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**Hanson**

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[54] **PLURAL SOURCES BEVERAGE DISPENSING APPARATUS**


[75] Inventor: **Sigurd A. Hanson,** Los Angeles, Calif.

[73] Assignee: **Bar Mates Fluidic Systems, Inc.,** Los Angeles, Calif.



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[52] **U.S. Cl.**..... **222/129.1,** 137/609, 137/625.18, 222/144.5

[51] **Int. Cl.**..... **B67d 5/56**

[58] **Field of Search**..... 222/129.1-129.4, 144.5; 137/625.18, 625.4, 607, 609, 637



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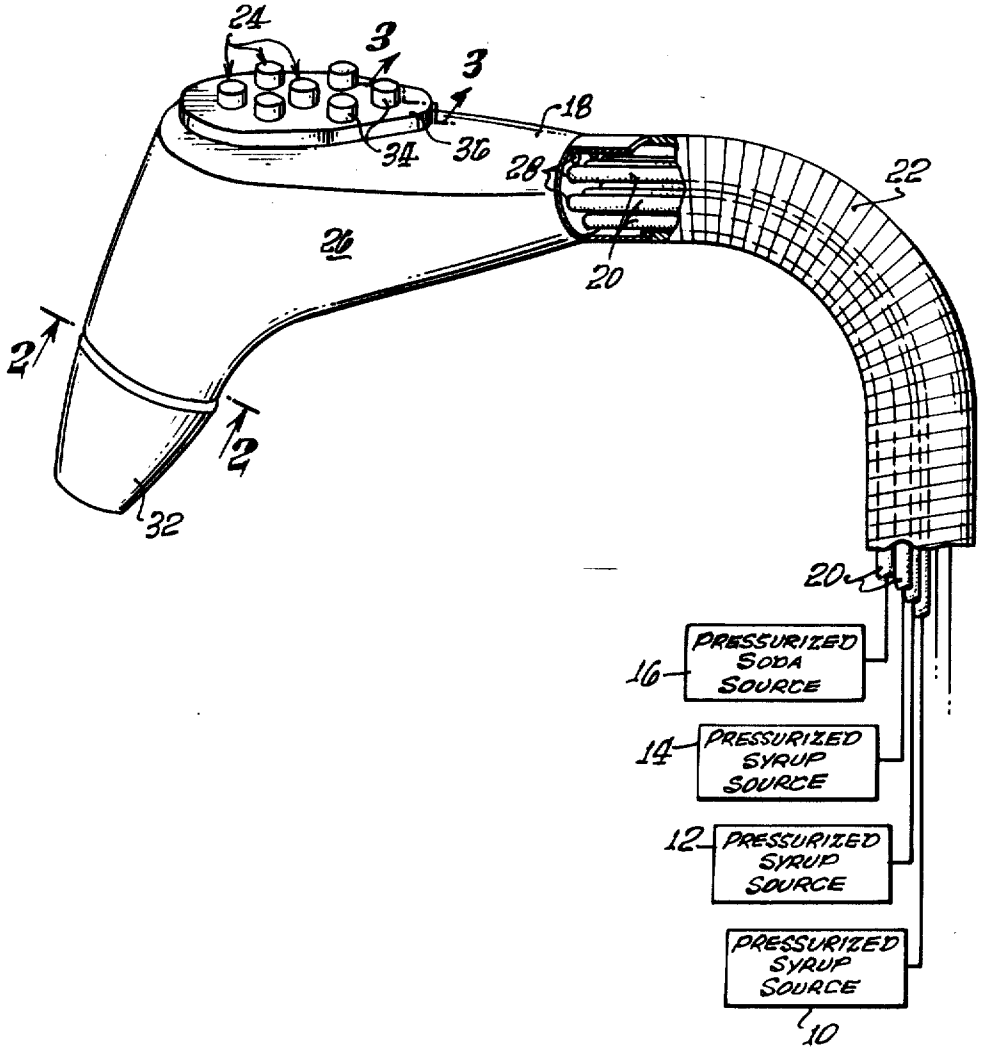
*Primary Examiner*—Robert B. Reeves
*Assistant Examiner*—Francis J. Bartuska
*Attorney, Agent, or Firm*—Harris, Kern, Wallen & Tinsley



[57] **ABSTRACT**

A beveraging dispensing system for mixing and dispensing soft drink syrup concentrates and mixing soda supplied under pressure to a hand-held control and dispensing head having a plurality of mechanically actuated control valves wherein displacement of the valves is assisted by the pressure and flow of the mixing soda.


