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FLUID PUMPING MECHANISM

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This invention relates to fluid pumping mechanism, and particularly to a novel pump assembly adapted to permit selective delivery of any of a plurality of fluids from suitable sources of supply thereof to a required delivery point.

In recent years, it has been found desirable to provide soft drink dispensing machines wherein various carbonated and noncarbonated beverages may be delivered from suitable receptacle therefore to a common delivery point into a cup or the like. Because of the space requirements of vending machine cabinets and the necessity of storing a maximum amount of the beverages in a minimum of space, it has been found most desirable to utilize different flavored syrups stored in suitable stacks therefor and to mix the syrup with the liquid, whether in carbonated or noncarbonated form, prior to delivery of the beverage to a cup for purpose by the customer. Standardization of the drinks dispensed by the machine requires that relatively exact quantities of the various syrups be delivered to the customer cups during each dispensing cycle. Problems have been found to arise with respect to the provision of pumping mechanism for delivering required amounts of syrups or the like to the dispensing station of the vending machine without the utilization of expensive and troublesome pumping units and controls therefor.

It is, therefore, the primary object of the present invention to provide novel pumping structure adapted to overcome the problems referred to above, and to permit selective delivery of any one of a number of fluids such as syrups or the like, to a common delivery station. In this respect, a further important object of the invention is to provide pumping mechanism for apparatus as described, which is adapted to dispense a plurality of liquids from respective sources of supply thereof, and wherein an individual pump is employed for each fluid and adapted to be selectively driven from a common power source through novel mechanism under the control of the customer so that all of the pumps may be independently and selectively driven from the single power source and eliminating the necessity of employing a prime mover for each pump along with the control mechanism therefor.

An important aim of the invention is to provide pumping mechanism of the character referred to above, wherein individual pumps are provided for each of the fluids to be dispensed from the machine and with the pumps being of the diaphragm type so that maximum pumping efficiency is obtained during operation thereof, permitting close control over the amount of fluid which is dispensed from a respective pump during operation thereof a predetermined period of time, and allowing the serviceman to readily and quickly clean the pump as required to maintain the same in a sanitary condition for dispensing of beverages.

Also an important object of the invention is the provision of pumping mechanism wherein the individual pumps may be driven from a common power source by virtue of the fact that the same have rocker actuators thereon which are disposed to be driven from a common drive shaft coupled to the single source of power, but with the actuators being movable freely without effecting operation of a respective pump until selectively controllable means under the control of the customer, is activated to effect direct coupling of one of the rocker actuators to the power shaft for operation thereby. In this respect, an important aim of the invention is to provide electrically actuated means

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such as solenoids or the like for controlling coupling of corresponding rocker actuators to the power shaft to thereby simplify the control mechanism for independently connecting the pumps to the single power source and minimizing the number of operating parts needed to provide the required selective coupling of individual pumps to the drive shaft.

Also an important object of the invention is to provide pumping mechanism of the aforesaid character, wherein is provided means for manually adjusting the initial position of the diaphragm of each of the individual pumps and thereby the "throw" of the pump, whereby the amount of fluid dispensed by each pump is accurately controlled and said power source need only be energized for a predetermined length of time in order to actuate the pump and dispense the requisite amount of fluid therefrom.

A still further important object of the invention is to provide a pumping assembly as defined, wherein the number of pump units driven by the common power source may be selectively varied at will, and thus making the apparatus universally adaptable for use in various types of machines designed to dispense different quantities of beverages as required for a particular application.

Other objects of the present invention will become apparent as the following specification progresses, reference being had to the accompanying drawing, wherein:

FIGURE 1 is a side elevational view of the fluid pumping mechanism which forms the subject of the present invention and illustrating the source of power common to all of the pump units associated therewith;

FIG. 2 is a cross-sectional view taken along line 2-2 of FIG. 1, parts being broken away to illustrate details of construction; and

FIG. 3 is a cross-sectional plan view taken along line 3-3 of FIG. 1.

