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Newberry et al.

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[54] LIQUID DISPENSING APPARATUS

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[52] **U.S. Cl.** **222/76**, 222/129.4, 222/134

[51] **Int. Cl.** **B67d 5/10**

[58] **Field of Search** 222/129.4, 134, 76, 129.1

[56] **References Cited**

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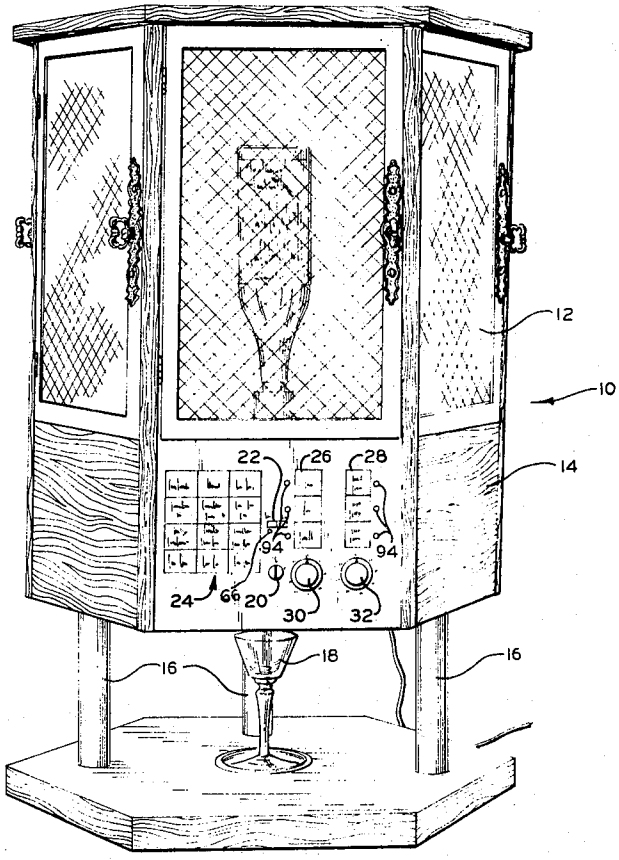
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[57] **ABSTRACT**

Apparatus for dispensing any of a plurality of liquids either singly or in predetermined combinations either "automatically" according to standard recipes or "manually" by selectively varying the quantities of each liquid dispensed. The disclosed embodiment is particularly directed to an alcoholic beverage dispenser and mixer which is simple and economical in construction, using sturdy and reliable electro-mechanical components, yet versatile in operation by providing two relays between each solenoid valve controlling flow of the respective liquids and a cam operated microswitch controlling the time for which a voltage is provided to the solenoid.

