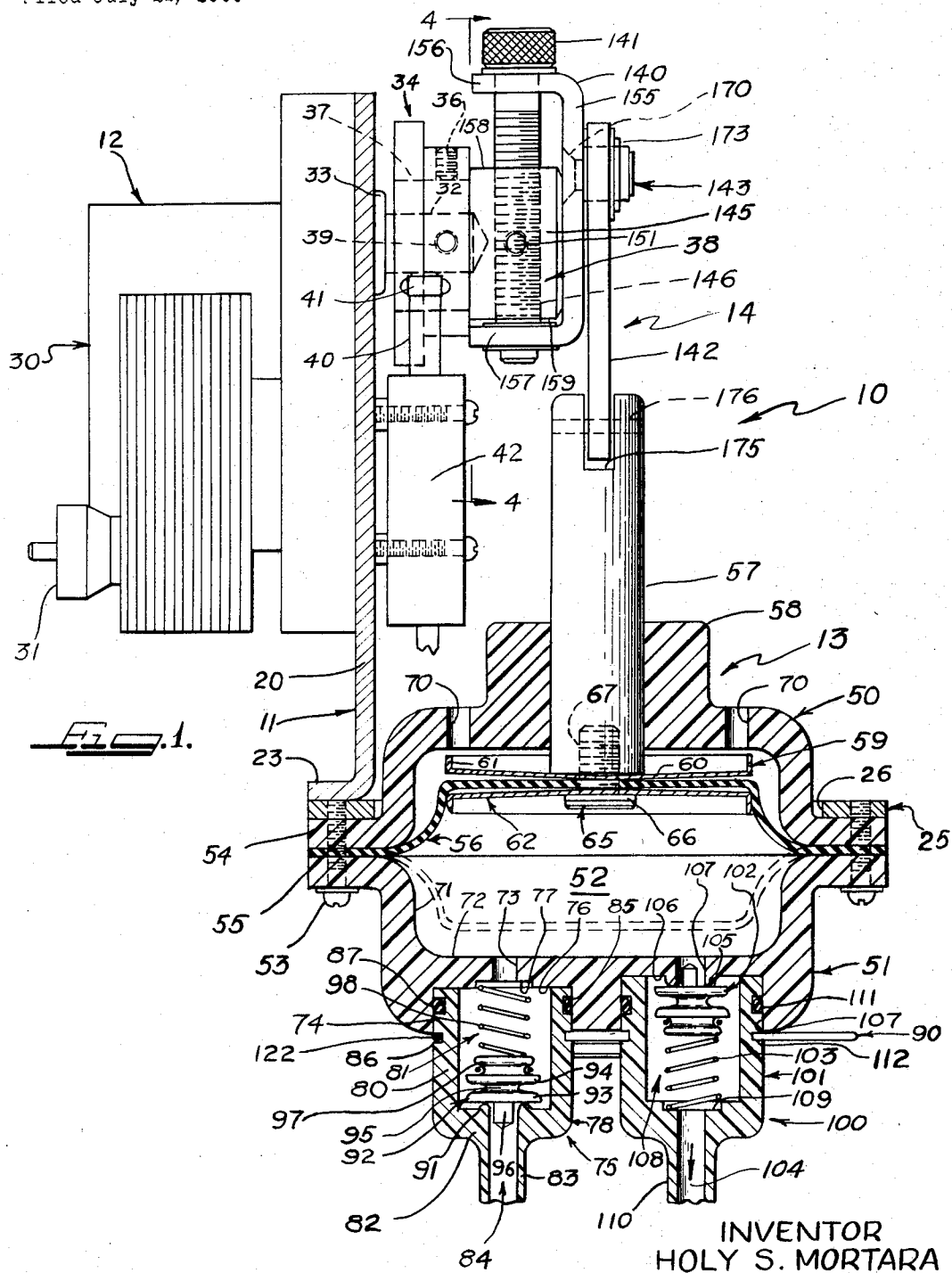


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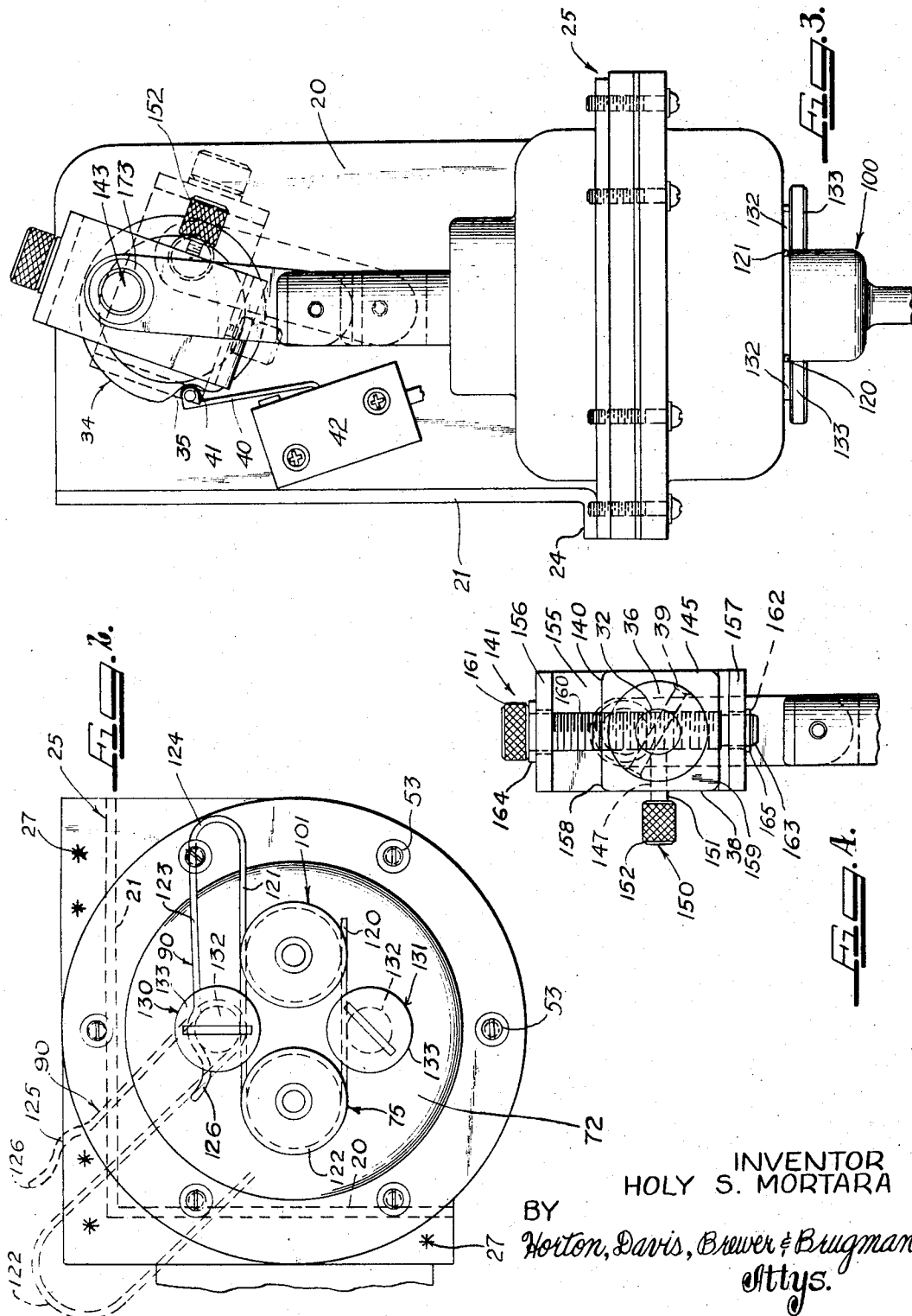
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PUMP MEANS

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2 Sheets-Sheet 2



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PUMP MEANS

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ABSTRACT OF THE DISCLOSURE

A diaphragm type vacuum pump for pumping and measuring flavoring syrup and other liquids having a selectively variable stroke for accordingly varying the pump piston displacement and including simplified check valve units removably associated with the pump housing and communicating with the vacuum chamber to afford easy clean out and repair of the vacuum chamber and valve units.

This invention relates generally to pump means, and more particularly pertains to improvements in vacuum pump means.

Vacuum pumps of the general category to which the present invention relates, have been widely used for a number of years in various applications. One of the more familiar uses therefore is found in the modern automobile wherein a vacuum pump having a diaphragm piston is utilized to pump gasoline or other fuel to the internal combustion engine. In general, such vacuum pumps are characterized by a vacuum pumping chamber across which is stretched a flexible diaphragm piston, one side of which is open to atmosphere and the opposite side of which is in sealed relation with the pumping chamber; the latter having suitable intake and discharge ports sequentially opened and closed by check valve means. In operation, materials are drawn into the vacuum chamber from a supply source in response to vacuum produced by increased volume of the pumping chamber in response to appropriate displacement of the diaphragm which is generally driven by a reciprocating rod means of fixed stroke. Conversely, opposite movement of the diaphragm creates a rapid decrease in the volume of