United States Patent

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[54] **DISPENSING SYSTEM**
7 Claims, 2 Drawing Figs.

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[51] Int. Cl. B67d 3/00
[50] Field of Search 222/52, 54, 181, 176; 212/86, 144, 145, 135, 136; 141/284, 104

[56] References Cited

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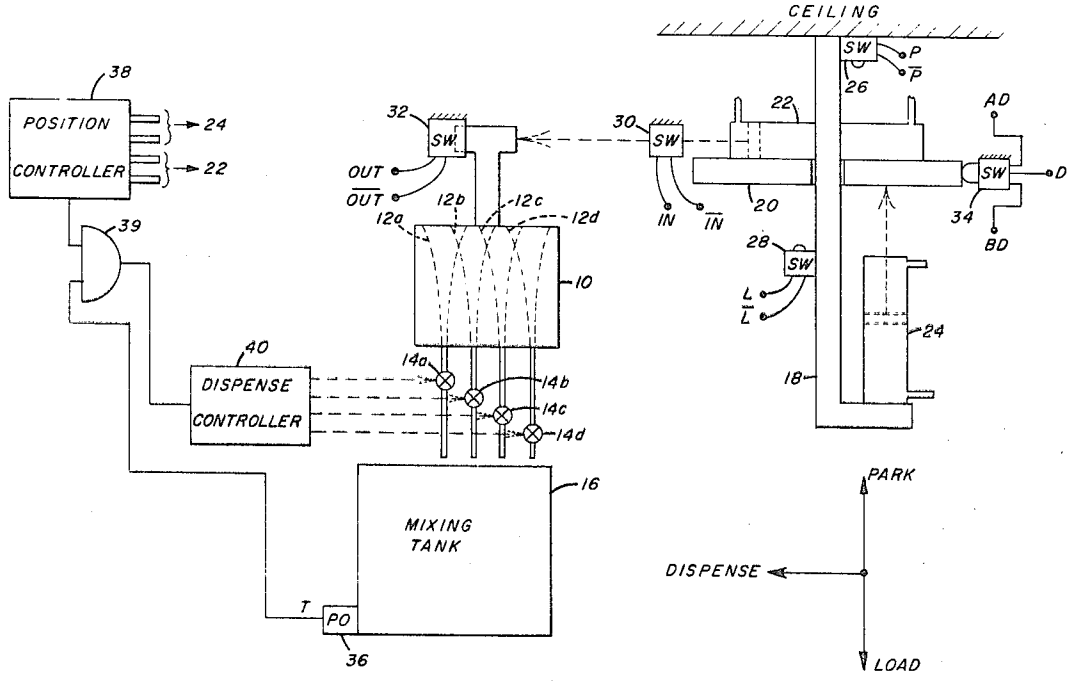
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ABSTRACT: Articulated apparatus for dispensing chemicals, or the like, into a vessel is disclosed. Dispensing of such chemicals can only occur if the position of the dispensing apparatus is complemented by a predetermined condition for the vessel, or its contents. The disclosure indicates the use of a "-program" circuit which allows various quantities of chemicals to be mixed in accordance with a certain time sequence for the respective chemicals; and such mixing may occur without the attendance of a technician.



