

Oct. 17, 1950

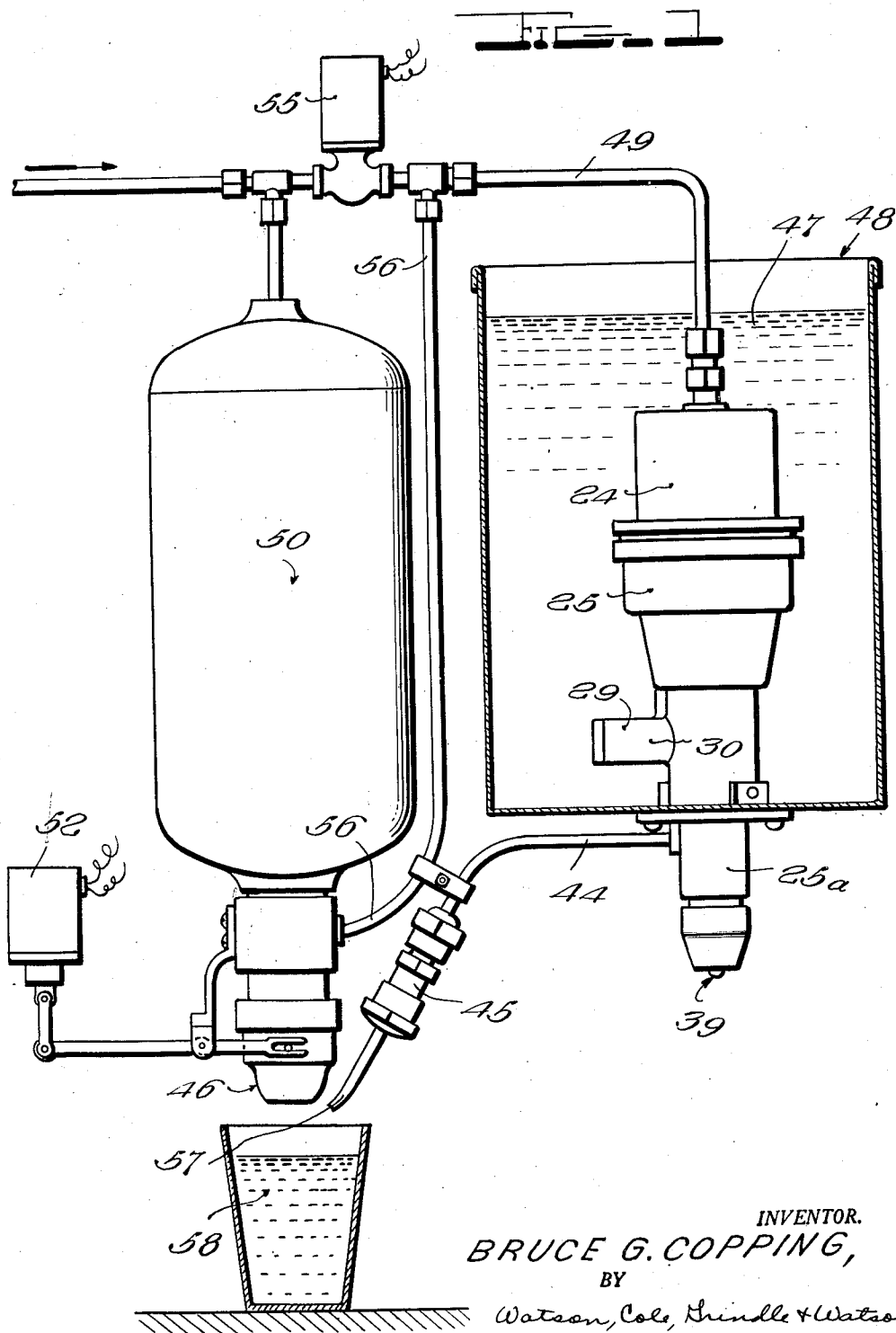
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2,526,331