the vacuum chamber so as to positively displace materials previously drawn into the pumping chamber. Such a simple diaphragm pump is generally quite dependable in operation, utilizes a minimum of moving or working parts, and has an operating life expectancy largely measured only by the integrity of the diaphragm. Characteristically, such heretofore known pumps have employed a constant or uniform stroke for displacing the diaphragm toward and away from the vacuum chamber, thereby providing constant volume displacement of liquids per pumping stroke, although being capable of increase or decrease in the pumping rate according to the oscillating frequency of the diaphragm.

In brief, the present invention, while utilizing the desirable simplicity of construction and rugged dependability attending previously known diaphragm vacuum pumps, provides needed improvement thereof by adapting the same for variable stroke, variable volume operation through the provision of selectively operable means for altering the stroke and displacement of the diaphragm piston. The present invention also provides new, improved and simplified check valve means for regulating the flow of liquids into and out of the vacuum chamber; such affording improved economies of manufacture and assembly and readily adapting the pump to the handling of edible liquids wherein sanitation requirements become of prime consideration. In this latter respect the improved check valve means and structural arrangement of elements according to the present invention afford the user

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ready access to the vacuum or pumping chamber and to the check valve means whereby the same may be conveniently cleaned, maintained and repaired. This feature permits satisfaction of sanitation and health requirements in handling edible liquids, particularly for human consumption and also provides improved and simplified means for maintaining the pump in satisfactory operating condition.