15 Claims, 8 Drawing Figures



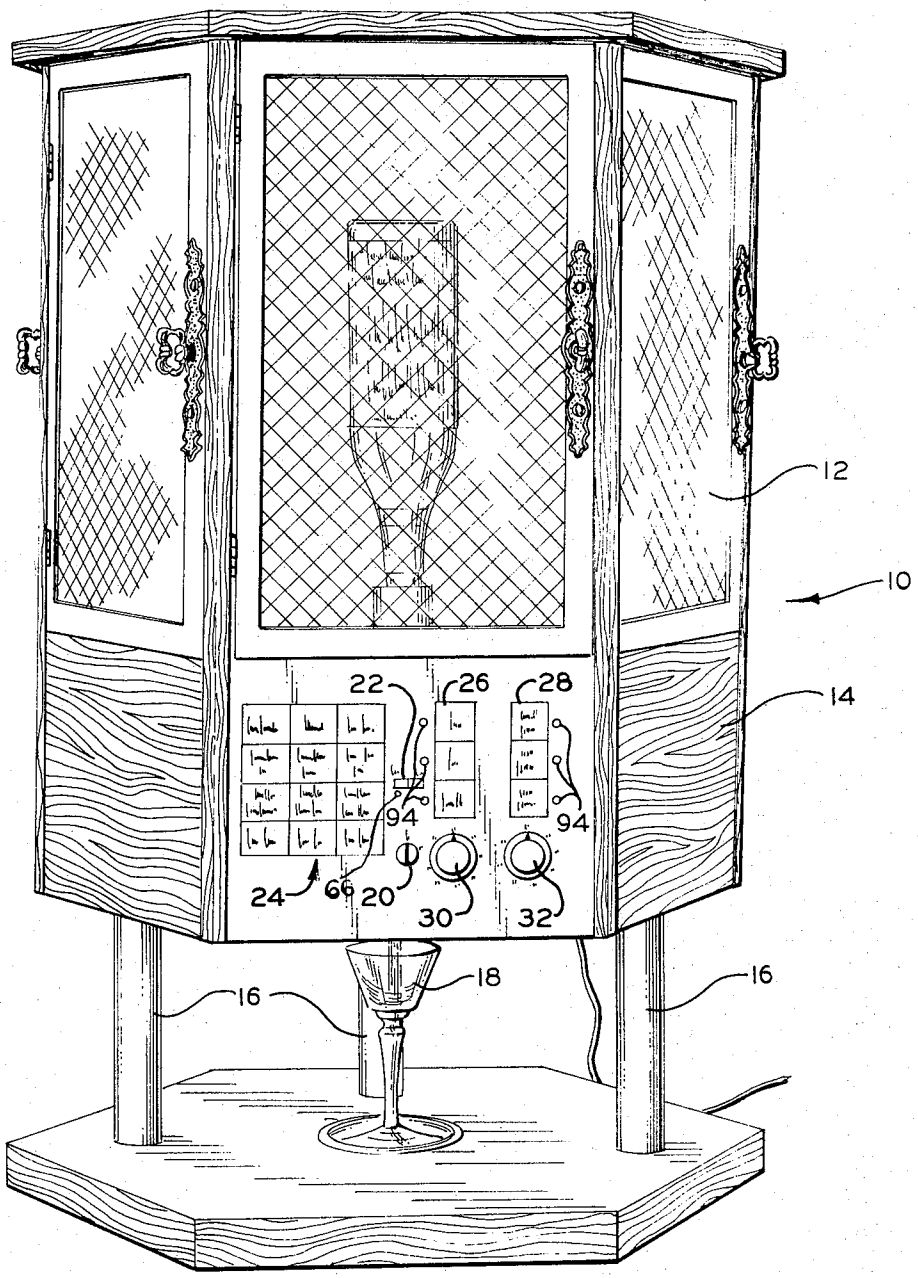


FIG. 1

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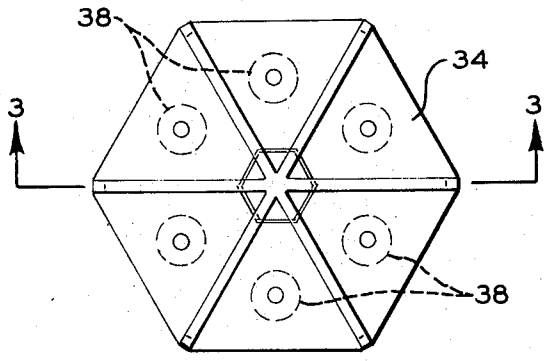


FIG. 2

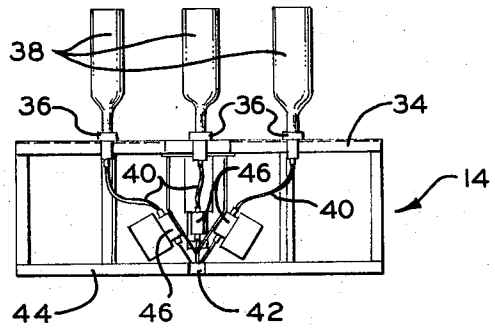


FIG. 3

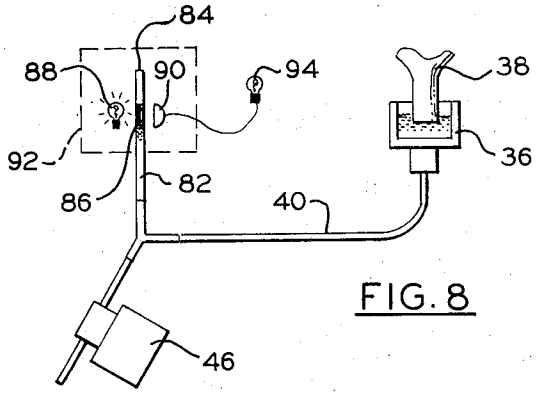


FIG. 8

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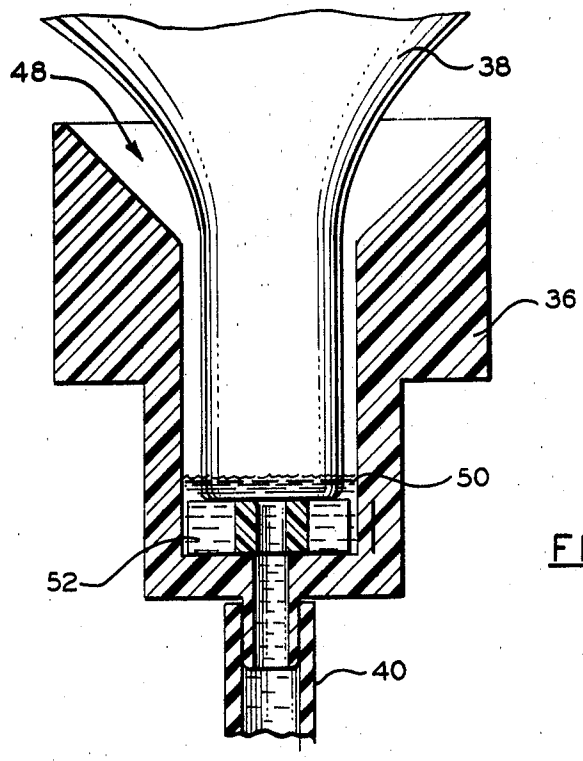


