3,439,835
LIQUID METERING DISPENSER WITH RECIPROCAL PISTON AND ROTATABLE CONTROL VALVE
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13 Claims

ABSTRACT OF THE DISCLOSURE
A beverage dispenser of the rotary valve type having a vertically movable piston dischargeable through an adjustable stroke by pressurized fluid to dispense a fixed quantity of said fluid each time the valve actuator is angularly moved from one operative position to the other. Inlet and outlet passages separated by axially elongated seals are formed between the valve body and the rotateable valve member. Fluid communication with fluid chambers on opposite sides of the piston through axially spaced ports in the valve member.

This invention relates to the dispensing of an adjustable fixed quantity of fluid such as liquid beverages from a pressurized source. More particularly, the present invention relates to a rotary valve mechanism having means for dispensing a measured quantity of fluid each time the valve actuator is displaced between two limit positions. In many installations, it is desirable to provide a dispensing valve mechanism which incorporates therewithin facilities for measuring a predetermined quantity of fluid to be dispensed as well as means for adjusting or changing the quantity as desired. The dispensing valve mechanism of this type must also be compact and versatile in installation. In particular, it is desirable to have such a dispensing valve mechanism for the serving of draft beer as a counter top dispenser, in an under bar installation or as a direct draw-type beer dispenser.

In accordance with the present invention, a dispensing valve mechanism fulfilling the foregoing requirements is provided which features a tubular valve member rotatably mounted within an elongated valley body so as to enclose fluid chambers on opposite sides of a vertically movable piston communicating through axially spaced ports in the valve member with inlet and outlet passages formed between the valve member and the valve body. The inlet and outlet passages are separated by axially elongated seal elements mounted by the valve body in wiping engagement with the external surface of the tubular valve member. The inlet passage being connected through tubing to the bulk container within which the pressurized fluid is stored while the outlet passage communicates with a dispensing spout. The valve member is angularly displaced between two limit positions in order to dispense a predetermined quantity of fluid by means of a handle actuator which mounts thereon, means for changing the stroke of the piston to thereby change the quantity of fluid dispensed each time the valve member is angularly displaced from one position to the other.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a perspective view showing the dispensing valve mechanism of the present invention in one typical installation.

FIGURE 2 is a longitudinal sectional view through the valve mechanism taken substantially through a plane indicated by section line 2—2 in FIGURE 1.

FIGURE 3 is a transverse sectional view taken substantially through a plane indicated by section line 3—3 in FIGURE 2.

FIGURE 4 is a transverse sectional view taken substantially through a plane indicated by section line 4—4 in FIGURE 2.

FIGURE 5 is a transverse sectional view taken substantially through a plane indicated by section line 5—5 in FIGURE 2.

FIGURE 6 is a transverse sectional view taken substantially through a plane indicated by section line 6—6 in FIGURE 2.

FIGURE 7 is a partial side elevational view of the valve mechanism in one of its positions opposite to the position illustrated in FIGURES 1—6, with parts broken away and shown in section.

FIGURE 8 is a partial transverse sectional view taken substantially through a plane indicated by section line 8—8 in FIGURE 7.

FIGURE 9 is a transverse sectional view taken substantially through a plane indicated by section line 9—9 in FIGURE 7.

FIGURE 10 is a partial sectional view showing a modified form of the invention.

Referring now to the drawings in detail, FIGURES 1 and 2 illustrate the dispensing valve mechanism generally denoted by reference numeral 10 mounted for example on a support 12 by means of a tubular support 14 so as to extend above a counter top. The tubular support is therefore connected at its upper end to a tubular valve body 16 by means of fasteners 18 for example whereby positioning a liquid dispensing spout 20 the proper distance above the counter top so as to accommodate a glass or container into which a measured quantity of liquid is to be dispensed. The liquid or beverage is derived from a pressurized container (not shown) disposed below the support 12 to which the tubular support 14 is connected by means of the fastener assemblies 22. The fluid is conducted from the pressurized source upwardly to the valve body by means of the tubing 24 within the tubular support 14.

The tubular body 16 is closed at a lower end by means of a base portion 26 which threadedly mounts the fitting 28 by means of which the tubing 24 is coupled to the tubular body conducting fluid into the tubular body through the passage 30 formed in the base portion 26. A cylindrical cavity is formed within the tubular body 16 with which the passage 30 communicates. An annular flow passage 32 is also formed in the tubular body which opens into the tubular support 14 through the base portion 26 and terminates adjacent the open upper end of the tubular body at a plurality of circumferentially spaced vent slots. The annular flow passage 32 accordingly conducts a flow of cold air upwardly from the source of pressurized fluid which is refrigerated in order to maintain any fluid stored within the valve mechanism at a low temperature suitable for drinking purposes. Fluid is stored within the tubular body 16 by means of a tubular valve member generally referred to by reference numeral 36. The valve member is rotatably mounted within the tubular body 16 to enclose sealed fluid chambers. Toward this end, an annular seal element 38 is positioned about an upwardly projecting boss 40 formed on the base portion 26 while an annular seal element 42 is seated on an annular shoulder 44 formed in the tubular body adjacent its upper open end 46. Also formed in the tubular valve body 16 at the upper open end, is a slot 48 through which the valve actuator handle 50 extends. The actuator handle is accordingly connected to...
the valve member 36 for angular movement thereof and also mounts thereabove, a stroke adjusting device 52. The valve member 36 includes a cylindrical wall portion 54 which is radially spaced from the internal surface of the tubular valve body 16 so as to form inlet and outlet passages 56 and 58 on opposite sides of axially elongated seal elements 60 and 62 that are mounted in the tubular body and are in wiping engagement with the valve member as more clearly seen in FIGURE 5. The liquid flow communication with the supply passage 30 through which pressurized fluid is conducted to the valve mechanism. The outlet passage 58 on the other hand is in constant communication with the discharge passage 64 formed in the spout 20.