**4 Claims, 4 Drawing Figures**



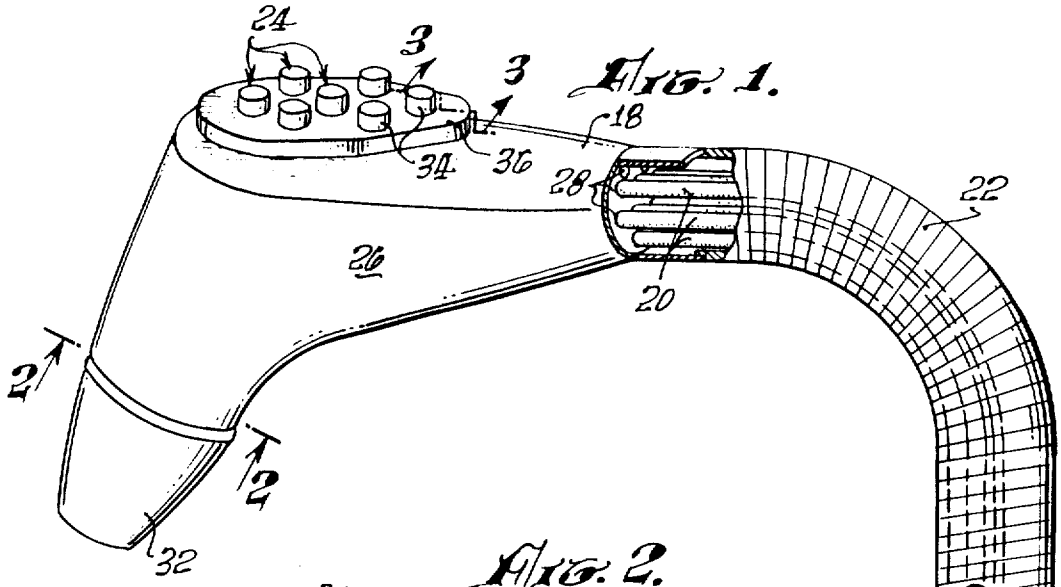
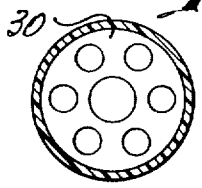
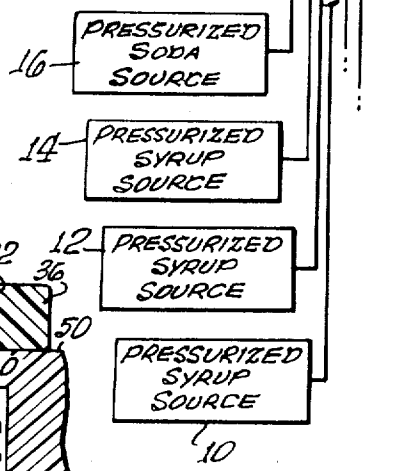



FIG. 1.

FIG. 2.



