Oct. 16, 1951 J. L. FINE ET AL 2,571,433

BEVERAGE DISPENSING RECEPTACLE

Filed March 23, 1948 2 Sheets-Sheet 1

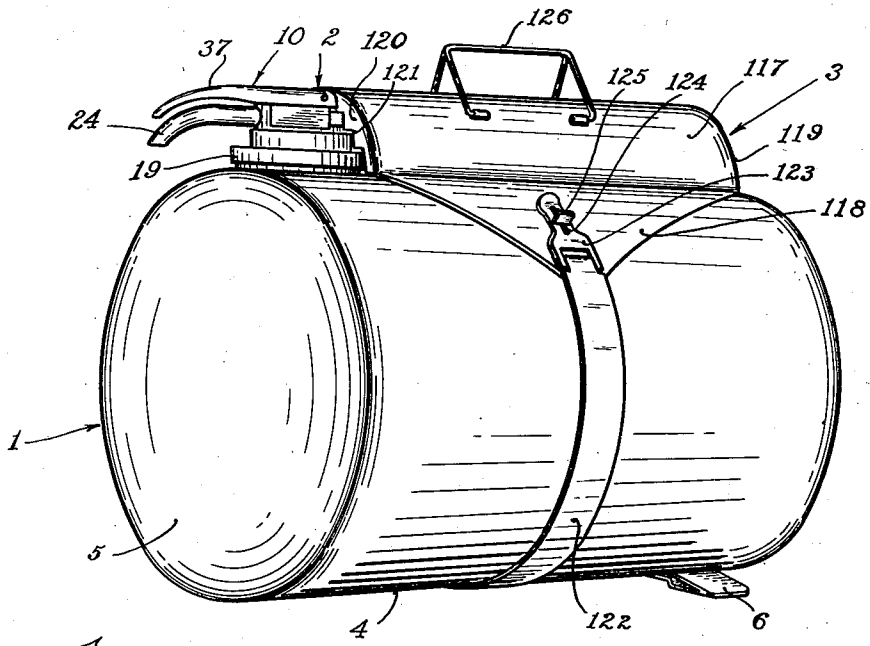


Fig. I

Fig. IV

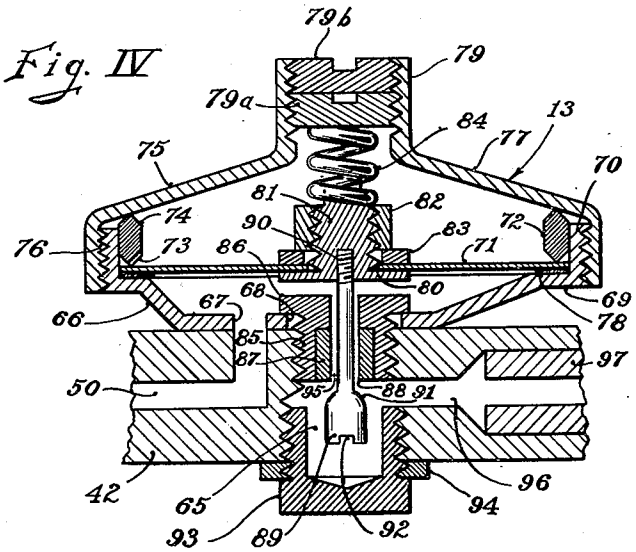
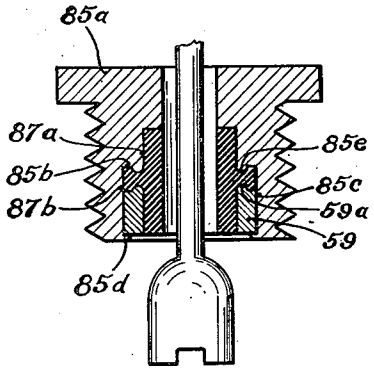