APPARATUS FOR PROPORTIONING A MEASURED AMOUNT OF SIRUP
AND CARBONATED WATER FOR BEVERAGE DISPENSERS

Filed June 27, 1945

4 Sheets-Sheet 1



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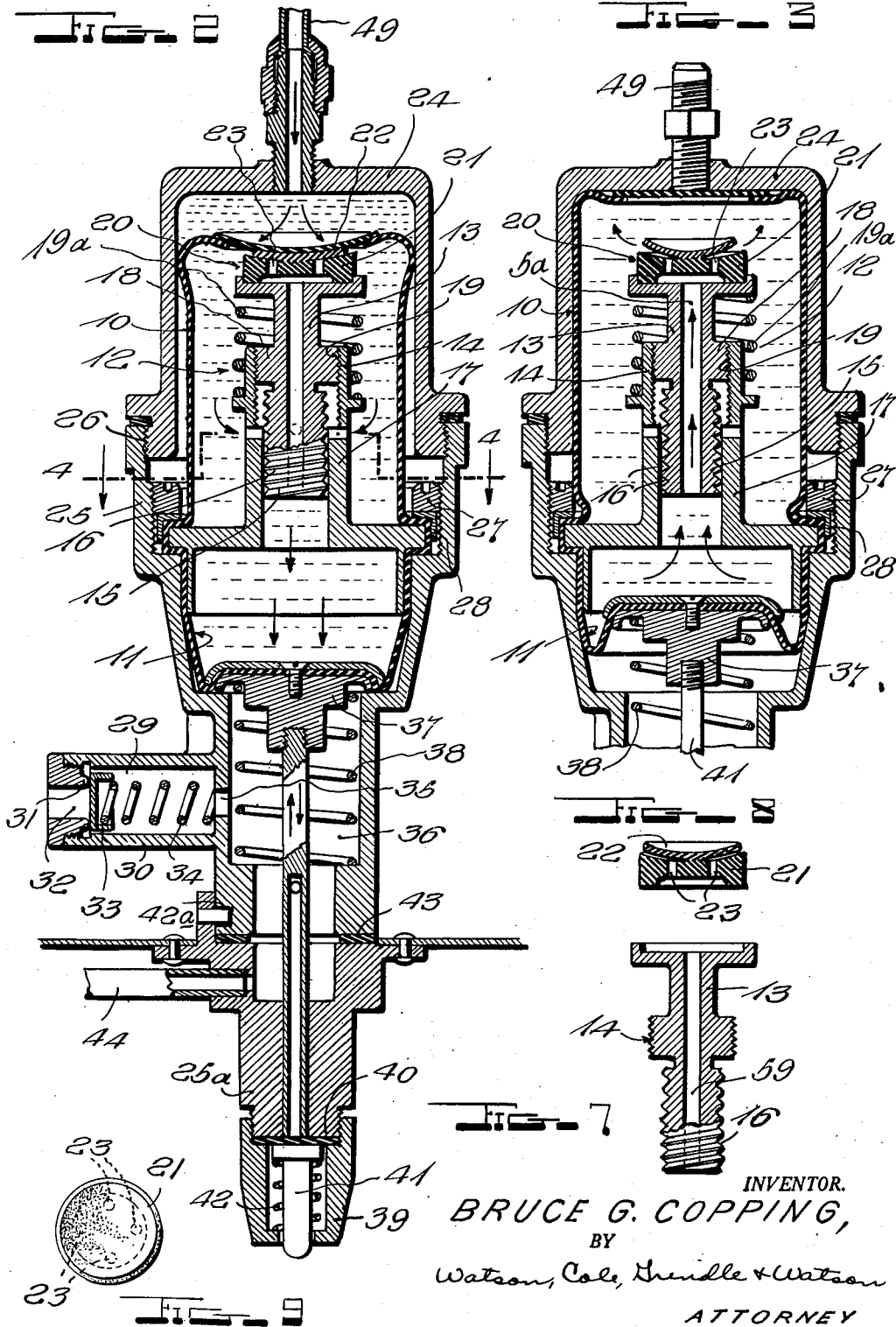
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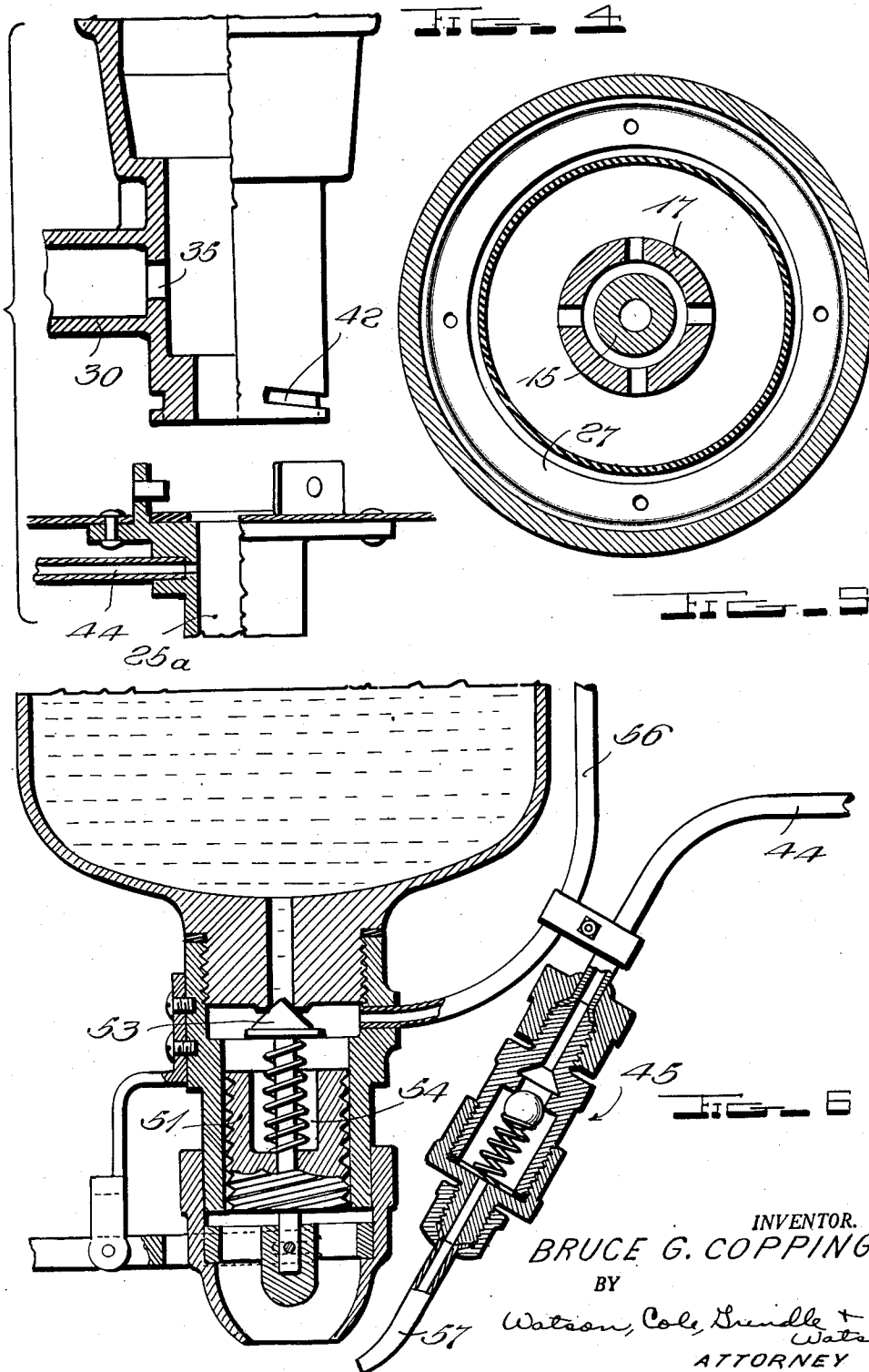
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4 Sheets-Sheet 3