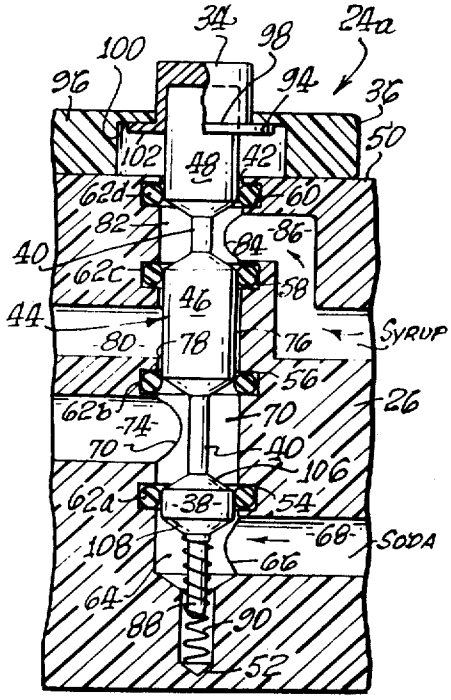




FIG. 3A.

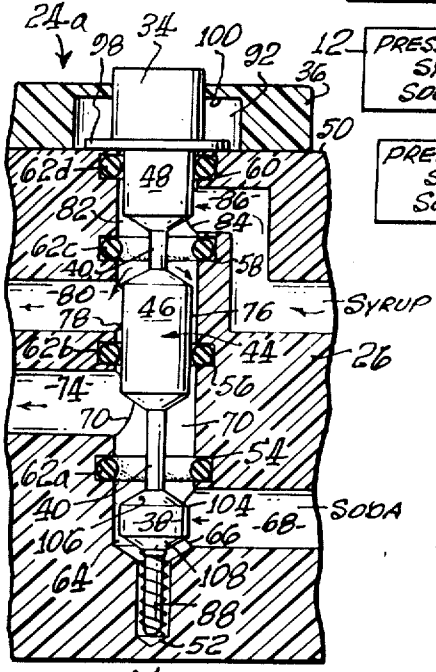



FIG. 3B.

# PLURAL SOURCES BEVERAGE DISPENSING APPARATUS

My invention relates to beverage dispensing systems and more particularly to carbonated soft drink dispensing systems where the soft drink is a mixture of a flavored syrup concentrate and carbonated water both supplied under pressure to a hand-held dispensing head.

Typically, such systems remotely locate the source of the beverage ingredients and offer a choice of beverages. Provisions may be made to select, direct, and control the flow of the selected beverage by manipulation of a valve control and dispensing means which may be hand-held.

Since the introduction of multiple beverage dispensers, electromechanical valve mechanisms have been provided as a means for controlling the flow of the beverage ingredients. The mechanisms used have included solenoid armatures acting in direct axial alignment with a movable valve element and impact type solenoid valves utilizing intermediate linkages between the armature of the solenoid and movable portions of the valves. In theory, these designs have shared the common objectives of providing a small, lightweight, reliable hand-held valve control means having a plurality of valves for offering a selectivity of beverages. In practice, however, these objectives have not been fully or satisfactorily achieved primarily because of electrical design problems. For example, because of size constraints, designers have used electromechanical components of small size and capable of generating only marginally effective forces for valve actuation. A marginally sufficient force tends to result in slow valve actuation speeds which tend to produce beverage dilution since the high viscosity of the concentrated flavoring syrup retards its flow through an only partially open valve while the carbonated mixing soda is a freely flowing fluid through a similarly only partially open valve. Further since mixing soda is most often at a higher level of pressurization than the syrups in order to maintain its carbonation, its rate of flow is typically much higher than for any corresponding amount of syrup valve opening which aggravates the problem of maintaining exactness of proportion between simultaneously dispensed beverage ingredients. The proportion control, of course, contributes to the palatability and acceptance of the beverage.

Because of the only marginally effective forces generated by small-sized electromechanical elements when operated at conservatively rated current levels, designers have tended toward reducing the safety margins of allowable current. This has lead to perhaps the most frequent cause of electromechanical valve control breakdown or inoperativeness, namely, control switch contact erosion and solenoid coil burn out. Beyond such problems, it is of course recognized that electromechanical valve mechanisms for controling the flow of liquids as in a beverage dispensing system are fraught with electrical shock hazards for the operators thereof.

Accordingly, in view of the foregoing problems it is an object of the present invention to provide a soft drink dispensing system utilizing a hand-holdable valve control means free of electrically controlled elements and their attendant problems.