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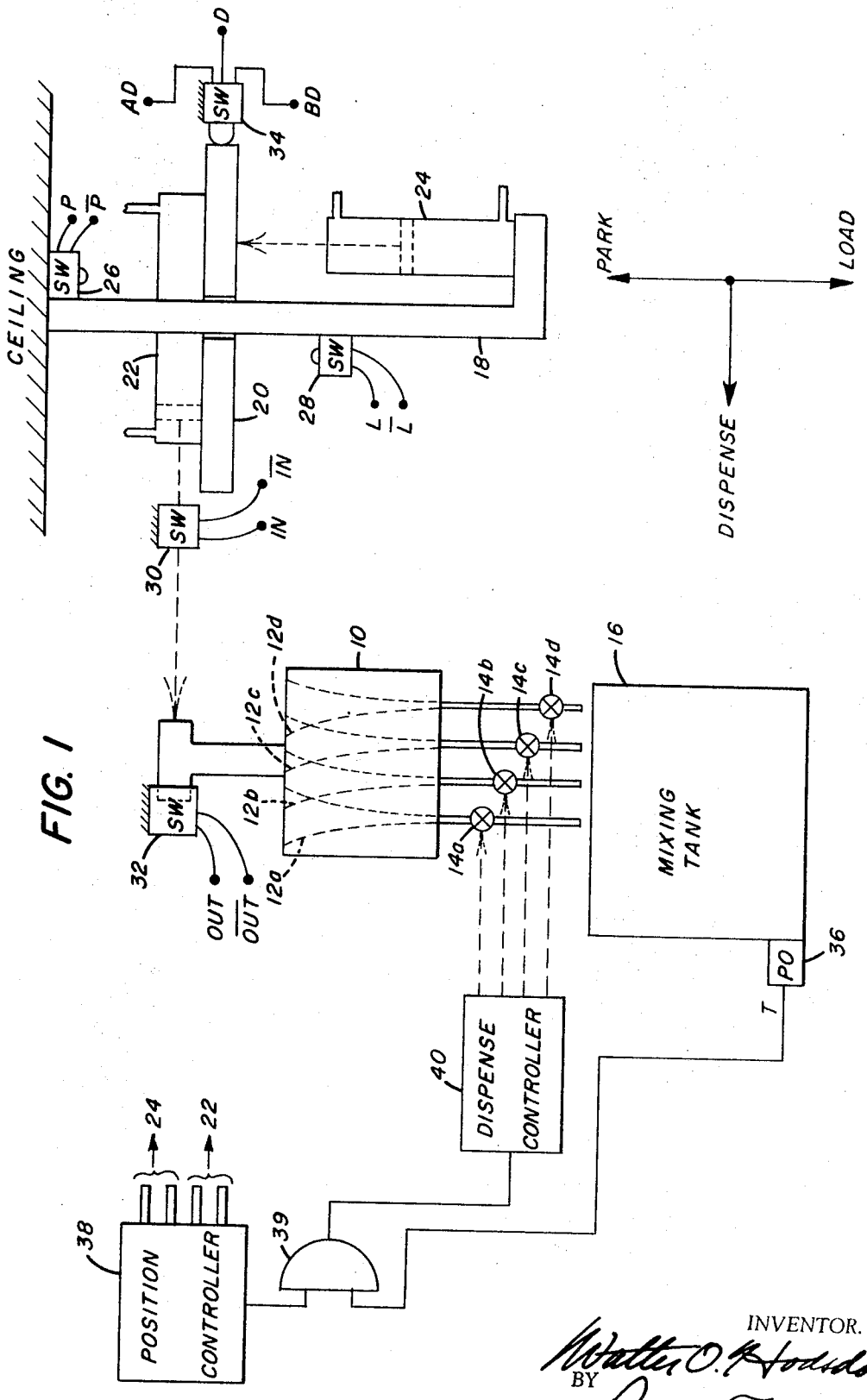


