

Aug. 23, 1966

M. S. BERMAN  
PUMP WITH DUAL, FLUID PRESSURE ACTUATED  
PISTONS AND MOVABLE PICK-UP TUBE

3,268,122

Filed Dec. 9, 1964

4 Sheets-Sheet 1

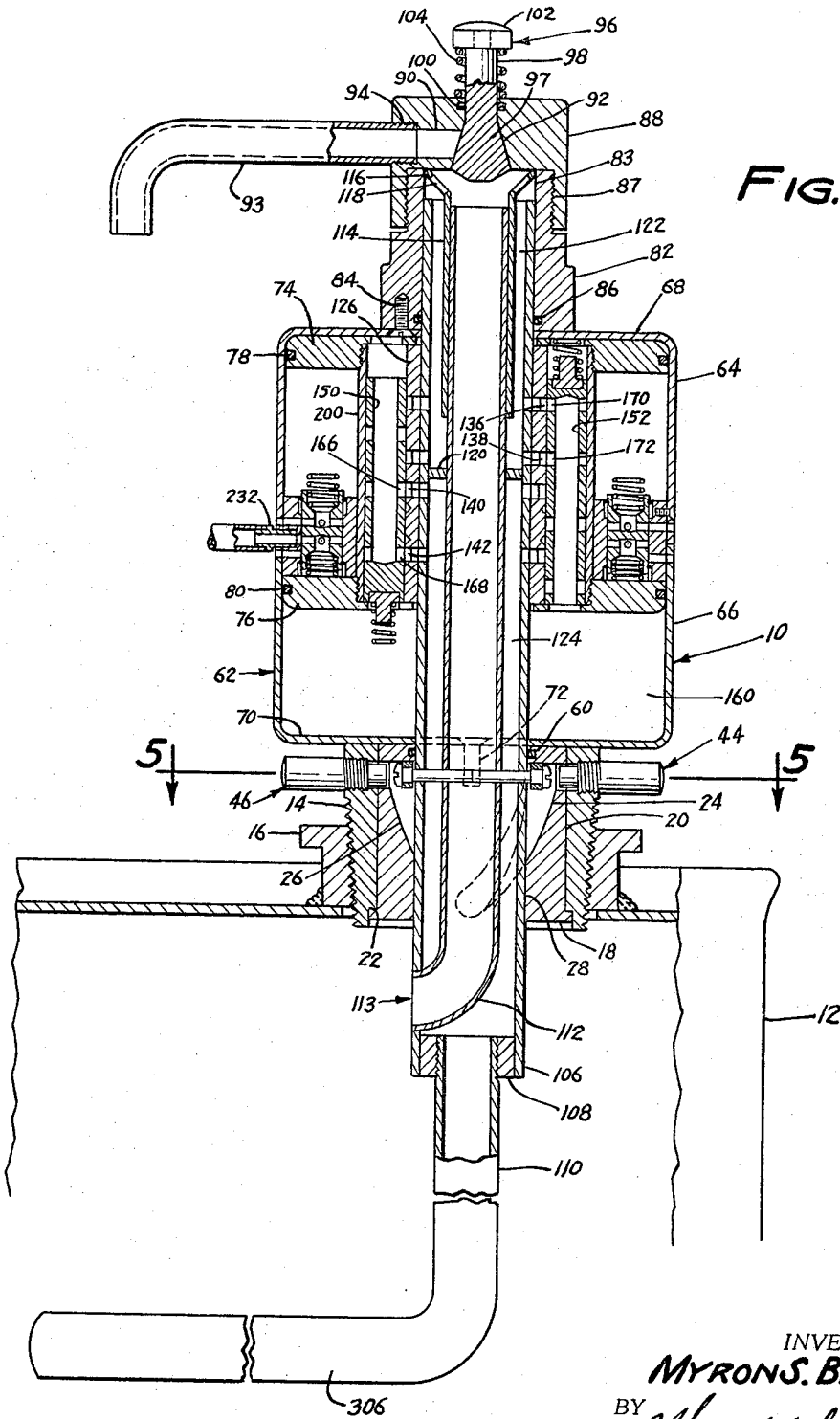


FIG. 1

