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[54] **AUTOMATIC SAFETY FEED SYSTEM FOR LIQUIDS**

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[52] **U.S. Cl.** **222/68**

[51] **Int. Cl.** **B67d 5/08**

[58] **Field of Search** 222/64, 67, 68

[56] **References Cited**

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[57] **ABSTRACT**

A unit system adapted to feed any number of liquid destinations on demand, especially dangerous liquids, and comprising a protected storage of said liquid, a motor driven pump means supplying said liquid into a holding means, a safety inlet valve governing flow of liquid from said pump means and into the holding means, and a flow outlet dispensing the said liquid; the invention residing in a motor and safety inlet control means responsive to high and low level sensors in said holding means so as to maintain a normal level therein, outlet safety means responsive to excessive flow in said outlet from the holding means and closing the safety inlet valve, and overflow safety means responsive to flooding of the holding means and overriding the motor control means. Utility resides in the adaptability to multiple installations wherein the fluid circuitry of each unit remains individually operable and protected while drawing from a common storage and motor driven pump means.

21 Claims, 3 Drawing Figures

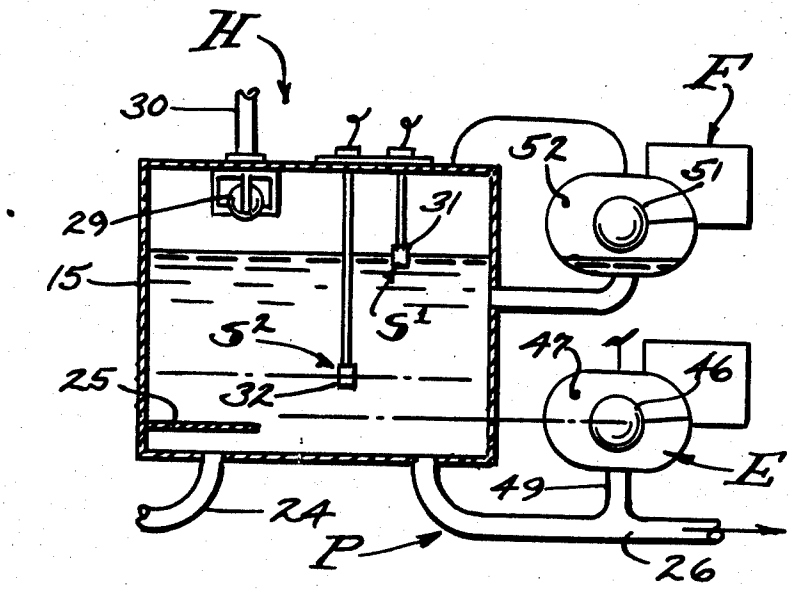

FIG. 1.

