SYSTEM FOR DISPENSING FLUIDS

Inventor: Gerald D. Sjostrand, 5440 East Lansing Way, Fresno, Calif. 93727

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ABSTRACT
An air-operated system for blending and dispensing fluids, particularly suited for use in blending and dispensing paint thinners and the like as they are employed in automotive paint shops. The system is characterized by a compartmented reservoir containing a plurality of types of fluids to be blended and dispensed; a manipulatable valve for successively dispensing charges of blended fluid; and an air-operated siphon pump coupled with both the reservoir and the valve for successively discharging charges of fluid drawn from the reservoir in response to manipulations of the valve.

3 Claims, 8 Drawing Figures
SYSTEM FOR DISPENSING FLUIDS

BACKGROUND OF THE INVENTION

The instant invention relates to fluid dispensing systems and more particularly to a selectively operable system for dispensing charges of blended paint thinners and the like for use in paint shops and similar installations.

The prior art is replete with dispensing systems for use in delivering fluids, under pressure. Among such systems are those currently employed in delivering paints and paint thinners to "pots" and tanks, of various types, employed in feeding pneumatically-operated paint guns during spray painting operations.

For reasons well understood by those versed in operations conducted in automotive paint shops, it often is desirable to blend various types of paint thinners.

A technique often employed in blending paints, thinners and the like simply involves opening a drum of selected materials to be blended and pouring selected quantities into pots or tanks to achieve a desired blend. Of course, in addition to the inherent attendant fire hazards thus created, such mixing techniques frequently result in substantial loss of the materials due to spillage and evaporative losses. Furthermore, the volatile nature of these materials normally necessitates a use of storage space remote from areas of use thus introducing an undesirable time-loss factor in painting operations.

Mixing valves have successfully been employed in blending thinners for use in paint shops and the like. One such mixing valve is provided with a plurality of inlet ports operatively coupled with selected sources of materials to be blended in proportions determined by the setting of the valve. However, in delivering thinners from their sources to the mixing valve, difficulty is, in some instances, encountered in avoiding certain hazards which normally can be expected to arise when delivering highly volatile liquids under elevated pressures derived from a pneumatic system. For example, atomized thinner is extremely hazardous, hence, air must be precluded from the delivery system, particularly where the system is pressurized system. Further, and for similar reasons, it is desirable that the pressure of gas within the reservoir be maintained at atmospheric, in order to avoid fracturing the system and developing a combustible spray.

OBJECTS AND SUMMARY OF THE INVENTION

It, therefore, is an object of the instant invention to provide a practical and safe fluid dispensing system for use in dispensing volatile fluids.

It is another object to provide an improved, selectively operable system for dispensing volatile fluids in charges or predetermined quantities.

It is another object to provide an improved system for dispensing blended volatile fluids in successive charges.

It is another object to provide an improved fluid dispensing system for use in blending and dispensing a plurality of types of paint thinners with an attendant absence of handling losses.

It is another object to provide a system for pumping, blending and dispensing paint thinners and reducers of types commonly employed in automotive paint shops.

It is another object to provide an improved, economic and safe fluid blending and dispensing system particularly suited for use in dispensing blended charges of multiple types of thinners commonly employed in paint shops for automobiles, without subjecting users to the hazardous effects of an over-abundance of vapors of the thinners.

These and other disadvantages are overcome through the dispensing system of the instant invention which, as a practical matter, is a fluid actuated system which serves to dispense single charges of blended fluid from a manipulable valve coupled with a plurality of single-charge siphon pumps communicating with appropriately vented reservoir compartments containing therein thinners to be blended and dispensed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic view of the fluid blending and dispensing system of the instant invention.

FIG. 2 is a sectioned elevational view of a charged unit of a siphon pump, of the type shown in FIG. 1, with its diaphragm being fully seated against one side of the shell of the unit.

FIG. 3 is an end view of a mixing valve depicted in FIG. 1.