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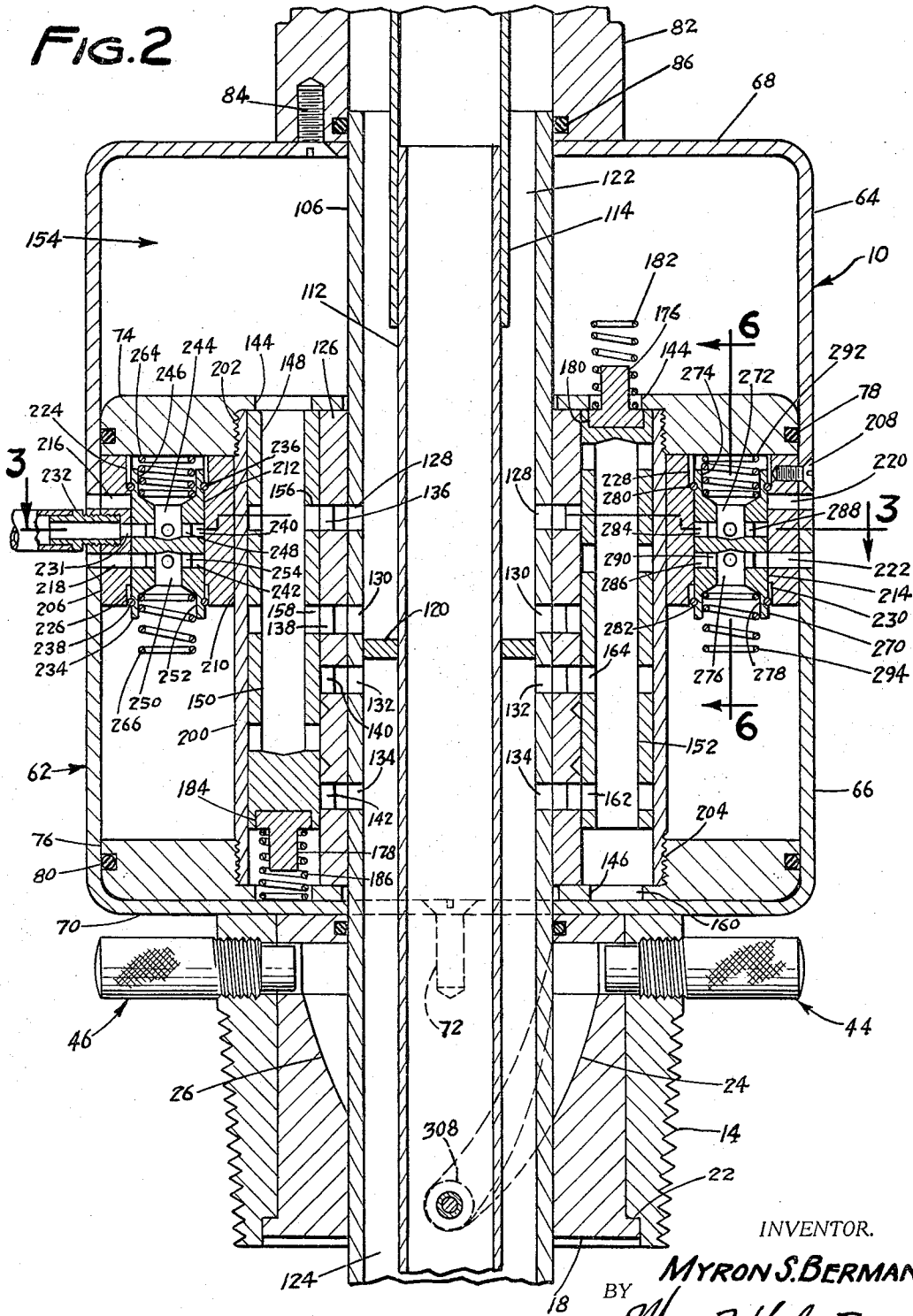
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FIG. 2



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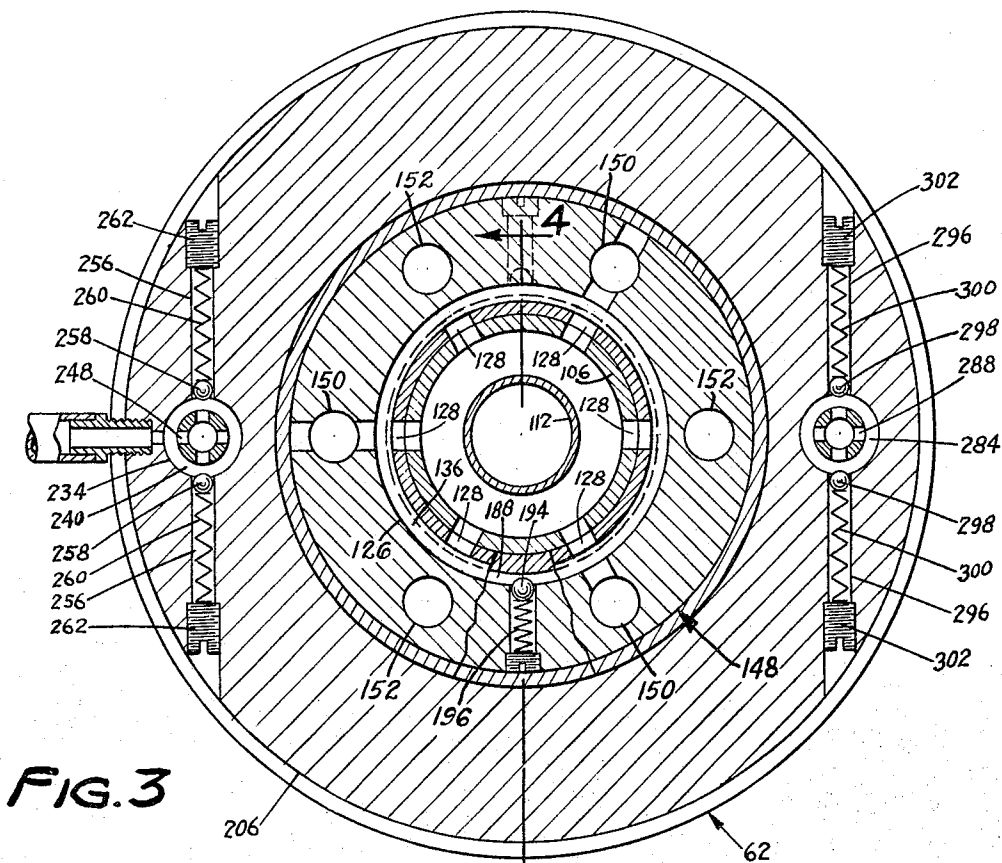