Another object of the present invention is to provide such a soft drink dispensing system of the foregoing



character wherein the actuation of a single control valve releases exact amounts of flavored syrup concentrate and mixing soda by utilizing the pressure of the mixing soda to assist the operation of the control valve.

A further object of the present invention is to provide a soft drink dispensing system of the foregoing character including a valve control means of simple and rugged construction yet rapid operation.

Still another object of the present invention is to provide a soft drink dispensing system of the foregoing character wherein the valve control means includes a plurality of mechanically actuated valves in a housing, each valve associated with a different source of syrup and soda under pressure and each valve including a spindle carrying a plurality of spools for directing the simultaneous flow of syrup and soda to a dispensing head.

A still further object of the present invention is to provide a soft drink dispensing system of the foregoing character wherein the soda coacts with a lower spool on each spindle to assist in the rapid closing of the valves upon release from an open condition.

The foregoing as well as other objects and features of the present invention may be more clearly understood by reference to the following detailed description when considered with the drawing, which, by the way of example only, illustrates one configuration of a soft drink dispensing system embodying the features of my present invention.

In the drawing:

FIG. **1** is an over-all pictorial and diagrammatic view showing the soft drink dispensing system of my present invention;

FIG. **2** is a sectioned view taken along line **2—2** of FIG. **1**;

FIG. **3A** is a partially sectioned internal view taken along the line **3—3** in FIG. **1** showing a valve of my valve control means in its closed position; and

FIG. **3B** is a partially sectioned view similar to FIG. **3A** showing a valve of my valve control means in its open position.

Generally speaking, the illustrated form of my soft drink dispensing system includes a plurality of beverage syrup sources such as **10, 12** and **14**, a source of carbonated water or soda **16**, and a fully mechanical valve control means **18**. The concentrated syrups in the sources **10, 12** and **14** are maintained at a low pressure relative to the soda in the soda source **16** and all the sources are located remote from the valve control means for separate connection thereto by flexible conduit **20** housed in a hose structure **22**. The valve control means **18** includes a plurality of similar fully mechanical valve **24** in a lightweight hand-holdable housing **26**. The housing **26** includes a plurality of fluid inlets **28** each connected to a different conduit **20** and a fluid outlet means **30** connected to a mixing and dispensing head **32**. Each valve, such as **24***a* in FIGS. **3A** and **3B**, is associated with a different one of the syrup sources and the soda source, and with a different push button **34** protruding from a cover and retaining plate **36** located on top of the housing. The valve **24** and porting in the housing **26** from the conduits **20** to the mixing and dispensing head **32** are such that a manual depression of the push button **34** associated with a valve such as **24***a* in FIGS. **3A** and **3B** produces a substantially instantaneous downward movement of the valve to a fully open position to permit the simultaneous and full flow

of a syrup such as orange concentrate and soda through the valve control means **18** to the head **32** for dispensing as orange soda into a glass or cup. Similarly, a manual depression of the push button **34** associated with another of the valves **24** produces a substantially instantaneous movement of that valve to a fully open position to permit the simultaneous and full flow of a different syrup such as cola concentrate, and soda through the valve control means for dispensing a carbonated cola beverage at the head **32.** In each instance, a release of the valve by removal of a downward force on the associated button **34** results in an extremely rapid and automatic return of the valve to its normally closed position. Such closing of the valves is assisted by coaction of soda from the soda source **16** with a lower spool **38** carried on a spindle **40** for each valve. As will be described in greater detail hereinafter, the pressure assist provided by the soda acting on the lower spool **38** of each valve allows for a highly compact design of the valve control means free of electromechanical devices, mechanical linkages, and/or heavy springs to effect the desired valve movement with the valve control.