In keeping with the above briefly outlined principles and featured of the present invention, the preferred structural embodiment hereinafter to be described and as illustrated in the accompanying drawings, comprises a vacuum pump assembly utilizing a diaphragm piston which is positively displaced by a reciprocating rod means having operative connection with a rotary driving source of constant r.p.m. by means of a unique arrangement and assembly of elements adapted selectively to vary the stroke of the diaphragm piston. This then serves to produce selectively variable volumetric output for the pump. Such capability of varying the pump's output leads to a particularly advantageous result in the handling of edible liquids as in automatic vending machines, since the user is also provided with pump means having a variable measuring capability for pumping selected measured quantities of liquids.

An important object of this invention is to provide improved pump means for measuring and displacing selectively variable liquid quantities.

Another important object of this invention is to provide pump means of the vacuum diaphragm class having means for selectively varying the displacement of the diaphragm piston.

A further important object of this invention is to provide a variable stroke pump having improved and simplified features of construction and arrangement of elements leading to improved economies of manufacture, assembly and maintenance.

Still another object of this invention is to provide new and improved check valve means for use in pump means as aforesaid.

A further object of this invention is to provide pump means operable for displacing selectively variable liquid quantities whereby the same is readily adapted for correspondingly measuring such quantities as selected.

Still another object of this invention is to provide new and improved pump means for use in handling edible liquids and the like, which includes simplified means for cleaning the same thereby to promote sanitary operation and maintenance.

Having thus described this invention, the above and further objects, features and advantages thereof will be recognized by those skilled in this art from the hereinafter appearing description of a preferred embodiment of its features as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a view at side elevation of an improved pump means according to this invention, with portions thereof shown in section to illustrate the relationship of parts employed in the pump assembly;

FIG. 2 is a bottom plan view of the pump means shown in FIG. 1;

FIG. 3 is a front elevational view thereof;

FIG. 4 is a partial elevational view of the means employed for varying the pump stroke according to this invention, taken substantially from vantage line 4—4 of FIG. 1 and looking in the direction of the arrows thereon.

Turning now to the particular embodiment of this invention illustrated in the drawings, those skilled in the art will recognize from FIGURES 1 through 3 in particular, that the improved pump means, indicated generally at 10 in FIG. 1, comprises support bracket means 11 to which

is attached drive means 12, pump assembly 13 and connector means 14 for interjoining pump means 13 with the drive means 12.

The support means 11 as best shown in FIGS. 1 and 3 of the drawings, may constitute any suitable bracket capable of mounting and supporting the above enumerated means 12 to 14. In the particular embodiment herein shown, support means 11 constitutes a metal bracket made up of a pair of planar wall members 20, 21 integrally joined in right angular relationship (see FIG. 3); the wall members 20 and 21 being skirted at their lower ends by outwardly projecting flange portions 23 and 24, respectively. Support means 11 is further normally disposed with its longitudinal axis upright, or that is, with the right-angularly related wall portions 20 and 21 thereof in a generally vertical attitude. A pump mounting plate 25 having an enlarged central opening 26 of circular profile is mounted across the lower end of the bracket means 11 and is attached to the flange portions 23 and 24 thereof as by spot welds 27 or like connective means, seen best in FIG. 2. Thus the pump mounting plate 25 is disposed in a plane normal to the planes of the walls 20, 21 for purposes which will appear presently.

Drive means 12 preferably comprises, as herein illustrated, a gear motor 30 of suitable r.p.m., having electrical terminal connectors 31 for coupling the same to a source of electrical energy such as 115 v., 60 cycle A.C. By way of example, motor 30 may drive a shaft means 32 at approximately 7 r.p.m. for operating the pump assembly 13. As best illustrated in FIG. 1 of the drawings, the motor 30 is mounted on one side, and near the upper regions of one of the bracket walls, such as wall 20, the same being attached thereto by any suitable means such as bolts, screws, or like fastening devices, not illustrated.

A sleeve bearing means 33 is mounted in and extends through wall 20 for rotatably supporting the motor shaft 32; the latter thereby extending through wall 20 for driving a concentrically related cam member 34 having a generally circular profile except for a single indented lobe portion 35, best shown in FIG. 3 of the drawings. More specifically, cam member 34 is attached by one or more set screws 36, to and about a cylindrical shoulder portion 37 extending from one end of a hub member 38. Hub member 38 in turn is fixed to shaft 32 by pin means 39. Thus cam member 34 is rotatable with shaft 32 in operation and is rotatably adjustable about shoulder 37, for adjusting the position of lobe 35.

From the foregoing it will be understood that in operation the cam member 34 rotates with the motor shaft 32 and in so doing serves to activate a follower arm 40 having roller means 41 tangentially associated with the periphery of the cam means. Arm 40 operates a cycle switch 42, which serves to de-energize motor 12 on completion of one revolution of the cam means 34 in the herewith presented embodiment. In this respect it will be understood that if constant operation of the pump means according to this invention is desired, the cycle switch and operating cam or similar operating means therefor may be eliminated.