The present invention provides fluid pumping mechanism for use with fluid dispensing machines, such as soft drink machines or the like, and includes a support on which is journaled an elongated shaft having longitudinally spaced cam means thereon. A plurality of pump units are secured to the support in alignment with the cam means on the shaft and each of the pump units is provided with push rod means for actuating the pump unit.

Rocker arm structure is provided for operating the push rods and includes an elongated element for each push rod for interconnecting the latter with the corresponding cam means on the rotatable shaft.

Means are provided for urging the elements into engagement with the various cam means on the shaft and further, means are provided for selectively engaging the elements at locations thereon spaced from the zones of interconnection thereof with the corresponding push rods to provide fulcrums therefor about which the elements swing responsive to the rotation of the shaft and the corresponding cam means.

The fulcrum means includes a solenoid device and a shiftably mounted plate-like component carried by the support adjacent each element. Actuation of the solenoid causes the component to abut the corresponding element so that the latter rocks about the component responsive to the rotation of the shaft to thereby actuate the push rod and the associated pumping unit.

The fluid pumping mechanism which forms the subject of the present invention is broadly denoted by the numeral 10 and comprises a support 12, having a normally vertically disposed side wall 14, a pair of opposed end walls 16 and 18 secured to side wall 14, and a top wall 20 secured to walls 14, 16 and 18 in overlying relationship thereto.

Side wall 14 is provided with a plurality of aligned, spaced openings 22 therein for receiving the push rods

24 of a plurality of pump units broadly denoted by the numeral 26, secured to the generally outermost face of side wall 14. A collar 28 surrounds each opening 22 and extends into the region enclosed by side wall 14 and end walls 16 and 18. Collar 28 provides a guide for each push rod 24 and shiftably mounts the latter for movement relative to and substantially normally of side wall 14.

Each pump unit 26 comprises an annular base 30 which is secured by screws 32 to the generally outermost face of side wall 14. Base 30 extends laterally from side wall 14 and is provided with an undulated, outermost marginal edge 34 upon which is disposed the annular, peripheral edge 36 of a flexible diaphragm element 38. A closure 40 mates with and is secured to base 30 and clamps the peripheral edge 36 of diaphragm element 38 to base 30 by virtue of a plurality of screws 42. Closure 40 is provided with a recess 44 therein providing a chamber between the inner surface of closure 40 and one face of diaphragm element 38. A boss 46 extends laterally from closure 40 away from side wall 14 and is provided with a bore 48 therethrough which communicates with an opening 50 in closure 40. A fluid passage 52 communicates with bore 48 in boss 46 through a check valve 54 which permits the flow of fluid toward recess 44 through bore 48 only.

A fluid passage 56 also communicates with bore 48 through a check valve 58, the latter permitting flow of fluid in the direction away from recess 44.

It is to be understood that base 30 is provided with an annular opening 60 which mates with the recess 44 of closure 40 and within which diaphragm element 38 is free to move.

Push rod 24 is provided with a first portion 62 which generally engages the inner surface of collar 28, and a second, externally threaded portion 64 which is threadably received within the hub 66 of a disc 68 disposed within base 30 adjacent side wall 14.

A circular element 70 is disposed concentric to disc 68 in spaced relationship to the latter by virtue of an annular flange 72 abutting one face of disc 68. Element 70 engages one face of diaphragm element 38 and is utilized as a backing to support the major portion of diaphragm element 38. As seen in FIG. 2, the major portion of diaphragm element 38 is urged into engagement with the entire circular face of element 70 by means of a disc 71 engaging the opposite face of diaphragm element 38, it being noted that the diameters of circular element 70 and disc 71 are substantially identical. A screw 74 secures disc 71 to the second portion 64 of push rod 24 to thereby clamp the aforesaid major portion of diaphragm element 38 between element 70 and disc 71.

It is to be understood that the diameter of disc 68 is slightly smaller than the diameter of opening 60 and, therefore, disc 68 is receivable within opening 60 when diaphragm element 38 moves toward opening 50 under the influence of push rod 24.