FIG. 3

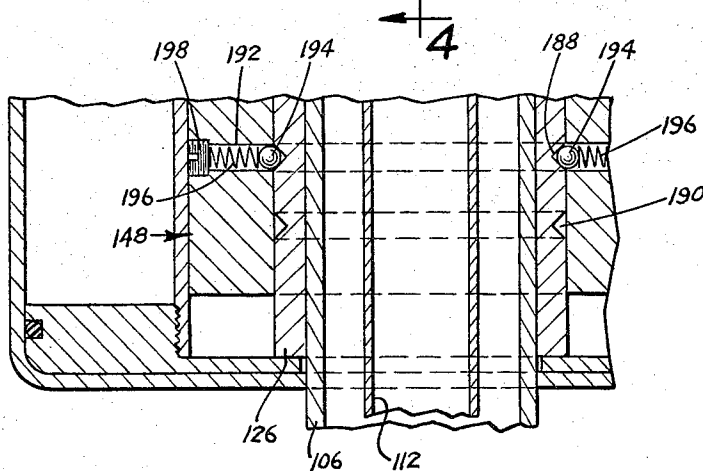


FIG. 4

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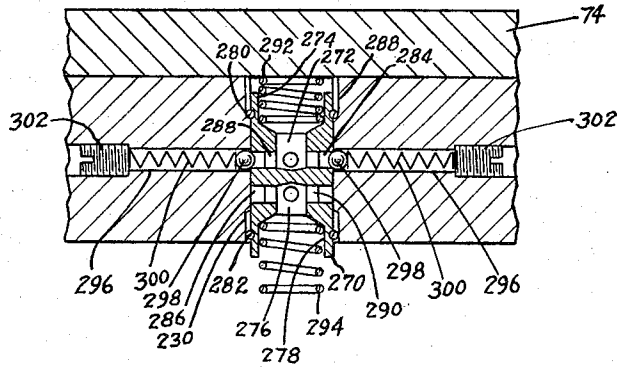
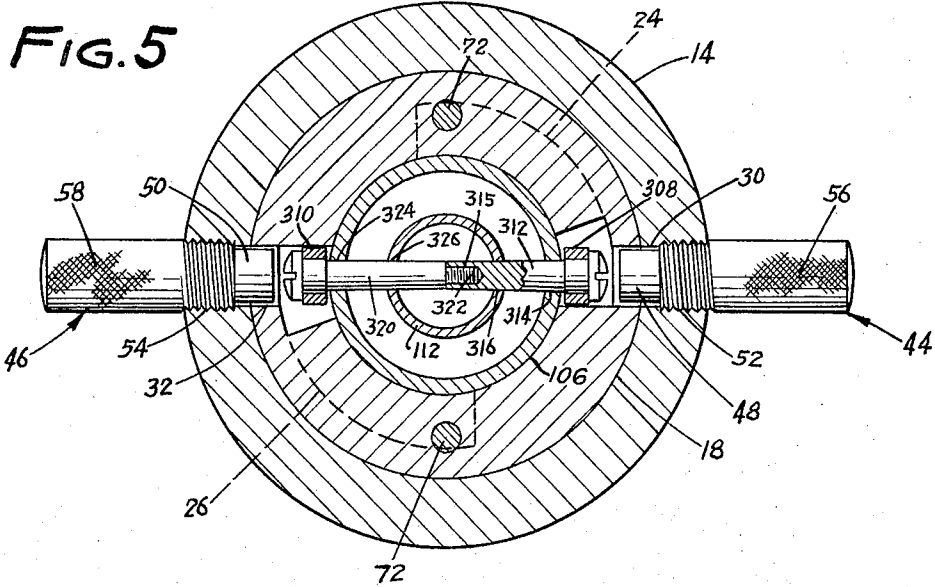
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**FIG. 6**

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**PUMP WITH DUAL, FLUID PRESSURE ACTUATED  
 PISTONS AND MOVABLE PICK-UP TUBE**

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4 Claims. (Cl. 222-246)

The present invention relates to a combination pump and liquid agitator. More particularly this invention relates to a pump which may be driven by fluid under pressure and which is adapted to alternatively pump fluid from a reservoir into a separate container or recycle the fluid back into the reservoir while continuously agitating said liquid.

In certain applications it is desirable to tap off a small quantity of liquid from a container thereof upon demand to fill a small container such as a spray gun reservoir from a barrel of paint. Liquids such as paint have the characteristic of settling if they are left standing for any appreciable length of time without mixing or agitating them. Thus, painters who buy paint by the barrel, but tap it off by the quart, found it necessary to agitate the paint barrel each time before a small quantity of paint is drawn off so as to insure uniform consistency. Such a procedure is very bothersome and time consuming.

It is thus an object of this invention to provide a pump which selectively deposits desired quantities of mixed liquids into a container from a reservoir thereof upon demand and recycles the pumped liquid into the main reservoir when there is no demand while continuously agitating the liquid in the main reservoir during the pumping action and recycling.

It is a further object of this invention to provide a pump which may be left running continuously and which, because it may be used with inflammable materials, is operated by non-sparking working material, and which will both pump the liquid from and agitate the liquid in a container thereof.

It is still a further object of this invention to provide a combination pump and liquid agitator comprising: a source of fluid; a body adapted to be secured to said source of fluid to be pumped; a cylinder secured to said body; exhaust means secured to said cylinder; a source of motive fluid under pressure secured to said cylinder; two pistons, a first and a second, rigidly secured to one another and adapted to reciprocate within said cylinder; a pick-up tube secured to said pistons and adapted to reciprocate therewith said pick-up tube adapted to be in communication with said source of fluid; a wall member secured to the inside of said pick-up tube and transverse thereto disposed to divide said pick-up tube into an upper chamber and a lower chamber; said tube including a plurality of ports communicating each chamber of said tube with the exterior thereof; an annular valve member longitudinally slidably secured to said tube and adapted to be resiliently locked in each of two extreme positions; said annular valve member including at least one blind longitudinal bore opening on the top thereof and one blind longitudinal bore opening on the bottom thereof and said annular valve member including a plurality of ports communicating each of said bores with the interior of said annular valve member said ports are disposed so that when said annular valve member is in the first extreme position the top opening blind bore is in communication with the bottom chamber of said pick-up tube only and the bottom opening blind bore is in communication with the upper chamber of said pick-up tube only and when said annular valve member is in the second position said top opening blind bore is in communication with the top portion of said tube and

said bottom opening blind bore is in communication with the top portion of said tube; means for resiliently locking said annular valve member in each of the two positions; means for releasing said resilient valve lock; means for resiliently urging said annular valve member to the second position when in the first position and for urging said annular valve member to the first position when in the second position; a sleeve member secured to each of said pistons and slidably embracing said annular valve member; a transverse wall member secured to and at the midpoint of said cylinder said annular wall member slidably embracing said sleeve member, said annular wall member including at least one longitudinal bore therein and ports communicating said bore with said exhaust means and with the source of fluid under pressure; a valve member slidably secured within said bore of said annular wall member, said valve member adapted to be resiliently locked in two positions corresponding to the first and second positions of said annular valve member, said valve member including a blind longitudinal bore in each end thereof and a transverse port communicating each of said blind bores with the exterior of said valve member, said transverse ports disposed so that when said valve is in the first position the space between said first piston and said annular wall is in communication with said exhaust means and the space between said second piston and said annular wall is in communication with said source of fluid under pressure, and when said valve is in the second position that the space between said first piston and said annular wall member is in communication with the source of fluid under pressure and the space between said second piston and said annular wall is in communication with said exhaust means; resilient means for yieldingly locking said valve member in each of said two positions; means for releasing said resilient locking means; and means for urging said valve member to the second position when in the first position and for resiliently urging said valve member to the first position when in the second position.