Fig. V



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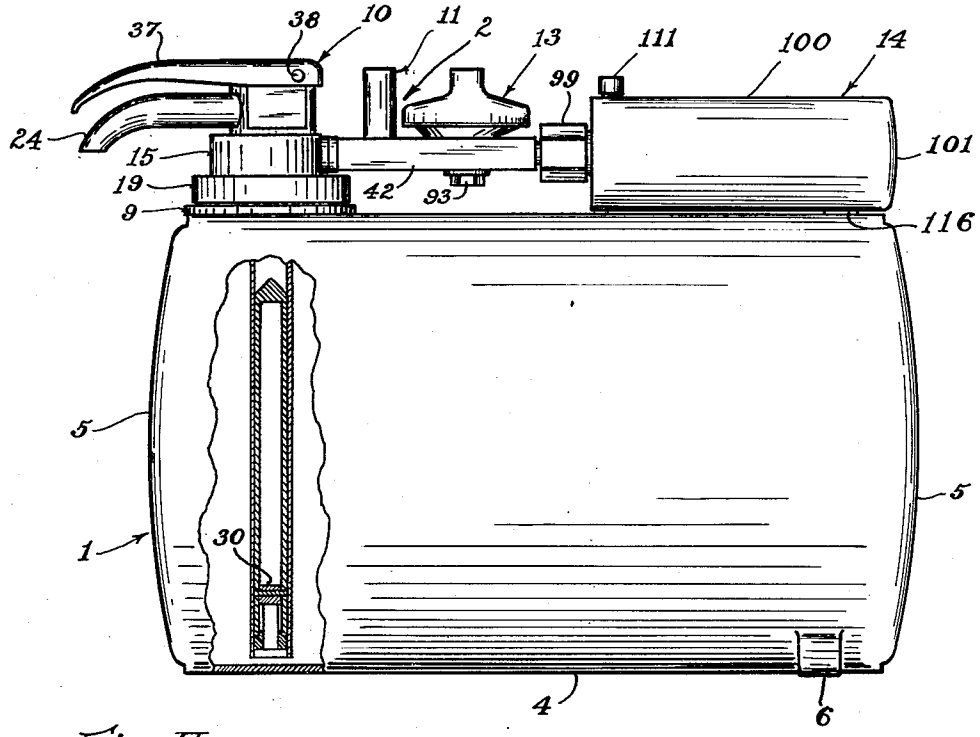


Fig. II

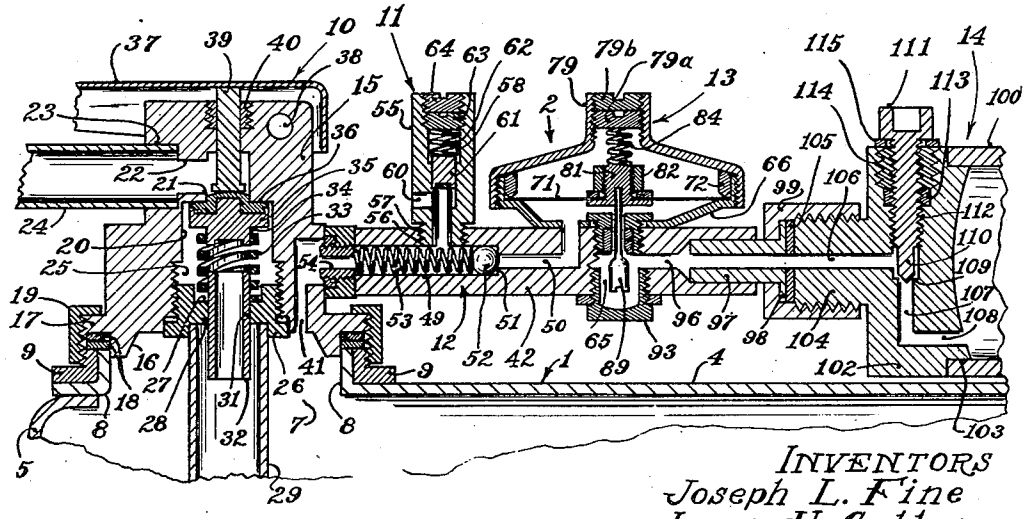


Fig. III

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BEVERAGE DISPENSING RECEPTACLE

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6 Claims. (Cl. 222—55)

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This invention relates to a liquid dispensing apparatus and more particularly to a liquid receptacle and dispensing means including an automatic control valve or pressure regulator for supplying a gaseous medium to the receptacle to maintain a substantially constant pressure therein at all times irrespective of the amount of liquid therein.