FIG. 4

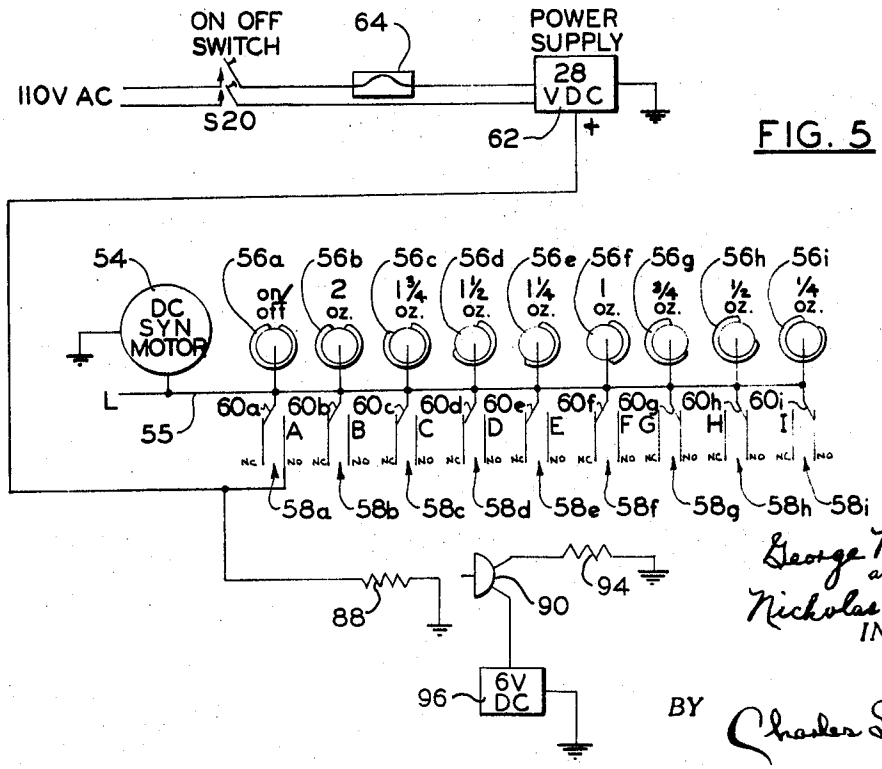


FIG. 5

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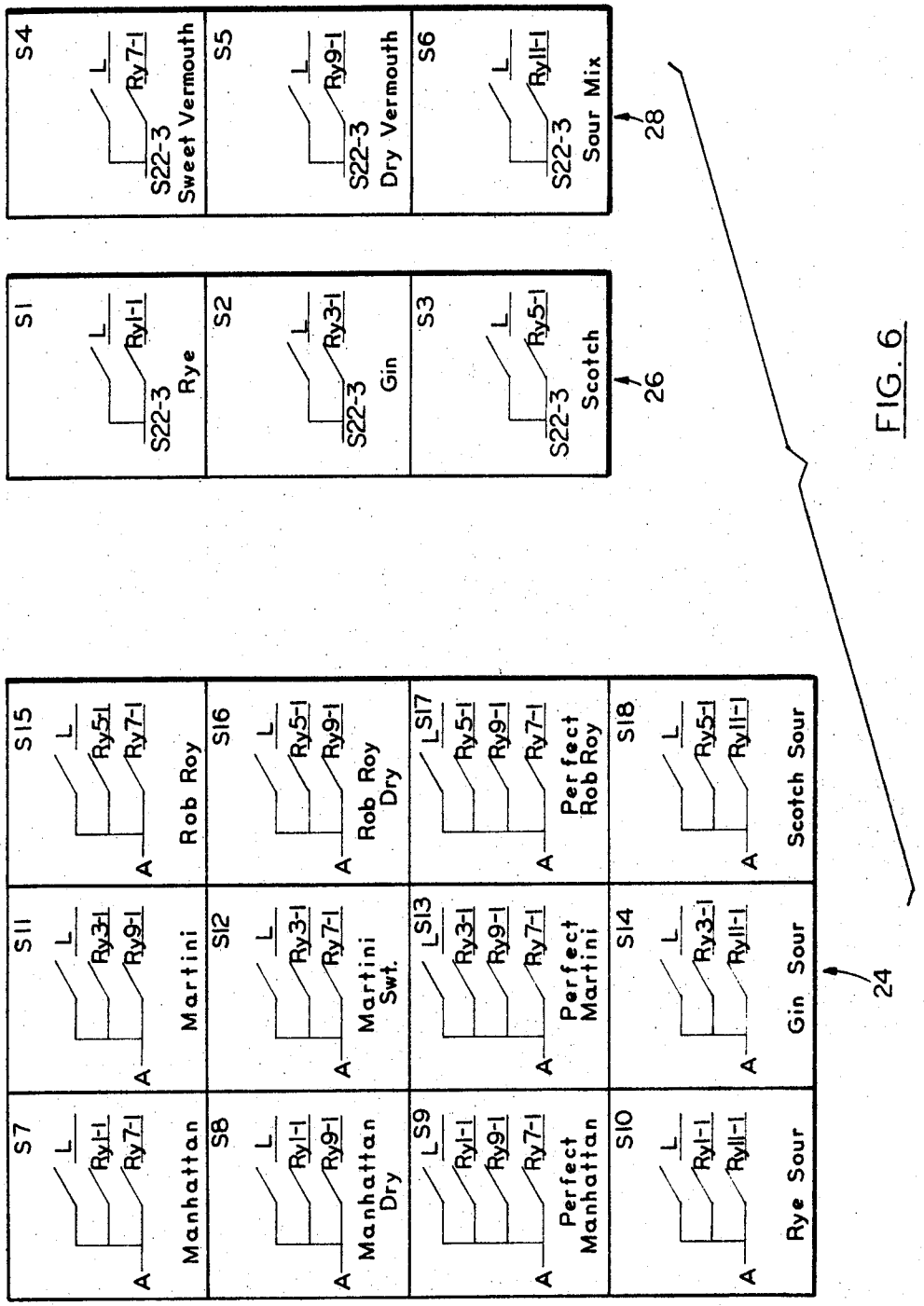


