed from the hook-like members **12** for cleaning.

Suspended from an overhead framework **32** which is vertically adjustable on the columns **10** are a plurality of measuring pots **23** which may be of the same volumetric content as the ampoules to be filled or of greater volumetric content. The pots **23**, and in the example referred to in this description there are eight arranged in two rows of four each, are submerged in the solution in the bowl **11**. Where the pots **23** are of larger volumetric content than the ampoules to be filled, displacement plugs **24** are employed to ensure delivery of the exact amount of solution from each pot. These pots **23** are thus not necessarily critical in their dimensions and they may either be made from a suitable base material for contact with the solutions or they may alternatively be vitreous enamelled or glass lined or otherwise suitably treated.

These pots **23** are preferably substantially cylindrical containers open at their upper ends and provided with inverted conical bases so as to provide a lowest central, or drain, point.

The tube **16** is attached to the drain opening **25** of each pot **23** through the medium of a glass valve housing **26** sealed in the drain opening **25** by a gasket of suitable plastic material or rubber. The valve **27** is a simple float valve which seals the entry of the tube **16** in the housing **26** when the pot **23** is emptied.

The valve **27** at the bottom of each pot **23** is provided with means for attaching the flexible filler tube **16** of a suitable inert material such as Tygon. The tubes **16** extend from the base of each pot **23** upwards and over the curved plate **15** so that their highest point is of necessity above the level of the solution in the bowl **11** and syphoning cannot commence of its own accord.

After passing over the edge of the bowl, the tubes **16** are carried on downwardly below the level of the bottom of the bowl to connect with filler nozzles **33** which are inserted accurately in the filling tube or neck of the containers to be filled.

The filler nozzles **33**, which are of known type, are passed through holes in a spring-loaded platform **34** carried by the columns **10** beneath the bowl. The platform is spring-loaded so as to be held down against stops **35** and the loading is such as to prevent movement of the platform during accurate positioning of the container necks within the nozzles **33**. However, should a container neck be malformed or inaccurately positioned, movement of the containers to the filling position causes the platform to be raised against the action of the spring or springs **36** and a micro-switch **37** is operated through linkage **38** and raising of the containers is stopped, as also is a pot-raising frame **32**, and thus solution is prevented from being delivered to the containers.

The pots **23** are supported in the bowl **11** by means of short cylindrical carriers **28**. The carriers **28** are preferably moulded from suitable plastic material and comprise upstanding female threaded sockets **29** which receive male threaded shafts **30** for adjustment of the heights of the pots **23** in the bowl and for raising and lowering the pots **23** for filling the ampoules. The shafts **30** pass through brackets **31** on a pot-lifting frame **32**.

Above each of the measuring pots **23** and aligned therewith is a bell **39** which is fixed to the overhead frame **13** secured to the columns **10**. Each bell **39** is substantially of hollow cylindrical form closed at the upper end **40** and open at the lower end **41**. The lower end **41** of the bell **39** or the upper lip of the pot **23** is provided with a sealing gasket **42** of suitable base material. The lower end **41** of the bell **39** is of such diameter as to coincide with the diameter of the top of the co-operating measuring pot **23** whereby when said pot and bell are brought into contact by the raising of the pot, the top edge of the pot seals against the lower edge of the bell with the gasket **42**, providing a fluid-tight seal between said bell and pot.

Air is fed continuously into each bell **39** through an opening **43** in the top of said bell at a restricted flow rate so that when the pot is sealed against the bell the air pressure will stabilize at a preset figure to maintain an overriding pressure on the solution consistent with the head pressure desired to achieve the required filling rate.

An adjustable displacement plug **24** is preferably, but not necessarily, fitted inside each bell **39** to displace a quantity of the solution from its respective pot **23** prior to the transfer of the solution from the pots to the ampoules. In this manner it is unnecessary to substitute pots of different capacity for filling ampoules of different capacity.