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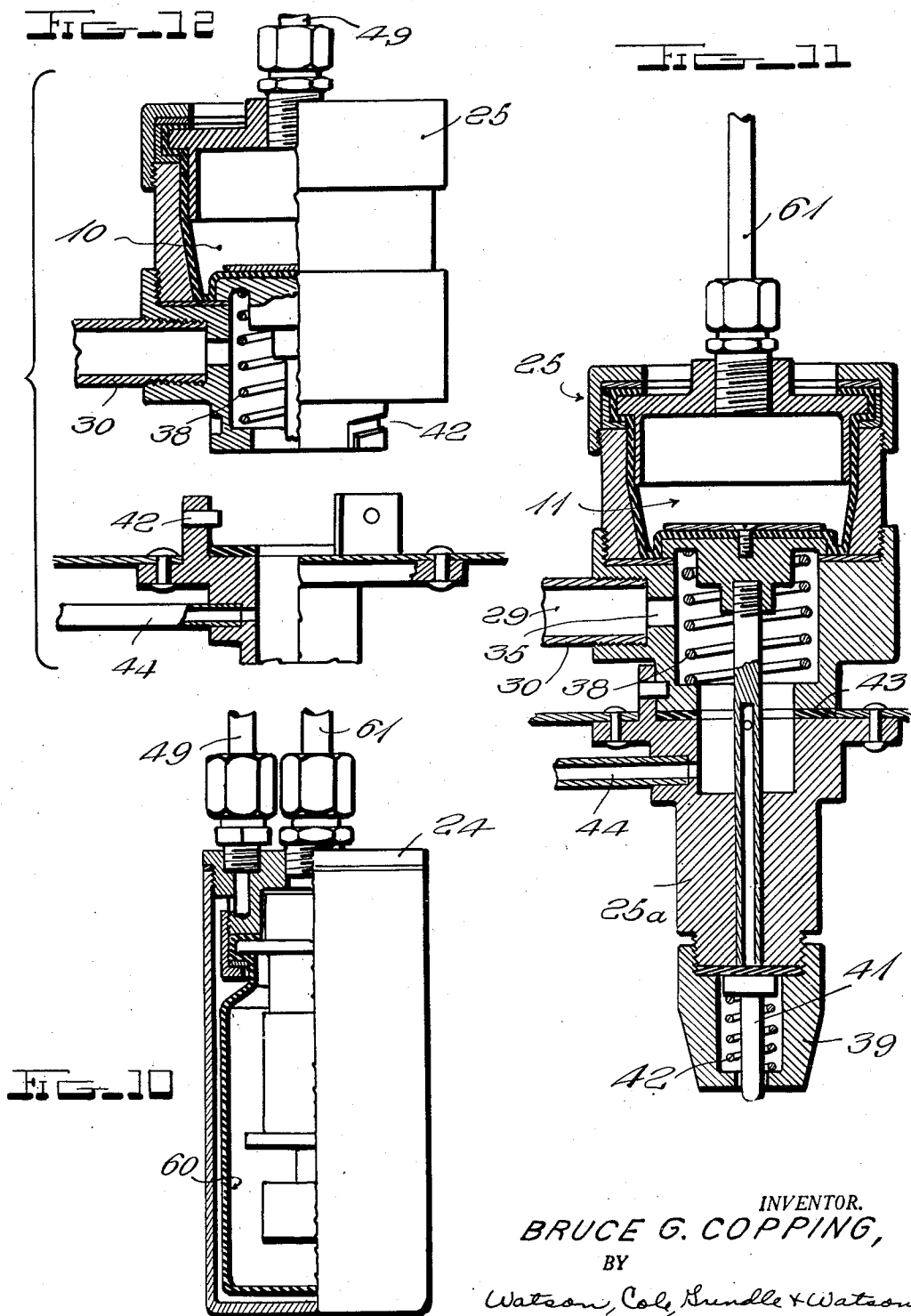
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4 Sheets-Sheet 4