These conditions are particularly desirable in connection with the dispensing of aerified or gasified liquids such as carbonated beverages, including beer, ale and any of the other well known carbonated beverages, and it is a primary object of our invention to provide an assembly comprising a receptacle associated with mechanism to effectively maintain these said conditions, said receptacle and associated mechanism being consistent with embodiment in an organization of such size as to be stored in the usual household refrigerator.

Another object of the invention is to provide a receptacle and associated dispensing mechanism in which all the operating elements on the dispensing mechanism, i. e., tap, pressure release, back pressure valve, pressure regulator and gas container, are located extraneously of and on top of the receptacle of the assembly, are arranged in line along the receptacle of the assembly, thereby resulting in simplicity and compactness in design, permitting quick and easy accessibility to each working part, and protection of the operating elements by a simple housing structure.

An additional object of the invention is to provide a receptacle and dispensing mechanism of the aforementioned type with a detachable cover forming a protective housing over the extraneous fittings, said cover providing a simple and efficient means for transporting the container.

A further object of the invention is to provide a pressure regulator and valve structure which is unfailing and sensitive in operation and which is capable of embodiment in a structure of a size conformable to the restricted dimensions of a liquid dispensing apparatus of the above indicated sort.

Other and further objects of the invention will become apparent as the description proceeds, reference being made to the accompanying drawings forming a part of the present disclosure, wherein:

Fig. I is a perspective view of a liquid dispensing apparatus constructed in accordance with the teaching of this invention.

Fig. II is a side elevational view thereof with

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the cover removed, parts being broken away and parts being shown in section.

Fig. III is an enlarged, fragmentary, vertical sectional view of the operating elements of the dispensing mechanism.

Fig. IV is an enlarged, fragmentary, vertical sectional view through the pressure regulator.

Fig. V is a detail view showing a preferred construction of the valve seat in vertical section and on an enlarged scale.

Referring in detail to the drawings, wherein for purposes of illustration the preferred embodiment of our invention is illustrated, it will be seen that our liquid dispensing apparatus comprises a liquid receptacle, generally indicated by reference numeral 1, a dispensing mechanism generally indicated by reference numeral 2 arranged in line along the top of the receptacle 1, and a cover structure, generally indicated by reference numeral 3, said cover structure providing a protective housing for certain of the operating elements of the dispensing mechanism and also a means for transporting the entire apparatus or assembly.

The receptacle is preferably constructed of stainless steel, and comprises a substantially cylindrical portion 4, the ends of which are closed by convex walls 5 welded or otherwise suitably secured to the cylindrical portion 4. The lower, rearward end portion of the cylinder 4 is provided with leg means 6 suitably secured thereto as by welding, to support the receptacle 1 in a stable position. The upper, forward end portion of the cylinder 4 is provided with an opening 7 surrounded by an upstanding flange 8 and an externally threaded flanged collar 9 surrounds the flange 8 and is welded or otherwise suitably secured thereto.

The dispensing mechanism 2, as mentioned previously, is arranged in line extraneously of and along the top of the receptacle 1, thereby providing compactness and simplicity in design, and quick and easy accessibility to each working part. From front to rear of the receptacle, the dispensing mechanism comprises a tap or faucet structure 10, a safety or pressure release valve 11, a back pressure valve 12, a pressure regulator 13, and the CO_2 or other gas container 14.

The tap 10 comprises a valve body 15 provided with a depending annular flange 16 received within the flange 8 surrounding the opening 7. A radially extending flange 17 just above the flange 16 seats upon gaskets 18 provided on the flange 8 and collar 9. An internally threaded and flanged

collar 19 engages the flange 17 and is threaded onto the collar 9 to securely fasten the valve body 15 to the receptacle 1.