As noted hereinabove, the illustrated embodiment of the present invention contemplates activation of the pump assembly 13 thereof during one rotational cycle of the cam means 34. This feature adapts the pump assembly 13 for both measuring and pumping in handling edible liquids such as flavoring syrup, or the like, familiarly employed in automatic drink vending machines. Such adaptation of the present invention is set forth herein because it is especially illustrative of the utilization of the present invention in a context wherein selective variation of the pump's volumetric output is employed to both measure and transfer desired quantities of flavoring syrup in accordance with mixture requirements of potable beverages. One example of such a beverage is found in carbonated

soft drinks familiarly dispensed by the soft drink vending machines.

Turning now to the specific features of the improved pump assembly 13, according to this invention, the embodiment illustrated comprises a cup-like upper pump chamber member 50, coaxially aligned and mounted in inverted opposing relationship to a similar lower pump chamber member 51; such two chamber members 50 and 51 enclosing therebetween a generally cylindrical pump chamber 52, as shown best in FIG. 1 of drawing. The interconnection of the two chamber members 50 and 51 is effected by plural cap screws 53 located at circumferentially spaced points about the periphery of the generally circular plan configuration of the upper and lower chamber members 50 and 51, and more specifically, through appropriate aligned openings in peripheral flange portions 54 and 55 thereof, respectively.

As previously noted, the illustrated pump assembly 13 is preferably of a diaphragm piston type and to that end the upper and lower pump chambers, as above described, are coaxially mounted on opposite sides of a flexible diaphragm member 56 made of rubber or a like elastomer. Specifically, diaphragm member 56 extends across the pump chamber 52, dividing the same in two, with peripheral portions of such diaphragm member mounted between the flange portions 54 and 55 of the chamber members. The several cap screws 53 therefore pass through both flange portions 54, 55 and corresponding openings in the periphery of the diaphragm 56 for threaded acceptance and engagement in openings, formed for that purpose, in the pump mounting plate 25, the latter being rigidly supported at the lower end of the bracket 11, and the upper pump chamber member 50 extending upwardly through the central opening 26 therein.

In order to activate the diaphragm member 56, a cylindrical diaphragm rod 57 extends through a cylindrical opening formed coaxially of an enlarged cylindrical boss portion 58 formed at the upper end of chamber member 50; rod 57 extending into the upper regions of the pump chamber 52; with the walls of the opening in boss portion 58 acting as a bearing guide for the reciprocating rod 57. At the lower end of rod 57 and within the upper end of the pump chamber 52 is a rigid upper support cup 59 of generally circular formation, having a concaved disc-like body portion 60 bordered by a cylindrical skirt portion 61 extending upwardly from the periphery of the body portion 60 thereof. An identical lower support cup 62 is disposed registeringly beneath cup 59 and on the opposite side of the diaphragm member 56. Thus the upper support cup 59 engages the upper surface of the diaphragm and the lower support cup 62 engages the lower surface thereof, substantially at and about the latter's center. Connection of the diaphragm and the two support cups 59 and 62 with the diaphragm rod 57 is effected by a rod screw 65 having an enlarged head portion 66; the screw being threadingly engaged with a coaxial blind bore 67 formed in the lower end of the diaphragm rod 57. This relationship of parts is best illustrated in FIG. 1 of the drawings whereat the rod screw 65 is shown extending upwardly through central openings of the lower support cup, the diaphragm 56 and the upper support cup 59. Tightening of the rod screw 65 in the threaded opening 67, produces a compression seal between the diaphragm and the two described support cups over a central area thereof. Similarly, an annular seal between the diaphragm and flange portions 54 and 55 of the pump chamber members, is brought about upon tightening the cap screws 53, as above related.

From the foregoing it will be recognized that the assembled diaphragm and support cups constitute a piston means adapted to be actuated with reciprocating movement of the diaphragm rod 57, which is driven in a manner to be described presently. To facilitate upward movement of piston means within the pumping chamber 52, the upper pump chamber member 50 is provided with one or more vent openings 70, there being two such open-

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ings in the particular illustrated embodiment, which open the upper half of the pumping chamber 52 to atmosphere thereby releasing the upper side of the piston means from pressurizing air as it moves upwardly within chamber 52. The lower half of the pumping chamber 52 is conversely enclosed and sealed so as to effectuate a rarified atmosphere or vacuum therein in response to rapid expansion of the chamber's effective volume as defined between the lower face of the flexible diaphragm member 56 and the cup-like interior formation of the lower chamber member, enclosed by side and bottom walls 71 and 72 thereof, respectively.

In order to effect intake and discharge of liquid materials into and from the lower half of the pumping chamber 52, that is, the vacuum side of the diaphragm 56 as above described, the bottom wall 72 of the lower chamber member 51 is provided with an inlet means 73 which communicates openly at its upper end with the chamber 52 and at its lower end with an enlarged bore 74 comprising a mounting socket for inlet check valve means 75. The bottom wall 76 of the socket bore 74 immediately surrounding the inlet opening 73 and concentric therewith is further distinguished by an inset annular shoulder seat portion 77, the opening 73 and bore 74 being of coaxial cylindrical formation.

The inlet check valve means 75 comprises a check valve body member 78 which is formed with a cylindrical side wall portion 80 concentrically surrounding and defining an internal cylindrical check valve chamber 81; the latter being open at its upper end and substantially closed at its lower end by bottom wall portion 82 of body member 78. Bottom wall 82 is distinguished by a coaxially, outwardly extending neck portion 83 having a cylindrical internal inlet passageway means 84 which communicates with the check valve chamber 81. The neck portion 83 is connected with a source of liquid to be pumped by means of intervening flexible tubing or piping, not shown, but according to known and recognized practice.