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2,526,331

APPARATUS FOR PROPORTIONING A MEASURED AMOUNT OF SIRUP AND CARBONATED WATER FOR BEVERAGE DISPENSERS

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Application June 27, 1945, Serial No. 601,839

14 Claims. (Cl. 225—21)

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This invention relates primarily to the soft drink industry, and more particularly to new and improved means for the proportional dispensing of beverage syrup and carbonated water. In this connection, the syrup pumping mechanism is of special significance.

In the preparation of soft drinks, either at the soda fountain, in cup dispensing machines, or otherwise, a predetermined amount of syrup is mixed or combined with a measured quantity of carbonated water to form the finished product. The proportioning of syrup and water is critical, since if too little syrup is present, a weak and unpalatable drink results; while if too much syrup is used, a sweet and even sickening beverage is the result. Either result is uneconomic, there being an obvious loss of good will in serving unbalanced drinks, and further, when excess syrup is present, a monetary loss accrues to the dealer in that he does not get a standard number of drinks to the gallon of syrup.

The art of preparing a potable beverage is a fine one, comparable to that of excellent cookery, or careful and accurate following of an industrial formula.

Heretofore various means have been employed to proportion syrup and carbonated water in the preparation of beverages. These have not been entirely successful, chiefly because the viscosity of syrup varies with the temperature, and conventional mechanisms of the prior art which rely upon a time factor, that is, holding a valve open by solenoid means or otherwise, for a stated period of time to allow the syrup to issue from a container, are subject to considerable error and variation in the amount of syrup dispensed under different temperature conditions. This factor of variation of viscosity of syrup enters into almost every device of the prior art employing mechanical means for pumping and/or measuring syrup.

An object of my invention is to provide a means for the proportional dispensing of carbonated water and syrup, which is constant in its operation.