FIG. 1

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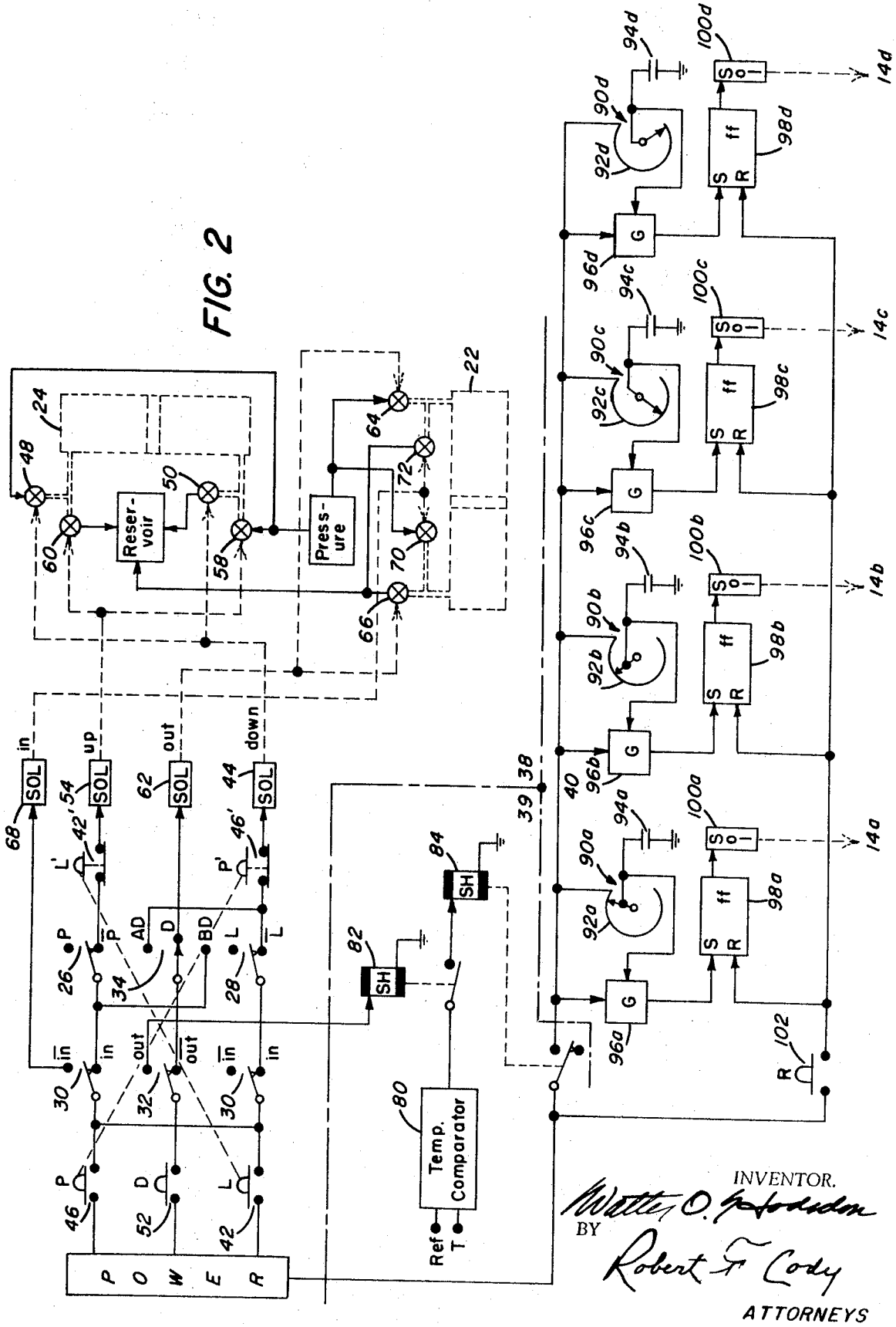
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FIG. 2



DISPENSING SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to systems for mixing chemicals, or the like. In particular, the invention provides positionable dispensing apparatus which may be easily stored and loaded; and which dispensing apparatus becomes operative when a certain of its positions is complemented by a given condition for a mixing tank (or its contents) into which such apparatus is to discharge its load. In its presently preferred form, apparatus according to the invention includes respective dispensers for the various chemicals, each such dispenser being programmed to discharge its respective load at a respective time, but only provided the above indicated complementing has occurred.

2. Description Relative to the Prior Art

A chemical batch frequently requires that the individual chemicals thereof be added together in accordance with a particular time sequence. The addition of large quantities of chemicals into a mixing tank or vessel may be physically difficult for a technician to handle (and, therefore, difficult to time); and wasteful of technician-time—which can better be spent doing other chores.

The most relevant known prior art may be found in U.S. Pat. Nos. 3,245,585, 3,319,637, and 3,435,247.

SUMMARY OF THE INVENTION

Apparatus according to the invention embodies a dispenser unit which is articulated to a ceiling-supported hoist. Pushbutton controls are provided for selectively hoisting the dispenser unit up to a ceiling-disposed PARK position; for positioning the dispenser unit to a floor-disposed LOAD level; and for positioning the dispenser unit away from the hoist—but over a mixing tank—to a DISPENSE position. The dispenser unit embodies a plurality of individual dispensers for respective chemicals; and such chemicals are added to the mixing tank in accordance with a technician-programmed sequence. Initiation of such programmed sequence occurs if the dispenser unit is in its DISPENSE position; and if a certain condition (e.g. temperature) for the mixing tank has occurred.