FIG. 6

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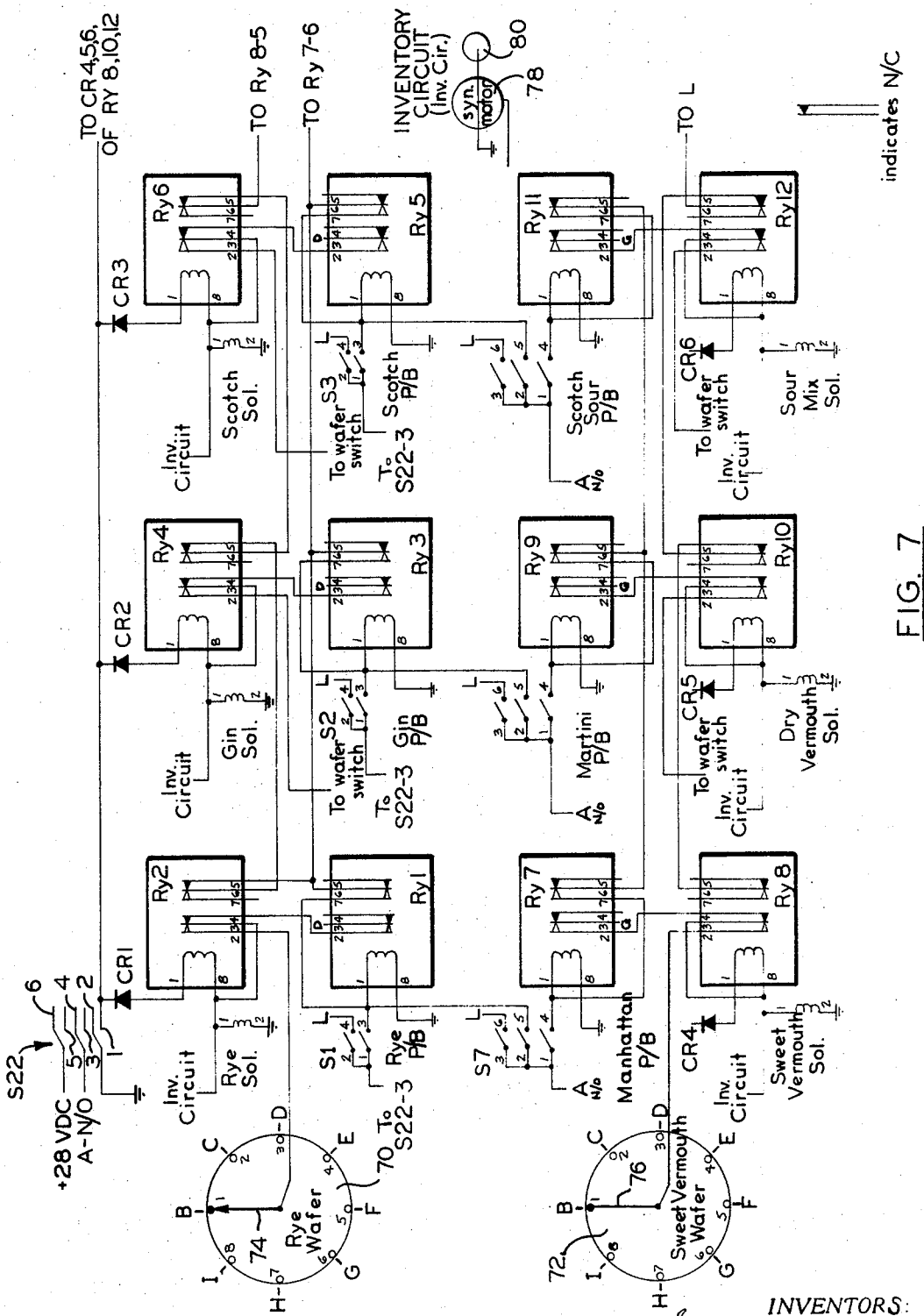


FIG. 7

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LIQUID DISPENSING APPARATUS

The present invention relates to liquid dispensing apparatus and, more particularly, to apparatus for dispensing in selectable quantities a plurality of liquids singly or in predetermined combinations.

Many embodiments of apparatus for dispensing beverages are presently known, including coin operated vending machines, computer-controlled mixers for a wide variety of alcoholic cocktails, and the like. Those directed primarily to automated or semi-automated dispensing of alcoholic beverages have generally tended to be either simple mechanical metering devices of limited utility, or expensive and complicated electronic equipment. While it is possible to construct automated systems which provide quick, accurate mixing of virtually any number of different liquids, and other features such as inventory control, billing, etc., with the added cost and complexity which accompany increased versatility such systems quickly become unsuitable for widespread use.

The present invention seeks to provide a system with sufficient versatility to allow individual metered dispensing of any liquid from a number of bottles, or combined dispensing from two or more bottles for mixed drinks either automatically according to preselected recipes or semi-automatically, allowing selective variations of the quantities of each ingredient. The system is constructed in modular form to allow simple and convenient expansion from a capacity of only a few bottles to a virtually unlimited number, depending on the needs of the particular installation. The components are electro-mechanical in nature, e.g., relays, solenoids, microswitches, etc., which are more consistent and reliable over long time periods and repeated cycles of operation than electronic components, such as transistors, potentiometers, etc. The system is also much easier to service and repair than comparable electronic machines, many of which require oscilloscopes, for example. Replacement components are also generally easier to obtain and no special tooling is required. The manufacturing cost of a system constructed according to the present disclosure is significantly lower than an electronically operated system of comparable capacity.