The side wall portion 80 of the valve body member is distinguished by a pair of axially spaced annular kerfs formed inwardly of the exterior thereof. A first kerf 85 thereof is formed near the upper end of the side wall portion 80 and houses an elastic annular O ring 87 whereby sealed connection is effected between the cylindrical exterior of the valve body member 78 and the side walls of socket bore 74 in assembly. A second kerf 86 is adapted to receive retaining means 90, to be described in further detail hereinafter, for positively locking the inlet check valve means 75 in socket bore 74.

Internally, the valve body member 78 is formed with an annular bead portion 91 immediately adjacent and concentrically surrounding the upper or inlet end of the passageway means 84 at the bottom of the check valve chamber 81 therein. Such bead portion constitutes a valve seat for sealing engagement with a check valve member 92 preferably molded from soft elastic material, such as silicon rubber.

The check valve member 92 is shown best in FIG. 1 of the drawings, is a unitary formation including a lower annular skirt portion 93 paralleled by an upper annular skirt portion 94 with such skirt portions being interjoined by a flexible web body portion 95 of substantially lesser diameter than the skirt portions. Coaxial with the lower skirt portion 93 is an axially depending guide projection 96 which is adapted to extend into the upper end of the inlet passageway means 84 to maintain the check valve member 92 in operating orientation with such passageway means. At the opposite end of the valve member 92 is a mushroom shaped head portion 97 suitably indented immediately adjacent the upper skirt portion 94 for locking engagement with the lowermost turn of a valve spring 98 which extends between the upper skirt portion 94 of the check valve member and the indented shoulder seat 77 coaxially surrounding the opening 73 which enters the pump chamber, as previously described.

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In operation, liquid entering passageway means 84 in response to vacuum in chamber 52 as created by upward movement of the diaphragm piston means, moves the check valve member 92 off of its seat 91 compressing spring 98, thereby permitting passage of liquid into the check valve chamber 81 and thence via inlet opening 73 into the vacuum side of pump chamber 52. When the vacuum within the pump chamber 52 has been satisfied by the intruding liquid hydraulically balancing valve member 92, the compressed valve spring 98 returns valve member 92 to seat 91 causing the flexible skirt portion 93 to comfortably hug the seat 91 to stop inflow of liquid and prevent the escape of liquid from chamber 52 via the inlet check valve means 75.

A generally similar check valve means 100 is employed for controlling the outflow or discharge of liquids from the chamber 52, as indicated in FIG. 1. As therein shown, the outlet check valve means includes a check valve body member 101, housing a check valve 102 and valve spring 103, all substantially identical to the corresponding members of the inlet check valve means 75 hereinabove described. Specific exceptions are found in a few particulars as will now be set forth. It will be noted, for instance, that whereas the inlet check valve body member 78 previously described is formed with an annular bead or seat portion 91 immediately adjacent the inlet passageway means 84, there is no such bead portion or valve seat adjacent the outlet passageway means 104 of the body member 101 for the outlet check valve means. Instead, an annular seat 105 for check valve 102 depends from the bottom wall 106 of the cylindrical mounting socket bore 107 formed in the bottom wall portion of the lower pump chamber member 51 and immediately surrounding the lower end of an outlet opening 107 therein. Opening 107 communicates between the lower end of pump chamber 52 and the upper end of the cylindrical outlet check valve chamber 108 which is provided internally of the valve body member 101. Consequently, outlet check valve 102 is disposed adjacent the upper end of the chamber 108 to cooperate with the annular seat 105 in a manner similar to the operation of the inlet check valve 92 previously described. In like fashion, the outlet check valve spring 103 extends between the lower end of the outlet check valve 102 and the bottom of chamber 108; the lower end of spring 103 being received and located in a cylindrical counterbore shoulder portion 109 formed coaxially about the upper end of the outlet passageway means 104.

In operation the outlet check valve means is normally held against its seat 105 by the spring means 103, thereby preventing passage of liquid through the discharge outlet opening 107 of the pump chamber. Upon downward movement of the diaphragm piston, however, liquid within the pump chamber 52 is immediately pressurized and forced through the outlet 107 to unseat the outlet check valve 102, overriding spring 103. This permits liquid to flow into the outlet check valve chamber 108 and into the outlet passageway means 104. Outlet passageway means 104 communicates with suitable tubing, piping, or like conduit means (not shown) connected to the axially extending neck portion 110 formed on the body member 101.

From the above it will be recognized by those skilled in the art that the check valve means described are extremely simple in structure, arrangement and number of working parts. Also, each of the check valve means 75 and 100 is readily mountable in its mounting socket formed by the bores 74 and 107 in the lower pump chamber member 51. In each instance an effective fluid-tight seal is made between the body members 78 and 101 and the walls of their respective mounting sockets, by virtue of O ring seals 87 and 111. This simplified arrangement permits the user of the pump means according to the invention to readily remove the check valve means from the lower pump chamber member and disassemble

the elements thereof. Such removal of the check valve means also makes the openings 73 and 107 readily accessible to the user so that the interior of the pumping chamber 52 may be cleaned by simply forcing hot water, or other flushing fluids therethrough.