Efficient use of the invention obtains as follows: The LOAD pushbutton is actuated to bring the dispenser unit, say from its ceiling-disposed PARK position, to its LOAD position. The individual dispensers of the dispenser unit are filled—by the technician—with respective chemicals; and when the mixing operation is to be started, the technician actuates the DISPENSE pushbutton. The dispenser unit is hoisted to its DISPENSE level; and then moved out over the mixing tank. Coincidence of such positioning of the dispenser unit together with a certain condition, say temperature, for the mixing tank or its contents, initiates initiates preselected time sequence programmed by the technician. While the sequenced mixing is taking place, the technician, rather than stand in attendance at the mixing tank, may ready other chemicals for a new batch thereof. Then, if desired, the above LOAD-DISPENSE procedure may be repeated; or the PARK button may be actuated to hoist the dispensing unit, for storage thereof, to its ceiling location.

An object of the invention is to provide improved apparatus for dispensing chemicals, or the like, into a vessel.

Another object of the invention is to provide apparatus for discharging a chemical, or chemicals, from a dispenser unit, into a vessel, when a certain position for such unit complements a certain condition for such vessel.

Another object of the invention is to provide dispensing apparatus for selectively discharging chemicals into a vessel when a certain condition of the vessel is complemented by a certain position for such apparatus, such chemicals being selectively discharged into such vessel according to a certain programmable time sequence.

Another object of the invention is to provide a dispensing unit which is articulated to a ceiling-supported hoist, and which unit selectively discharges chemicals into a vessel when a certain condition of the vessel is complemented by a certain position for the dispensing unit, such chemicals being selectively programmed into such vessel according to a certain time sequence.

The invention will be described with reference to the figures:

FIG. 1 is a schematic block diagram illustrating dispensing apparatus according to the invention, and

FIG. 2 is a diagram illustrating the electrical and hydraulic details of control circuits for carrying out the invention.

Referring to FIG. 1, a dispensing unit **10** has a plurality of bins **12***a*, **12***b*—which serve as individual dispensers for respective chemicals. The individual dispensers discharge their respective contents via respective solenoid-actuable valves **14***a*, **14***b*—; and mixing tank **16** is adapted to receive such dispenser contents.

The dispensing unit **10** is articulated to a hoist **18** which is supported from the ceiling of the building housing the dispensing system. A vertically positionable traveller **20** rides on the hoist **18**; and supports a hydraulic cylinder **22** for horizontally positioning the dispensing unit **10**. The hoist **18** supports a hydraulic cylinder **24** for vertically positioning the traveller **20**.

Switches are provided to indicate the position of the articulated dispensing unit **10**: A switch **26** indicates whether the dispensing unit **10** is in its PARK (P) position, or not so positioned ($\overline{P}$); a switch **28** indicates whether the dispensing unit **10** is in its LOAD (L) position, or not so positioned ($\overline{L}$); a switch **30** indicates whether the dispensing unit is adjacent (IN) to its hoist **18**, or not so positioned ($\overline{IN}$); and a switch **32** indicates whether the dispensing unit **10** is at its dispensing location (OUT), or not so positioned ($\overline{OUT}$). A switch **34** is also provided to indicate whether the dispensing unit **10** is at its dispense (D) level; below such level (BD); or above such level (AD).

The condition, e.g. temperature, of the mixing tank **16** or its contents is sensed by a suitable pickoff **36**; and actuation of the hydraulic cylinders **22**, **24** is by means of a position controller **38**. In accordance with the invention, a dispensing unit controller **40**—actuable when the DISPENSE position of the dispensing unit **10** is complemented, at the input to an AND device **39**, by a certain condition for the mixing tank **10**—sequences the actuation of the valves **14***a*, **14***b*.