The aforementioned objects and advantages, among others which will become apparent as the description proceeds, are attained by the construction, combination of elements and arrangement of parts exemplified in the illustrative embodiment described in the following paragraphs and shown in the accompanying drawings, wherein:

FIG. 1 is a perspective view of a suggested external construction and control panel layout for the system;

FIG. 2 is a plan view of a portion of the system of FIG. 1;

FIG. 3 is an elevational view in section on the line 3—3 of FIG. 2;

FIG. 4 is a front elevation detail, in vertical section, of portions of the unit;

FIG. 5 is a schematic diagram of the cam-operated, microswitch timing means and refill indicators;

FIG. 6 is a schematic diagram showing the electrical connections to each of the push button switches on the control panel of FIG. 1;

FIG. 7 is a schematic wiring diagram of exemplary portions of the relay network; and

FIG. 8 is a somewhat diagrammatic elevation of the refill indication system.

The illustrated embodiment of the invention provides means for holding six bottles and dispensing the contents thereof individually or in certain combinations. As previously mentioned and described in more detail hereinafter, however, the system is constructed in a modular manner which allows the use of as many bottles as desired while retaining the basic principles of construction and wiring. It will be understood, therefore, that the disclosed embodiment is subject to a wide variety of constructions.

Referring now to the drawings, in FIG. 1 is shown an enclosed cabinet **10**, having an upper portion **12** which opens to receive a plurality of bottles, or other such containers, and

lower portion **14**. Cabinet **10** is supported on columns **16** or other suitable supports so that glass **18** or other receptacle may be placed under the discharge opening. Upper portion **12** may be open on the sides or may include doors, etc. as desired, for styling and appearance. Arranged on a panel of lower portion **14** are the controls for the system, including on-off switch **20**, mode selection switch **22**, 12 mixed drink selection push buttons **24**, and first and second groups **26** and **28** of single liquid selection push buttons. Portion selector dials **30** and **32** are operative to change the amount of ingredients dispensed from the first and second groups **26** and **28**, respectively, when mode selector **22** is in the "manual" position, as explained in detail later.

FIGS. **2** and **3** show in greater detail the mechanical elements for holding the bottles and dispensing the liquids therefrom. Platform **34** generally separates the upper and lower portions of cabinet **10** and has a hexagonal configuration for the illustrated six-bottle embodiment. Platform **34** has six openings in which bottle holders **36** are inserted to receive the open ends of bottles **38**. Each of bottle holders **36** is connected by suitable tubing **40** to common discharge opening **42** in lower wall **44** of cabinet **10**. Solenoid operated valves **46** are interposed in each tube to control the flow of liquid therethrough. The quantity of liquid dispensed through any of valves **46** is a function of the inside diameter of tubing **40**, the head of the liquid and the time during which the valve is open. By maintaining the former two constant for all bottles, dispensing may be controlled solely as a function of elapsed time between opening and closing of the valve. This, in turn, is dependent upon the time of energization of the solenoid coil of the valve, which is controlled by the timed closing and opening of a pair of switch contacts.

FIG. **4** shows in greater detail the simple, yet effective means for maintaining a constant head of fluid regardless of the amount of liquid in the bottle. Bottle **38** is inverted and the open neck is placed in holder **36**, preferably tapered inwardly and down as indicated at **48** to assist in placing the neck in the holder. Liquid **50** from the bottle fills tubing **40** as far as the valve and partially fills holder **36** to form a reservoir around the neck of bottle **38**. The bottle is supported and spaced from the bottom of holder **36** by spacer element **52**, which may be essentially star-shaped, for example, to allow liquid to flow freely from the supported bottle. Since the bottle is closed at the bottom, the liquid reservoir in holder **36** forms a seal so that no more air can enter and thus no more liquid leave the bottle. As liquid is disposed, the seal is broken momentarily and a sufficient amount of air admitted to replace the liquid dispensed.

Switch contacts for energizing the solenoids are opened and closed in a time-controlled manner by synchronous movement of a number of cams, each operating a respective microswitch by connecting the cam follower to the switch contacts in conventional fashion. The general arrangement being well known, the cams and switches are shown schematically in FIG. **5**. The shaft of synchronous motor **54** is connected to rotate collectively all of cams **56***a*–**56***i* at a known, uniform rate. The cams have associated therewith microswitches **58***a*–**58***i*, respectively, each switch having an arm (**60***a*–**60***i*) movable between normally closed and normally open contacts by the cam follower in the usual manner. Switch arms **60***a*–**60***i* are electrically connected to one another and to motor **54** by a line **55** shown in FIG. **5** as ending at a terminal designated by the letter L. The normally open contact of each of the switches are designated by the letters A–I. Contact A is connected to power supply **62** which is connected through fuse **64** and on-off switch **S20** to a conventional 110v AC source.

For illustrative purposes, the six liquids in the bottles are assumed to be rye, gin, scotch, sweet vermouth, dry vermouth and sour mix. The push buttons for selection of each of these components, singly and in various combinations, are shown in FIG. **6** laid out in the same format as on the control panel of FIG. 1. The names of the single components and mixed drinks are shown on the respective push button effecting control

thereof, as well as the electrical connections of the switch terminals with the circuitry of FIG. 7. The liquids are divided into two groups, viz., liquors (rye, gin, scotch) and mixes (sweet vermouth, dry vermouth, sour mix).

Details of the two modes of circuit operation will be explained in connection with the selection of a particular mixed drink, i.e., a Manhattan, consisting of rye and sweet vermouth. In the first example, operation is described with switch S22 (seen also in FIG. 1) as shown in FIG. 7, i.e., in the open, or "automatic" position. The solenoid coils for operating each of the six valves **46** are shown in FIG. 7 with the name of the liquid controlled thereby. It will be noted that there are two relays associated with each of the six solenoids, a total of 12 relays, designated Ry1 – Ry12. The relays are identical double pole, double throw type with a total of eight terminals each. For convenience, the terminals of all relays are numbered **1–8**, with the notation for a particular relay used where applicable to designate its respective terminals; that is, Ry **2–3** denotes terminal **3** of relay **2**, etc. It will also be noted that one side of all push button switches in group **24** (mixed drink) are designated as connected to contact A, the normally open contact of microswitch **58***a*, meaning that a voltage is present on one side of these push button switches, as it is on contact A of microswitch **58***a*. One side of the single liquid push button switches in groups **26** and **28** are connected to terminal **3** of switch S22, for reasons explained later.