The mounting of the check valve means in the lower pump chamber member 51, is readily accomplished by simply inserting the two check valve assemblies into their respective mounting sockets or bores, and locking the same in proper operating position by means of a simplified retaining means 90.

As shown best in FIG. 2 of the drawing, the retaining means 90 comprises a generally S-shaped wire clip member preferably having spring-like resiliency yet sufficiently rigid to maintain its formation. Basically, the retaining means 90 comprises a pair of parallel spaced valve retaining arm portions 120 and 121 which are interjoined at one end by a semi-circular bend portion 122. Arm portion 121 is similarly related in parallel fashion with a third locking arm portion 123 with which it is integrally joined by an intervening semi-circular bend portion 124; the three arm portions 120, 121, 123, being integral and substantially parallel. Arm 123 is further distinguished by a curvilinear detent hump portion 125 formed near its outer free end 126, the latter of which is turned outwardly to permit easy manual engagement thereof by the operator. Each of the arm portions 120 and 121 is adapted to be received tangentially in annular kerfs 86 and 112 formed inwardly of the exterior walls or surfaces of the check valve body members 78 and 101. It is to be noted (FIG. 1) that each of the kerf portions 86 and 112 of the inlet and outlet check valve means, respectively, are located at equal axial distances from the outer ends of the check valve body members. Further, when such body members are properly inserted in their respective sockets 74 and 107, the kerfs 86 and 112 reside in coplanar registry adjacent the bottom surface of the lower pump chamber member 51. Thus the two clip arm portions 120 and 121 are adapted to be slidably inserted into the aligned kerfs 86 and 112 along opposite sides of the valve body members, while the end curvilinear clip portion 122 is housed fully within kerf 86 of the inlet check valve means, as shown in FIG. 2.

To assist the user in properly assembling the two check valve means in the pump chamber member 51, the outlet body member 101 and the socket 107 therefor are longer and deeper, respectively, than the corresponding body member 78 and the bore 74 of the inlet check valve means. Thus, to align the two kerfs 86 and 112 in the same plane for reception of the arm portions 120 and 121 of the retaining means 90, the longer outlet check valve body member necessarily must be inserted in its proper socket in the lower pump chamber and the same holds true as to the shorter inlet body member 78.

In order to attach the retaining means 90 to the lower pump housing, a pair of locking studs 130 and 131 are provided in diametrically opposed relationship on opposite sides of a common axis or plane passing through the centers of the check valve sockets 74 and 107 (see FIG. 2 of the drawings). Each of the locking studs bears a threaded shank receptive in an appropriate threaded opening formed therefor in the bottom wall 72 of the lower pump chamber member. Each locking stud also has an enlarged head portion 133 which is spaced axially away from the outer face of the bottom wall portion 72 on the lower pump chamber member when the stud member is in its mounted position. This spacing between the head and the outer face of the lower pump chamber member 51 accommodates the diameter of the wire retaining means 90 in the fashion illustrated in FIG. 2. More specifically, the arm portions 120 and 121 of the means 90 pass beneath the enlarged head portions 133 of the two spaced locking studs, tangentially of the shank portions thereof, and in tangential alignment with the inner diameters of the two coplanar aligned kerfs 86 and 112 of

the two check valve means, thereby axially locking the latter to the chamber member 5 of the pump means. As the retaining clip means is advanced to the right as shown in FIG. 2, the bend portion 122 between arm portions 120 and 121 enters kerf 86 on the inlet check valve body member 78, according to the full line position of means 90 illustrated in FIG. 2. During this operation the parallel arm portions 121 and 123 of the clip means, disposed on opposite sides of the shank portion detent associated with the lock stud 130, slide therealong until eventually detent portion 125 of the locking arm portion 123 snaps over the shank portion of lock stud 130 to keep the retainer means in locking position, holding the two check valve assemblies in the lower pump housing.

When it is desired to remove the check valve means, for cleaning or repair, as above described, the arm 123 is lifted away from stud 130 to release detent portion 125 and means 90 is slidably moved from its full line position of FIG. 2 to its dotted line position set out in that figure. This operation is effected simply by moving the means 90 to the left as viewed in FIG. 2 until the curvilinear portion 124 which interjoins arm positions 121 and 123 thereof engages the shank of the lock stud 130. The clip means 90 then may be swung or pivoted about the lock stud 130 to clear the two check valve assemblies, permitting their removal from the pump housing as above related.

It will be understood that reciprocating activity of the diaphragm rod 57 serves to oscillate the diaphragm piston means up and down within the pump chamber 52 so as to alternately draw liquid through the intake check valve means 75 into the pump chamber 52 and thereafter to expel such liquid from the chamber 52 in response to the downstroke of the diaphragm piston. In order to produce the necessary reciprocating activity of the diaphragm rod 57, in response to the rotational driving of the motor driven shaft 32, connection must be made between the diaphragm rod 57 and the motor shaft. This connection, according to the present invention is made by means 14 which permits selected variation for the stroke of rod 57 in distinction of previous practice in this art.

As shown best in FIGS. 1, 3 and 4 of the drawings, the improved connector means 14, according to this invention, comprises the hub member 38 previously described, an eccentric yoke member 140 mounted over the hub member and adjustably attached to the latter by means of a stroke-adjuster 141 which permits adjustable positioning of the yoke member relative to the hub member. The yoke member is also attached to the upper end of a connecting rod 142 by a connecting pin means 143, while the lower end of the connecting rod 142, in turn, is pivotally attached to the upper end of the diaphragm rod 57.