FIG. 4 is a partially sectioned elevational view of a mixing valve of the type shown in FIG. 3, illustrating an inoperative position for the valve components.

FIG. 5 is a fragmented, partially sectioned view of the valve shown in FIG. 4, illustrating an operative position for the valve components as the system is rendered operative for dispensing a charge of fluid.

FIG. 6 is a sectioned view taken generally along line 6-6 of FIG. 4.

FIG. 7 is a perspective view of the check-valve employed in venting the drums shown in FIG. 1.

FIG. 8 is an enlarged, fragmentary view of material employed in the diaphragm shown in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like reference characters designate like or corresponding parts throughout the several views, there is illustrated in FIG. 1 a system which embodies the principles of the instant invention.

Briefly, the system, as illustrated, includes a mixing valve, generally designated 10, coupled with a compartmented reservoir, generally designated 12, and a siphon pump, generally designated 14 and including a plurality of units 15. A control system, generally designated 16, is coupled with the mixing valve 10 and pump 14 in a manner such that the pump is caused to respond to an opening of the mixing valve and deliver charges of thinner, previously extracted, from multiple compartments of the compartmented reservoir 12.

Of course, it is to be understood that the compartmented reservoir 12 is of any suitable configuration so long as its compartments are capable of confining therein selected types and quantities of thinner to be blended at the mixing valve 12. As illustrated in FIG. 1, the compartmented reservoir 12 includes a pair of drums 18 within which thinner normally is delivered from a supplier, however, closed compartments of any configuration can be employed equally as well.
While the system of the instant invention particularly is suited for use in dispensing blended charges of thinner, it should readily be apparent that the system can be employed in dispensing fluids, both blended and uncut, of a general nature.

The mixing valve 10 which is of a known design preferably includes a dial 20 supported at the distal end by a rotatable shaft 22. This shaft supports the dial 20 in a manner such that the dial can be reversely rotated for altering the blending function of the valve 10. Additionally, a pivoted handle 24, supported at a pivotal coupling 25, is provided to be grasped by an operator for purposes of accommodating a manipulation of the valve for discharging a blended charge of thinner delivered thereto. The fluid is delivered from the reservoir 12 through a plurality of delivery lines 26, in response to an activation of the pump 14. Aluminum tubing serves quite satisfactorily for this purpose.

As shown, the mixing valve 10 includes a housing 30 having formed therein a pair of inlet ports 32, FIG. 6, which communicates with the delivery lines 26 through suitable screw-threaded fittings 34. The housing 30 is provided with a bore which serves as a mixing chamber, designated 36. The chamber 36 terminates in a transverse end wall 37, having a planar surface, and communicates with both ports 32 through suitably formed conduits 38 and a metering chamber 40. The metering chamber 40, in effect, is a slotted, transverse passageway extending between the conduits 38.

Coaxially related to the mixing chamber 36 there is a bore 42 which bisects the metering chamber 40 and extends through the end wall 37 of the mixing chamber 36. Within this bore there is seated a metering shaft 44 which, in turn, includes a transversely directed recess 46 so dimensioned as to register with the metering chamber 40 for conveying to the mixing chamber 36 fluids delivered thereto from either of the ports 32 when the recess is in communication with the chamber 36. The metering shaft 44 preferably is formed as an integral part of the shaft 22. Therefore, reciprocating axial displacement of the metering shaft 44 is, in operation, achieved by reciprocating the shaft 22.

About the metering shaft 44 there is provided an annular sealing head 48 so configured as to seat on the wall 37 for sealing the metering chamber 40. Preferably, a suitable O-ring 50 is provided to assure that a sealings of the metering chamber 40, from the mixing chamber 36, is effected when the shaft 44 is in its retracted position, as illustrated in FIG. 4, for thus interrupting communication between the mixing chamber 36 and the metering chamber 40. However, when the metering shaft 44 is in its extended position, within the mixing chamber 36, the recess 46 is in simultaneous communication with the metering chamber 40 and the mixing chamber 36 so that fluid delivered from the ports 32 is afforded entry into the mixing chamber 36 through the recess 46.