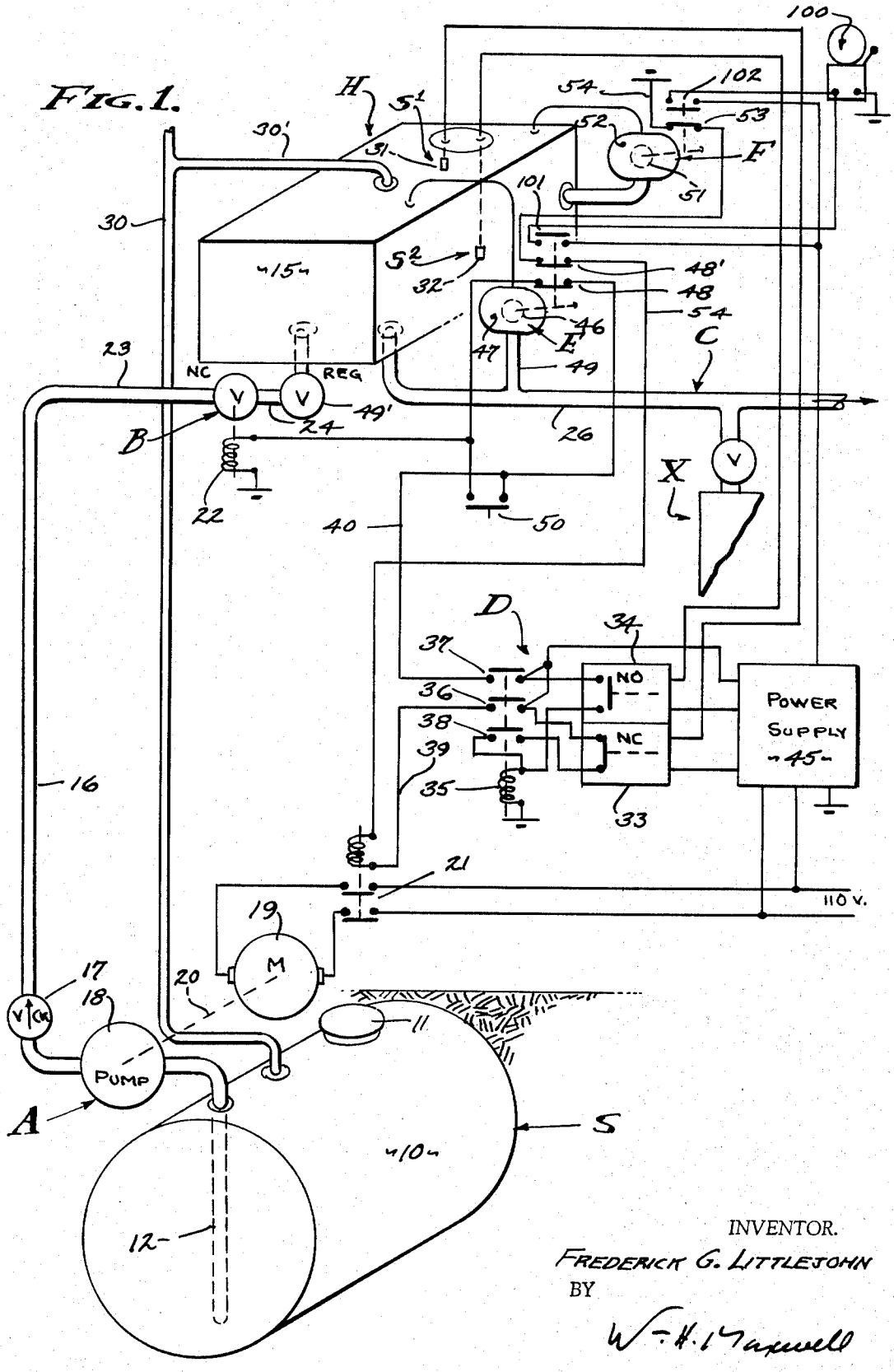

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FIG. 2.