A passage 20 extends inwardly from the bottom of the valve body 15 to a valve seat 21, through which the passage 20 communicates with a forwardly extending passage 22. The passage 22 is enlarged at its open end 23 to receive a spigot 24 which may be welded or otherwise suitably secured therein. As illustrated, the spigot 24 extends forwardly of the receptacle 1, thus permitting ease of tapping and accessibility to the spigot regardless of any position or space in the refrigerator in which the receptacle is stored.

A lower end portion 25 of the passage 20 is threaded and receives a nut 26 provided with recesses 27 and 28 on its inner and outer faces, respectively. The recess 28 receives a pipe 29, suitably secured therein as by welding, said pipe extending down into the receptacle to a point adjacent the bottom thereof. The tube 29 is provided with the usual restrictor 30 of well known construction to give an even, smooth flow to the spigot.

The control portion of the nut 26 is apertured as indicated at 31 and a relatively short tube 32 is suitably secured therein. The tube 32 extends slightly above the nut 26 and functions as a spring retainer for a coil spring 33 embracing the upper end of said tube and a depending portion 34 of a valve 35. The seating portion of the valve is preferably provided with a washer 36 as is usual in this type of valve construction.

A control lever 37 embraces the upper end of the valve body 15 and is pivotally connected thereto at the upper rearward portion of the valve body as by means of a pin 38. The control lever extends forwardly just above the spigot 24 and hence is also readily accessible and cooperates with the spigot 24 to permit ease of tapping. An arm 39 is suitably connected to the control lever 37 and extends downwardly into the valve body through the passage 22 to engage the valve 35. Preferably, a packing gland or nut 40 surrounds the arm 39 at the upper end of the valve body. It will be obvious from the above that when the operating lever 37 is depressed, the arm 39 will unseat the valve 35 thereby establishing communication between the receptacle 1 and the spigot 24.

A gas passage 41 is provided in the valve body 15 rearwardly of the passage 20. The passage 41 opens at the bottom of the valve body and also opens at the rear of the valve body at a point spaced above the flange 17, in communication with a passage through an elongate rectangular member 42 which at one end thereof joins the valve body 15.

The said one end of the member 42 is provided with a relatively large passageway 49 communicating with the passageway 41. A smaller passageway 50 leads inwardly from the passageway 49 and thence upwardly to the pressure regulator 13. The shoulder 51 between the passages 49 and 50 is formed to provide a valve seat, and a ball valve 52 is positioned in the passage 49 and normally urged to seating position by means of a coil spring 53 retained in position in the passage 49 by means of a threaded sleeve 54. The valve structure just described is the back pressure or one way valve 12 previously referred to and functions to prevent reverse flow through the passage 50.

The pressure relief valve 11 comprises a housing 55 having a reduced threaded end 56 received in a threaded opening 57 communicating with the passage 49. The housing 55 is provided with a passageway 58 of stepped, progressively increasing area upwardly which is provided with a radial outlet 60. A valve 61 in passage 58 and urged downwardly by a coil spring 62, maintained in the passage 58 by means of the nut 63 and locking nut 64, controls communication between passage 49 and outlet 60. The valve 11 is usually set to open when the pressure within the receptacle 1 exceeds a desirable maximum.

Rearwardly of the passage 50, the member 42 is provided with a vertical passage 65 extending entirely therethrough and communication between the passages 50 and 65 is established through the pressure regulator 13.

The pressure regulator 13 (Fig. IV) comprises a lower cup-shaped member 66 welded to the member 42 and provided with openings 67 and 68, in registry with the passages 50 and 65, respectively. The upper portion of the member 66 terminates in a horizontally extending annular flange 69 and a vertically extending externally threaded annular flange 70.