While the valve components employed in the mixing the thinners form no specific part of the instant invention, it is to be understood that blending, or proportionate mixing, of the thinners delivered from the ports 32 to the mixing chamber 36, is varied simply by rotating the dial 20 so as to impart rotation to the metering shaft 44 whereby the angular orientation of the recess 46 relative to the metering chamber 40 and the conduits 38 is varied for thus altering the relative flow rates of the thinners as they are delivered through the conduits 38 to the mixing chamber 36. Additionally, by advancing and retracting the metering shaft 44, relative to the metering chamber 40, the position of the sealing head 48, relative to the surface of the end wall 37 of the mixing chamber 36, is varied for thus metering the total flow of a blended thinner or other fluid from the metering chamber 40 to the mixing chamber 36. Of course, in the event retraction of the metering shaft 44 is maximized, a fluid-tight seal is established between the sealing head 48 and the adjacent surfaces of the mixing chamber 36, whereupon the valve is closed.

As a practical matter, the metering shaft 44 continuously is urged toward its retracted position by a compression spring 52 seated in a concentric relationship with the distal end of the shaft 44, designated 53, in the chamber 36. Thus the spring is arranged to act against the sealing head 48. This spring has a spring constant adequate for maintaining a sealing relationship between the sealing head 48 and the adjacent surface of the end wall 37 of the mixing chamber 36.

In order to advance the metering shaft 44 toward its extended position, there is provided between the shaft 22 and the metering shaft 44 an annular cam surface 54 which circumscribes a portion of the shaft 22 as it extends from the housing 30. A cam rider 56 is provided to extend from the distal end of the pivoted handle 24 into a position to continuously engage the cam surface 54. Consequently, as the handle 24 is pivoted, about the pivotal coupling 25, the cam rider 56 acts against the cam surface 54 and axially advances the metering shaft 44 through the bore 42 for thus advancing the sealing head 48 out of engagement with the adjacent surfaces of the mixing chamber 36.

In practice, the handle 24 is a spring-loaded handle and employs a compression spring 57 to urge the cam rider 56 into constant engagement with the cam surface 54. Of course, the spring constant of the spring 57 necessarily is inadequate for overcoming the effects of the spring 52.

As a practical matter, the thinners are delivered from the mixing chamber 36 downwardly through a dispensing conduit 58 of a tubular configuration. Preferably, the dispensing conduit is so dimensioned as to employ the effects of surface tension in order to preclude "dripping" of the thinners once the valve 10 has been closed through an appropriate manipulation of the handle 24.

In view of the foregoing, it should readily be apparent that a blending of fluids delivered through the delivery lines 26 readily is achievable simply by manipulating the dial 20, for selectively positioning the recess 46, and the handle 24 for permitting the thinners to be delivered through the metering chamber 40, into the mixing chamber 36, and hence through the dispensing conduit 58 into selected pots, tanks and the like, not shown, commonly employed with so-called spray guns.

In order to achieve a delivery of the thinners from the drums 18, through the lines 26, each of the drums is provided with a siphon system, generally designated 60, FIG. 1. This system includes a flexible siphon tube 62 deposited within each of the drums 18, a ball-check valve 64 seated in the drum's bung hole and a transfer
line 66 coupling the valve 64 with one of the delivery lines 26 through a T-fitting 68. The fitting 68 is disposed above the level of the thinner within the reservoir 12 in order to preclude undesired siphoning in the event a leak is introduced into the delivery line 26.

In practice, each of the siphon tubes 62 of the siphon system 60 is formed of a flexible tubing and is coupled with a transfer line 66 at a ball-check valve 64. The ball-check valves 64, in effect, are of any suitable commercially available design. In practice, however, each of the ball-check valves 64 includes a spring-loaded ball 70, FIG. 7, supported out of sealing engagement with an appropriately formed ball seat 72 by a spring 74. The purpose of the ball 70 and spring 74 is to accommodate a one-way passage of fluid from the drum 18 in a manner constant with that of known ball-check valves.