Considering now the specific features of the several elements above enumerated which go to make up the improved connecting means 14, it will be recalled that the hub member 38 is pinned or otherwise rigidly affixed to the shaft 32, rotatably driven by gear motor means 30. It also will be recalled that the one end of the hub member 38 affixed to shaft 32 is distinguished by a cylindrical collar portion 37 over which the cycle switch cam means 34 is mounted. As shown particularly in FIGS. 1 and 4 of the drawings, axially beyond the collar portion 37, hub member 38 includes a substantially square adjusting block portion 145 formed integrally with the collar portion 37. Block portion 145 is particularly distinguished by a threaded cylindrical bore 146 which passes lengthwise therethrough for threading engagement with the stroke adjuster 141, which, in the particular instance illustrated, constitutes a threaded bolt means.

Extending sideways into the bore 146, is an additional threaded opening, designated at 147 in FIG. 4 of the drawings, which receives locking screw means 150 having a threaded shank portion 151 and a knurled manually engageable head portion 152. The threaded shank portion 151 of the lock means is threadingly mounted in bore

147 and serves to engage the stroke adjuster 141 in the bore 146 so as to interlock the hub member 38 and stroke adjuster 141 at various relative positions, as will be explained in greater detail hereinafter.

As noted previously, the hub member 38 is operatively assembled within the yoke member 140; connection therebetween being effected by the stroke adjuster 141. Specifically the yoke member 140 is substantially U-shaped in side elevation, as best illustrated in FIGURE 1 of the drawings, and as such includes a main body portion 155 of rectangular planar configuration from the opposite ends of which extend right angularly related arm portions 156 and 157. In assembly the yoke member 140 is mounted adjacent the hub member 38 with the two arm portions 156 and 157 thereof respectively disposed over the top and bottom end surfaces 158 and 159 thereof. It will be noted that each of the arm portions 156 and 157 of the yoke member is provided with suitable smooth walled opening for the unthreaded passage of the stroke adjuster 141 so that the latter is freely rotatable with respect thereto.

With reference now to FIGURE 4 of the drawings, it will be recognized that the adjuster means 141 is a threaded bolt means in the particular embodiment illustrated, and as such comprises a threaded shank portion 160 and at the upper end thereof a knurled manually engageable head portion 161. The lower end of the shank portion 160 is reduced in diameter to define a cylindrical stub portion 162 which is suitably provided with an annular recessed slot adjacent the terminal end 163 of the shank portion. In assembly the adjuster means 141 passes through the openings in the two yoke arm portions 156 and 157, as illustrated in FIGURE 4, with the knurled manually engageable head portion 161 thereof being embraced and axially held from the arm portion 156 by an intervening washer 164. The extreme lower end of the adjuster means and more specifically its stub portion 162, after passing through the lower arm portion 157 of the yoke member, is embraced by a snap-on spring lock washer 165 mounted in the slot or recess formed therein adjacent the terminal end 163 thereof. Thus the adjuster means is axially locked to the yoke member.

From the above it will be understood that rotational movement of the adjuster means 141 serves to threadingly move the same relative to the hub member 38. While such relative movement between the threaded adjuster means and hub member 38 occurs as noted, in point of fact the hub member being pinned to the motor shaft 32 constitutes a stationary anchor member which resultantly causes the yoke member 140 to move relative to the hub member 38 in response to rotational operation of the stroke adjuster 141. Locking the hub member to the stroke adjuster 141 and thus locking of the yoke 140 in selected positions relative to the hub member is effected by tightening of the locking screw 150 against the shank of the stroke adjuster 141.

It will thus be understood that the yoke 140 is adapted to be adjustably positioned relative to the hub member 38 in response to rotation of the stroke adjuster 141. In order to utilize this selective positioning of the yoke member to accomplish the objective of varying the reciprocating stroke of the diaphragm rod 57, the yoke member 140 is provided with the connecting pin means 143 constituting a stub shaft projecting outwardly of the main portion 155 of the yoke member and on the opposite side of such portion from the hub member 38. Connection of the pin means 143 to the yoke body may be effected by any suitable means, but in the specific embodiment illustrated, by rivet means 170 welded in place, as shown in FIGURE 1 of the drawings.

The connecting pin means 143, as previously noted, is pivotally coupled to the upper end of the connecting rod 142 which bears an appropriate opening receptive of the pin means 143; a snap-on locking ring 173 being employed to removably lock the connecting rod to the pin

means 143. The lower or opposite end of the connecting rod 142 is similarly pivotally fastened to the upper end of the diaphragm rod 57 and more specifically is received in a slotted opening 175 formed inwardly of the upper end of the diaphragm rod 57; a transversely extending pin rod 176 passing through the upper end of the diaphragm rod across the slotted opening 175 therein and through an appropriate opening formed for that purpose in the lower end of the connecting rod 142. Thus the connecting rod is pivotally joined to both the upper end of the diaphragm rod 57 and to the pivot pin 143 mounted on the eccentric yoke 140.