As previously indicated, each of the valves **24** is of a similar construction and operates in a similar manner. Accordingly, only the details of the valve **24***a* will be described hereinafter with reference to FIGS. **3**A and **3**B, it being understood that a similar construction and operation is associated with each of the other valves in the valve control means **18.**

In more specific detail, and referring to the drawing, the valve **24***a* includes a cylindrical valve cavity **42** in the housing **26** receiving a movable valve body **44** comprising the spindle **40** carrying the spool **38** as well as spools **46** and **48.** As depicted in FIGS. **3**A and **3**B, depression of the valve body **44** from the closed position in FIG. **3**A to the open position in FIG. **3**B permits soda and syrup to simultaneously flow through porting in the housing **26** into the cavity **42** and past the spools to porting leading to the fluid outlet **30** and dispensing head **32.** A release of the valve body **44** results in a rapid and automatic return of the spindle **40** to the closed position of FIG. **3**A to block the flow of syrup and soda.

As illustrated, the valve cavity **42** extends downwardly through an outer top surface **50** of the valve housing **26.** While the cavity **42** may be of a generally uniform diameter it includes a bottommost portion having a smaller diameter which forms a spring housing or well **52.** In addition four vertically spaced annular grooves **54, 56, 58** and **60** are formed in the side wall of the cavity. The location and spacing between adjacent grooves divides the cavity **42** into four distinct zones. A first zone **64** is formed below the bottom-most groove **54** and includes the aforementioned spring housing or well **52** and a cavity side wall opening designated as a first inlet port **66** formed by an intersecting and horizontally extending passageway **68** for conducting pressurized soda to the valve cavity from an inlet port **28.** A second zone **70** is formed above the annular groove **54** and below the groove **56** and includes a side wall opening or first outlet port **72** formed by an intersecting and horizontally extending passageway **74** for conducting pressurized soda away from the valve cavity to the oultet **30.** A third zone **76** is formed above the groove **56** and below the groove **58** and includes a side wall opening or second outlet port **78** formed by an intersecting and horizontally extending passageway **80** for conducting flavored syrup away from the valve cavity to the outlet **30.** A fourth and uppermost zone **82** is formed above the annuler groove **58** and below the groove **60** and includes a side wall opening or second inlet port **84** formed by an intersecting and horizontally extending passageway **86** for conducting flavored syrup to the valve cavity from an associated inlet port **28.** Each of the aforementioned annular grooves carries an O-ring **62***a–d* for sealing and thereby controlling the flow of either syrup and/or soda through the valve **24***a* relative to the position of the movable valve body **44** in the cavity **42.**

In this regard, in the movable valve body **44** the spools **38, 46** and **48** carried by the spindle **40** are located at lower, intermediate, and upper positions along the spindle **40.** Further, the spools are dimensioned such that the spool **38** slidably engages and seals against the O-ring **62***a* in the groove **54,** the spool **46** against the O-rings in the grooves **56** and **58,** and the spool **48** against the O-ring in the groove **60.** In addition, the valve spindle **40** includes a lower portion **88** below the valve spool **38** carrying a coil spring **90.** An upper coil of the spring **90** has a natural diameter less than the diameter of the lower spindle portion **88,** thereby providing a gripping force for retaining the spring in position on the spindle. The length of the spring **90** is such that it normally extends downwardly from the lower portion **88** into the spring well **52** to engage a bottom thereof (see FIG. **3**A). The weight and strength of the spring **90** are such that the spring is only strong enough when compressed in the well **52** to start upward movement of the spindle from the open position of the valve shown in FIG. **3**B toward the closed position shown in FIG. **3**A and in the absence of soda at the inlet **64** to urge the spool **38** into nonsealing contact with the lower O-ring **62***a*. In brief, the spring **90** is a small, light weight spring. The well **52,** of course, is sufficiently large to freely receive the spindle end and spring combination. Only the bottom of the well serves as a bottom limit for the free or bottom end of the coil spring. It is not intended that the bottom end of the spindle extension **88** make contact with the bottom of the well **52** as a means for limiting the downward displacement of the valve body **44.** Such limitation of downward movement as well as upward movement is provided by the cap **34** and retainer or cover plate **36.**