The housing of each of the ball-check valves 64 includes a plurality of screw threads 78 which permit the valve to be screw-threadingly received within the bunghole of a drum 18 so that the siphon tube 62 can be suspended therefrom into the drum. As a practical matter, each of the drums 18 is vented through a suitable venting port 79 drilled through the housing of the ball-check valve 64 associated therewith in a manner such as to accommodate reversing flow of gases therethrough, whereby the thinners within the drums 18 continuously are maintained under substantially constant atmospheric pressure. Hence, as a thinner is siphoned from the drums 18 atmosphere is permitted to enter through the venting ports 79 and conversely, in the event elevated pressure develops within the drums 18, the pressure is relieved through the venting ports 79. Consequently, the thinners within the drums 18 are pressurized by atmospheric pressure.

In order to effect a siphoning of the thinners from the drums 18, each of the drums is associated with one unit 15 of the siphon pumps 14. This is achieved by coupling each of the T-fittings 68 to one of the units 15 of the pump 14 through a standpipe 80. The standpipe 80 is of a rigid steel construction and, in effect, serves as a two-way conduit for first transporting fluid siphoned from an associated drum 18 toward the associated pump 14 and subsequently delivering the fluid through the T-fitting 68 to an associated delivery line 26.

As a practical matter, once the siphon system 60 is functioning in the manner intended, the last quantity of fluid siphoned from an associated drum 18 is retained within the standpipe 80 and is first discharged into a delivery line 26. Hence, it is not necessary that the thinner be delivered through the standpipe 80 into the siphon pump 14. Of course, a reverse flow of thinner into the associated drum 18 is precluded, as a reverse flow in the standpipes 80 is effected, due to the action of the ball-check valve 64.

As best illustrated in FIG. 2, each of the units 15 of the pump 14 includes a housing 81 formed of two shell-halves 82 and 84. These shell-halves are mated to form an annular lip 86 circumscribing the periphery of each of the housings 81. The shell-halves are united through a plurality of screw-threaded pins 88 which extend through a plurality of appropriately formed openings. Thus the shell-halves together serve to establish therewithin a pumping chamber 89.

It is to be understood, however, that clamped between the shell-halves 82 and 84, at the lip 86, there is a peripheral portion of a diaphragm 90. This diaphragm is formed of a flexible and somewhat resilient material. In practice, as best illustrated in FIG. 8, the diaphragm 90 is fabricated from a material which includes two outer layers 92 of foamed, closed-cell polyethylene sandwiched therebetween a cloth fabric 94. The fabric 94 can, if so desired, be formed of a suitable synthetic material which imparts tensile strength to the diaphragm.

As also is shown in FIG. 2, the diaphragm 90, in effect, serves to divide the pumping chamber 89 into two non-communicating, hermetically sealed subchambers 96 and 98, each being of a variable dimension. Hence, the chambers 96 and 98 define variable volumes dictated by the instantaneous position of the diaphragm 90, as the diaphragm is, in operation, oppositely displaced within the pump chamber 89.

The subchamber 96 is coupled with the standpipe 80 through an internally threaded port 100, by means of a suitable screw-threaded fitting 102. Similarly, the subchamber 98 is coupled with the control system 16 through an internally screw-threaded port 104 and a suitable screw-threaded fitting 106 provided at the distal end of a pneumatic pressure line 107 and seated therein. Hence, fluid is delivered into the subchamber 96 through the port 100, while an actuator fluid, preferably compressed air, is delivered into the subchamber 98 through the port 104 from the line 107. The fluids thus delivered into the pump chamber 89 act in opposite directions against opposite faces of the diaphragm 90 for repositioning the diaphragm within the pumping chamber 89.