The displacement plugs **24** are piston-type members arranged centrally within each bell **39** (see FIG. 3). The displacement plug comprises a vertical shaft **44** affixed to the top of said plug **24**. A guide bush **45** for the shaft **44** is fitted in an opening in the top of the bell **39** and is clamped tightly thereon by a knurled and threaded member **46**. The upper end of the shaft **44** of the plug **24** is threaded into a sleeve member **47** which is clamped to a vertically adjustable frame **48** by a knurled lock nut **49**. The plugs **24** are adjustable vertically within the bell **39** to vary the amount of solution to be displaced from the pot **23** prior to the sealing of said pot and bell. The adjustment of the displacement plug is accomplished by mounting the frame **48** on the pillars **10** so as to be slidable vertically thereon. The frame **48** is provided on each side of the apparatus with a bracket **50** which is welded or otherwise suitably affixed to the upper surface of the frame **48**. Attached to the brackets **50** and extending laterally from the apparatus are threaded bearing blocks **51**. Arranged directly beneath the brackets **50** are similar brackets **52** affixed to the beams **13**. Extending laterally from brackets **52** are plain bearing blocks **53**. A threaded shaft **54** is carried by the plain bearing blocks **53** with the upper portion of said shaft threaded into the threaded bearing block **51**. The top end of each shaft **54** carries a sprocket wheel **55** and a chain **56** passes around said sprocket wheels. The lower end of one of said shafts **54** is provided with an operating wheel **57** to permit the shaft **54** keyed or similarly affixed thereto to be turned. Turning of the operating wheels **57** and associated shaft **54** causes the other shaft **54** to be turned an identical amount through the chain **56**.

Turning of the shafts **54** result in lowering or raising of the frame **48** and thus cause the displacement plugs **24** to be adjusted vertically within the bells **39**. In FIGURE 3, the broken outline shows frame **48** in substantially its lowermost position which means that the displacement plug displaces a substantial amount of solution prior to the sealing of the bell and pot. The plug would be adjusted to this position only when a small amount of solution is to be delivered to an ampoule.

Also extending between each pair of brackets **50** and **52** is a threaded shaft **58**. The shafts **58** are provided with lock-nuts **59** and **60** for locking the frame **48** in position after it has been adjusted by the shafts **54**.

Fine or minor adjustments of the plugs **24** may be effected by means of the knurled members **47**.

When the plug **24** is in its fully retracted or uppermost position the pot **23** is permitted to deliver its full capacity to the ampoule. If only half the contents of the pot are to be delivered, the plug is lowered within the bell **39** so that when the pot and bell are brought together in sealing engagement, the plug enters the solution in the pot **23** and causes half of it to be displaced. Numerous adjustments may be made to the plug to dispense any desired volume of solution from the pot.

In order to fill the ampoules **61**, it is necessary for the ampoules **61** to be brought into contact with the filler nozzles **33** and the pots **23** into contact with the bells **39**. This is accomplished by causing the pot-carrying

framework 32 to be raised on the columns 10 to thereby bring the pots 23 into sealing contact with the bells 39 and similarly a cradle 62 arranged beneath the ampoules 61 is also caused to be raised on the columns a corresponding distance. The raising is accomplished by means of a piston 64 and cylinder 63 arranged substantially centrally within the base of the apparatus. The piston 64 is connected to the cradle which is guided in its vertical movement by the columns, and the pot-carrying framework 32 is connected by rods 65 or the like to said cradle 62 whereby when the cradle is raised by the piston and cylinder, the pot-carrying framework is raised a corresponding distance, bringing the tops of the pots 23 into sealing engagement with the bells 39.

The containers are introduced to the apparatus by means of a conveyor 66 which passes laterally between the columns 10 and between the sides of the lifting cradle 62. The lifting cradle is of H-design to permit the conveyor 66 to pass through. The conveyor 66 is preferably of cross-dolly type and is adapted to support a carriage 67. The carriage 67 is carried by a pair of vertical posts 68 which are fixed to the conveyor 66 at specified distances.

An ampoule receptacle 69 of moulded plastics material is so designed and constructed to provide cylindrical receptacles for eight ampoules and to retain them in such relation as to deliver the filler neck of each ampoule to its associated filler nozzle 33.

The receptacle 69 is a dual receptacle such that when mounted on the carriage 67 in one position the upper portion 70 of the receptacle 69 provides accommodation for eight one-litre ampoules, and when inverted the portion 71 of the receptacle provides accommodation for eight half-litre ampoules. The design of the receptacle is such that the filler necks of the one- or half-litre ampoules are the same distance beneath the nozzles 33. The receptacle comprises a pair of sleeves or guides 72 which slide vertically on the posts 68 and which prevent horizontal movement of the receptacle as it is raised or lowered. (See FIG. 4.)

The side walls of the receptacle 69 are engaged by guide or locating rollers 73 which ensure that the receptacle enters the apparatus in correct alignment. The rollers 73, of which there are two pairs, are rotatably mounted on brackets 74 secured to or integral with stripper supports 75 which are vertical posts or the like attached to the lifting cradle 62.