Another object is to provide syrup pumping means that are positive, regardless of the temperature of the fluid being handled.

Another object is to provide an improved check valve in such a device.

A still further object is to provide economy of manufacture in a syrup pump.

Another object is to provide a syrup pump with a minimum of moving parts.

Another object is to make possible minimum maintenance costs in a device of the instant type.

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These and other objects, made clear during the further progress of this specification, are effected by means of my invention, a full and complete understanding of which is facilitated by reference to the drawings herein, in which:

Fig. 1 is a side view of my assembled device and associated structure;

Fig. 2 is an enlarged vertical sectional view of my pump in discharged position;

Fig. 3 is a view similar to that of Fig. 2, except that the pump has been discharged and is adjusting itself for another pumping operation;

Fig. 4 is an enlarged view, fragmentary in part, of the syrup intake portion of my pump.

Fig. 5 is a view of the device in horizontal cross-section, taken substantially along the line 4—4 of Fig. 2;

Fig. 6 is an enlarged vertical cross-sectional view of the nozzle and syrup discharge portions of the instant structure;

Fig. 7 is an enlarged view, partially in vertical cross-section, of the metering spindle, showing the capillary grooves therein;

Fig. 8 is a vertical cross-sectional view of the check valve which is a feature of my invention;

Fig. 9 is a top view of said valve;

Fig. 10 is an enlarged side view partially in cross-section, and fragmentary in part, showing a modification of the instant invention;

Fig. 11 is a view in vertical cross-section of the structure shown in Fig. 10, showing the device in discharged position; and

Fig. 12 is a side view, fragmentary in part, showing a still further modification of the instant device.

Referring now to the drawings:

10 (Figs. 2 and 3) is a pressure sac, which may be cylindrically shaped, and which is hermetically sealed to a working sac 11, within which two sacs is a metering unit 12. This unit has a metering spindle 13, threaded at its upper end 14, and near the lower end 15 of the spindle is provided capillary grooves 16, which will be described in detail hereafter with particular reference to their hydraulic cooperation with other features of the instant invention.

The metering unit spindle fits snugly with apertured metering unit body 17, thereby closing capillary grooves 16 on their open side and forming closed capillary passages.

18 is an adjusting nut assembly, internally threaded as at 19 to fit the threads 14 of spindle 13, and by rotating assembly 18, metering spindle 13 is moved upwardly or downwardly in metering unit body 17, this depending upon the direction

of rotation of the adjusting nut assembly, and by these means the length of the capillary passages 16 formed between 13 and 17 is varied, making it possible to regulate the rate of flow of water through the metering unit itself. A coil spring 19 may be employed to facilitate maintenance of the relative position of metering spindle 13.

Attention is now directed to the return check valve assembly 20 of my device, this consisting essentially of a rubber block or anvil 21, on top of which is fastened a circular rubber flap 22, preferably by vulcanizing the flap to the block at a point near their centers. Anvil 21 has a series of holes or apertures 23 therein, and flap 22 is held securely down over said holes, yet is entirely free to open upwardly if pressure is applied from below. This check valve has been found to be positive and efficient in operation and entirely suitable for its intended purpose.

The entire metering unit is hermetically sealed within pressure sac 10 and working sac 11, and within said sacs is a predetermined amount of water. The sacs are carried within pressure sac cap 24, and working sac base 25, which screws into 24 at 26, a suitable gasket being interposed between the cap and the base, and said base further engaging a sac locking ring 27. A sac protector ring 28 is preferably disposed between the ring 27 and the base.

Base 25 has associated with it a syrup-intake check valve 29, comprising an annular member 30, affixed to one end of which is a syrup check seat 31, having an opening 32 therein.

A syrup check disc 33 is normally held against seat 31 by spring tension exerted by syrup check spring 34, and an opening 35 in base 25 communicates with the interior of 30, permitting syrup to enter the space 36 below a working sac piston 37, which piston is normally held upwardly by spring 38.

The bottom of base member 25 may be capped by a limit switch pin cap 39, a diaphragm 40 being interposed between these two elements, and a limit switch pin 41 operating in 39 against the pressure of switch spring 42 in such a manner as to both cushion the action of sac piston 37, and regulate the operation of the pump.

For servicing and other reasons it has been found desirable to form base member 25 in two sections, 25 and 25a, the latter comprising a bayonet type of fitting readily detachable from a bayonet socket 42a, a gasket 43 effectuating sealing at this point.