In order to assure a proper functioning of the pump 14, a compression spring 108 is seated within the shell-half 82, preferably in a cylindrical cavity 110 stamped or otherwise formed therewithin in coaxial relationship with the port 100. At the opposite end of the spring 108 there is provided a disk-shaped pressure plate 112 which serves to support the center portion of the diaphragm 90 in a planar configuration as the diaphragm is reversely advanced through the pump chamber 89.

In operation, the actuator fluid delivered through the fitting 106 enters the subchamber 98 and acts against the adjacent face of the diaphragm 90 for forcing the diaphragm to advance against the combined reaction forces of fluid confined within the subchamber 96 and the spring 108. Continued advancement of the diaphragm serves to eject the fluid from the subchamber 96 into the standpipe 80 through the fitting 102. Of course, once the pressure thus established within the subchamber 98 is released through the port 104, the spring 108 is effective for again seating the diaphragm 90 in its initial position in the shell-half 84 for thus siphoning thinner from the associated drum 18 into the standpipe 80 and from the standpipe 80 into the subchamber 96. Thus the advancement of the diaphragm under the influence of the spring 108 achieves a siphoning effect through the system 60. It will be appreciated, of course, that so long as the mixing valve 10 is closed, fluid cannot be drawn from the delivery lines 26 into the standpipe 80 due to the resulting negative pressure or vacuum established within the delivery lines 26.
The actuator fluid delivered through the fitting 106 into the subchamber 98 is acquired through the control system 16 from a source of compressed air 114 which serves as a source of actuator fluid. While the source of compressed air 114 can be a simple air-bottle, preferably the source is an outlet manifold of a compressed air system of the type normally found in an automotive paint shop. Should it be found desirable to do so, a suitable compressing apparatus can be employed for delivering air under pressure to the control system 16. Hence, it should be apparent that the particular source of actuator fluid employed is a matter of convenience only.

The control system 16 includes a pressure regulator unit, generally designated 116, which is interposed between the source of compressed air 114 and the pump 14 for purposes of controlling the pressure of the air delivered to the control system 16. The control system 16 also is provided with a two-way valve 118 coupled with the output side of the pressure regulator unit 116, as best shown in FIGS. 4 and 5. As a practical matter, the two-way valve 118 is provided with a housing 120 coupled with the housing 30 of the mixing valve 10 through suitable screws 122.

The housing 120 also is provided with a pair of axially spaced ports including an inlet port 124 and an outlet port 126. The port 126 communicates with each of the units 15 of the pump 14, through the pneumatic pressure line 107. In practice, the line 107 is a bifurcated line including a T-fitting, not designated, to couple each of the subchambers 98 with the port 126. Within the port 126 there is seated a fitting 130 for coupling the pneumatic pressure line 107 with the valve 118, while a fitting 132 similarly is provided for coupling the valve 118 with the pressure regulator unit 116 through a suitable sub-line, not designated.

The housing 120 is machined or otherwise provided with a bore 134, which receives therein a reciprocating shuttle plug 136, and a recess 138 coaxially related to the bore 134. The recess is of a diameter common to that of the mixing chamber 36 but is of a toroidal configuration defined by a concentrically related tubular body 140. This body is, of course, coaxially related to the bore 134.

It is important to note that when the housing 120 is united with the housing 30, the recess 138 forms an end portion of the mixing chamber 36 and therefore is coaxially related to the sealing head 48. Accordingly, the recess serves to receive and support the opposite end of the compression spring 52. Hence, it should readily be apparent that the compression spring 52 is concentrically supported by the tubular body 140, as well as by the distal end 53 of the metering shaft 44.

The body of the shuttle plug 136, not designated, is of a diameter approximating the diameter of the bore 134 and is seated for axial reciprocation therein. A plurality of O-rings 142 serves to establish an hermetic seal about the periphery of the shuttle plug as it is reciprocated within the bore 134, between first and second positions.