Other objects of the invention will become apparent as the description proceeds.

To the accomplishment of the foregoing and related ends, this invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principles of the invention may be employed.

The invention is illustrated by the accompanying drawings in which the same numerals refer to corresponding parts and in which:

FIGURE 1 is a sectional elevation of the pump shown secured to a barrel of liquid;

FIGURE 2 is a sectional elevation of the pump drawn to a larger scale than FIGURE 1, depicting the pump elements in a different position than shown in FIGURE 1;

FIGURE 3 is a transverse section along the line 3-3 of FIGURE 2 and is drawn to the same scale as FIGURE 2;

FIGURE 4 is a fragmentary section taken along the line 4-4 of FIGURE 3 and drawn to the same scale as FIGURE 3.

FIGURE 5 is a transverse section taken along the line 5-5 of FIGURE 1 and is drawn to a larger scale than FIGURE 1; and

FIGURE 6 is a sectional view taken along the line 6-6 of FIGURE 2 and drawn to the same scale as FIGURE 2.

A pump body 10 is secured to a liquid reservoir such as a drum 12 by any suitable means as, for example, by the hollow threaded fitting 14 which is threaded into the drum bung 16. A cam fitting 18 is provided to fit within the opening 20 of the threaded fitting 14. The cam fitting 18 is provided with the rim 22 which engages the threaded fitting 14 at the lower end thereof. The cam fitting 18 includes at least one and preferably two cam tracks 24 and 26 as seen therein and in communication with the bore 28 of the bore of the cam fitting 18. An O-ring gasket 60 is secured to the bore 28 of the cam fitting 18.

A transverse hole 30 is provided through the thread fitting 14 and the cam fitting 18. A transverse hole 32 through the threaded fitting 14 and the cam fitting 18 is provided diametrically opposite from the transverse hole 30. Handles 44 and 46 are provided to fit the holes 30 and 32, to facilitate the screwing of the body 10 into the bung 16, respectively. It is to be noted that the shank 48 of the handle 44 extends inwardly, so as to interfere with and hold the cam fitting 18 against rotation relative to the threaded fitting 14. It is also to be noted that the shank 50 of the handle 46 extends inwardly so as to interfere with and hold the cam fitting 18 against rotation relative to the threaded fitting 14. The handles 44 and 46 are secured to the threaded fitting by any convenient manner such as pressing them into position or by providing the threaded portions 52 and 54, respectively. A knurled surface 56 and 58, on the handles 44 and 46 is provided to promote ease of insertion and withdrawal of the handles 44 and 46.

A cylinder 62, conveniently constructed of an upper cylinder portion 64 having an upper cylinder head 68 and a lower cylinder portion 66 having a lower cylinder head 70, is rigidly secured to the cam fitting 18 by any suitable means as, for example, by means of the screws 72. It is thus seen that the threaded fitting 14 is secured to the cam fitting 18 by means of the rim 22 and the rigid securement of the cam fitting 18 to the cylinder end 70.

A pair of pistons 74 and 76 are disposed within the cylinder 62 and adapted for reciprocating motion therein. Means for sealing the fit between the piston 74 and the cylinder 62 are to be provided, one suitable means is demonstrated by the O-ring gasket 78. Similar sealing means, as, for example, the O-ring gasket 80, is secured to the piston 76.

A hollow top fitting 82 having a central bore 83 is rigidly secured to the cylinder end 68 by any suitable means, exemplary of which is the use of the screws 84. The top fitting 82 is provided with an internal sealing means, such as the O-ring gasket 86. Hollow top fitting 82 has, at its upper portion, a threaded end 87 which receives a cap 88 which is threadably secured thereto. The threaded cap 88 is provided with a transverse bore 90 which is in communication with the valve seat 92 and which is, in turn, in communication with the opening of the top fitting 82. An outlet or spout 93 is secured to the transverse bore 90 by any suitable means as, for example, by threads 94. A valve 96 is fitted in the cap 88 so as to normally interrupt communication between the bore 90 and the opening of the top fitting 82. The valve 96 may be of any of a number of constructions but one very suitable valve is as follows. A tapered valve body 97 is adapted to the valve seat 92, and shaft 98 extend upward therefrom. The valve shaft is sealed in its bore by an O-ring gasket 100 or any other suitable sealing means. A nut 102, is threadably secured to the shaft 98 to allow adjustments to be made as to the amount to which the valve 96 may be opened. The valve 96 is resiliently upwardly urged to maintain engagement with the valve seat 92 by any means, as, for example, by the coil spring 104 embracing the shaft 98 and interposed between nut 102 and the cap 88.

A tube 106 is slidably secured to the top member 82 and to the lower cam fitting 18 through the openings

thereof. The tube 106 engages the O-rings 60 and 86. Tube 106 has, at its lower end, a diameter reducing plug, to prevent the intake of excessive amounts of air when the amount of liquid in the drum runs low. Such a reduction is exemplified by the internally threaded plug 108. An angle tube 110 is threadably secured to the internally threaded plug 108.