In that regard, the valve retaining plate **36** is secured on the top of the valve housing **26** and includes a plurality of circular holes each having a diameter slightly larger than the outer diameter of an associated push buttom **34.** The holes are formed in a spaced-apart relationship corresponding to the location of the valves **24** as shown in FIG. **1.** A concentric and circular recess **92** is formed in the bottom surface of the valve retaining plate **36** relative to each push button clearance hole. The recess **92,** in cooperation with the top surface of the valve body serves to restrict the axial displacement of the push button **34** and, in turn, the displacement of the valve body **44.**

In particular, the push button **34** is essentially a cap for fitting over the end of the upper spool **48** of the valve body **44.** As clearly shown in FIGS. **3**A and **3**B the push button **34** is of a "hat" shaped cross section having a lower rim **94** of a larger diameter than the upper cylindrical portion protruding upwardly above the top surface **96** of the valve retaining plate **36.** The push button **34,** in cooperation with the valve retaining

plate **36** and the top surface of the housing, provides a means for limiting the axial translation of the valve body **44**. As shown in FIG. 3A, an upper annular surface **98** of the rim **96** and an annularly shaped surface **100** of the retaining plate **36** are in contact. With such contact, the valve body **44** is restricted from further axial displacement in an upwardly direction thereby defining a closed position of the valve. The downward displacement of the valve body **44** is similarly limited by engagement of the rim **88** with the top surface of the valve housing as shown in FIG. 3B. Here, a lower annular surface **102** of the rim makes contact with the housing surface.

When considering the valve **24***a* in its closed position as shown in FIG. 3A, several conditions relating to the position of the valve body **44** within the valve cavity **42** are to be noted. The O-ring **62***a* carried in the lower groove **54** is in sealing contact with the lower spool **38** and pressurized soda fills only the inlet passageway **68** and the valve zone **64** immediately below the spool **38**. The next uppermost zone **70**, and its associated soda outlet passageway **74** are empty of pressurized soda. The O-ring **62***b* carried in groove **56** which defines the upper limit of zone **70** is in sealing contact with the intermediate spool **46**. At this time the syrup outlet passageway **80** and communicating cavity zone **76** are similarly free of concentrated flavoring syrup due to the sealing of the O-ring **62***c* carried in the groove **58** against the spool **46**. Pressurized syrup fills the passageway **86** and zone **82** located immediately above the intermediate spool **46** and below the upper spool **48**. It will be noted that the O-ring **62***d* carried in the uppermost groove **60** is in sealing contact with the uppermost spool **48** thus preventing leakage of the syrup from the valve cavity. Since pressurized syrup generates equal forces against the top sloping surface of the intermediate spool **46** and the bottom sloping surface of spool **48** the pressurization of the syrup does not contribute toward displacement of the valve body **44**.

In order to achieve the full open valve condition as shown in FIG. 3B wherein the valve body **44** is fully displaced downwardly, it is only necessary to initially overcome the opposing force generated by the pressure of the soda bearing against the lower sloping surface of the valve spool **38**. In the fully open position the O-ring **62***a* is no longer in sealing contact with the lower valve spool and soda is free to flow from the inlet passageway **68** through the zone **64** and upwardly into zone **70** and then through the outlet port **70** and associated passageway **74**. It will also be noted, that when the valve body is displaced in the full open position, sealing contact between the upper portion of the intermediate spool **46** and the O-ring **62***c* is no longer maintained. Pressurized syrup is then free to enter the upper zone **82** through inlet passageway **86** and pass downwardly into zone **76** and then into the outlet passageway **80**. It is to be noted that in the full open position the intermediate spool **46** remains in sealed contact with the O-ring **62***b* and thereby prevents an intermingling of the syrup and soda within the valve cavity.