From 25a, syrup discharge line 44 leads to a discharge check valve 45, and thence to discharge nozzle 46 (Fig. 1). The complete syrup pump assembly is shown immersed in syrup 47 within a syrup tank 48; which is a practical, but not necessarily essential arrangement.

A flexible pipe 49 carries carbon dioxide (CO₂) gas to the syrup pumping unit, such construction permitting removal of the entire syrup pumping unit from tank 48 if servicing or other conditions make this desirable. It is apparent that if CO₂ gas is supplied to pipe 49 under pressure, it will be directed to the space within the syrup pumping unit which surrounds the pressure sac 10.

My system as illustrated is particularly suitable for use in an automatic vending machine for dispensing carbonated beverages in cups. The complete set up includes a carbonator 50 of suitable design to provide carbonated water of desired characteristics, and 51 is preferably a capillary nozzle of the type illustrated and described in my co-pending patent application Serial No.

585,886, filed March 31, 1945 (now Patent 2,211,529, June 13, 1950. 52 is a solenoid for opening valve 53 in the nozzle, which valve may normally be held closed by spring 54; thus regulating the flow of carbonated water through nozzle 51. 55 is a solenoid-operated valve the purpose of which is to control the flow of CO₂ gas to the syrup pumping assembly. Or if desired, a double-acting solenoid valve may be employed at this point, said valve having a small port which vents the CO₂ gas from the pump side of the system, to the atmosphere, when the gas is shut off, this eliminating the necessity of equalizer pipe 56 which otherwise performs a balancing function, as described hereafter.

In operation, my system works as follows: When it is desired to dispense a drink, solenoid 52 and solenoid-operated valve 55 are energized simultaneously, this causing carbonated water to pass through nozzle 51, and CO₂ gas to pass through pipe 49 and apply pressure to the exterior of pressure sac 10. This latter action causes water within the sac to be forced through the capillary grooves 16 of metering unit 12, so that there is a flow of water through said metering unit from the pressure sac to the working sac. It will be noted that at this point the lower end of equalizer pipe 56 is at substantially the same pressure as its upper end, the former at carbonator pressure and the latter at the corresponding CO₂ supply pressure, which means that there is no flow in either direction through said pipe.

In an optimum arrangement, capillary grooves 16 are designed to be hydraulically identical to the grooves in the capillary dispensing nozzle 51, and hence the rate of flow through each will maintain a constant relationship, identical pressures being present and identical fluids (water) being handled. This is particularly significant in maintaining a desired relationship in the proportional dispensing of carbonated water and syrup.

Water flowing from pressure sac 10 through metering unit 12 into working sac 11 causes said working sac to become inflated and to thereby force the working sac piston 37 downwardly against the primary pressure of spring 38. Chamber 36 below working sac 11 is full of syrup, and hence, the inflation of the working sac tends to eject syrup from this space. Syrup-intake check valve 29 automatically prevents the outward flow of syrup back into the tank at this point, and accordingly the discharge of syrup is forced to follow the syrup discharge line 44, pass through the discharge check valve 45, and thence through discharge nozzle 57. By this arrangement and means, syrup is ejected from the discharge nozzle at a rate which bears a controlled relationship with the rate of flow of the carbonated water from the capillary dispensing nozzle 51. Syrup and water thus dispensed combine below the dispensing nozzle and are caught in a cup 58, or other suitable container.

When the serving cycle is complete, the solenoid 52 and solenoid-operated valve 55 are de-energized, this causing valve 53 to shut off the flow of carbonated water; and cuts off the syrup pumping unit from the CO₂ supply, thereby venting pipe 56 to the atmosphere. This almost instantly dissipates the actuating pressure surrounding pressure sac 10, upon which spring 38 working against working sac piston 37, deflates working sac 11 and forces water within the working sac upwardly through passage 59 in metering spindle 13, and into pressure sac 10. Water

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thus rushing upwardly readily displaces flap 22 from holes 23 in bloc 21, thereby permitting the facile return of fluid from the working sac to the pressure sac.

As the spring 38 forces the working sac piston and the working sac upwardly, the space 36 re-fills with syrup, this being readily accomplished by the opening of the syrup-intake check valve 29, which permits the entry of syrup from syrup tank 48 into space 36.

Discharge check valve 45 of conventional design prevents any backward flow of syrup or air through syrup discharge line 44.