A concentric tube 112 is secured within the tube 106. The tube 112 is provided with an outlet near and in communication with the top of the tube 106. A bend is made in the tube 112 so as to form an outlet 113 extending through the side of the tube 106 near its bottom but within the liquid container 12.

A sleeve 114 slidably embraces the tube 112 near its upper end. The upper end of the sleeve 114 is formed into an outwardly flaring conical portion and is secured within the bore 83 of the top fitting 82. The conical portion 116 of the sleeve 114 is provided with a plurality of holes 118 communicating the top of the tube 106 with the tube 112 and particularly the annulus between tubes 112 and 106.

A disc wall member 120 is secured to each of the tubes 112 and 106 and forms an upper chamber 122 and a lower chamber 124 within the tube 106. It is to be noted that the widest part of the valve body 97 approximates the inside dimension of the sleeve 114.

A ring member 126 is conveniently used to provide a thicker wall section for the tube 106 within the cylinder 62. The ring 126 is conveniently used as a spacer between the pistons 74 and 76.

Series of valve ports are provided in the composite tube 126 and 106. These are represented by the holes 128, 130, 132 and 134. The holes 128, 130, 132 and 134 are conveniently drilled through the composite tube 126 and 106 so as to be on both sides thereof. An annular groove 136 is provided in the exterior of the annular ring 126 at the position of the holes 128. An annular groove 138 is provided in the periphery of the ring 126 at the position of the hole 130. A series of annular grooves are to be provided in the periphery of the ring 126: the annular groove 136 is at the position of the ports 128; the annular groove 138 is at the position of the ports 130; the annular groove 140 is at the position of the ports 132; and the annular groove 142 is at the position of the ports 134.

Longitudinal holes 144 (FIG. 2) are provided in the piston 74 and longitudinal holes 146 are provided in the piston 76.

An annular valve member 148 is slidably secured to the ring member 126. The annular valve member 148 is of a length dimension less than that of the ring member 126. The annular valve member 148 is provided with at least two longitudinal blind bores. At least one blind bore 150 opening to the top of the annular valve member 148, and at least one blind bore 152 opening to the bottom of the annular valve member 148. Each of the blind bores 150 and 152 have associated therewith a series of transverse ports which may be selectively aligned with the corresponding ports in the ring 126. When the annular valve 148 is in the position shown in FIGURE 2, there should be communication between space 154 above the piston 74 and the upper chamber 122 of the tube 106. This is accomplished by providing the transverse valve ports 156 and 158, associated with the blind bore 150, which are in alignment with the annular grooves 136 and 138, respectively. Also, when the annular valve 148 is in the position shown in FIGURE 2, there should be communication between the space 160, between the piston 76 and the cylinder head 70, and the lower chamber 124. Such communication is established by providing transverse valve ports 162 and 164, associated with the longitudinal blind bore 152, disposed to be in alignment with the annular grooves 142 and 140, respectively.

When the pistons 74 and 76 are in the position shown in FIGURE 1 the blind bore 150 is to be in communica-

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tion with the lower chamber 124 of the tube 106. Such communication is accomplished by providing the transverse valve ports 166 and 168, associated with the longitudinal bore 150, which are in communication with the annular grooves 140 and 142, respectively. The space 160 between the cylinder end 70 and the piston 76 is to be in communication, through the blind bore 152, with the upper chamber 122. Such communication is accomplished by providing the transverse valve ports 170 and 172 which are in alignment with the annular grooves 136 and 138, respectively, when the annular valve 148 is in the position depicted in FIGURE 1. It is to be noted that when the device is in the configuration depicted in FIGURE 1, that the appropriate ports are closed by movement of the annular valve 140 so that there is no communication between the blind bore 150 and the upper chamber 122, and no communication between the blind bore 152 and the lower chamber. When the annular valve assumes the position depicted in FIGURE 2 there is no communication between the blind bore 150 and the lower chamber 124 and no communication between the blind bore 152 and the upper chamber 122.

Means are provided whereby the annular valve member 148 is automatically moved from the position depicted in FIGURE 1 to that depicted in FIGURE 2. Such means are conveniently represented by the inserts 176 and 178. The insert 176 is secured to the annular valve member 148 by any suitable means, one example of which is the press fit joint at 180. It will be noted that in FIGURE 2 the uppermost end of the annular valve member 148 is retained by the bottom surface of the piston 74. And that the insert 176 extends therebeyond through the hole 144. Resilient means, as, for example, the spring 182, are secured to the base of the insert 176 and extend therebeyond. The insert 178 is secured to the annular valve member 148 at a position longitudinally aligned with the bore 150 and on the blind side thereof. One means of suitably securing the insert 178 is by means of a press fit at the position 184. Resilient means, as, for example, the spring 186, are secured to the base of the insert 178 and extends therebeyond through the hole 146 of the piston 76.

Means for resiliently locking the annular valve member 148 in each of the positions depicted in FIGURES 1 and 2 are provided. Such means are conveniently represented by the arrangements shown in FIGURE 4, wherein a pair of spaced annular grooves 188 and 190, are provided in the periphery of the ring 126. A transverse hole 192 completely through the annular valve 148 is provided. A ball 194 is inserted in the hole 192 on each side of the ring 126. Balls 194 which are of a diameter slightly less than that of the hole 192 are used. The balls 194 are urged radially inwardly into engagement with one of the grooves 188 or 190 by any suitable means as, for example, by the springs 196. Means for retaining resilient pressure on the balls 194, or for adjusting the pressure thereon, are to be provided and are suitably represented by the set screws 198 which are threaded into the hole 192 on each end thereof. A resilient lock is thus provided which will hold the annular valve member 148 in rigid relation to the ring 126 and to the ports therein. When the piston 76 approaches the cylinder head 70, the spring 186 is first compressed thus urging the annular valve 148 member upward. The balls 194 engaged in the groove 190, however, retain the position of the annular valve 148. When, however, insert 178 engages the cylinder end 70, the resilient locking due to the balls 194, is overcome, and the balls 194 are urged outwardly against the springs 196, thus releasing the annular valve member from its relation with the ring 126. When the locks 194 are released the compressed spring 186 snaps the annular valve member 148 upwardly until the balls 194 engage the annular groove 188, locking the annular valve member 148 in the position depicted in

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FIGURE 2. When the piston 74 approaches the cylinder head 68, the spring 182 is first compressed urging the annular valve member 148 downward. Ball locks 194 engaging the groove 190, however, hold the annular valve 148 against such movement. When at the top of the stroke, the insert 176 engages the cylinder head 68, the annular valve 148 is released as the balls 194 move out of engagement with the groove 190. The spring 182, having been compressed, snaps the annular valve 148 downward to the position depicted in FIGURE 1. The balls 194 reengage the groove 190 to maintain the lock relation between the annular valve 148 and the ring 126.