A piston element 66 is slidably mounted within the tubular valve member so as to separate an upper fluid chamber 68 from a lower fluid chamber 70 formed within in the valve member between the base portion 26 of the valve body 16 and the actuator handle 50. A port 72 is formed in the cylindrical wall 54 of the valve member adjacent its upper end in order to establish fluid communication between the inlet passage 56 and the upper fluid chamber 68 in one angular position of the valve member as more clearly seen in FIGURE 5. In this same angular position, fluid communication is established between the lower fluid chamber 70 and the outlet passage 58 through a second port 74 which is located adjacent the lower end of the valve member as more clearly seen in FIGURE 6. Thus, in the angular position of the valve member illustrated in FIGURES 5 and 6, the axially spaced ports 72 and 74 are disposed on opposite sides of the seal elements 60 and 62. Therefore, in the position of the valve member illustrated in FIGURES 2, 5 and 6, fluid under pressure will be conducted through the inlet passage 56 to the upper fluid chamber 68 causing downward displacement of the piston element 66 which will thereby displace the fluid within the lower fluid chamber 70 into the output passage through port 74 resulting in the discharge of fluid through the spout 20. The quantity of fluid so discharged will be determined by the volume of the lower chamber 70 when the piston is at the upper end of its stroke.

The valve member 36 is held axially assembled within the tubular valve body 16 by means of a U-shaped retainer 76 which projects from the cylindrical hub portion 78 of the actuator handle 50 through an arcuate slot 80 formed in the tubular valve body 16 adjacent to the open upper end 46 as more clearly seen in FIGURE 4. The retainer 76 therefore also limits angular movement of the actuator 50 and the valve member 36 to which it is connected. The hub portion 78 of the actuator is also provided with an upwardly extending tubular extension 82 by means of which the piston stroke adjusting device 52 is mounted.

The stroke adjusting device 52 includes an outer adjustment knob 84 to which an externally threaded screw member 86 is connected, the screw member extending downwardly from the top of the knob through the tubular extension 82. The knob is held axially on the screw by means of an U-shaped retainer 88 which extends transversely through the knob and is received within the annular groove 90 formed in the tubular extension for this purpose as more clearly seen in FIGURE 3. The screw member 86 extending downwardly from the top of the knob 84, is threadedly received within a threaded bore of the stop member 92 slidably mounted in the tubular extension 82. The stop member is provided with an external keyway 94 as more clearly seen in FIGURES 4, 5 and 8. An axial bore is formed through the hub portion 78 and the extension 82 for slidably receiving the stop member 92 which is formed within the bore through the pin 96 projecting radially from the hub portion 78 into the keyway 94 formed in the stop member. It will be apparent therefore, that rotation of the knob 84 and the screw member 86 connected thereto will cause axial displacement of the stop member 92 inasmuch as it is prevented from rotation relative to the actuator handle assembly 50 within which it is movably mounted. The stop member 92 projects from the handle assembly into the stop member 68 so as to limit the upward stroke of the piston element 66. By rotating the knob 84 in one direction or the other, the extent to which the stop member projects into the fluid chamber may be varied in order to change the piston stroke. A reduction in the piston stroke will accordingly reduce the quantity of fluid dispensed whereas an increase in its stroke will increase the measured quantity of fluid dispensed.

As hereinbefore indicated, when the actuator assembly 50 is in the position illustrated in FIGURES 2-6, downward displacement of the piston element 66 by pressurized fluid supplied to chamber 68 will displace the fluid stored within the lower fluid chamber 70. After all of the fluid from chamber 70 has been discharged by movement of the piston element 66 to the bottom of its stroke as shown in FIGURE 7, the upper fluid chamber 68 will be charged with fluid. The actuator assembly 50 may then be displaced to its other operating position illustrated in FIGURE 8 in order to dispense the same quantity of fluid once again, thus, the axially spaced ports 72 and 74 will have been displaced to the other sides of the seal elements 60 and 62 so that the lower port 74 establishes communication between the inlet passage 56 and the lower chamber 70 while the upper port 72 establishes fluid communication between the upper chamber 68 and the outlet passage 58.