As shown in FIGURES 1 and 3 of the drawings, the eccentric yoke is disposed off the rotational center for the motor driven shaft 32, or that is eccentrically with respect thereto, to accordingly locate the pivot pin 143 eccentrically with respect to the rotational axis of motor driven shaft 32. This position of the yoke 140 affords maximum cranking action to the connecting rod 142 and resultantly maximum displacement of the diaphragm piston within the pump chamber 52, as indicated in dotted lines in FIGURE 1.

Although not illustrated, stroke adjuster 141 may also be operated to position the axis of the upper pivot pin 143 coaxially of the axis of rotation for the motor driven shaft 32. In such position of adjustment, the stroke of diaphragm actuating rod 57 is minimal or that is such rod 57 does not reciprocate in response to rotation of shaft 32 since the latter's axis and that of pin 143 are coincident. Thus the stroke of the rod 57 is adjustable selectively between zero and maximum limits, to accordingly adjust the displacement of the diaphragm piston within the pump chamber. This range of adjustability for the means 14 provides improved selectivity in the pumping capacity of pump means 13 so that various selected quantities of liquid may be pumped per stroke of the diaphragm piston. Due to this factor not only the volumetric output of pump means 13 is adjustable, but the permissible variation of such output provides a desired capability to correspondingly vary measured quantities of liquid discharged by the pump per stroke of the diaphragm piston. This latter feature is especially desirable and useful in soft drink vending machines and similar uses where successful operation requires the introduction of measured quantities of flavoring syrups for each vend cycle. For example, in dispensing soft drinks in which flavoring liquids are mixed with carbonated water or like carriers, the taste and flavor of the resulting drink may be varied widely by varying the amount of flavoring syrup per drink. The pump means of the present invention readily lends itself to meeting and satisfying such circumstances by pumping various selected measured quantities of liquid syrup.

From the foregoing it is believed that those familiar with the art will readily recognize and appreciate the many advantages and improvements of the present invention which mark the same apart from prior pump means of the class described. Further while the particular embodiment of the present invention is directed to its utilization in conjunction with measuring and pumping selected quantities of flavoring ingredients for soft drink vending machines and the like, the invention is not limited to such field of utility nor is it limited to use with liquids of a portable or edible nature wherein the requirements of maintaining sanitary cleanliness of the portions of the pump coming in contact with the fluid, as has been related, are encountered. Further, it is also to be recognized that while the present invention has been described in association with a particular preferred embodiment, illustrated in the accompanying drawings, nevertheless the same is susceptible to variation and substitution of equivalents without departing from its spirit and scope. Consequently it is intended that the present invention be unlimited by the foregoing except as may appear in the following appended claims.

I claim:

1. In combination, vacuum pump means having means enclosing a vacuum chamber, reciprocating diaphragm piston means in said chamber, and inlet and outlet means communicating with said chamber; rod means connected to said piston means for reciprocating the same in said chamber, rotatably driven shaft means, means pivotally interconnecting said shaft means and rod means including adjustable eccentric means for reciprocating said rod means, means for selectively adjusting said eccentric means to accordingly vary the stroke of said piston means, inlet and outlet check valve means over said inlet and outlet means respectively, for controlling the flow of fluid unidirectionally through said chamber according to the intake and discharge strokes, respectively, of said piston means; each of said check valve means comprising a unitary body member having an internal check valve chamber, said body member being removably inserted in a socket formed therefor in the chamber enclosing means of said pump means, a unitary elastic valve member mounted within said valve chamber, and spring means axially biasing said valve member against a seat provided adjacent one end of said valve chamber to control the flow of fluid therepast; and retainer means slidably engageable with recessed portions formed in the body member of each of said check valve means and with spaced locking means on said chamber forming means, said retainer means being operative to removably lock said valve means in the sockets therefor.

2. The combination as set forth in claim 1 wherein said retainer means comprises a generally S-shaped clip member having three spaced arm portions, and a pair of spaced locking studs with enlarged heads mounted adjacent the valve sockets in said chamber enclosing means; two of said arm portions slidably engaging recessed kerf means in opposite sides of each said check valve body member and also passing beneath the heads of said locking studs to axially interlock said body members and studs, and the third arm portion having detent means engageable with one of said locking studs to removably lock the same to said one stud.

3. Vacuum pump means comprising a pair of chamber members interconnected and defining therebetween an internal pump chamber, reciprocating diaphragm piston means mounted across said chamber and dividing the same into two portions one of which is vented to atmosphere,

check valve means mounted over inlet and outlet means formed in one of said chamber members for controlling the flow of fluid into and out of said vacuum chamber, a rotatably driven shaft member, rod means coupled to said piston means for oscillating the latter in response to reciprocating movement of said rod means, and connector means coupling said rod means to said shaft member comprising a hub member mounted on and rotatable coaxially with said shaft member, a U-shaped yoke member mounted over said hub member and having parallel spaced arms at the opposite ends thereof, threaded bolt means rotatably connected to and extending between said arms of said yoke member and having threaded connection with said hub member whereby said yoke member may be moved and disposed at selected positions relative to said hub member in response to rotational movement of said bolt means, connecting pin means mounted on said yoke member, connecting rod means pivotally coupled at one end to said connecting pin means and at its opposite end to said rod means, and means for selectively locking said bolt means against rotation whereby said yoke member may be fixed at selected positions relative to said hub member to correspondingly dispose said connecting pin on or eccentric of the rotational axis of the shaft member thereby to accordingly selectively vary the stroke of said rod means.

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