The cycle is initiated by momentary depression of the Manhattan push button, closing switch S7, a three pole switch having contacts numbered, in FIG. 7, **1–6**. (All push button switches are biased to the open position and re-open as soon as released). Closing contacts **3** and **6** of switch S7 completes a circuit from A to L, thereby providing a voltage to operate motor **54**. Thus, cams **56***a* – **56***i* begin to rotate and, due to the design of cam **56***a*, arm **60***a* is immediately moved to normally open contact A. In fact, all of the cams and followers are so positioned that the arms of all microswitches are moved from the position shown, on the normally closed contacts, to the normally open, just after initial rotation. The motor will now continue to receive power, through contact A and line **55**, after switch S7 is released, removing power from terminal L. Likewise, the arms of all the other microswitches **58***b* – **58***i* will receive power from the time the push button switch is closed.

Contact **5** of Manhattan switch S7 is connected to Ry **1–1**, thereby providing power to the relay coil when S7 contacts **2** and **5** are closed. This actuates relay Ry**1**, closing the normally open contacts thereof, connecting Ry**1–2** to Ry **1–3** and Ry **1–7** to Ry **1–6**. Since contact **5** of switch S7 is also connected to Ry **1–7**, it may be seen that a circuit will be completed through the normally closed contacts of relay Ry**2**, from Ry **2–5** to Ry **2–6**. The normally closed contacts of all even numbered relays are likewise connected in series with Ry **12–6** connected to L. Thus, since L will receive a voltage through line **55**, arm **60***a* and contact A, the connection through the normally closed contacts of all even numbered relays back to Ry**1–1** insures that relay Ry**1** will remain actuated after the contacts of switch S7 have been allowed to open.

Terminal Ry **1–3** is connected to normally open contact D of microswitch **58***d* and thus receives a voltage from contact A through arm **58***a*, line **55** and arm **60***d* during the time that arm **60***d* is on contact D, a function of the design of cam **56***d*. Ry **1–2** is connected to Ry **2–4** and through the normally closed contacts of deactuated relay Ry**2** to Ry **2–3**. The latter terminal is connected to one side of the rye solenoid, thereby actuating the associated valve for the time arm **60***d* is on contact D.

Contact **4** of switch S7 is connected to Ry **7–1**, thereby actuating relay Ry**7** through switch contacts **1** and **4** when the Manhattan push button is depressed. The normally open contacts are then closed, connecting Ry **7–7** with Ry **7–6**, the latter being connected to Ry **2–5** through the line indicated as "To Ry **7–6**" on the right of relay Ry**5**. This provides a latching voltage for relay Ry**7** in the same manner as for relay Ry**1**, through the series - connected even numbered relays to terminal L. Terminal Ry **7–3** is connected to contact G of microswitch **58***g*, and thus will receive a voltage during the time arm **60***g* is on the normally open contact. Although arms **60***g*, **60***h* and **60***i* are shown on the contact opposite that of the other switch arms, this is due to the conventional cam design of 180° programmable cam sets.

Terminals Ry **7–3** and Ry **7–2** are in electrical contact since relay Ry **7** has been actuated. Terminal Ry **7–2** is connected to terminal Ry **8–4**, and the latter to Ry **8–3** through the normally closed contacts of relay Ry **8**. Terminal Ry **8–3** is connected to terminal **1** of the solenoid controlling the valve through which sweet vermouth is supplied, solenoid terminal **2** being connected to the DC return. Thus, the valve will be open to dispense a quantity of sweet vermouth for the time arm **60***g* is in contact with terminal G, as determined by cam **56***g*.

The operation just described takes place in response to depression of one of the mixed drink push buttons (from group **24**) when mode selection switch **22** is in the "automatic" position, i.e., with S22 open as shown in FIG. 7. The proportions of each ingredient dispensed are determined by the time for which the microswitch contact to which the relay terminals are wired receives a voltage. In the illustrated embodiment, terminal **3** of relays **1**, **3** and **5** is connected to the normally open contact of microswitch **58***d*, and terminal **3** of relays **7**, **9** and **11** to the normally open contact of microswitch **58***g*. In FIG. **5** the cams are indicated as being so designed with respect to the other parameters that ingredients are dispensed in quarter-ounce increments when connected to the microswitch contact controlled thereby. Thus, ingredients will be dispensed in 2 to 1 ratios with the relays connected to microswitches **58***d* and **58***g* as shown. These fixed connections determine the recipes for mixed drinks with switch **22** in the automatic mode and may be wired to provide the ingredients in the most commonly used proportions. Although the illustrated connections will provide all drinks in 2 to 1 ratios, the relays may obviously be connected to the microswitches to provide, for example, a 4 to 1 martini, a 3 to 1 Manhattan, a 2 to 1 sour, etc.