The system for the proportional dispensing of carbonated water and syrup described up to this point contemplates a pressure sac and a working sac that are immediately adjacent to, and in fact sealed to one another. It may be noted that this close coupling is not essential to the operation of the device, and that under given conditions it is entirely practicable to separate the pressure sac and the working sac. Such an arrangement is suggested in Figs. 10 and 11, in which a pressure sac 60, contained in a pressure sac cap functionally similar to element 24, within which is a metering and return check valve of the general type described heretofore, communicates with a working sac, working sac piston, syrup-intake and syrup-discharge structure, likewise of similar or identical structure to that described supra; through a flexible pipe 61, the working sac being a separate element, remote from the pressure sac and metering unit. Both the working sac and the pressure sac are filled with water to the exclusion of all air, and the connecting pipe is likewise filled with water, the entire system being hermetically sealed so that there is no loss of water at any point. Under such conditions, any compression of the pressure sac will immediately result in the inflation of the working sac, with attendant pumping of syrup in the manner desired.

Fig. 12 discloses an important modification of the instant invention, employed under conditions where continuous proportioning of syrup and water is not necessary or desired. At such a time, there is no necessity for the upper or pressure sac, or for the metering unit, this situation being present in some beverage cup vending machines wherein the syrup and water are not injected proportionately and continuously, but on the contrary, the syrup is injected during the later portion of the dispensing cycle. It is then possible to eliminate all of the top portions of the assembly and apply the CO₂ gas directly to the lower or working sac, without the water leg in between, as illustrated in Fig. 12, the remaining structure being substantially as described heretofore. This eliminates the proportional measuring feature of my invention, there only being used at such time that part thereof which functions as a syrup pump per se.

From the foregoing it is apparent that I have described a new and useful system for the proportional dispensing of carbonated water and syrup. That such system is simple and economical of construction, maintenance and operation. That it employs new structures and combinations of elements and structures in utilizing hydraulics in manners and through means not heretofore known to the art. That certain advantageous modifications of the invention are likewise recognized and set forth and described herein.

While certain structures and arrangements have been described at some length and in con-

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siderable detail in this specification, it is manifest that no limitations are intended or implied thereby, but that on the contrary, the appended claims are to be given a construction and scope fairly in keeping with my contribution to the art.

I claim:

1. In a device of the character described, a pressure sac, a working sac, a metering unit operatively disposed between the sacs, a working sac piston adjacent said working sac, means for alternately directing a liquid to a space beneath the working sac piston, housing means for said sacs, a predetermined amount of fluid in said pressure sac, and means for directing energy against the pressure sac whereby fluid therein is passed through the metering unit into the working sac, forcing the piston downwardly and discharging liquid therebeneath.

2. In a device of the character described, a pressure sac, a working sac associated therewith, a metering unit operatively disposed between said sacs, a predetermined amount of fluid in said pressure sac, a working sac piston adjacent the working sac, means for alternately directing liquid to a space beneath the working sac piston, housing means for containing said sacs, and means for directing energy against one of the sacs whereby the liquid contained therein is caused to flow through the metering unit into the other sac, forcing the working piston downwardly and discharging liquid therebeneath.

3. In a device of the of the character described, a pressure sac, a working sac connected thereto, a metering unit disposed between said sacs for regulating the passage of a liquid from one sac to the other, a working sac piston operatively disposed to the working sac, means for directing a liquid beneath the working sac piston, housing means for the sacs and piston, and means directing energy against the pressure sac and by collapsing same, causing the working sac to drive the working sac piston and thereby move the liquid in the space under said piston.

4. In a device of the character described, a pressure sac, a working sac communicating therewith, a metering unit disposed between said sacs for regulating the passage of a liquid from one sac to the other, a working sac piston operatively disposed adjacent the working sac, a housing for said sacs and piston, a liquid receiving space beneath said piston, means for alternately directing a liquid to said space, and means for directing a force against said pressure sac and by collapsing said sac, causing the contents thereof to move to the working sac and drive the working sac piston to move the liquid beneath said piston.

5. In a device of the character described, a pressure sac, a working sac communicating therewith, a metering unit disposed between said sacs for regulating the passage of a liquid from one sac to the other, a piston operatively disposed adjacent said working sac, a housing containing said sacs and piston, a liquid receiving compartment beneath the piston, a predetermined amount of fluid in said sacs, means for directing energy against the pressure sac for the purpose of driving said fluid into the working sac through the metering unit, whereby the piston is caused to move into the liquid receiving compartment and pump the contents thereof through a discharge line.