To insure proper functioning it is necessary that the pistons 74 and 76 be rigidly secured to one another. Such a rigid securement is achieved by providing a sleeve 200 (FIGS. 1 and 2) which slidably embraces the annular valve 148. Sleeve 200 is threaded to each of the pistons 74 as at 202, and 76, as at 204. It will also be noted that the sleeve 200 serves to seal the outside holes 156, 158, 164, 162, 166, 168, 170 and 172 which, as a matter of manufacturing convenience, would be drilled completely through the annular valve member 148.

An annular wall member 206 is rigidly secured to the interior of the cylinder 62 by any suitable means as, for example, by the screws 208. The fit 210 between the annular wall 206 and the sleeve 200 is a snug sliding fit. At least one longitudinal bore is to be provided in the annular wall member 206 communicating the spaces between the piston 74 and 76. It is desirable, however, that at least two such bores are included. Two such bores are shown at 212 and 214. The bore 212 has associated therewith the transverse ports 216 and 218 communicating with the exterior of the cylinder 62. The bore 214 has associated therewith the transverse ports 220 and 222 which communicates said bore 214 with the atmosphere. Bore 212 has at each of its ends the counter bore 224 and 226. The bore 214 has at each of its ends a counter bore 228 and 230. A third transverse port 231, associated with the bore 212, is interposed between the transverse ports 216 and 218 and is provided with nipple means 232 for connecting said port with a source of working fluid under pressure. A sliding valve 234 is provided to reciprocate within the bore 212. Sliding valve 234 has, at one of its ends, and rigidly secured thereto a rim 236 of a smaller diameter than the counter bore 224 but of a greater diameter than the bore 212. At the other end of the sliding valve 234 is secured a second rim 238 which is also of a slightly smaller diameter than the counter bore 226 but of greater diameter than the bore 212. A pair of annular grooves 240 and 242 are provided in the sliding valve 234. A longitudinal blind bore 244 with a counter bore 246 therein opens to the top of the sliding valve 234. Transverse ports 248 communicate the annular groove 240 with the blind bore 244. A second blind bore 250 extends longitudinally from the bottom of the sliding valve 234 and has at the bottom thereof a counter bore 252. Transverse ports 254 communicate the blind bore 250 with the annular groove 242.

A hole 256 is drilled through the annular wall member 206 and a pair of ball locks are inserted therein (FIGURE 3). The ball locks are comprised of a ball 258 of a diameter slightly less than the hole 256 and of such a dimension which allows engagement with but larger than the annular grooves 240 and 242. A spring 260 is inserted outside the balls 258 and are retained in the hole 256 by the set screws 262.

A spring 264 is secured at one of the ends of the valve 234 within the counter bore 246 thereof and extending therebeyond. A second spring 266 is secured at one of its ends within the counter bore 252 and extends therebeyond. As the piston 76 moves upward the spring 266 first engages the surface of the piston 76 and is compressed by it, causing the valve 234 to be urged upward. The spring loaded balls 258, engaging the annular groove 240, however, retain the position of the sliding valve 234 against

such resilient urging. When the bottom edge of the sliding valve 234 contacts the pistons 76 the balls 258 are released from the annular groove 240 and the valve 234 snaps upward until the balls 258 engage the annular groove 242 thus resiliently retaining the valve 234 in the position depicted in FIGURE 1. When the piston 74 contacts the spring 264 said spring will be compressed, urging the valve 234 downward. The valve 234 will be retained against such downward urging by the engagement of the balls 258 with the groove 242. When, however, the piston 76 engages the top of the valve 234 the balls 258 are thereby released from the groove 242 allowing the valve 234 to snap downward to the position shown in FIGURE 2. The balls 258 engage, in this position, the groove 240 to hold the valve 234 in the position depicted in FIGURE 2. It will be noted that when the valve 234 is in the position depicted in FIGURE 2 that the source of fluid under pressure through the nipple 232 is in line with the annular groove 240. In this configuration the fluid under pressure is in communication with the piston 74, so as to drive the piston 74 upward. The annular groove 242 is in communication with the exhaust port 218 in said position. When the valve 234 is in the position depicted in FIGURE 1, the source of fluid under pressure through the nipple 232 is in line with the annular groove 242. In this configuration the fluid under pressure is in communication with the piston 76, so as to drive said pistons downward. The annular groove 240 is in communication with the exhaust port 216 in said position.

While the device will operate satisfactorily with only one valve such as the valve 234 it is desirable to provide at least two such valves when operating with air and possibly more when operating with water under pressure. Thus, a second valve 270 is provided. The valve 270 includes a longitudinal blind bore 272 with its open end upward, and a counter bore 274 at the top of the valve 270. A second longitudinal blind bore 276 opening downwardly is provided. A counter bore 278 extends up from the bottom of the valve 270. A rim 280 is rigidly secured near the end of the valve 270. The rim 280 is of a diameter slightly smaller than that of the counter bore 228 but larger than that of bore 214. Another rim 282 near the bottom end of the sliding valve 270 is rigidly secured thereto. The rim 282 is of a diameter slightly less than that of the counter bore 230 but greater than that of the bore 214. A pair of annular grooves 284 and 286 are provided in the periphery of the sliding valve 270. Transverse ports 288 are provided communicating the annular groove 284 with the longitudinal blind bore 272. A second set of transverse ports 290 communicate the annular groove 286 with the longitudinal bore 276. A resilient member such as the spring 292 is secured at one of its ends within the bore counter bore 272 and extends therebeyond. A second resilient member, as for example, the spring 294, is contained within the counter bore 278 and is rigidly secured at one end thereof extending therebeyond.