Referring to FIG. 2, representative dispense and position controllers **38**, **40** for practicing the invention are indicated. To facilitate an understanding of such controllers, the description is directed to their respective modes of operation. Assuming the dispensing unit is unloaded, and in its PARK position: the technician actuates a normally open LOAD pushbutton switch **42**, thereby applying power to a solenoid **44** via the switches **30** (IN) and **28** ($\overline{L}$), and via a normally closed pushbutton switch **46'**. The solenoid **44** opens valves **48**, **50** respectively causing pressure fluid to be applied to and exhausted from the hydraulic cylinder **24**. Thus the traveller **20** and the dispense unit **10** move **48**, **50** down" to the LOAD level; and when such level is reached, power is removed from the solenoid **44** by action of the switch **38** (L), thereby causing the valves **48**, **50** to close.

The technician then fills the respective bins **12***a*, **12***b*—with previously prepared chemicals; and he sets the dispense program (as will be described below).

When it is desired to initiate batch mixing, the technician actuates a normally open DISPENSE pushbutton switch **52**; and he holds such switch closed until the dispensing unit is in its dispensing position. Holding the DISPENSE switch **52** closed causes power to be applied first to a solenoid **54** via the switch **32** ($\overline{OUT}$), **34** (BD) and **26** ($\overline{P}$), and via a normally closed pushbutton switch **42'**. The solenoid **54** opens valves **58**, **60**, respectively applying fluid to and exhausting fluid from the hydraulic cylinder **24**. The traveller **20** and dispensing unit

10 thus move to the dispensing level at which time power is switched (switch 34, D) to a solenoid 62. The solenoid 62 opens valves 64, 66 causing fluid to be applied to and exhausted from the hydraulic cylinder 22, thereby moving the dispensing unit 10 out over the mixing tank 16. When the dispensing unit 10 is so positioned, power is removed from the solenoid 62—causing the valves 64, 66 to close—by action of the switch 32 (OUT). If, assuming the preselected dispense program has been completed, the technician desired to repeat the load-and-dispense sequence, he would again actuate the LOAD pushbutton switch 42. This causes power to be applied to a solenoid 68 via the switch 30($\overline{\text{IN}}$), thereby opening valves 70, 72 and causing fluid to be respectively applied to and exhausted from the hydraulic cylinder 22. When the dispensing unit 10 is "in," the switch 30 actuates to its IN position; causing power to be applied to the solenoid 44 via the switches 30, 28 and 46', thereby moving the dispensing unit down to its LOAD level. The dispensing operation may then be repeated, as above.

After the programmed dispensing operation is over, the dispense unit 10 may be parked at its ceiling location by actuation of a pushbutton PARK switch 46. Since the dispensing unit 10 is, at this time, away from its hoist 18 the switch 30 is in its ($\overline{\text{IN}}$) position, causing actuation of the solenoid 68. Once the dispensing unit 10 reaches its "in" position, however, power is switched to the solenoid 54 via the switches 30 (IN), 26 ($\overline{\text{P}}$) and 42', thereby causing the dispensing unit 10 to move up to its PARK position.

As above stated, an important requirement of the invention is the complementing of the "dispense" position of the dispensing unit 10 by a "set" condition for the mixing tank 16. The "set" condition for the mixing tank occurs when the pickoff (36) signal T is the same as a preset reference signal; and such signals are compared in a comparator 80. The comparator may, for example, be like the circuit shown and described in Massachusetts Institute of Technology Radiation Laboratories, Volume 19, page 343, McGraw Hill Book Company, New York. When the dispensing unit 10 is in its DISPENSE position, a self-holding relay 82 (self-holding contacts not shown) gets energized via the switch 32 (OUT); and assuming the required condition for the mixing tank 16 has been reached, a self-holding relay 84 is actuated by the comparator 80. (Suitable interlocks or the like may be provided for deenergizing the self-holding relays 82, 84 as required). Thus, when the relays 82 "and" 84 are both simultaneously energized, the timed actuation of the dispenser valves 14*a*, 14*b*—may commence in accordance with the sequence programmed by the technician.