As the shuttle plug 136 is caused to seat in the first position, the inlet port 124 is sealed from communication with the bore 134, and consequently communication with the outlet port 126 is interrupted. However, as the shuttle plug 136 reversely is displaced to its second position, the ports 124 and 126 are caused to communicate through the bore 134. Hence, it is possible to achieve a sealing of the inlet port 124, for thus interrupting a flow of air between the inlet and outlet ports, by seating the plug 136 in its first position and to open the inlet port to accommodate delivery of air to the outlet port by seating the plug in its second position wherein the port 124 is uncovered by the periphery thereof.

As illustrated in FIG. 5 the bore 134 includes an annular shoulder 144 against which the shuttle plug 136 is permitted to seat, as it is seated in its first position, for thus assuring a sealing of the inlet port 124. In order to seat the plug 136 in its first position, a compression spring 146 is mounted within the bore 134 and supported under compression by a suitable retainer 148. Therefore, it should be apparent that the spring 146 acts against the shuttle plug 136 for continuously urging the shuttle plug into a seated disposition against the annular shoulder 144 so that the valve 118 normally is closed.

Accordingly, it should be appreciated that the two-way valve 118 is a normally closed valve which is, in operation, opened for accommodating a passage of air under pressure to the pump 14 through the pneumatic pressure lines 107.

In order to achieve an opening of the two-way valve 118, there is provided a push rod 150 which is seated for axial reciprocation within the tubular body 140. The rod 150 is extended from within the bore 134 into engagement with the distal end 53 of the metering shaft 44 so that as the metering shaft 44 is advanced into the mixing chamber 36, in response to a manipulation of the handle 24, the push rod 150 is advanced into the bore 134. As a practical matter, the push rod 150 is circumscribed by an O-ring seal which serves to hermetically seal the mixing chamber 36.

Interposed between one end of the shuttle plug 136 and, in engagement with the adjacent end of the push rod 150, there is a spring-loaded ball 154. This ball is adapted to seat on an annular shoulder 156 concentrically formed within the end of the shuttle plug 136. In practice, the shoulder 156 circumscribes the base of a first recess 158 coaxially related to the push rod 150 and coaxially is related to an adjacent spring-retaining recess 160. A compression spring 162 is seated within the recess 160 and extended into a biasing engagement with the ball 154 so that the ball is urged into a spaced relationship with the shoulder 156 of the recess 158. Preferably, the spring constant of the spring 162 is such that the spring 162 cannot overcome the applied force of the spring 146.

Hence, it should readily be apparent that in order for the push rod 150 to displace the plug in an axial direction, as it axially is displaced, the push rod must be advanced through a distance sufficient for causing the spring 162 to collapse and the ball 154 to seat on the shoulder 156 of the recess 158. However, once the ball is seated and motion of the shuttle plug 136 is continued, axial movement of the plug is initiated for thus unseating the inlet port 124.

Accordingly, it is to be understood that as the handle 24 is displaced, for thus opening the mixing valve 10, the push rod 150 is caused to seat the ball 154 on the shoulder 156 and displacement of the shuttle plug, against the applied force of the spring 146, is initiated.
so that the port 124 is caused to communicate with the port 126 through the bore 134. Hence it can be appreciated that the pump 14 remains inactive until such time as the mixing valve 10 has been opened and the shuttle plug 136 responsive has been displaced by the push rod 150. Of course, as the ports 124 and 126 are caused to communicate, passage of air under pressure from the source of compressed air 114 to the subchamber 98, through the valve 118, is accommodated. Hence, pressure is developed in the subchamber 98. Continued passage of the air to the subchamber pressurizes the subchamber to an operative magnitude sufficient for displacing the diaphragm 90.

In order to relieve pressure thus established within the subchamber 98, the shuttle plug 136 and the retainer 148 are provided with coaxially related openings 164 and 166. The opening 164 is, in effect, an axial bore extending through the shuttle plug 136 into communication with the recess 160. Hence, so long as the ball 154 remains out of sealing engagement with the shoulder 156, each of the subchambers 98 connected with the valve 118, through the bifurcated line 107, communicates with atmosphere. However, once the push rod 150 is advanced for displacing the shuttle plug 136, the ball 154 is caused to seat and thus seal the opening 164 so that an elevated pressure can be established within the subchambers 98. Accordingly, it should readily be apparent that the spring-loaded ball 154 and the opening 164 serve as a relief valve for accommodating a simultaneous depressurization of the subchambers 98 of the units 15.