FIGURE 10 illustrates another form of the invention in which the tubular valve member is modified to replace the piston element with a rolling diaphragm 98. The hub of the actuator is provided with a cavity 100 communicating with the inlet passage 56 through the pin 96 on the upper side of the diaphragm anchored to the valve member by the retainer ring 104. A metal stiffener 106 is centrally connected to the diaphragm in engagement with the stop member 92 at the upper end of its stroke as shown in FIGURE 10. This form of the invention operates in the same manner as hereinbefore described with respect to FIGURES 1-11 with less friction and greater fluid sealing between the upper and lower metering chambers. Thus, accurate metering of pressurized as well as non-pressurized beverages is made possible.

Because of the metering valve arrangements of the present invention and its simplicity of construction, the most rigid sanitary requirements may be met. Further, any form of counting device may be added economically to obtain accurate accountability for the product sold. By eliminating the adjustment feature 82, the dispenser may be made self-draining which is particularly useful where carbonated beverages are to be dispensed.

The foregoing is considered as illustrative only of the principles of the invention. What is claimed as new is as follows:

1. A liquid dispenser adapted to discharge metered quantities of fluid from a pressurized source comprising a tubular body having a closed end and an open end, a tubular valve member rotatably mounted on said ends in axially spaced relation to the tubular body forming an annular cavity therein, spaced seals mounted by the tubular body in wiping engagement with the tubular valve member partitioning the annular cavity into an inlet passage and an outlet passage, conduit means extending through said closed end of the tubular body in fluid communication between the inlet passage and the pressurized source, an outlet spout mounted on the tubular body in fluid communication with the outlet passage, said tubular valve member having at least two axially spaced ports respectively communicating with the inlet and outlet passages, fluid operated means movably mounted within the tubular valve member forming fluid pressure chambers on opposite axial sides thereof between said axially spaced
ports, and actuator means connected to the valve member for angular movement thereof between operative positions displacing the ports across the seals to switch the passages communicating with the fluid chambers through said ports.

2. The combination of claim 1 including means mounted by the actuator means for adjusting the stroke of the fluid operated means to vary the quantities of fluid dispensed.

3. The combination of claim 2 wherein said actuator means comprises a handle connected to the valve member at the open end of the tubular body, and means connected to the handle holding the valve member axially assembled in the tubular body and limiting angular movement thereof between the operative positions.

4. The combination of claim 3 wherein said stroke adjusting means comprises a stop member slidably mounted by the actuator means projecting into one of the fluid chambers within the valve member, an adjustment knob threadedly engaged with the stop member and retainer means holding the knob axially fixed on the actuator means for axial displacement of the stop member in response to rotation of the knob.

5. The combination of claim 4 wherein said tubular body is provided with an annular flow passage opening through said closed end and circumferentially spaced vent openings formed in the tubular body adjacent the open end communicating with the annular flow passage.

6. The combination of claim 1 wherein said actuator means comprises a handle connected to the valve member at the open end of the tubular body, and means connected to the handle holding the valve member axially assembled in the tubular body and limiting angular movement thereof between the operative positions.

7. The combination of claim 6 wherein said tubular body is provided with an annular flow passage opening through said closed end and circumferentially spaced vent openings formed in the tubular body adjacent the open end communicating with the annular flow passage.

8. The combination of claim 1 wherein said tubular body is provided with an annular flow passage opening through said closed end and circumferentially spaced vent openings formed in the tubular body adjacent the open end communicating with the annular flow passage.

9. The combination of claim 1 including a piston stop member slidably mounted by the actuator means projecting into one of the fluid chambers within the valve member, an adjustment knob threadedly engaged with the stop member and retainer means holding the knob axially fixed on the actuator means for axial displacement of the stop member in response to rotation of the knob.

10. The combination of claim 1 wherein said fluid operated means is a rolling diaphragm.

11. A liquid dispenser adapted to discharge metered quantities of fluid from a pressurized source comprising a valve body, a tubular valve, means rotatably mounting the valve within the body to form inlet and outlet passages radially spacing the valve from the valve body, a fluid pressure displaceable piston mounted within the valve to form expansible chambers therein, said valve having spaced ports conducting fluid to one of the chambers from the inlet passage and fluid from the other of the chambers to the outlet passage, and actuator means connected to the valve for angular displacement of said ports to operative positions relative to the inlet and outlet passages.

12. A fluid valve assembly comprising a valve body, a tubular valve member enclosing a valve chamber, means rotatably mounting the valve member within the valve body to form an annular passage about the valve member, said valve member having valve ports establishing fluid communication between the valve chamber and the annular passage, said valve body having inlet and outlet ports in fluid communication with said annular passage and seal means mounted in the annular passage for controlling axial flow of fluid to and from the valve chamber in response to angular movement of the tubular valve member between operative positions.

13. The combination of claim 12 including pressure responsive means reciprocally mounted within the valve chamber for displacing fluid from the valve chamber into the annular passage.

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