An example of operation of the device with switch **22** in the manual mode, to allow selective variation of the respective amounts of mixed drink components, will now be described. With reference to FIG. 7 placing S22 in the closed position connects each of the even numbered relay solenoids directly to the DC return through S22 contacts **1** and **2**. Contact **3** is connected to the input of all single component push button switches (those in groups **26** and **28**), thereby providing a connection through closed contacts **3** and **4** of S22 to the single component switches. Contacts **5** and **6** of S22 provide a direct voltage supply to mode indicator lamp **66** on the front panel, as shown in FIG. **1**, to show that the switch is in the manual mode.

Terminal **2** of each even numbered relay is connected to the arm of a wafer switch, those for rye and sweet vermouth being shown in FIG. 7 and numbered **70** and **72**, respectively. Arm **74** of switch **70**, as well as the wafer switch arms associated with relays Ry **4** and Ry **6**, is movable to any of the eight contacts shown by movement of selector dial **30** on the front panel. Likewise, arm **76** of switch **72**, and those of the wafer switch arms to which relays Ry **10** and Ry **12** are connected, is movable by dial **32**. Suitable indicia on the dials indicates the amount of each ingredient selected, and/or the ratio of such ingredient in the mixture. For example, setting arm **74** on contact **2** and arm **76** on contact **7** will provide a Manhattan with 1 ¾ oz. of rye and one-half oz. sweet vermouth, or a 7 to 2 (3 ½ – 1) Manhattan, each contact of the wafer switches being connected to one of the normally open microswitch contacts.

After selecting the desired amounts of the respective components, pushbutton switch S7 is depressed, thereby providing a voltage through closed contacts **3** and **6** to motor **54** in the same manner as in the automatic mode. Initial motor movement causes arm **60***a* to move to normally open contact A, thereby providing power to the motor and all microswitch

arms after power is removed from terminal L by opening of the push button switch. The voltage supplied through switch S7 contacts 2 and 5 again serves to actuate relay Ry1, thereby closing the normally open contacts between terminals Ry 1–3 and Ry 1–2.

Since initial motor movement has moved arm 60*d* to the normally open contact D of microswitch 58*d*, a voltage will be provided to terminal Ry 1–3. This voltage will be transferred through terminals Ry 1–2, Ry 2–4 and Ry 2–3 to actuate the rye solenoid, as in the automatic mode. However, since switch S22 is now closed, a connection is provided through the relay Ry 2 coil, diode CR1 and S22 contacts 1 and 2 to the DC return. Thus, relay Ry2 will be immediately actuated and open the normally closed contacts through which the voltage to actuate the relay and the solenoid valve was received. Actuation of relay Ry 2 closes the normally open contacts, thereby connecting terminals Ry 2–2 & Ry 2–3, the former being connected to wafer switch arm 74 which is assumed to be set on contact 2 and thus is electrically connected to contact C of microswitch 58*c*. Arm 60*c* has been moved to contact C by initial motor movement and will therefore supply a voltage serving to maintain relay Ry2 and the rye solenoid in the actuated state for as long as cam 56*c* allows arm 60*c* to remain on contact C, i.e., for the time required to dispense 1 ¾ oz. of rye through the solenoid valve.

Meanwhile the closing of push button switch S7 contacts 1 and 4 has provided a voltage to actuate relay Ry 7. The normally open contacts between terminals Ry 7–2 and Ry 7–3 are now closed and a voltage provided to terminal Ry 8–4 since microswitch arm 60*g* has been moved to contact G which is connected to terminal Ry 7–3. Since relay Ry 8 is not yet actuated, this voltage will pass through the normally closed contacts to terminal Ry 8–3 and actuate the sweet vermouth solenoid. The same voltage serves to actuate relay Ry 8, however, since a path to the DC return is provided through the relay coil and diode CR 4. Upon closing the normally open contacts, terminals Ry 8–2 and Ry 8–3 are connected and a voltage is provided from contact H of microswitch 58*h*, through wafter switch arm 76 (assumed to be contact 7) and the normally open contacts of relay Ry 8 to maintain the relay and the sweet vermouth solenoid in the actuated condition until one-half ounce of sweet vermouth has been dispensed at which time arm 60*h* will be moved by cam 56*h* to the normally open contact.

It should be noted that actuation of the corresponding even numbered relay removes the latching voltage for the initially actuated odd numbered relay when the system is operated in the manual mode, thereby disengaging altogether the automatic dispensing circuit. Also, the single component push button switches may be used only with switch S22 in the manual position since they are connected to switch S22 contact 3 and thus receive voltage only when S22 contacts 3 and 4 are closed. It is therefore possible to select individually any quantity of a single component from ¼ ounce to 2 ounces.

Also indicated in FIG. 7 is a simplified inventory system for each bottle. The input terminal for the coil of each solenoid valve is also connected to a synchronous motor, connected on the other side to the DC return. Shown at the right of FIG. 7 is motor 78 arranged to drive a counting device 80 of any convenient, known design. One such arrangement is provided for each solenoid valve; since the amount of liquid dispensed is a function of the time for which a voltage is supplied to the solenoid coil and the same voltage is supplied for the same time to the motor, counting device 80 can be easily arranged to indicate the number of ounces dispensed through the associated valve since the counter was last reset.

An additional feature of the system is illustrated in FIG. 8. Tubing 40 is provided with a Y connection in advance of valve 46 to provide a vertical portion of tubing 82 with open end 84. Opaque float 86 is inserted in tubing 82 and is supported by the liquid therein, which tends to remain at the same height as the liquid in bottle holder 36. Bulb 88 is positioned on one side of float 86 and photocell 90 on the other side, a lighttight enclosure indicated diagrammatically by dotted lines 92 being provided so that light can reach the photocell only when float 86 is removed from the path of light from bulb 88. Photocell 90 is arranged in a circuit with an appropriate power supply to act as a switching device for bulb 94 in response to light impinging on the photocell. Float 86 is of such length and buoancy, and the branches of tubing 40 and 82 so arranged with respect to valve 46 that at least an upper portion of the float remains between bulb 88 and photocell 90 when any liquid is removed from tubing 82 due to dispensing through valve 46. Only when the liquid level falls below holder 36, or any other predetermined height, does photocell 90 receive light to actuate bulb 94.