The strippers 76 are a pair of flat horizontal plates extending at least the full lentgh of the receptacle 69 and which are fixed to a stripper support 75 at each side of the apparatus. The inner longitudinal edge 77 of each stripper plate is adapted to engage against portion of the top of the ampoules 61 associated with each said stripper plate 76 if the ampoules 61 fail to return to their lowered position on the carriage 67 after filling. The inner edge portion 77 of each stripper plate may be recessed or otherwise shaped to engage against the top of the ampoules 61 without risk of damage.

The conveyor 66 is adjusted to move at intervals such as will enable the ampoules 61 in the receptacle 69 on the carriage 67 to be properly positioned beneath their respective filling nozzles 33.

The cradle 62 is provided on its upper surface with pads 79 which provide a sealing for the receptacle 69. The receptacle 69 is formed with corner blocks 80 and 81 moulded integrally therewith. When presenting one-litre ampoules for filling, the receptacle 69 is supported on the pads 79 by the blocks 80 and when presenting half-litre ampoules for filling, the blocks 81 rest on the pads 79.

The pinching members 17, which, as hereinbefore described are associated one with each delivery tube 16, are fixed to the horizontal shafts 18 whereby rotation of the shaft 18 causes all four pinching members 17 affixed thereto to move in unison. A tension spring 82 is attached to the pinching members 17 at each side and at each end of the apparatus, i.e., to four members 17, each spring 82 being pivotally attached to the arms 83 of the members 17 whilst the lower ends of the springs 82 are anchored to a fixed portion of the frame of the apparatus. The springs 82 are provided to exert such force on the pinching members 17 as to prevent flow of solution through the tubes 16 when filling is not taking place.

In order to release the pinching members 17 to permit the flow of solution when filling is taking place, the rods 65 which raise and lower the pot-lifting frame 32 are provided with lugs 85 which abut against the outer end of the arms 83 of the four end pinching members 17 when the pots 23 are raised for sealing against the bells 39. The continued upward movement of the rods 65 causes the lugs 85 to pivot the members 17 about the shaft 18, thereby raising the cross clamp members 20 from the tube 16.

Each bell 39 is provided in the top thereof with an air inlet 86 in the form of a threaded hollow plug 87. Air under controlled perssure is fed from a common source to the bells 39 through these inlets 86. The air flow is continuous but is only effective in delivering solution from the pots 23 when the pots 23 and bells 39 are in sealing engagement.

The micro-switches 37, of which there are four, one at each top corner of the apparatus, are actuated by rod 38 and linkage 90 when the spring-loaded nozzle retaining plate 34 is raised from the stops 35. The lower ends of the rods 38 are attached to the corners of the plate 34. Thus, when any corner of the plate is raised by the non-entry of an ampoule neck into the nozzles 33, the rod 38 is raised thereby tripping the micro-switch and causing the cylinder 63 to lower the cradle 62 and pot frame 32. The tension springs 36 serve to normally retain the plate 34 on the stops 35.

All components of the apparatus are readily removable for cleaning purposes.

Operation of the apparatus is as follows:

Solution is fed continuously to the bowl 11 from a supply tank and the excess solution is recycled, such as by pumping, for further use. This means that the bowl 11 is full at all times except for slight variation during filling of the ampoules 61.

When a filling operation is to be performed, an ampoule receptacle 69 is placed on the carriage 67 of the conveyor 66 by sliding the sleeves 72 of the receptacle downwardly over the posts 68. The placement of the receptacle is determined by whether one or half-litre ampoules are to be filled. The conveyor 66 delivers the ampoule receptacle to the filling station beneath the nozzles 33 and in order to ensure the central positioning of the recpetacle, the guide rollers 73 engage the sides of the receptacle.

At this stage it will be seen that all is in readiness for the filling operation in that the ampoules are beneath the nozzles 33; solution is being fed continuously to the bowl 11 which is full; the pots 23 are submerged in the bowl and thus they also are full; air is being fed continuously to the bells 39 but as they are open at this stage, the air is permitted to escape freely; the valve 27 is sealing the drains of the pots 23 and the pinching clamp 20 is preventing solution from dripping from the nozzles 33.