Push rod 24 is provided with a ring 80 secured thereto on the first portion 62 thereof in spaced relationship to collar 28. Ring 80 provides shoulder means against which a coil spring 82 abuts when spring 82 is disposed between side wall 14 and ring 80. By virtue of this construction, push rod 24 is biased in a direction away from side wall 14 to thereby urge diaphragm element 38 toward side wall 14.

An elongated member 84 in the nature of a rotatable shaft, is journaled at the ends thereof in end walls 16 and 18 by virtue of bearings 86 and 88 respectively. The end of shaft 84 is operably coupled to a source of power 90 such as an electric motor or the like for rotating shaft 84 about the longitudinal axis thereof. As is clear in FIGS. 1 and 2, shaft 84 is positioned below and spaced from top wall 20 and is also spaced from side wall 14 above the generally horizontally aligned push rods 24 of pump units 26.

A cam device 92 is provided at each of a plurality of longitudinally spaced locations on shaft 84, which locations correspond to each pump unit 26. Each device 92 is provided with a hub portion 94 having a setscrew 96 therein engageable with the outer surface of shaft 84 to secure device 92 to the latter. Device 92 is provided with a second portion 98 having an eccentric, peripheral surface 100 surrounding shaft 84. Rotation of shaft 84 causes each of the devices 92 to rotate therewith.

Rocker arm structure is provided for interconnecting each cam device 92 with the corresponding push rod 24. To this end, a pair of elongated elements 102 are pivotally secured to a corresponding push rod 24 at the end thereof remote from side wall 14 by virtue of a pivot pin 104. Elements 102 are disposed on opposed sides of the push rod 24, the latter having flattened surfaces 106 to accommodate the flat, innermost faces of the elements 102. It is understood that each pivot pin 104 is provided with a head 108 engaging the proximal element 102, and a cotter key 110 is operably coupled to the pin 104 for maintaining elements 102 on push rod 24.

Each element 102 is formed from an initially flat strip of rigid material such as a suitable metallic material, and is provided with rectilinear end stretches 112 and 114 respectively, intermediate stretch 116 spanning the distance between stretches 112 and 114 and disposed laterally of the longitudinal axes of stretches 112 and 114. As is shown in FIG. 1, stretches 114 are in substantial engagement as a result of elements 102 being inwardly bent adjacent the zone of interconnection of stretches 114 and 116. It is further to be noted that stretches 112 are provided with aligned openings therein for receiving pin 104 interconnecting elements 102 to the corresponding push rod 24.

Each pair of elements 102 is provided with a roller 118 therebetween by virtue of fastening means 120. Each roller 118 is secured to arcuate stretch 116 substantially intermediate the ends of the latter. As shown in FIG. 2, the roller 118 is indicated in dashed lines and also, the eccentric surface of the corresponding cam device 92 is illustrated partially in dashed lines to show the interengagement of surface 100 with the peripheral surface of roller 118.

A coil spring 122 is secured to each pair of stretches 114 and to a downwardly extending projection 124 secured to top wall 20. Spring 122 thereby biases stretch 114 away from side wall 14 and by virtue of coil spring 82, arcuate stretch 116 is directed so that the roller 118 thereof engages the outer surface 100 of cam device 92, it being understood that coil spring 82 is under compression.

Selectively operable structure is provided for use as a fulcrum for each pair of elements 102 to thereby actuate each push rod 24 responsive to the rotation of shaft 84. To this end, an elongated, plate-like component 126 is shiftably mounted on support 12 by virtue of a bracket 128 secured to and depending from top wall 20. Component 126 is generally rectangular and is provided with a pair of shoulders 130 which are movable into engagement with the proximal face of a vertical section 132 forming a part of bracket 128, it being noted that section 132 is provided with a slot 134 therein through which the proximal portion of component 126 passes.

A section 136 of bracket 128 is provided with a slot 138 therein through which the proximal portion of component 126 passes. A bight section 140 interconnects sections 132 and 136 and is secured to the underside of top wall 20 to secure bracket 128 to the latter.