A diaphragm 71, preferably constructed of relatively thin metal, is supported in the member 66. The peripheral edge of the diaphragm rests on a gasket 78 lying between diaphragm 71 and the flange 69 and is clamped thereto by means of a ring 72 having a V-shaped lower edge 73, and an approximately V-shaped upper edge 74 bearing against the inner surface of the upper wall of an inverted cup-shaped member 75. Member 75 having an internally threaded peripheral wall 76 receiving the externally threaded flange 70 completes the housing for the pressure regulator, and the upper sloping wall 77 thereof bears against upper edge 74 of the ring 72 to force the ring downwardly and secure the diaphragm 71 to the flange 69. The wall 77 terminates centrally in an upstanding, internally threaded nipple 79.

The diaphragm 71 is provided with a central aperture 80 through which a headed, externally threaded stem 81 extends upwardly. The stem 81 is secured to the diaphragm by means of a nut 82 and washer 83, and the upper end thereof is of reduced diameter and is embraced by a coil spring 84 extending into the nipple 79 and retained by means of a nut 79a and locking nut 79b threaded in the said nipple. Obviously, the nuts may be adjusted to vary the force exerted by the spring 84 on the diaphragm 71.

The upper portion of the passage 65 is threaded to receive a threaded sleeve 85 extending through the opening 68 and provided with a flange 86 engaging the bottom of the member 66. At its lower end portion, the sleeve 85 is recessed to receive a resilient sleeve 87 of neoprene rubber or the like natural or synthetic rubber, which is provided at its lower end with a square edge valve seat 88. A valve 89 is integrally connected with a stem 90 threaded into or otherwise suitably secured to the stem 81. Valve 89 which is actuated by the diaphragm 71 is provided with a spherical surface adapted to seat on resilient seat 88. The valve 89 is provided on its lower end with a screw driver receiving slot 92.

It is believed that the manner of assembling the pressure regulator will be obvious. In general, however, the elements of the pressure regulator just described are assembled in the order of the description relating thereto, except that the sleeve 85 must of course be threaded into the passage 69 before the diaphragm 71 is placed in the member 66, and the stem 81 will be secured to the diaphragm before it is so placed.

After the valve 89 is secured to the stem 81, the lower end of the passage 69 is closed by a cup-shaped nut 93 threadedly received in the said passage. A washer 94 is interposed between the head of the nut and the member 42 to prevent leakage, and the nut 93 is shaped to provide space for movement of the valve 89.

The effective area of the diaphragm 71 bears a definite and critical relationship with respect to the effective area of the passage or opening 95 extending through the sleeves 85 and 87. We have found that in order to take a 100 to 1500 lbs./in.^{2} pressure or more and reduce it down in a single stage to deliver a constant, uniform 5, 10, 15, 20, more or less, lbs./in.^{2} pressure the ratio of the effective area of the diaphragm 71 to the effective cross-sectional area of passage 95 may suitably be apportioned for good functioning of a regulator assembly of small size.

We have found that if the passage 95 through the valve fitting be of restricted effective cross-sectional area, the flow of pressure gas to the low pressure side of the valve is to a desirable extent retarded. It is therefore unnecessary to employ a diaphragm of extended area so to act against spring 84 as to prevent a violent pressure surge when the pressure on the low pressure side of the valve falls to such value that the diaphragm does not act to hold the valve in closed position against the force exerted by the spring, and to prevent oscillating action of the valve with negligible changes on the low pressure side. If, the area of the diaphragm be made too great with respect to the effective cross-sectional area of the passage, it tends to act too forcefully to oppose the spring and to hold the valve closed against substantial decrease in pressure on the low pressure side of the valve. If, conversely, the effective cross-sectional area of the valve passage be too greatly restricted with respect to the area of the diaphragm the valve is not closed with adequate positiveness and tends to remain open an unreasonably great length of time, the flow of pressure gas being too greatly retarded by friction in the passage.

