Nov. 24, 1959 R. A. FORESMAN, JR 2,914,096

APPARATUS FOR FILLING AND DISCHARGING CONTAINERS

Filed March 5, 1956 2 Sheets-Sheet 1

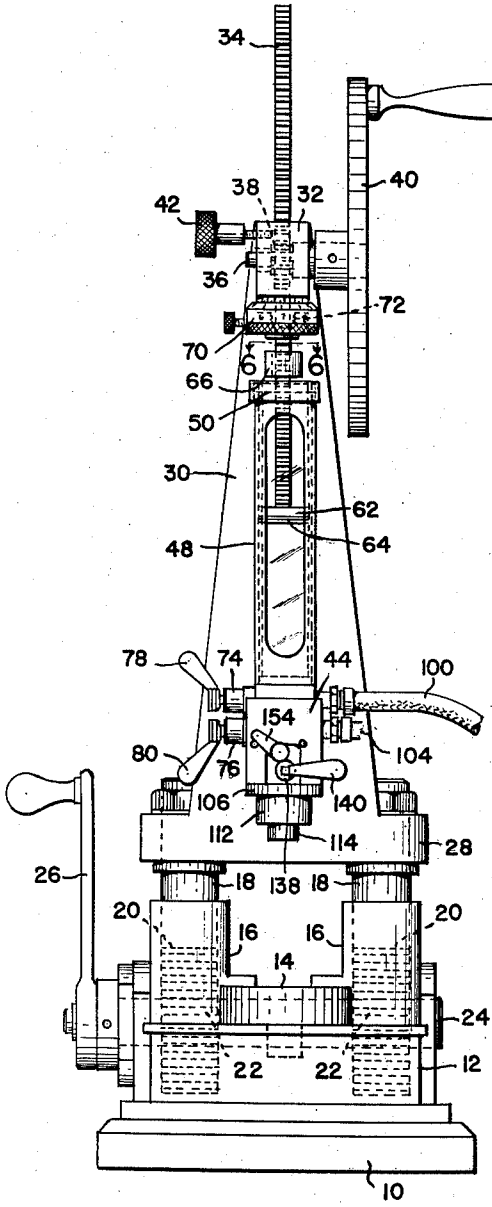


FIG. 1.

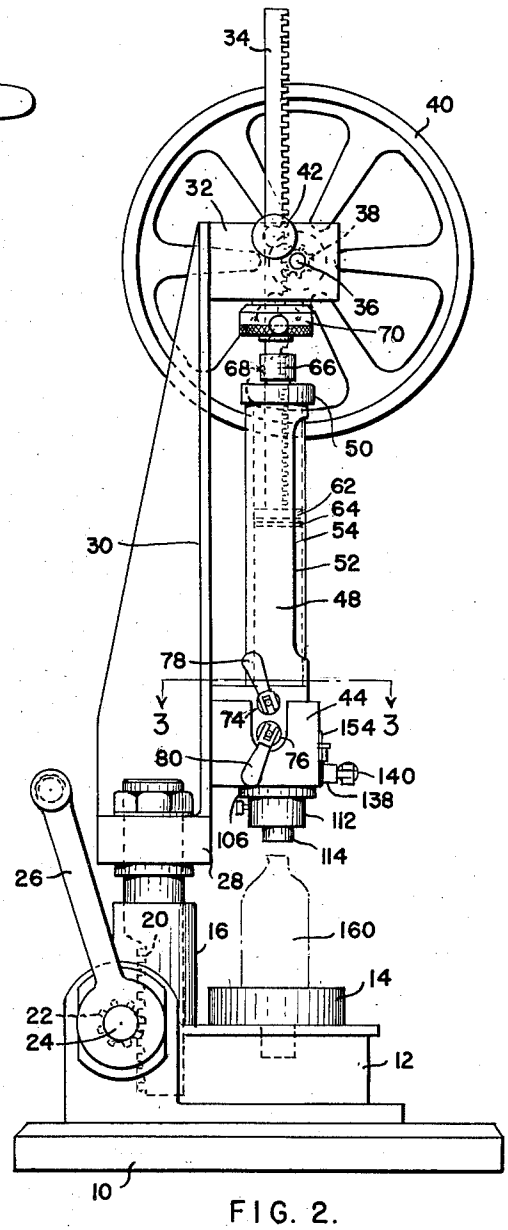


FIG. 2.