Component 126 is provided with a knife edge 142 which is receivable within aligned notches 144 in stretches 114 of elements 102 when shoulders 130 move away from section 132. Further, component 126 is provided with a transversely extending slit 146 adjacent edge 142 for receiving stretches 114 when shoulders 130 are in substantial abutment with section 132.

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Means for shifting component 126 relative to sections 132 and 136 comprise an electrically actuated solenoid device 148 mounted on a normally horizontally extending section 150 integral with section 136 and extending laterally therefrom to end wall 16. Solenoid device 148 is provided with a core 152 which is shiftable into and out of the coil of device 148 and, by virtue of a connector 154, is secured to component 126 at the end thereof remote from the end passing through slot 134. A coil spring 156 surrounds core 152 and normally biases connector 154 toward section 136 of bracket 128. Thus, component 126 is biased in a direction so that slit 146 is aligned with stretches 114.

When device 148 is energized, core 152 is drawn into the coil of the latter and component 126 is shifted so that edge 142 thereof engages the stretches 114 within notches 144 thereof. Thus, since component 126 is not free to shift laterally, the same serves as a fulcrum for elements 102 and therefore, the latter rock about a horizontal axis through the point of contact between edge 142 and stretches 114. Rocking movement of elements 102 causes push rod 24 corresponding thereto, to reciprocate into and out of collar 28 to thereby reciprocate diaphragm element 38 within recess 44. Actuation of diaphragm element 38 alternately draws fluid into recess 44 through passage 52 and forces fluid out of recess 44 through passage 56.

In operation, passages 52 of pump units 26 are normally interconnected with sources of different kinds of fluid such as soft drinks or the like. In addition, passages 56 are normally interconnected with a common outlet so that the fluids pumped out of the storage regions by pump units 26 may be dispensed at a common point. Further, source 90 is caused to be energized to rotate shaft 84 a single revolution about the longitudinal axis thereof each time it is desired to dispense the various fluids from the individual pump units 26. So long as edges 142 of components 126 are not disposed within notches 144, stretches 114 of elements 102 are free to reciprocate within slits 146 of components 126 responsive to the rotation of shaft 84 and the interengagement of cam devices 92 with rollers 118.

It is noted that the compression forces of coil springs 82 are great enough to overcome the tension of coil springs 122 to thereby cause stretches 114 to move into and out of slits 146 so long as edges 142 do not engage stretches 114 within notches 144. When it is desired to dispense a particular type of fluid, the corresponding solenoid device 148 is actuated through a conventional holding circuit initiated by a control panel on the machine to which mechanism 10 is attached.

When device 148 is energized, the core 152 thereof is caused to shift into the coil of device 148 to thereby shift the component 126 thereof to a position wherein the edge 142 moves into the notches 144 of stretches 114. Stretches 114 thereby are rendered immovable and, since shaft 84 continues to rotate, cam device 92 associated with the particular solenoid device 148, causes elements 102 to rock about the horizontal axis formed by the interengagement of edge 142 with stretches 114 within notches 144 of the latter. Rocking motion of elements 102 overcomes the compression force of the corresponding coil spring 82 to thereby reciprocate push rod 24 within collar 28. This last-mentioned action causes the corresponding diaphragm element to reciprocate within recess 44 to alternately draw fluid into and force fluid out of recess 44 toward the dispensing region.

It is evident that each pump unit 26 is actuated independently of the pump units 26 adjacent thereto and all pump units 26 are operated from the same source of power, namely, the source 90 to which shaft 84 is operably coupled.

A switching device 158 is secured to end wall 16 below shaft 84 and is provided with a shiftable pole 162 engageable with a cam 160 rigid to shaft 84 for actuating device

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158 responsive to the rotation of shaft 84. Device 158 is adapted to be operably coupled with source 90 to de-energize the latter after one complete revolution of shaft 84, whereupon a predetermined amount of fluid will have been delivered by an actuated pump unit 26.