OPERATION

It is believed that in view of the foregoing description, the operation of the system will be readily understood and it will be briefly reviewed at this point.

With the system assembled in the manner hereinbefore described, it is prepared by coupling the delivery lines 26 with the drums 18, located within the reservoir 12 and remotely separated from the mixing valve 10, and the system by coupling the valve 118 with the source of compressed air 114. The mixing valve handle 24 can now be manipulated in a manner such as to prime the system and fill the delivery lines 26 with thinners siphoned from different drums 18.

Once the system is primed and the lines 26 have been filled, the system of the instant invention is prepared for operation and can be employed for blending the thinners derived from the drums 18. In order to achieve a desired blending, the dial 20 is manipulated for rotating the metering shaft 44 in a manner such that different flow rates are established by the metering shaft 44 for the delivery of fluid from each of the lines 26, through the ports 32 and the metering chamber 40 into the mixing chamber 36. Hence, the fluid can be dispensed as a predetermined blend from the dispensing conduit 58.

In order to impose a dispensing mode of operation on the valve 10, the handle 24 is advanced against the spring 57 and in a direction such that the cam rider 56 acts against the cam surface 54 for axially advancing the metering shaft 44. As the metering shaft 44 is advanced, the sealing head 48 is unseated with respect to the planar surface of the end wall 37 of the mixing chamber 36 thus permitting a flow of fluid to be established from the metering chamber 40 through the mixing chamber 36 to the dispensing conduit 58.

Continued motion of the handle 24 axially advances the push rod 150 for causing the push rod to advance the spring-loaded ball 154 against the applied force of the spring 162. Continued advancement of the push rod causes the ball 154 to seat against the shoulder 156 of the shuttle plug 136. As seating of the ball 154 occurs, the opening 164 is sealed. Continued advancement of the push rod 150, in response to motion imparted to the handle 24, causes the shuttle plug 136 to advance along the bore 134 for unsealing the inlet port 124, whereupon compressed air is delivered from the source 114 into the pneumatic pressure lines 107 through which it is distributed to all of the subchambers 98, simultaneously, causing the subchambers 98 to expand against the applied forces of the springs 108, as well as back pressures developed within the subchambers 96. As the subchambers 98 are expanded, thinners or other fluids, contained within subchambers 96 are formed through the ports 100, the standpipes 80, the T-fittings 68, the delivery lines 26 and the ports 32 and into the mixing chamber 36 of the valve 10, from which the fluids are dispensed through the dispensing conduit 58.

Once the handle 24 is released, the springs 146, 162, 52 and 108 act to reverse the position of their associated system components for thus causing the plug 136 to seal the inlet port 124, the ball 154 to unseat and the subchamber 98 to vent to atmosphere so that the subchambers 96 are permitted to expand, under the influence of the springs 108, for siphoning fluid from the associated drums 18, through the check-valve 64, as the spring 52 drives the metering shaft 44 to a position wherein the sealing head 48 closes the metering chamber 40. Reseating of the metering shaft thus reseals the mixing valve 10 and the system thus is prepared for another cycle of operation.