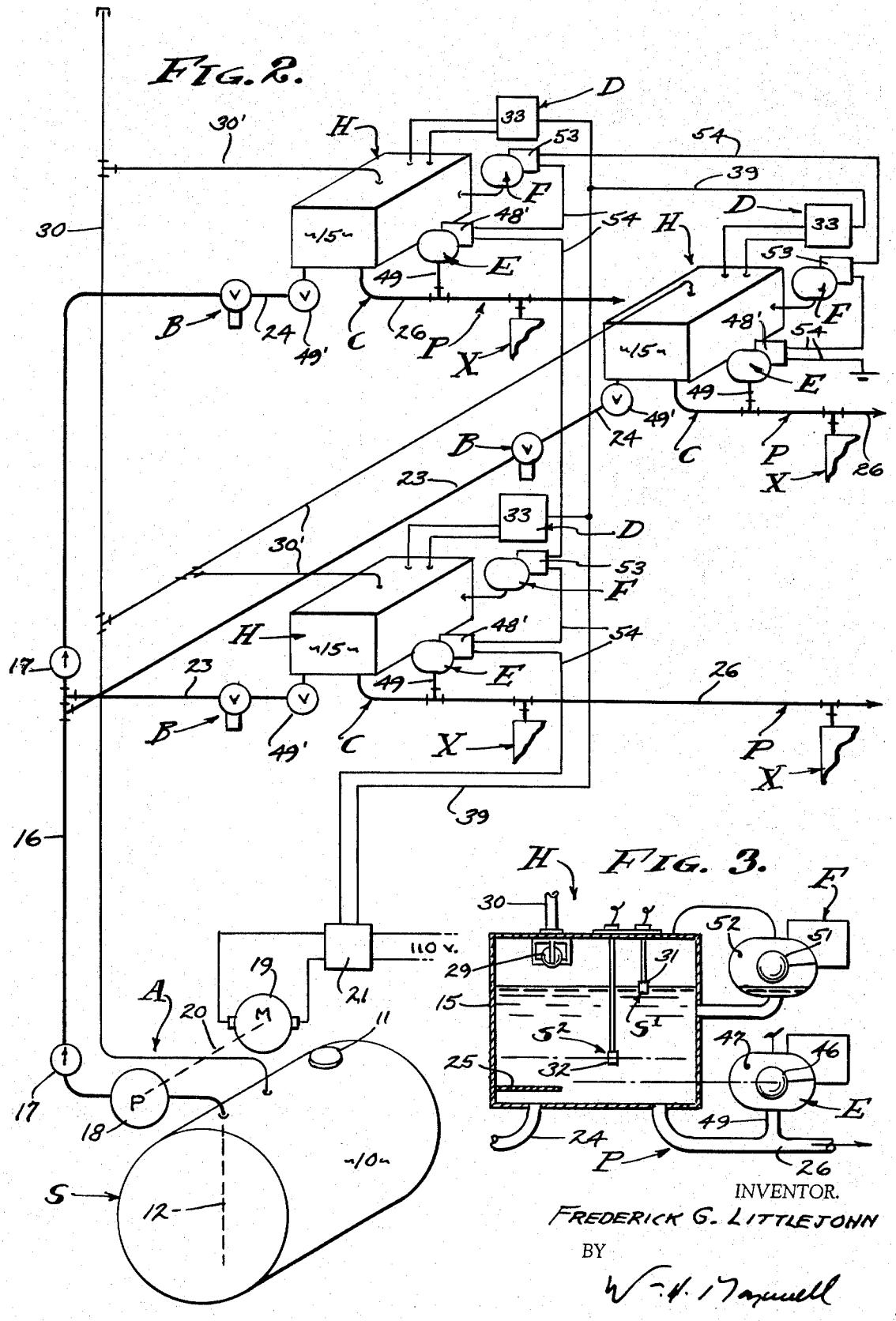

FIG. 3.

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AUTOMATIC SAFETY FEED SYSTEM FOR LIQUIDS

This invention is concerned with the storage and supply of dangerous liquids such as, for example, isopropyl alcohol as it is used to enhance the processes of printing wherein an admixture of water and alcohol, and/or each solution, and dampening solutions, are used in the fountains of printing presses. There are many fountain solutions that are used and for this reason there are many admixtures requiring various basic fluids, dispensation thereof being the subject matter of this disclosure. Further, the destination of liquids to be used commercially in a press facility, for example, is complex involving more than one press or pressroom and also involving more than one level of installation. Heretofore, it has been common practice to batch feed solution circulators and to replenish them manually with a bucket or bottle or canister of liquid and from time to time; there being a recognized purpose in said practice when dispensing a dangerously inflammable liquid such as alcohol. In practice, bulk storage of alcohol has been in drums confined within fireproof vaults, and the transfer of alcohol to the presses has been a manual time consuming service, but nevertheless accompanied by the prevalent danger in openly handling the inflammable liquid. Therefore, it is an object of this invention to provide a safe storage and automatic dispenser with fail-safe means protecting the supply and discharge of liquid to any one destination thereof.