In FIG. 5 a schematic circuit is shown for the refill indication system, and in FIG. 1 refill bulbs 94 are shown adjacent the push button switch for each of the separate liquid components. Bulb 88 is indicated in FIG. 5 as a resistance in a line directly connected to the 28v DC power supply. Photocell 90 may conveniently be chosen from a variety of commercially available devices of this type, the most common of which are 6 volt devices. Thus, a 6v DC power supply 96 is shown in FIG. 5 and bulb 94, of course, is a 6v bulb.

Diodes CR1 – CR 6 are provided to prevent actuation of the even numbered relays when switch S22 is in the automatic (open) position. Since a voltage is present at one side of the relay Ry2 coil, for example, the relay would be actuated by being connected to the DC return through the coil of relay Ry4 and the gin solenoid but for diode CR2.

As mentioned at the outset, the system may be modified in a number of ways and expanded to virtually any capacity while still retaining the basic principles of the invention. For example, rather than providing one selector dial for the liquor component and one for the mix, a separate selector dial could be provided for each wafer switch, thereby allowing different quantities of two different mixes, for example, to be selected in a single mixed drink. Likewise, only one wafer switch need be provided for all of the liquors and one for all of the mixers, if desired. Drinks with any number of components may be mixed by providing push button switches having a number of contacts equal to the number of components, plus a power contact. In any case, however, to provide both automatic and manual operation, as those terms have been defined herein, two sets of relays will be provided for each bottle or ingredient to be used.

What is claimed is:

1. Apparatus for dispensing a plurality of liquids singly or in predetermined combinations, the proportions of each liquid in such combinations being determined either automatically or selectively, and apparatus comprising, in combination:

a. a plurality of supply lines, one for each liquid to be dispensed;

b. a solenoid operated valve in each of said lines to control the quantity of liquid dispensed therethrough as a function of the time the valve is open;

c. electrical switching means controlling the voltage to operate said valves;

d. cam means movable in a time controlled manner to operate said switching means, and thereby said valves, in accordance with movement of said cam means;

e. relay means interposed between said switching means and each of said valves, actuation of said relay means being effective to initiate movement of said cam means and to complete a circuit between said switching means and said solenoids;

f. first manually operable means for selecting the liquid or combination to be dispensed and actuating said relay means;

g. second manually operable means movable between a first position, wherein the proportions of liquids in a selected combination are determined automatically, and a second position, wherein said proportions may be selectively determined; and

h. third manually operable means movable between a plurality of positions to effect selection of said proportions where said second means is in its second position.

2. The invention according to claim 1 wherein said relay means comprise a plurality of double pole, double throw relays, at least two of which are associated with each of said solenoid valves.

3. The invention according to claim 2 wherein two of said relays are associated with each of said solenoid valves, one being actuable to complete the circuit between its associated solenoid and said switching means when said second manually operable means is in its first position and the other completing said circuit when said second means is in its second position.

4. The invention according to claim 3 wherein said one of said relays is actuated by said first manually operable means in both positions of said second manually operable means, and a latching voltage for said one relay is provided through said other relay only when said second manually operable means is in its first position.

5. The invention according to claim 1 wherein said cam means comprises a plurality of cams mounted for common movement by a synchronous motor.

6. The invention according to claim 5 wherein said switching means comprises a plurality of individual microswitches, each having an arm movable between first and second contacts by movement of an associated one of said cams.

7. The invention according to claim 6 wherein said arms are arranged to receive a voltage while said motor is running, whereby a voltage is received by the switch contact with which the arm is in contact.

8. The invention according to claim 7 wherein selected ones of said switch contacts are permanently connected to certain of said relay means which complete a circuit between said selected contacts and said solenoid valves when said second manually operable means is in its first position, thereby actuating the solenoid for the time during which said selected contacts receive a voltage.

9. The invention according to claim 6 wherein said third manually operable means comprises multiple contact switch means, each contact being connected to a different one of said microswitches, whereby the setting of said multiple contact switch means is effective to establish the one of said cams controlling actuation of at least one of said solenoid valves with which said multiple contact switch means is associated.

10. The invention according to claim 9 wherein a plurality of said multiple contact switch means, separately settable and associated with different ones of said solenoid valves, are provided.

11. The invention according to claim 10 wherein said multiple contact switch means comprise wafer switches and said first manually operable means comprise push button switches each effective to actuate relay means to dispense a different one or combination of said liquids.

12. The invention according to claim 1 and further including counter means associated with each of said solenoid valves and actuable therewith to indicate the cumulative quantity of liquid dispensed by each valve.

13. The invention according to claim 1 and further including visual indicating means associated with each liquid and actuable in response to its associated liquid falling below a predetermined level.

14. The invention according to claim 13 wherein said visual indicating means comprise an individual lamp bulb for each of said liquids operated in response to photoelectric sensing means.

15. The invention according to claim 14 wherein said sensing means comprise a light source and photocell, and each of said supply lines includes a branch line containing an opaque float supported between said light source and photocell by said liquid when the latter is at or above said predetermined level.

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