Both outlet passages **74** and **80** conducting soda and syrup respectively away from the valve cavity terminate at an end of the housing **26** in a hole pattern formed in the housing as shown in FIG. **2**. The center hole is the terminal discharge opening of the pressurized soda passageway while each of the outlying and smaller diameter holes are terminal passageway openings for conducting pressurized syrup. The dispensing head **32** is in sealed contact with the end of the valve housing and includes the identical pattern of openings at its inlet surface as shown in FIG. **2**. The dispensing head exit openings may be continued in the same pattern as shown in FIG. **2** or may be arranged and directed so as to cause a mixing of the pressurized soda and pressurized flavoring syrup upon exiting from the dispensing head.

Turning now to the mechanical actuation of any given valve within my valve control means **18**; it has been shown that a simple downward displacement of a single push button **34** is the only requirement to change a given valve from a fully closed position to fully open. In my experience I have found that the pressure of the mixing soda and diameter of the valve spool **38** may be established so as to require a maximum downwardly directed force upon the push button **34** of less than approximately 3 pounds. Additionally, the valve control as I have provided requires only small displacements of the valve body **44** for transition between its fully closed and fully open positions. A small displacement of under one-eighth of an inch accompanied by a relatively high working pressure of mixing soda of approximately 100 psi and coupled with an elasticity inherent to the flexible inlet conduit **20**, provides an unique "feel" when a valve body **44** is displaced to either its open or closed position. Upon opening and just as an upper edge portion **104** of the lower spool **38** clears contact with its O-ring **62***a*, the inrush of mixing soda filling the subcavity zone **70** and its associated exit passageway **74** causes a partial equalization of pressures between top surface **106** of the valve spool **38** and its bottom surface **108** causing a sudden reduction in the amount of pressure required to continue the displacement of the valve body **44** toward its fully open position. The operator of my valve control then experiences this sudden reduction in the amount of digitally applied force as a momentary pulse. Thus, the valve I have provided insures transition between a fully closed position and fully opened position as a "snap-type" of action which insures uniform proportion control between the flavored syrup concentrate and mixing soda. In any other than an instantaneously opening valve for controlling the flow of two fluids of dissimilar viscosity, the flow of the fluid having heavier viscosity necessarily lags the flow of that fluid with lesser viscosity. As applied to soft drink beverages an overage of mixing soda, the fluid of less viscosity, directly affects the palatability of the beverage.

In addition to the "snap-opening" characteristic of the valves of my valve control means, I have provided a similar characteristic of the valve upon moving to the fully closed position. In this instance only a slight relaxation of the push button pressure displacing the valve body **44** in its fully open position is required. A momentary pulse, similar in nature to that as just previously described as accompanying the displacement of the valve body **44** from fully closed to fully opened position, accompanies the displacement of the valve body from its fully open to fully closed position. Upon a slight relaxation of digitally applied pressure to the push button **34** the coil spring **90** responds by slightly displacing the valve body **44** upwardly away from the limit stop provided as part of the push button flange. At a point of upward displacement approximately between 50 percent open and 50 percent closed positions, the lower valve spool **38** commences to restrict flow be-

tween the sloping surface **108** and the surface of the O-ring **62a**. This restriction of flow has the effect of increasing the pressure differential in the mixing soda as measured between the inlet and outlet passageways intersecting the adjacent valve cavity zones **64** and **70.** This increase in differential pressure has the effect of accelerating the displacement of the valve body **44** toward its fully closed position due to the higher pressure of the inlet mixing soda bearing against the lower surface of the spool **38.** The valve body **44,** accelerated by the pressure of the mixing soda, arrives at its point of uppermost travel while accelerating. The rapid termination of acceleration is afforded by contact of the push button annular surface **98** making contact with the corresponding surface **100** of the valve retaining plate **36.** Thus, the instantaneous termination of upward displacement by the valve body **44** is experienced as a momentary pulse by the operator of the valve control. This rapid "shut-off" of the flowing concentrated syrup and mixing soda has the desirable effect of terminating flow of the two ingredients having dissimilar viscosities in a manner which insures a balance of proportion between amounts of beverage ingredients entering the outlet passageways **74** and **80.**

From the foregoing detailed description, it is to be understood that the soft drink dispensing system of my present invention provides for the convenient selection and dispensing of soft drinks comprising a flavored concentrated syrup and a mixing soda. My hand-held valve control provides for simple, direct acting, and pressure assisted valve operation requiring only a slight amount of thumb or finger movement and force for initializing valve displacement toward its fully opened position, and having been reached, requires only that the externally applied force be momentarily removed to thereby enable the pressure of the mixing soda to take over and displace the valve body to its fully closed position.