When alcohol is used in the fountain solutions of printing presses, evaporation becomes a critical factor. Since alcohol evaporates faster than water, a predetermined mix is maintained in balance by means of hydrometer controlled mixture determining devices. Consequently, there is a continuous demand for supplement alcohol and in large printing installations the demand is burdensome and often difficult to meet with manual labor. Therefore, it is an object of this invention to provide an automated feed system for the liquid constituents of fountain solutions. With present circulators and hydrometer controlled supply of liquid thereto, it is the automated supply of liquid which is provided as hereinafter described.

An object of this invention is to provide a holding means and pressure supply of liquid that is immediately available to flow at the destination to which it is plumbed.

Another object of this invention is to provide a safety inlet valve opening into a holding means of a system of the character thus far referred to, a valve which is fail-safe to close when deactivated.

It is another object of this invention to provide an outlet safety means from a holding means of the character thus far referred to, a means sensing a flooding condition at the unit involved and thereupon deactivating the liquid pressure supply thereto, and necessarily interrupting the supply to other like units coupled in common therewith.

It is also an object of this invention to provide a serviceable system of the type referred to, wherein the storage of liquid can be supplemented at any time, wherein back flow is prevented, wherein electrical energization fully automates the feed and supply of liquid to each and every destination to which the system is plumbed, and wherein each unit operation is

individually initiated without affect upon other unit operations; and all to the end that recognized safety standards are for the first time more than complied with, safety heretofore neglected.

The various objects and features of this invention will be fully understood from the following detailed description of the typical preferred form and application thereof, throughout which description reference is made to the accompanying drawings, in which:

FIG. 1 is an electrical diagram and perspective schematic illustration of the liquid handling system unit.

FIG. 2 is a composite electrical block diagram and liquid schematic showing the cooperative arrangement of a plurality of fluid handling system units shown in FIG. 1.

FIG. 3 is a transverse section through the liquid handling means and taken as indicated by line 3—3 on FIG. 1.

The safety feed system for liquids is a system of units that are employed individually and/or cooperatively, to supply liquid to at least one and most advantageously to a plurality of destinations. The plumbing of liquid handling pipes varies widely as circumstances require to meet specifications involved with each terminal service thereof. In practice, each terminal service is controlled by a valve or the like, at the terminus of the plumbing pipe thereto or by control means within equipment being serviced, supplied with liquid. An inherent danger is, of course, the possibility that the flow controls might fail, or that accidental damage might result in drainage of liquid from the plumbing. In cases where dangerous liquids are being supplied, such as volatile and any number of active fluids, safety becomes critical and measures are to be considered in order to preclude the voluminous discharge of said liquids in the event of a malfunctioning of equipment and/or controls, or in the event of some accident or mistake which would normally result in the creation of dangerous conditions. Therefore, the present inventive concept involves a protected storage S of liquid to be dispensed, a limited supply of said liquid in a holding means H, and plumbing P extending to any number of equipment units X to be serviced. The distribution of liquid is accomplished with safety by employing the inventive concept which includes, generally, a motor driven pump means A supplying said liquid into the holding means H, a safety inlet valve B governing flow of liquid into the holding means H, a flow outlet C dispensing the said liquid into the plumbing P, a motor and safety inlet valve control means D responsive to high and low sensors S1 and S2 respectively, outlet safety means E responsive to excessive flow in outlet C, and overflow safety means F responsive to abnormal flooding of the holding means H. The elements and/or means A through F are cooperatively combined to govern the storage S, holding means H and plumbing P with fail-safe assurance of eliminating the hazards that usually accompany the handling of dangerous liquids.

The protected storage S is for the containment of bulk liquid, for example, inflammable alcohol, and comprises a tank **10** having a filler opening with a closure **11** and having a syphon tube **12** extending to the interior sump area of the tank. The tank **10** is preferably installed underground and is sizeable commensurate with the facility to be serviced thereby, said

underground installation being the acceptable safe way of storing inflammable liquids.