By a series of experimental apportionments we have determined that the ratio between the effective cross-sectional area of diaphragm 71 and the effective cross-sectional area of the aperture 95 should be 256 plus or minus 20% to 1, i. e., 205–308 to 1. Above a ratio of 308 to 1 and below a ratio of 205 to 1, the fineness of regulation is impaired and the regulator size becomes large and ungainly or of two-step operational construction. In either case the valve is unsuitable for use with a portable receptacle as herein disclosed and for allied uses. Within the ratio of 205–308 to 1, fineness and certainty of regulation is obtained whether the overall dimensions and the size of the parts be so increased that the regulator is a foot or more in diameter or reduced to a diameter of an inch or less. A ratio of approximately 256 to 1 between the area of the diaphragm and the cross-sectional area of the passage may be considered to be optimum in combing fineness of regulation with possibility for small scale physical embodiment. Within the broader designated range, however, satisfactory results as to both such considerations are obtained.

In addition to the ratio of effective areas of diaphragm and inlet aperture, the structures of valve 89 and valve seat 88 play an important part in the functioning of the regulator. The diaphragm 71, consisting of thin gauge flexible material secured firmly around its periphery, theoretically assumes a concave position with the application of pressure against its surface. However, due to the required thinness of the gauge of the material used in the diaphragm, the theoretical concavity assumed by the diaphragm in actual working practice is not absolute, nor even, nor uniform. Hence, a valve stem attached at a right angle to the surface of the diaphragm will not always move in and out in the same path and will most often assume a position inclined relative to the valve seat. The seating surface 91 of valve 89 and the yielding structure of seat 88 thus assure an absolute closure regardless of an actual variation in the position of the valve stem occasioned by the imperfect concavity of the diaphragm when it is actuated by pressure against its surface.

A preferred valve seat structure is shown in detail in Fig. V of the drawings. In that figure a yielding sleeve member 87*a* is provided with a peripheral flange 87*b*, which lies beneath a shoulder 85*b* in threaded fitting 85*a*. A metal ring 59 lies below flange 87*b* of the yielding sleeve member in recess 85*c* of the fitting sleeve 85*a* and has on its upper surface a ridge or series of bosses 59*a* cooperating with analogous structure 85*e* on shoulder 85*b* the more firmly to engage flange 87*b*. As shown, the inner and lower edge of fitting 85*a* is upset or otherwise deformed at 85*d* to hold ring 59 and yielding sleeve 87*a* in place.

The rearward end of the member 42 is provided with a horizontal passage 96 communicating with the passage 65 and enlarged at its outer end to receive a sleeve 97 which is rigidly secured therein in any suitable manner. The rearward end of the sleeve 97 is provided with a flange 98 which functions as a retainer for an internally flanged and threaded sleeve nut 99 rotatably mounted on the sleeve.

The gas container 14 is constructed to withstand 5,000 lbs./in.^{2} pressure and is of sufficient volume to maintain the desired pressure in the receptacle 1 until the contents therein have been drawn off. Ordinarily, for beer, a 15 lbs./in.^{2} pressure is maintained in the receptacle 1. Pressures as herein given should be taken as pressures above atmospheric pressure at sea level.

In the form chosen for illustration, the gas container 14 comprises a cylindrical portion 100 and a rearward end wall 101 either integral therewith or welded thereto. The forward end of the cylinder is closed by a relatively thick cylindrical wall 102, the inner end of which is recessed, as indicated at 103, and received within the cylinder 100. The wall 102 is welded to the cylinder 100 and at its forward end is provided with an integral externally threaded nipple 104 received by the nut 99. An annular washer 105 is interposed between the nipple 104 and the flange 98 of the sleeve 97, and the nut 99 provides a means whereby the gas container may be readily removed and replaced in the assembly.

A passage 106 is provided in the nipple 104 and communicates with the passage 96 through the washer 105 and sleeve 97. The rearward end of the passage 106 terminates substantially centrally of the wall 102, at which point it opens into a radially extending passage 107 which in turn opens into a longitudinally extending passage 108 opening into the cylinder 100.