To vary the amount of fluid delivered by each pump unit 26, disc 68 is moved toward or away from opening 60 in base 30 by threadably shifting hub 66 relative to threaded portion 64 of push rod 24. The initial position of diaphragm element 38 relative to base 30 is therefore, varied to thereby vary the volume of recess 44 and the amount of fluid receivable therewithin. It is to be understood of course, that disc 68 is not movable to an extent causing a corresponding element 102 to be shifted into the notch 146 of the associated component 126 which would operate to prevent movement of the latter upon energization of the solenoid operably connected thereto.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. Fluid pumping mechanism comprising:

a support;

a plurality of individual pumps mounted on said support and each having elongated, reciprocable actuating means thereon;

an elongated actuating element pivotally secured at one extremity thereof to each of said actuating means and extending transversely therefrom in one direction;

a rotatable drive member common to all of said elements and engageable therewith intermediate the extremities thereof for causing each of the elements to oscillate about said one extremity thereof during rotation of said drive member;

power means operably connected to said drive member for rotating the same;

shiftable means operably associated with the opposite extremity of each of the actuating elements remote from said actuating means, each of said shiftable means being movable from a position clearing said opposite extremity of a respective actuating element during oscillation thereof to a location blocking oscillation of said opposite extremity of a corresponding actuation element whereby when each shiftable means is in said location thereof, rotation of the drive member causes said one extremity of the respective actuating element to be oscillated relative to said opposite extremity thereof and effecting reciprocation of a corresponding actuating means pivotally connected thereto; and

selectively operable means coupled to each of said shiftable means for independently shifting the latter between said position and the location thereof.

2. Fluid pumping mechanism as set forth in claim 1 wherein said selectively operable means control the operation of said power means.

3. Fluid pumping mechanism as set forth in claim 1 wherein said drive member is provided with eccentric cam means thereon for each of said actuating elements and engageable therewith for oscillating said actuating elements.

4. Fluid pumping mechanism as set forth in claim 1 wherein is provided means at opposed extremities of each of the actuating elements for biasing the latter into engagement with said drive member, the force of the biasing means at said one extremity of each actuating element exceeding the force of the biasing means at said opposite extremity thereof.

5. Fluid pumping mechanism as set forth in claim 1 wherein said power means is normally operable only when one of the shiftable means is in said location thereof.

6. Fluid pumping mechanism comprising:

a support;

a plurality of individual pumps mounted on said support and each having a shiftable piston assembly and a push rod connected thereto for reciprocating a

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respective piston assembly, all of said rods being in parallel, substantially aligned relationship;
 an elongated rocker arm element pivotally connected at one end thereof to the outer extremities of each of said push rods, each of said rocker arm elements extending from said push rods in one direction and lying in generally aligned, parallel relationship;
 a drive shaft positioned adjacent said rocker arm elements in generally perpendicular relationship thereto, located intermediate the ends of said rocker arm elements and provided with eccentric cam means thereon engaging corresponding rocker arm elements for oscillating the latter about the pivotal connections thereof to respective push rods as the shaft is rotated;
 power means operably coupled to said shaft for rotating the same at preselected intervals;
 shiftable fulcrum members located adjacent the opposite ends of said rocker arm elements remote from said push rods, each of said fulcrum members being movable from a position clearing said opposite end of a respective rocker arm element during oscillation thereof to a location blocking oscillation of said opposite extremity of a corresponding rocker arm element whereby when each fulcrum member is in said location thereof, rotation of the shaft causes the cam means thereon to effect oscillation of said one end of the respective rocker arm element with respect to the opposite end thereof and thereby caus-

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ing the push rod connected to the corresponding rocker arm element to be reciprocated;
 means operably joined to each of said fulcrum members for normally maintaining the latter in said positions thereof; and

selectively operable solenoid means joined to each of said fulcrum members for shifting the latter from said position to the location thereof upon actuation of respective solenoid means.

7. Fluid pumping mechanism as set forth in claim 6 wherein is provided first spring means coupling the opposite end of each of the rocker arm elements to said support and biasing respective rocker arm elements toward said cam means on the shaft, and second spring means engaging said support and each of the push rods for biasing said one end of each of the rocker arm elements toward said cam means on the shaft, the force of each of said second spring means exceeding the force of each of said first spring means.

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