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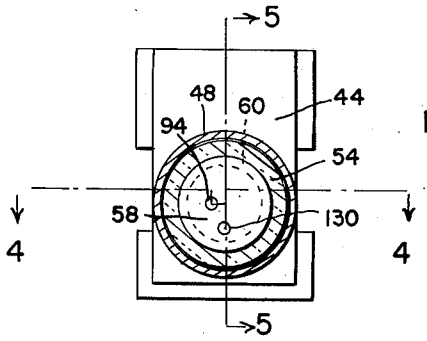


FIG. 3.

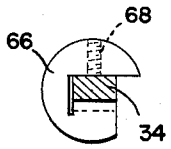


FIG. 6.

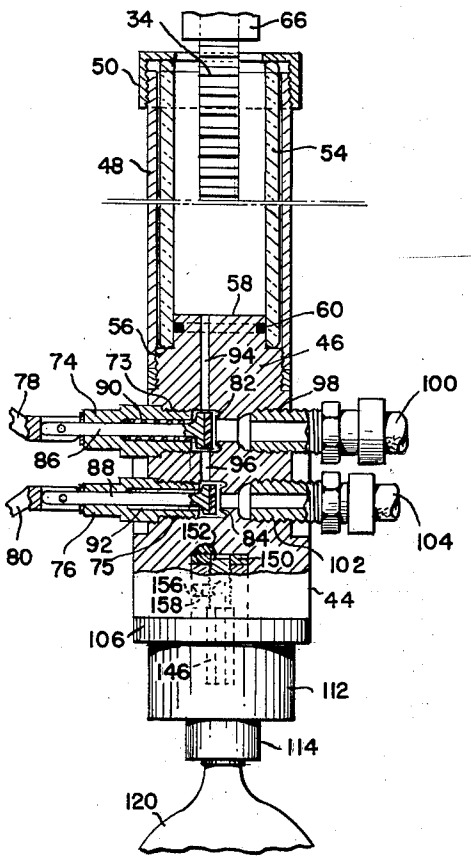


FIG. 4.

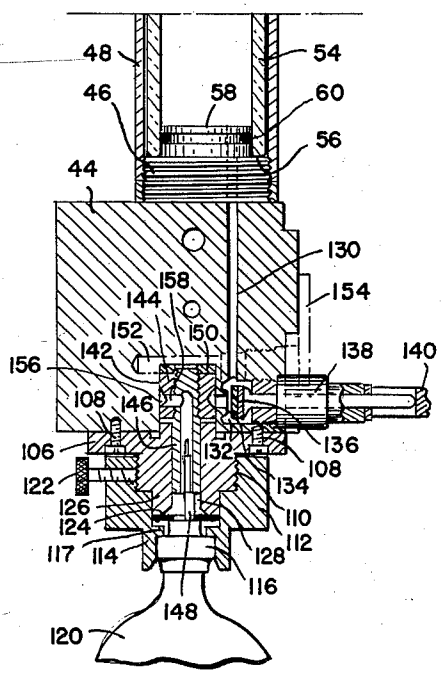


FIG. 5.

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2,914,096

Patented Nov. 24, 1959

2,914,096

APPARATUS FOR FILLING AND DISCHARGING CONTAINERS

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Application March 5, 1956, Serial No. 569,583

3 Claims. (Cl. 141—20)

This invention relates to apparatus for passing fluids under pressure to and from containers.

It is the primary object of the invention to provide manually operated apparatus suitable for use in a laboratory and in connection with experimental operations by means of which fluids under pressure may be charged into or discharged from valved containers.

It is a further object of the invention to provide an apparatus specifically adapted for charging or discharging containers with fluids including liquefied gases in measured quantities.

These and other objects of the invention relating particularly to the construction thereof will become evident from the following description when read in conjunction with the accompanying drawings, in which:

Figure 1 is a front elevation of the apparatus;

Figure 2 is a side elevation of the apparatus showing the left-hand side of Figure 1;

Figure 3 is a transverse section through a fragmentary portion of the apparatus taken on the trace 3—3 shown in Figure 2;

Figure 4 is a vertical section through a fragmentary portion of the apparatus taken on the trace indicated at 4—4 in Figure 3;

Figure 5 is a vertical section through a fragmentary portion of the apparatus taken on the trace indicated at 5—5 in Figure 3; and

Figure 6 is an enlarged transverse section through the apparatus showing a fragmentary portion of the apparatus shown in Figures 1 and 2.