6. In a device of the character described, a pressure sac, a metering unit associated there-

with for the purpose of regulating the passage of a liquid from said pressure sac, a working sac remote from the pressure sac but communicating therewith a working sac piston operatively associated with said working sac, a liquid-containing compartment adjacent said piston, and means for deflating the pressure sac thereby expanding the working sac and driving the working sac piston to pump the liquid adjacent said piston.

7. A pump comprising oppositely disposed flexible sacs, a fluid in said sacs in a quantity less than the combined volume of the sacs, a metering unit operatively positioned between the sacs for regulating the passage of a liquid from one sac to the other, a housing for the composite assembly, a liquid-containing compartment adjacent one of the sacs, means for alternately directing a liquid to said compartment, and means for moving the fluid from one sac to the other, thereby causing the liquid to be pumped from the compartment to a point of discharge.

8. In a device of the character described, in combination, a source of carbonated water supply, a capillary nozzle connected thereto, a syrup tank, a syrup pump positioned within said tank, said pump having a pressure sac, a working sac, and a metering unit positioned between the sacs for regulating the passage of a liquid from one sac to the other, the metering unit having a metering spindle with capillary passages with the same hydraulic characteristics as the capillary nozzle; and means for combining syrup pumped from the tank, with carbonated water discharged from said nozzle.

9. In a device of the character described, in combination, a source of carbonated water, a spiral capillary nozzle connecting therewith, a syrup tank, a syrup pump position within said tank, said pump having a pressure sac, a working sac, and a metering unit disposed between said sacs for regulating the passage of a liquid from one sac to the other, said metering unit having a metering spindle with passages having the same hydraulic characteristics as the spiral capillary nozzle; and means for proportionally dispensing syrup pumped from the tank, with carbonated water issuing from the nozzle.

10. In a device of the character described, in combination, a source of carbonated water, a spiral capillary nozzle connecting therewith, a syrup tank, a syrup pump associated therewith, said pump including a metering unit having the same hydraulic characteristics as the capillary nozzle whereby the amount of syrup dispensed by the pump during a given period, is in direct mathematical ratio to the amount of carbonated water dispensed by the capillary nozzle during such time, and means for proportionally uniting syrup pumped from the tank, with carbonated water from the nozzle.

11. In a device of the character described, in combination, a source of liquid, a capillary nozzle connecting therewith, a syrup tank, a syrup pump associated with the tank, a metering unit in said pump, said metering unit having the same hydraulic characteristics as the capillary nozzle whereby the amount of syrup dispensed by the pump during a given period, is in direct mathematical ratio to the amount of carbonated water dispensed by the capillary nozzle during such time, and means for combining syrup pumped from the tank with liquid from the nozzle.

12. In a device of the character described, in combination, a source of liquid, a capillary nozzle connecting therewith, a fluid tank, a pump associated with said tank in operative relationship thereto, a metering unit in said pump, said metering unit having the same hydraulic characteristics as the capillary nozzle whereby the amount of syrup dispensed by the pump during a given period, is in direct mathematical ratio to the amount of carbonated water dispensed by the capillary nozzle during such time, and means for combining liquid issuing from the nozzle, with fluid pumped from the tank.

13. In a dispensing device of the class described, a casing defining a single fluid dispensing compartment having inlet and outlet openings, check valves in said respective inlet and outlet openings, a sealed flexible working sac extending across said compartment and movable to inflate and deflate to increase and decrease the effective capacity of the compartment and thus exert a pumping action to alternately draw fluid in through said valved inlet opening and dispense it through the valved outlet opening, means acting on said sac in one direction and fluid pressure means acting directly on the outer surface of the sac in a direction opposed to the first named means, said two means acting in alternation to effect said inflating and deflating movements and being the sole means acting on said fluid for pumping it through said compartment.

14. In a dispensing device of the class described, a casing defining a single fluid dispensing compartment having inlet and outlet openings, check valves in said respective inlet and outlet openings, a sealed flexible working sac extending across said compartment and movable to inflate and deflate to increase and decrease the effective capacity of the compartment and thus exert a pumping action to alternately draw fluid in through said valved inlet opening and dispense it through the valved outlet opening, a working sac piston connected with said sac and adapted to reciprocate with the inflating and deflating movements of the sac, means acting on said sac and piston in one direction and fluid pressure means acting directly on the outer surface of the sac in a direction opposed to the first named means, said two means acting in alternation to effect said inflating and deflating movements and being the sole means acting on said fluid for pumping it through said compartment.

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