A transverse hole through the annular wall member 206 is provided. The balls 298 are of a diameter slightly less than that of the hole 296 but of a larger diameter than the annular grooves 284 and 286. Balls 298 are inserted in the hole 296, as is depicted in FIGURE 3. The springs 300 are inserted in the bore hole 296 to resiliently urge the balls 298 inwardly toward the grooves 284 and 286. Means for adjustably retaining the springs 300 in the hole 296 are provided and are suitably exemplified by the use of the set screws 302 which are threaded into the hole 206. Thus, it is seen, that when the piston 76 approaches the annular wall 206 that the piston 76 contacts the spring 294. The spring 294 will be compressed and urge the valve 270 upwardly. The valve 270 will be retained against movement by the engagement of the balls 298 in the groove 284. When, however, the piston 76 contacts the lower edge of the valve 270 the balls 298 will release allowing the spring 294 to snap the valve 270

upward to a position at which the balls 298 will engage the groove 286 and retain the valve 270 in position. When the valve 270 is in a position depicted in FIGURE 1, and the piston approaches the upper end of valve 270, the spring 292 is first compressed as the piston 74 makes contact therewith, urging the valve 270 downward. The valve 270 is held against such movement, however, by the balls 298 resiliently engaging the groove 286. When the piston 74 engages the top edge of the valve 270 the balls 298 will resiliently yield allowing the valve 270 to assume the position depicted in FIGURE 2. Thus, it will be seen that when the valve 270 is in the position of FIGURE 2, it will communicate the bore 276 with the exterior of the cylinder while the bore 274 is sealed relative to the cylinder. When the valve 270 is in position of FIGURE 1, the bore 274 will be in communication with the exterior of the cylinder 62 and the bore 276 will be sealed as relative to the outside of the cylinder 262. It will be appreciated that only one of the valves 234 and 270 need be in communication with a source of fluid under pressure when the fluid is a compressed gas. However, when water is desired to be used, as the operative fluid multiple inlets communicating with the source of said liquid under pressure are desirable to obtain the capacity required of the pump.

It is clear that the tube 106 is secured to the pistons 74 and 76 via the ring 126, and, thus the tube 106 will reciprocate therewith. It is seen that this reciprocating motion is transferred to the lower curved end of the tube 110. A further agitation of the liquid within the barrel 12 is desirable to keep the liquid stored therein from settling. One convenient way of moving the arm 306 from side to side to further agitate the liquid in the barrel 12 is demonstrated by providing at least one cam follower secured to the tube 106. The cam followers are adapted to engage and follow the helical cam grooves 24 and 26. A very suitable and convenient mode of providing such a cam follower is demonstrated in FIGURE 5. A cam follower bearing 308 is adapted to engage and follow the helical cam track 24. Another cam follower bearing 310 is adapted to engage and follow the helical cam groove 26. The cam follower bearings 308 and 310 are conveniently secured to the tube 106 in the following manner: a tapered screw 312 is inserted through the hole 30 of the threaded fitting 14 and the cam fitting 18. The cam follower bearing 308 is adapted to ride on the shank of the screw 312. The shank of the screw 312 is inserted through the hole 314 of the tube 106 and the hole 316 of the tube 112. It will be noted that the screw 312 has a taper which will, as the screw 312 is pulled toward the center of the composite tubes 106 and 112 be wedged in to prevent liquid leakage. The end of the screw 312 is provided with a threaded cavity 318. A similar screw 320 but with a threaded male end 322, which matches the threaded cavity 318 of the screw 312, is inserted through the hole 32 of the threaded fitting 14 and the cam fitting 18, and inserted through the hole 324 of the tube 106 and the hole 326 of the tube 112. It will be noted that the cam follower bearing 310 rides on the shank of the screw 320. The shank of the screw 320 is tapered to form a seal with the hole 324 of the tube 106 and with the walls of the tube 112 as the screw 320 is pulled towards the center. Thus, to assemble the cam unit the cam follower bearings 308 and 310 are placed on the screws 320 and 312 respectively and then said screws are inserted through their respective holes and a screw driver is used on each end thereof, the male end 322 being threaded into the cavity 318 pulling the screws 312 and 320 tightly together. The holes 314, 316, 326 through the tube walls are thus sealed and cams are provided which will cause the arm 306 to oscillate, keeping the liquid agitated as long as the pump is operated.

It is apparent that many modifications and variations of this invention as hereinbefore set forth may be made without departing from the spirit and scope thereof. The

specific embodiments described are given by way of example only and the invention is limited only by the terms of the appended claims.

I claim:

1. A means for pumping fluid comprising: a source of fluid; a body adapted to be secured to said source of fluid; a cylinder secured to said body; exhaust means secured to said cylinder; a source of fluid under pressure secured to said cylinder; two pistons, a first and a second, rigidly secured to one another and adapted to reciprocate within said cylinder; a pick-up tube secured to said pistons and adapted to reciprocate therewith said pick-up tube adapted to be in communication with said source of fluid; a wall member secured to the inside of said pick-up tube and transverse thereto disposed to divide said pick-up tube into an upper chamber and a lower chamber; said tube including a plurality of ports communicating each chamber of said tube with the exterior thereof; an annular valve member longitudinally slidably secured to said tube and adapted to be resiliently locked in each of two extreme positions; said annular valve member including at least one blind longitudinal bore opening on the top thereof and one blind longitudinal bore opening on the bottom thereof and said annular valve member including a plurality of ports communicating each of said bores with the interior of said annular valve member said ports are disposed so that when said annular valve member is in the first extreme position the top opening blind bore is in communication with the bottom chamber of said pick-up tube only and the bottom opening blind bore is in communication with the upper chamber of said pick-up tube only and when said annular valve member is in the second position said top opening blind bore is in communication with the top portion of said tube and said bottom opening blind bore is in communication with the top portion of said tube; means for resiliently locking said annular valve member in each of the two positions; means for releasing said resilient valve lock; means for resiliently urging said annular valve member to the second position when in the first position and for urging said annular valve member to the first position when in the second position; a sleeve member secured to each of said pistons and slidably embracing said annular valve member; a transverse annular wall member secured to and at the midpoint of said cylinder said annular wall member slidably embracing said sleeve member, said annular wall member including at least one longitudinal bore therein and ports communicating said bore with said exhaust means and with the source of fluid under pressure; a valve member slidably secured within said bore of said annular wall member, said valve member adapted to be resiliently locked in two positions corresponding to the first and second positions of said annular valve member, said valve member including a blind longitudinal bore in each end thereof and a transverse port communicating each of said blind bores with the exterior of said valve member, said transverse ports disposed so that when said valve is in the first position the space between said first piston and said annular wall is in communication with said exhaust means and the space between said second piston and said annular wall is in communication with said source of fluid under pressure, and when said valve is in the second position that the space between said first piston and said annular wall member is in communication with the source of fluid under pressure and the space between said second piston and said annular wall is in communication with said exhaust means; resilient means for yieldingly locking said valve member in each of said two positions; means for releasing said resilient locking means; and means for urging said valve member to the second position when in the first position and for resiliently urging said valve member to the first position when in the second position.

2. The means for pumping fluid of claim 1 wherein the bottom of said pick-up tube is bent to approximately a right angle, a helical cam track is provided in said pump

body, and a cam follower is secured to said pick-up tube and disposed to engage said helical cam track.

3. The means for pumping fluid of claim 1 wherein: an outlet means for selectively delivering a quantity of fluid is secured to said pump body in communication with the upper chamber of said pick-up tube; a return tube is secured within said pick-up tube said return tube passing through said transverse dividing wall and opening into said source of fluid above the pick-up tube intake, the top of said return tube being in communication with the top of said pick-up tube; valve means secured to said pump body interposed between said outlet means and pick-up tube adapted to selectively open communication between said pick-up tube and said outlet means while interrupting communication between said pick-up tube and said return tube.

4. A combination pump and liquid agitator comprising:

A. a pump body adapted to be secured to a liquid container;

B. means for driving said pump comprising:

(a) a cylinder secured to said pump body;

(b) a pair of spaced apart pistons rigidly secured to one another and adapted to reciprocate within said cylinder;

(c) a wall member secured to said cylinder and interposed between said pistons;

(d) means for introducing fluid under pressure between the first of said pistons and said wall member while exhausting fluid contained between the second of said pistons and said wall member; and,

(e) means for reversing said fluid under pressure inlet and exhaust at one end of the stroke of said pistons so that fluid under pressure is introduced between the second of said pistons and said wall member and fluid is exhausted from between the first of said pistons and said wall member, and another reversing means to change the inlet and exhaust back when at the other end of the stroke of said pistons;

C. means for drawing liquid out of the container and into said pump body;

D. means for forcing liquid out of said pump body comprising:

(a) a valve member longitudinally slidably secured to said pistons said valve having two extreme positions, said valve including at least one blind bore opening in each longitudinal direction, each of said blind bores being in communication with the space between a piston and a cylinder end;

(b) a tube slidably secured to said valve member including a plurality of transverse ports therein, the lower end of said tube extending into the liquid container;

(c) a dividing wall transverse to said tube secured therein so as to separate said tube into lower and an upper chamber, said dividing wall being disposed so as to have an equal number of transverse ports on either side thereof

(i) said valve member including a series of ports communicating said bore with the junction thereof with said tube,

(ii) said ports being disposed so that when said pistons are at the bottommost position the top opening blind bore is in communication with the upper chamber of said tube only and said bottom opening of blind bore is in communication with said lower chamber of said tube only, and when said pistons are in the topmost position that said top opening blind bore is in communication with the lower chamber of said tube only and said bottom opening blind bore is in

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- communication with the upper chamber of said tube only;
- (d) resilient locking means secured to said valve member to yieldingly secure said valve member at each of its extreme positions; and, 5
- (e) resilient means secured to said valve member for urging said valve member towards the other extreme position from the position occupied;
- E. means for selectively delivering a quantity of liquid and returning liquid not so delivered comprising: 10
- (a) a liquid outlet at the top of said tube communicating therewith;
- (b) a return tube disposed within said tube and secured thereto including an outlet into the liquid container above the bottom of said tube, the top of said return tube being in communication with the top of said tube; and, 15
- (c) valve means for selectively interrupting communication between said liquid outlet and said tube while leaving the communication between said tube and return tube open for selectively opening communication between said liquid outlet and said tube while simultaneously restricting communication between said tube and said return tube; 20
- F. and means for agitating the liquid within the con-

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- tainer simultaneously with said pumping comprising:
- (a) a generally horizontally disposed arm secured to the bottom of said tube, said tube being rigidly secured to said pistons and adapted to reciprocate therewith;
- (b) a helical cam track means included in said pump body; and,
- (c) cam follower means secured to said tube and adapted to travel in said cam track means.

## References Cited by the Examiner

## UNITED STATES PATENTS

916,463	3/1909	Lewis	221—229	X
1,965,038	7/1934	Hartman	91—229	X
2,387,233	10/1945	Clapp	222—334	
2,846,123	8/1958	Gray	222—318	X
2,974,601	3/1961	Zubaty	91—229	X
3,042,259	7/1962	Engel	222—318	X
3,082,917	3/1963	Anderson et al.	222—334	X

## FOREIGN PATENTS

566,802 5/1958 Belgium.

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