The apparatus includes a base plate 10 adapted to be positioned upon any suitable supporting surface. Affixed to the upper surface of the base plate 10 is a block 12 mounting a container locating and receiving block 14. Integral with the block 12 is a pair of vertically extending cylindrical receivers 16 supporting vertically movable rams 18 provided with racks 20 engaged by pinions 22 affixed to a shaft 24 extending transversely through the block 12 adjacent to the receivers 16. A handle 26 is in driving relation with the shaft 24 and, by rotation of the handle, the rams 18 may be raised and lowered. If desired, a self-locking type of handle structure may be employed such as, for example, that described in the patent to Guy E. Swartz No. 2,300,022. The combination of vertically movable rams and a self-locking operating means therefor is well known in the art and is fully described in Catalog #953 of the Swartz Tool Products Company and thus need not be described in detail herein. It is sufficient to note that by operation of the handle 26 the rams 18 may be raised and lowered and that the rams 18 cannot, as a result of loading thereon, be moved or displace the handle 26.

Affixed to the upper ends of the rams 18 is a mounting block 28 which supports a vertically extending frame plate 30. A block 32 is attached to the upper end of the plate 30 and is provided with a vertically extending bore through which there is passed a rack bar 34. The

block 32 is provided with a horizontal bore through which there extends a shaft 36 mounting a pinion gear 38 which is in mesh with the rack 34. A hand wheel 40 is attached to an outwardly extending end of the shaft 36. It will be evident that by rotation of the hand wheel 40 the rack 34 may be made to move upwardly or downwardly through the block 32. A thumb screw 42 is threaded into the block 32 and is adapted to bear against the rack 34 in order to lock the rack 34 in the block 32.

A control block 44 is affixed to the lower portion of the plate 30. The block 44 is provided with an upwardly extending threaded projection 56 adapted to receive the threaded lower end of a tubular member 48. The upper end of the tubular member 48 is threaded and receives a cap 50 provided with a bore through which the rack 34 may pass. The tubular member 48 is provided with longitudinally extending cutout portion 52 through which there may be viewed a glass cylinder 54, the lower end of which rests upon a shoulder 56 on the top of the threaded projection 46 and fits around a projection 58 extending from the projection 46 which is provided with a slot for the receipt of an O-ring 60 which serves to provide a seal between the projection 58 and the glass cylinder 54. The cap 50 bears upon the upper end of the glass cylinder 54 and serves to retain it in position. The lowermost end of the rack 34 carries a piston 62 in snug sliding fit relation with the inside wall of the glass cylinder 54. The piston 62 is provided with an O-ring 64 in order to insure a tight sealing relation between the piston and the inside wall of the glass cylinder 54. From the foregoing, it will be evident that rotation of the hand wheel 40 will cause the piston 52 to move upwardly or downwardly within the glass cylinder 54.

In order to limit the upward stroke of the piston 62, there is provided a piston stop collar 66 which is best shown in Figure 6 and is adapted to be slid over the rack 34 in engagement with a tooth thereof. A small screw 68 is provided in order to securely position the collar 66 on the rack 34. Upon upward movement of the rack 34, the collar 66 comes into engagement with a micrometer stop ring 70 having an internal diameter providing clearance around the rack 34 and threaded for engagement with external threads on a micrometer screw 72 affixed to the underside of the block 34. It will be evident that the collar 66 can be only positioned at increments equivalent to the spacing between the teeth on the rack 34. Thus, in order to provide a fine adjustment, the micrometer assembly 70, 72 is provided. The arrangement of the collar 66 and the micrometer 70, 72 serves to limit the upward travel of the piston 64 to a predetermined distance from the top of the projection 58. The diameter of the bore through the cap 50 is such as to permit the collar 66 to pass downwardly into the glass cylinder 54 and to thus permit the piston 62 to pass downwardly to the bottom of the chamber within the glass cylinder 54.

The block 44, as is most clearly shown in Figures 1 and 4, is provided on its left-hand side with bores 73 and 75 adapted to receive valve assemblies 74 and 76 controlled by levers 78 and 80, respectively. The bores 73 and 75 are provided with valve seats 82 and 84, respectively. Valve members 86 and 88 are urged into engagement with the seats by springs 90 and 92, respectively, and are lifted from their seats by the operation of levers 78 and 80. The bores 73 and 75 are in vertically spaced alignment. The bore 73 connects with the space within the glass cylinder 54 through a vertically exending bore 94 and the bores 73 and 75 are joined together by means of a bore 96. A bore 98 in alignment with and in communication with the bore 73 is adapted to receive

a fitting for connection to a liquid supply line **100**, and a bore **102** in alignment with and in communication with the bore **75** is adapted to receive a fitting for connection to a fluid discharge line **104**. From the foregoing, it will be evident that fluid under pressure may be delivered to the space within the glass cylinder **54** by actuation of the lever **78** to open the valve **86**, **82**, and fluid under pressure within the glass cylinder **54** may be discharged by actuation of the lever **80**.