In order to effect filling of the ampoules, all that is now necessary is to bring the ampoules into contact with the filling nozzles 33 and to bring the pots 23 and bells 39 into sealing engagement with each other. This is effected by actuation of the lifting cylinder 63 at the base of the apparatus which causes the receptacle lifting cradle 62 to rise so that the pads 79 engage the underneath blocks 80 on the receptacle and thereby slide the receptacle vertically upwardly on the conveyor posts 68. This upward movement causes the necks of the

ampoules **61** to enter the filler nozzles **33** for receiving the solution.

By reason of the connection between the carriage lifting cradle **62** and the pot-carrying frame **32**, through the four rods **65**, the lifting of the cradle **62** results in the pot-carrying frame **32** being raised a corresponding distance. Lifting of the pot-carrying frame results in the pots **23** being raised from the bowl **11** and brought into sealing engagement with their respective bells **39**.

The raising of the pot-lifting framework rods **65** also causes the lugs **85** on the tops of said rods to abut against the arms **83** of the pinching members, thereby releasing their clamping effect on the tubes **16** to permit flow of solution to the nozzles **33** when the valves **27** in the drain openings of the pots **23** are opened.

Because of the continuous feeding of air to the bells **39**, the sealing thereof with the pots **23** means that there is no escape for the air and thus the air forces the solution downwardly in the pots, thereby forcing the valves **27** to open and allowing the solution to escape through the opening in the bottom of the pots and through the connecting tubes **16** to the nozzles **33**. The nozzles **33** being in filling engagement with the necks of the ampoules allow the solution to be forced therethrough into the ampoules **61**.

When all the solution has been delivered from the pots **23**, a timing mechanism (not shown) causes the cylinder **63** to lower the pot-carrying frame **32** and cradle **62**. This causes the pots **23** to be returned to their submerged position in the bowl, the receptacle **69** and ampoules **61** to be returned to the conveyor carriage **67**. The lowering of the rods **65** causes the tension springs **82** to return the pinching members **17** to their clamping position on the tubes **16**.

If any ampoule remains jammed in its respective filling nozzle, the lowering of the cradle brings the striper plate **76** into contact with the top of the ampoule and wipes or strips it from the nozzle **33**.

The conveyor **66** is actuated to remove the filled ampoules and simultaneously position a new group for the next filling operation.

If one or more ampoules **61** is malformed at its neck portion in such manner that it could not be properly positioned in the filler nozzle **33**, the raising of the lifting cradle **62** and ampoules **61** would cause the malformed neck to push against the filler nozzle **33** rather than enter same and thereby raise the spring-loaded plate **88** on which the nozzles are mounted and trip the micro-switch **37**. Operations of the micro-switch **37** causes the lifting cylinder **63** to be reversed immediately to lower the cradle **62** to its original position. Thus, unless and until all ampoules **61** are properly positioned in the filling nozzles **33**, filling cannot commence.

When the bells **39** are employed without the use of the displacement plugs **24**, it is necessary that the pots **23** should be accurately manufactured and marked, as the entire contents of the pots are delivered to the containers when the pots are sealed against the bells. However, when the displacement plugs are used, the accurate manufacture is not quite so important, as the plugs can be adjusted infinitely to cope with manufacturing inaccuracies.

When the displacement plugs **24** are set to the proper position, depending upon the volumetric capacity of the pots **23** and the amount to be delivered therefrom, the raising of the pots **23** into sealing engagement with the bells **39** causes the displacement plugs **24** to enter the solution in the pots and displace a volume equivalent to the amount of immersed plug. Thus, by alternation of the positioning of the displacement plugs **24**, any desired proportion of solution may be delivered from the pots.

I claim:

1. Container filling apparatus of the type comprising a filler bowl, means for maintaining solution in said filler bowl at a predetermined level, a measuring pot in said bowl, a container filler tube connected to the pot and having a filler nozzle associated with its lower end, a support for containers to be filled from said nozzle, and means for raising said measuring pot from the liquid in said bowl for trapping a predetermined volume in the pot; the improvement wherein an air bell is mounted above said measuring pot, means are provided for sealing the top of the pot with said bell, and means are provided for delivering air to the bell for ejecting liquid from the pot when the pot seals against the bell, so that the solution trapped within the pot is delivered to the filler nozzle.

2. The apparatus of claim **1**, wherein said container support is connected to said measuring pot raising means for raising a container simultaneously with said measuring pot to connect the container to said filler nozzle.

3. The apparatus of claim **1**, wherein said means for delivering air to the bell delivers air continuously, but the measuring pot is not emptied until it seals with its bell.