In view of the foregoing, it should readily be apparent that the system of the instant invention provides a simple and practical solution to the problem of delivering and blending volatile fluids, particularly thinners, to points of use within confined areas, such as automotive paint shops and the like.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the illustrative details disclosed.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A system for dispensing fluid comprising:
   A. a fluid circuit including a reservoir;
   B. a manipulatable valve coupled with said circuit adapted to be opened for discharging fluid delivered thereto from said reservoir;
   C. an activatable pump coupled in said circuit in operative association with said valve and said reservoir for delivering fluid from the reservoir to the valve; and
   D. control means for activating the pump in response to a manipulation of the valve, including:
1. means defining an hermetically sealed chamber including means defining therein a pressure port coupled with a source of fluid under pressure and a delivery port coupled with said pump,
2. a shuttle plug seated for axial reciprocation within said hermetically sealed chamber for sealing said pressure port when seated in a first position within the chamber and for opening said pressure port when seated in a second position axially displaced from said first position,
3. means defining a resealable vent in said shuttle plug for venting said chamber to atmosphere when said shuttle plug is in said first position and for sealing said chamber to atmosphere when said plug is in said second position,
4. biasing means continuously urging said shuttle plug in displacement toward said first position, and
5. a push rod supported for axial reciprocation and extended between said sealed chamber and said valve in coaxial alignment with said shuttle plug for forcing said plug in displacement toward its second position, against said biasing means, in response to an opening of said valve, and for accommodating a displacement of said shuttle plug to its first position in response to a closing of said valve.

2. The system of claim 1 wherein the vent includes:
A. means defining an axial bore extended through said shuttle plug;
B. means defining within said shuttle plug a first retainer chamber coaxially related to said bore;
C. means defining a second retainer chamber communicating with said first retainer chamber and said hermetically sealed chamber, including means defining an annular ball-seat circumscribing one end of said second retainer chamber adjacent to said hermetically sealed chamber;
D. a compression spring seated in said first retainer chamber and axially extended into said second retainer chamber; and
E. a ball seated in said second retainer chamber in engagement with said push rod and said compression spring, supported out of engagement with said ball-seat by said spring and positionable against said ball-seat in response to axial advancement of said push rod as said shuttle plug is forced in displacement toward its second position.

3. A system for dispensing successive charges of selectively blended fluids comprising:
A. a reservoir having a plurality of compartments vented to atmosphere, each compartment confining a selected fluid under atmospheric pressure;
B. a plurality of siphon tubes, each operatively disposed within a compartment of said reservoir;
C. a mixing valve including multiple intake ports, each port communicating with a given siphon tube and a discharge port commonly communicating with all of the intake ports;
D. a one-way check valve interposed between each siphon tube and said mixing valve;
E. a plurality of pumps, each pump having a chamber coupled with a siphon tube through a fixed orifice and means including a placeable diaphragm dividing said chamber into first and second adjacent subchambers, each having an instantaneous volume determined by the instantaneous position of the diaphragm;
F. a compression spring seated in each of the first subchambers for continuously urging the diaphragm in displacement toward the adjacent second subchamber;
G. a pneumatic conduit coupled with a source of compressed air and terminating in the second subchamber of each pump, whereby air under pressure simultaneously delivered from the source to each of said second subchambers, through said conduit, is caused to act against the compression spring seated in the adjacent first subchamber for simultaneously moving said diaphragms in displacement toward said adjacent first subchamber; and
H. a pneumatic valve interposed in said conduit and operatively coupled with said mixing valve including valve means for accommodating a simultaneous delivery of air to the second subchamber of said plurality of pumps, subsequent to an opening of said mixing valve, for thus simultaneously forcing a charge of fluid from said first subchambers, through the fixed orifices, and simultaneously to bleed delivered air from each of said second subchambers when the mixing valve is closed, so that each compression spring is permitted to move one of the diaphragms toward a second subchamber for thus drawing a charge of fluid from the reservoir, including:
1. means defining a pneumatic chamber of a cylindrical configuration;
2. means defining within the chamber a pair of axially spaced ports;
3. a spring-loaded shuttle plug seated in said chamber axially displaceable between a first position wherein said plug serves to hermetically seal one of said ports and a second position wherein said ports are afforded communication through said chamber;
4. a compression spring operatively associated with said plug continuously urging the plug toward said first position; and
5. means defining a check valve operatively associated with said chamber including means for venting said chamber when said shuttle plug is in said first position.

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