A fitting **106** is affixed to the underside of the block **44** by means of screws **108** and is provided with a downwardly extending externally threaded projection **110**. An adapter **112** is threaded over the projection **110** and is provided with a downwardly extending cylindrical receiver **114** adapted to receive the shoulder of a cap **116** on a container **120** which is to be filled with fluid under pressure. A thumb screw **122** is provided in order to secure the adapter **112** to the fitting **106**. It will be evident that various adapters may be employed in order to provide for engagement with variously shaped caps on various containers to be formed. A rubber washer **124** is affixed to the undersurface of a cylindrical projection **126** extending downwardly from the fitting **106**. The washer **124** is adapted to bear upon the upper surface of the cap of a container and to provide a sealing engagement therewith preventing fluid under pressure existing within a longitudinally extending bore **128** within the fitting **106** from escaping to the atmosphere around the cap **116** of the container.

The block **44** is provided with a longitudinally extending bore **130**, the upper end of which enters the space within the glass cylinder **54**. The lowermost end of the bore **130** communicates with a bore **132** provided with a valve seat **134** which is engaged by a valve member **136**. The valve member is spring loaded within a member **138** threaded into the bore **132** and the valve member is controlled by a pivotally mounted lever **140**. It will be evident that this valve assembly is identical to those controlled by the levers **78** and **80** previously described.

The vertically extending bore **128** in the fitting **106** communicates with a bore **142** extending upwardly from the lower surface of the block **44**. A piston member **144** is slidably positioned in the bore **142** and has extending downwardly therefrom a cylindrical member **146** passing within the bore **128** in the fitting **106**. The cylindrical member **146** is adapted to rest upon a shoulder formed on the upper end of a valve stem **148** extending from the cap **116** of the container. The upper surface of the piston **144** is provided with a wear ring **150** which is adapted to be engaged by an extended cam member **152** connected to a lever **154** positioned externally of the block **44**. Rotation of the lever **154** rotates the cam **152** and depresses the piston **144** and the tube **146**, thus depressing the valve stem **148** and opening a valve in the cap of the container. The bore **132** communicates through an annular recess **156** and a radial bore **158** in the piston **144** with the interior of the cylindrical member **146**. From the foregoing, it will be evident that, upon operation of the valve lever **140**, the valve **134**, **136** may be opened or closed, controlling communication between the cylinder **54** and the interior of the cylindrical member **146**. Rotation of the lever **154** controls the opening and closing of a valve assembly in the cap **116** of the container being filled. It will be evident that suitable packing means such as, for example, an O-ring, will be provided to prevent the escape of fluids past the cam shaft **152**.

In operation of the apparatus, a container, such as the container **160** shown in Figure 2, is positioned on the container receiving block **14**. An adapter **112** will have been selected to accommodate the particular cap assembly on the container **160**. For example, instead of a cap assembly formed such as that shown in Figure 5, there may be employed a cap assembly having a substantial internal recess into which the rubber sealing washer **124** would pass and the adapter would possibly be formed with projections similar to the projection **114** shown in Figure 5 but which would pass annularly inside of the cap rather than annularly outside of the cap as shown in Figure 5. Numerous types of caps may be employed and numerous types of adapters may be employed to accommodate these caps. The essential consideration is that the fitting **106** and the sealing washer **124** may, in combination with various adapters, serve to provide sealing engagement with containers having variously formed caps.

With the container **160** positioned as shown in Figure 3, rotation of the handle **26** will serve to move the mounting plate **30** downwardly and bring the adapter into engagement with the cap on the container. As previously noted, the handle **26** and the apparatus associated therewith may be provided with self-locking means in order to cause the container **160** to be held snugly in position between the adapter **112** and the block **14**.

The adapter **110** is so positioned on the threaded fitting **106** that, when the cap of the container is bearing upon the inwardly extending shoulder **117** of the adapter, the uppermost end of the container valve stem has not yet engaged the bottom end of the tube **146**. It may be noted that some containers are provided with tubular stems. It will be evident that the adapter for such a container would be positioned so that the uppermost end of the tubular container valve stem would be positioned adjacent to but not in engagement with the lowermost end of the tube **146**. Under these conditions, upon rotation of the cam **152**, the container valve will be opened and, when the cam **152** is in the position shown, the container valve is closed.