Additionally, the precise valve operation afforded by the mixing soda fluid pressure assist enables close proportionate beverage ingredient control and eliminates the previously known problems commonly associated with electromechanical valve control means.

While a particular embodiment of a soft drink dispensing system is described in some detail herein, it is appreciated that changes and modifications may be made in the illustrated form without departing from the spirit of the invention. Accordingly, it is intended that my present invention be limited in scope only by the terms of the following claims.

I claim:

**1.** A soft drink dispensing system comprising:

a plurality of sources of syrup each maintained at a relatively low pressure;

a source of soda maintained at a relatively high pressure;

a hand-holdable, fully mechanical valve control means having a plurality of fluid inlets and a fluid dispensing head at a fluid outlet thereof; and

conduit means connecting said plurality of syrup sources and said soda source to different inlets of said valve control means; and

said valve control means including

a housing,

a plurality of normally closed valves in said housing one for each different syrup source and each including

a valve cavity extending from an outer surface of said housing,

a valve spindle in said cavity with an upper end portion exposed beyond said outer surface,

upper, intermediate and lower spools on said valve spindle,

a first inlet port into a side of said cavity immediately below said lower spool,

a second inlet port into a side of said cavity immediately above a top of said intermediate spool and below said upper spool,

a first outlet port from a side of said cavity above said first inlet port and below said intermediate spool,

a second outlet port from a side of said cavity below said second inlet port,

a first seal on an inner wall of said cavity between said first inlet and outlet ports slidably engaging an outer surface of said lower spool to block fluid flow between said first inlet and outlet ports when said valve is in its normally closed position and releasing from said lower spool as said spindle is moved axially into said cavity to define an open position for said valve,

a second seal on an inner wall of said cavity between said first and second outlet ports slidably engaging an outer surface of said intermediate spool to block fluid flow between said second inlet and outlet ports and said first outlet port,

a third seal on an inner wall of said cavity between said second inlet and outlet ports slidably engaging an outer surface of said intermediate spool to block fluid flow between said second inlet and outlet ports when said valve is in said closed position and releasing from said intermediate spool as said valve is moved to said open position,

a fourth seal on an inner wall of said cavity between said second inlet and a top of said cavity slidably engaging an outer surface of said upper spool to block fluid flow from said top of said cavity, and

spring means for urging said valve spindle away from a bottom of said cavity to said closed valve position, said spindle being finger depressible in said cavity to said open valve position, and

conduit means in said housing connecting said first inlet port to said fluid inlet connected to said soda source, said second inlet port to a fluid inlet connected to a syrup source and said first and second outlet ports to said fluid dispensing head, whereby soda at said relatively high pressure acts on the lower spool of each valve to produce an upward force rapidly moving the valve from said open to closed positions upon a release of its associated valve spindle and an initial upward movement thereof in response to its associated spring means.

**2.** The system of claim **1** wherein said spring means comprises a spring dimensioned for location in said cavity and being of a size and weight just sufficient to develop a force for initially moving said spindle away from a bottom of said cavity upon a release of said valve spindle in said open position.

**3.** The system of claim **2** wherein said spring means includes a coil spring having coils in slidable engage-

ment around a lower end portion of said valve spindle and at least one upper coil nonslidably engaged thereon for retaining said coil spring on said valve spindle.

4. The system of claim 1 wherein the axial length of said lower spool along said valve spindle is less than the distance across said first inlet port measured axially along said side of said cavity.

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