Programming obtains as follows: The technician sets timing circuits 90*a*, 90*b*—for the respective dispensers 12*a*, 12*b*—whereby the dispenser valves 14*a*, 14*b*—will be opened at their respective selected times. Each timing circuit includes a rheostat 92; and a capacitor 94 which is charged via its respective rheostat. At the instant the relay 84 actuates in response to the above-discussed complementary conditions, the capacitors 94*a*, 94*b*—start to charge. The capacitor 94*a*—its corresponding rheostat set for an early time—charges first; and when charged opens a gate circuit 96*a*. When the gate circuit 96*a* opens, a flip-flop circuit 98*a* is SET, thereby energizing a solenoid 100*a* which opens the "first" dispenser valve 14*a*. The other timing circuits 90*b*, 90*c*, 90*d* similarly cooperate—with respective gate circuits 96*b*, 96*c*, 96*d*; and with respective flip-flop circuits 98*b*, 98*c*, 98*d*; and with respective solenoids 100*b*, 100*c*, 100*d*—to open dispenser valves 14*b*, 14*c*, 14*d* at respective later times. A reset pushbutton switch 102 is provided to reset the flip-flop circuits 98*a*, 98*b*, —thereby to deenergize their respective solenoid 100*a*, 100*b*—. This allows the dispenser bins 12*a*, 12*b*—to be filled again for a repeat dispense program.

The gate circuits 96*a*, 96*b*—may be, or include, lamps thereby to indicate when the respective dispensers discharge.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variation and modifications can be effected within the spirit and scope of the invention.

I claim:

1. Apparatus for dispensing substances into a vessel comprising:
   a. dispensing means,
   b. means, for positioning said dispensing means from at least one nondispensing position to a dispensing position,
   c. means for registering when said dispensing means is in its dispensing position,
   d. means responsive to a given vessel condition, and
   e. logical AND circuit means cooperative with said registration means and said responsive means for actuating said dispensing means when said dispensing means is in its dispensing position and when said vessel has said given condition.

2. The apparatus of claim 1 wherein said means responsive to a vessel condition is temperature responsive means.

3. The apparatus of claim 1
   a. wherein said dispensing means comprises a plurality of individual dispensers,
   b. wherein said apparatus includes respective means for discharging the contents of the said individual dispensers, and
   c. wherein said apparatus further includes respective circuit means for actuating said respective discharging means in accordance with a predetermined sequence, each said actuating circuit means comprising:
      1. a manually adjustable RC circuit,
      2. a flip-flop circuit,
      3. means for setting sad flip-flop circuit in response to a predetermined potential across the capacitor of said RC circuit, and
      4. a solenoid actuator cooperative with a respective dispenser discharging means and responsive to the setting of said flip-flop circuit.

4. The apparatus of claim 3 wherein said means responsive to a vessel condition is temperature responsive means.

5. The apparatus of claim 3 wherein said means for positioning said dispensing means is adapted to position said dispensing means selectively to positions above and below the input to said vessel, but to one side of said vessel; and wherein said means for positioning said dispensing means is further adapted to position said dispensing means directly over the input to said vessel.

6. Articulated apparatus for dispensing chemicals or the like into a vessel comprising:
   a. a ceiling supported hoist disposed to one side of said vessel,
   b. a traveller supported by and vertically positionable on said hoist,
   c. first positioning means for vertically positioning said traveller on and along said hoist,
   d. a dispensing unit coupled to said traveller,
   e. second positioning means for horizontally positioning said dispensing unit away from said hoist and over said vessel,
   f. control means cooperative with said first and second positioning means for selectively positioning said dispensing unit vertically between park and load locations, and for positioning said dispensing unit horizontally to a dispense location, and
   g. logic AND circuit means for discharging said dispensing unit in response to a complementary predetermined condition for said vessel and a dispense location for said dispensing unit.

7. The apparatus of claim 6 wherein said dispensing unit includes respective dispenser bins for respective chemicals, or the like, and wherein said apparatus includes programming means for timing the discharge of such bins, said programming means comprising respective discharging means for controlling the discharge of said bins, each said discharging means comprising:
   a. a manually adjustable RC circuit,

b. a flip-flop circuit,

c. means for setting said flip-flop circuit in response to a predetermined potential across the capacitor of said RC circuit, and

d. a solenoid actuator cooperative with a respective bin to discharge said bin, said solenoid actuator being responsive to the setting of said flip-flop circuit.