With the container thus positioned, the exhaust valve control lever **80** is operated to open the exhaust valve, whereupon the hand wheel **40** is rotated in order to carry the piston **62** downwardly into engagement with the upper surface of the projection **58** of the block **44** whereupon the exhaust valve controlled by the lever **80** is closed and the inlet valve controlled by the lever **78** is opened. Fluid under pressure, for example, a liquefied gas, may then pass inwardly from the supply line **100** to the cylinder **54** moving the piston **62** upwardly to the limit of its upward travel as determined by the seatings of the stop collar **66** and the micrometer **70**, **72**. When the piston **62** has risen to the limit of its travel, the space within the cylinder **54** below the piston will be filled, whereupon the valve controlled by the lever **78** is closed and, if the lever **54** is operated to open the valve of the container, the valve controlled by the lever **140** may be opened and, upon rotation of the hand wheel **40**, the liquefied gas or other fluid contained within the cylinder **54** will be delivered under pressure to the interior of the container.

When the fluid being employed is a liquefied gas, the container is preferably prepared by displacing the air within the container with a suitable volume of the gas which, in liquefied form, is to constitute the charge in the container. This may be accomplished in the present apparatus by employing the apparatus to deliver a small volume of the liquefied gas to the container wherein the liquefied gas or at least a portion thereof will vaporize and then, if the container valve is open to the atmosphere, substantially all of the air contained within the container will be expelled therefrom along with the vaporizing liquid, whereupon the container may then be substantially completely filled with the liquefied gas without the simultaneous inclusion of air or other unwanted gases which may be in a vapor state under the conditions of pressure and the temperature at which the liquefied gas is in a liquid state.

From the foregoing, it will be evident that this invention provides a simple, practical, manually operated piece of laboratory apparatus by means of which containers of various sizes and containers having various cap struc-

tures may be filled with various fluids under pressure including liquefied gases. It will also be evident that the apparatus may not only be employed for the measurement of predetermined quantities of a fluid to be delivered to a container, but that the apparatus may also be employed to deliver predetermined quantities of each of various successive fluids to a single container. Furthermore, the apparatus may be employed for withdrawing predetermined quantities of elastic fluid from a container or, if the apparatus is mounted in a position inverted from that shown in the drawings or if a siphon tube is provided, an inelastic fluid may be withdrawn from a container. A measured quantity of fluid may be withdrawn from the container and observed in the glass cylinder and thereafter returned to the container. Alternatively, a quantity of fluid can be withdrawn from a container and discharged from the apparatus to provide a sample of the fluid which may, for example, be subjected to analysis or various other tests.

Thus the apparatus disclosed provides not only for the filling of containers, but for various manipulations of fluid delivered to or removed from containers and these fluids may be either elastic or inelastic fluids.

What is claimed is:

1. In apparatus for filling pressure fluid containers, the combination comprising means providing a seat for a container to be filled, a filling head over said seat, means for moving said seat and filling head relative to one another for clamping said container therebetween, means mounted upon and providing a chamber over said filling head, said filling head being provided with a passage for placing said chamber in communication with a source of fluid under pressure, a passage for venting said chamber and a passage for placing said chamber in communication with the interior of the container, valves carried by said filling head and selectively operable manually for controlling said passages, manually controlled means for opening the valve of the container while the same is clamped in the manner aforesaid including a member in the form of a cam follower adapted for engagement with said container valve and having a hollow interior forming a section of said valved passage for placing said chamber in communication with the interior of the container, said cam follower being carried by and shiftably mounted in the filling head, and a cam member carried by said filling head and operable for shifting said cam follower, and displaceable means in said chamber operable manually for driving fluid from said chamber through said valved passage section for discharge thereof into said container.

2. In apparatus for filling pressure fluid containers, the combination comprising means providing a seat for a container to be filled, a filling head over said seat, means for moving said seat and filling head relative to one another for clamping said container therebetween, means mounted upon and providing a chamber over said filling head, said filling head including manually controlled means for opening the valve of the container while the same is clamped in the manner aforesaid, and being provided with a valved passage means through which said chamber may be selectively vented, placed in communication with a source of fluid under pressure or placed in communication with the interior of the container, said manually controlled means including a member in the form of a cam follower shiftably mounted in said filling head and adapted for engagement with said container valve, and a cam member carried by said filling head and operable for shifting said cam follower, and displaceable means in said chamber operable for driving fluid from said chamber through said valved passage means for discharge thereof into said container while said chamber is unvented and cut off from communication with said fluid pressure source.

3. The combination defined in claim 2 wherein the cam follower is provided with a hollow interior which forms a section of the valved passage means through which the chamber may be placed in communication with the interior of the container.

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