The inner end of the passage 107 is enlarged to provide a valve seat 109 and the passage 107 may be closed when desired by means of a needle valve 110. The needle valve 110 is formed integral with the recessed head screw 111 received

in a threaded opening 112 formed in the wall 102 in axial alignment with the passage 107. A packing gland comprising a packing 113 and a sleeve nut 114 is provided at the outer end of the opening 112 to prevent leakage past the screw 111, and preferably, a washer 115 is interposed between the head of the screw 111 and the wall 102. The recessed head screw 111 provides a simple, handy and easily operated means for opening the gas container, both for the purpose of expelling the gas content and for refilling.

The cylinder 4 is provided with a saddle structure 116, diagrammatically illustrated in Fig. II, to aid in supporting the gas container 14 and other elements of the dispensing mechanism and also to prevent lateral movement thereof.

The cover structure 3 is illustrated in Fig. I and comprises a downwardly opening semi-circular housing 117, the sides of which terminate in converging aprons 118. The rearward end wall 119 of the housing 117 is preferably closed but the forward end wall 120 is cut-away as indicated at 121 to receive the member 42, valve body 15, flange 19, etc. A cinch strap 122 is hingedly connected at one end to an apron 118 (not shown), and the other end of the strap 122 has a fastening element 123 provided with an elongated slot 124 hingedly connected thereto. The apron 118 illustrated has a pivoted wing cooperating fastening element 125 secured thereto, in position to permit the slot 124 to be passed thereover, whereupon the wing 125 is turned to fastening position in a well known manner. A handle 126 is secured to the top of the housing 117, preferably substantially centrally longitudinally of the receptacle 1.

The readily detachable cover structure 3 provides a protective housing over most of the extraneous fittings of the dispensing mechanism, and, with its cinch strap and handle, provides a simple, handy, and efficient means for transporting the entire assembly. The cover structure, formed to conform in contour with the cylindrical container, also imparts an ornamental appearance to the overall assembly.

The device of our invention lends itself readily to hygienic cleansing, and, after such cleansing, the receptacle 1 is filled with the desired liquid at atmospheric pressure. The gas container 14 is filled with the desired gas, usually CO_2, to a desired pressure, such as a pressure of 1200 to 1500 lbs./in.^{2} or higher, and the valve 110 closed. The gas container 14 is then connected to the other elements of the dispensing mechanism by means of the nut 99 and the dispensing mechanism is attached to the receptacle by means of the collar 19. The valve 110 is then opened, the pressure regulator 13 having been previously adjusted and locked to the desired delivery pressure, and the gas passes from the container 14 through the passages 108, 107, 106, 96, 65 through the pressure regulator passages 50, 19 and 41 into the receptacle until the set pressure is reached therein, at which time the valve 89 will be automatically closed due to the force resulting from the pressure acting on the diaphragm overcoming the force of the spring 84.

The cover structure 3 is then applied and sealed whereby the consumer may readily transport the device home, and store the device in his refrigerator. It will be noted that as disclosed and discussed above particular merit has been made of the fact that the dispensing receptacle is capable of small-size embodiment for inclusion in home refrigerators. As a standard for such purpose, the receptacle conveniently may be made of 2-gallon capacity. If desired, however, the size and capacity of the receptacle can be increased for use in commercial establishments, either as packed with a suitable refrigerant or inserted in a refrigerator or refrigerating apparatus.

When some of the liquid is withdrawn from the receptacle 1 by means of the tap 10, the pressure within the receptacle will be reduced and the spring 84 will automatically open the valve 89 allowing gas to escape from the container 14 to the receptacle 1 until the set pressure is again reached, at which time the valve 89 will again be automatically closed.

It is evident from the foregoing description of our invention that it presents a simple and effective means whereby a liquid within a receptacle and under pressure, may be withdrawn therefrom continuously or in interrupted quantities at spaced intervals, the pressure upon the liquid contents being automatically maintained at a predetermined uniform pressure during these operations by the pressure regulator 13.

The extremely small size of the pressure regulator 13 and the fact that the pressure is reduced in a single stage, makes it possible to manufacture our pressure regulator at a minimum of cost. The necessity of using bulky castings, large diaphragms, and heavy adjustment springs is eliminated by our invention due to our discovery of the criticalness of the ratio of the effective area of the diaphragm to the effective area of the inlet aperture.