4. The apparatus of claim **1**, wherein said bowl has an overflow outlet leading to a supply tank, said solution level being maintained in said bowl by providing means for delivering solution to the bowl at a rate greater than that at which it is withdrawn during filling of the containers, any excess solution returning to said supply tank via said overflow outlet.

5. The apparatus of claim **1**, wherein said bowl is lined with vitreous material, and wherein said bowl is supported in the apparatus by a plurality of hook-like members, the upper ends of which are attached to beam members carried in the upper portion of the apparatus.

6. Container filling apparatus comprising an open-topped filler bowl, a liquid supply source means for delivering solution from said supply source to said bowl at a rate greater than that at which it can be consumed for the purpose of filling containers; a plurality of measuring pots in said bowl, overflow means in said bowl for returning excess solution to the source of supply, said overflow means being such as to cause the depth of solution in said bowl to be sufficient to enable said measuring pots to be fully submerged in the solution between filling operation, a drain opening formed at the bottom of each pot, a filler tube connected to each drain opening and passing upwardly over the rim of said bowl thence downwardly to a level below the bottom of said bowl, each tube having a filler nozzle at its lower end, each nozzle being affixed to plate means mounted beneath said bowl; a bell associated with each measuring pot and supported in the apparatus directly above each pot, means for raising said pots from their submerged position in the bowl into fluid-tight engagement with their associated bells, each bell having an air inlet; means for delivering air to said bells continuously for emptying the measuring pots when they are raised into fluid-tight engagement with their associated bells, thereby forcing solution out of said pots and through the filler tubes to said nozzles, and a support for containers to be filled disposed beneath said filler nozzles.

7. The container filling apparatus of claim **6**, wherein a float valve is situated in the drain opening of each pot to prevent leakage of solution therefrom between filling operations.

8. The container filling apparatus of claim **7**, wherein the bowl is supported by hook-like members affixed to beam members carried by the apparatus above said bowl, and wherein convexly curved plates are associated with the hook-like members and situated adjacent each side rim of the bowl whereby each filler tube is supported and guided by said plates so that said tubes are not kinked or deformed in their passage from the bowl to the filler nozzles.

9. The container filling apparatus of claim **8**, characterized by tube pinching members associated with each filler tube, means for causing said pinching members clamping the tubes against the convex guide plates to prevent solution dripping from the nozzles between filling

operations, and means for releasing said pinching members during filling of the containers.

10. The container filling apparatus of claim **6**, wherein the measuring pots are of greater volumetric content than the containers to be filled, and wherein each bell includes a displacement plug which displaces a predetermined amount of solution from each measuring pot prior to said pot and bell forming a fluid-tight seal.

11. The container filling apparatus of claim **10**, wherein each displacement plug is suspended by a vertical shaft slidable through the top of said bell and connected to a frame vertically adjustable in the apparatus, and means for raising and lowering said frame for causing all of said displacement plugs to be adjusted an identical amount in said bells.

12. The container filling apparatus of claim **6**, wherein said measuring pots are supported in the bowl by carrier means, said carrier means having upstanding posts mounted in a pot-carrying frame, and wherein means are provided for mounting said upstanding posts for vertical adjustment in said pot carrying frame.

13. The container filling appartaus of claim **6**, wherein means are provided for raising said container support to connect containers with said filler nozzles simultaneously with the raising of said pots into fluid-tight engagement with their associated bells.

14. The container filling apparatus of claim **13**, wherein filler tube shut off members are provided, and operators for said tube shut off members are associated with said pot raising means for opening said tubes when said pots are raised.

15. The container filling apparatus of claim **13**, wherein said nozzle plate means is resiliently mounted in the apparatus, and a nozzle plate sensor is connected to said plate means for detecting displacement of the plate means due to misalignment of containers with their nozzles.

16. The container filling apparatus of claim **6**, wherein said support for the containers includes a conveyor and separate receptacles for groups of containers, and means for raising said receptacles from the conveyor to connect containers on the receptacles with said nozzles.

17. The container filling apparatus of claim **16**, wherein container stripper plates are mounted on said container receptacle raising means for freeing containers that are stuck in their nozzles upon lowering of said receptacle raising means.

18. The container filling apparatus of claim **16**, wherein said container receptacles have container pockets on opposite sides thereof for containers of different size, said receptacles being reversibly mounted on said receptacle raising means.

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