It is to be understood that the disclosed form of our invention is merely exemplary, that numerous modifications in the form and arrangement of parts may be made without departing from the spirit of the invention, so long as such changes come within the scope of the appended claims.

We claim as our invention:

1. A liquid dispensing apparatus comprising a liquid receptacle, a dispensing mechanism for said receptacle, said dispensing mechanism comprising a tap, a pressure regulator, a gas container and interconnecting conduit means therefor arranged in line extraneously of and along the top of said receptacle, and a cover structure, said cover structure comprising an enclosing housing for at least a part of said dispensing mechanism, a cinch strap adapted to extend around said receptacle to secure the said cover structure thereto, and a handle structure on said housing.

2. A liquid dispensing apparatus comprising a liquid receptacle, a dispensing mechanism for said receptacle, said dispensing mechanism comprising a tap, a pressure regulator capable of effecting a high order of reduction in the pressure of gases passed therethrough, a gas container and interconnecting conduit means therefor, said container having a structure and capacity to maintain a substantial volume of gas under high pressure, said elements of the dispensing mechanism being arranged in line extraneously of and along the top of said receptacle, said pressure regulator comprising a housing, a diaphragm in said housing, inlet and outlet apertures in said housing, a valve seat at said inlet aperture, a valve for closing said inlet aperture, said valve being connected to said diaphragm for actuation thereby, and spring means for actuating said diaphragm in one direction, the ratio of the effective area of said diaphragm to the effective area of said inlet aperture being within the range of from 205–308

to 1, and a cover structure, said cover structure comprising an enclosing housing for at least a part of said dispensing mechanism.

3. A liquid dispensing apparatus comprising a liquid receptacle, a dispensing mechanism for said receptacle, said dispensing mechanism comprising a tap, a pressure regulator, a gas container and interconnecting conduit means therefor arranged in line extraneously of and along the top of said receptacle, a cover structure comprising an enclosing housing for the portion of said dispensing mechanism disposed rearwardly of said tap, and means for securing said cover structure to said receptacle.

4. A liquid dispensing apparatus comprising a liquid receptacle, a dispensing mechanism for said receptacle, said dispensing mechanism comprising a tap, a pressure regulator capable of effecting a high order of reduction in the pressure of gases passed therethrough, a gas container and interconnecting conduit means therefor, said container having a structure and capacity to maintain a substantial volume of gas under high pressure, the elements of said dispensing mechanism being arranged in the line extraneously of and along the top of said receptacle.

5. A liquid dispensing apparatus comprising a liquid receptacle, a dispensing mechanism for said receptacle, said dispensing mechanism comprising a tap, a back pressure valve, a pressure relief valve, a pressure regulator capable of effecting a high order of reduction in the pressure of gases passed therethrough, a gas container and interconnecting conduit means therefor, said container having a structure and capacity to maintain a substantial body of gas under pressure, the elements of said dispensing mechanism being arranged in line extraneously of and along the top of said receptacle, a cover structure comprising an enclosing housing for the portion of said dispensing mechanism disposed rearwardly of said tap, said housing being constructed to provide for escape of pressure by way of said pressure relief valve, and means for securing said cover structure to said receptacle.

6. A liquid dispensing apparatus comprising a liquid receptacle, a dispensing mechanism for said receptacle, said dispensing mechanism comprising a tap, a back pressure valve, a pressure relief valve, a pressure regulator capable of effecting a high order of reduction in the pressure of gases passed therethrough, a gas container and interconnecting conduit means therefor, said container having a structure and capacity to maintain a substantial body of gas under pressure, the elements of said dispensing mechanism being arranged in line extraneously of and along the top of said receptacle.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,659,263	Harris	Feb. 14, 1928
1,795,615	Parran	Mar. 10, 1931
2,009,467	Amsdell	July 30, 1935
2,014,824	Wallace	Sept. 17, 1935
2,080,923	Lassen	May 18, 1937
2,156,823	Stettner	May 2, 1939
2,165,684	Struck	July 11, 1939