The holding means H is provided for the instantaneous supply of liquid to the plumbing P under a suitable head of pressure adapted to ensure immediately forceful flow of fluid into any one of the equipment units X. The holding capacity of means H can vary greatly and is limited for safety purposes, and means H is also a means for establishing a consistent head of pressure upon the fluid column within the plumbing P. Although various types of accumulators and/or fluid pressure supply or pumping devices with liquid volume reserve can be employed, an elevated holding tank **15** is preferred and which is of limited volume and located at a height so as to establish the desired head of pressure. From FIG. **1** of the drawings, it will be seen that the system unit involves an elevated holding tank **15** that receives liquid forced vertically through a supply or standpipe **16**, there being a foot-valve **17** immediately above the tank **10**, a checkvalve permitting vertical flow and preventing return of liquid to the tank.

Referring to FIG. **2** of the drawings, it will be seen that a multiplicity of safety feed systems are cooperatively combined and supplied from a common storage tank **10**, and that the separate feed systems are operable at co-levels and as well at multi-levels, it being a feature of the invention that each safety feed system is self-protective without interfering with the operation of the other cooperatively related systems, and that the systems are cooperatively protective as related commonly to the storage of liquid and motor operated pressure supply or lift therefor. However, each safety feed system can and preferably remains identical one with the other, and virtually without change or modification, regardless of the number of units in the multiplicity thereof.

Each safety feed system involving a holding means H supplying a separate plumbing system P comprises the elements and means A through F hereinabove referred to, supplied with liquid from the protected underground storage tank S and supplied with operational energy from the usual commercial electrical power lines **14**. And the multiplicity of individual systems being identical and/or essentially alike, a description of the elements and means of one system (see FIG. **1**) will suffice for all.

The motor driven pump means A that supplies liquid into the holding means H is a fluid lift adapted to be electrically powered to transfer liquid from the storage tank **10** and into the elevated holding tank **15**. The form of pump can vary, the pump **18** being driven by an electric motor **19** through a drive shaft **20**. The foot-valve **17** is interposed between the pump **18** and standpipe **16**, thereby protecting the pump and maintaining the liquid column in said standpipe. As shown, the motor **19** is put into and out of service by means of a normally open relay **21** included in the circuitry of the control means D hereinafter described.

The safety inlet valve B is a normally closed valve that is opened by the control means D responsive to the depletion of a normal liquid level in the holding tank **15**. It is preferred that the system control be electrical in which case the valve B is a solenoid valve having an operating coil **22** adapted to energize a magnet that opens the valve. Valve B is disposed in a lateral pipe **23** extending from the standpipe **16**, there being a filler pipe **24** extending from the valve and opening into the holding tank **15**. It is preferred that the pipe **24** fill the tank **15** through the bottom thereof, there being a baffle **25** overlying the entrance in order to level the filling function.

The flow outlet C opens from the holding tank **15**, dispensing the liquid therefrom and into the plumbing P that provides the service to various equipment units X. It is preferred that the outlet C comprise a flow pipe **26** opening through the bottom of the tank **15**, from the tank at a sump or lowermost extremity thereof, in order to ensure depletion of liquid therein when so required.

The holding tank **15** is a closed vessel except for the aforementioned fill and outlet openings and except for a vent **30** that permits variation in the liquid level therein. In practice, the vent **30** opens to atmosphere from the top extremity of the tank, thereby establishing a breather to atmosphere. The safety feature, as best illustrated in FIG. **3**, is the provision of a float controlled shut-off valve **29** that ultimately closes the vent **30** in the event that motor driven pump means A does not cease to operate after liquid reaches a high level in tank **15**. For example, a malfunctioning motor relay could cause such an event. In practice, the pump **18** operates by centrifugal action and develops limited pressure well within the strength range of the tank and related piping. Thus, there can be no discharge of liquid through the vent **30**, as would be caused by continued operation of the pump **18**.

The motor and safety inlet valve control means D involves and is responsive to high and low liquid level sensors S1 and S2 located within the closed holding tank **15**. The control means D is preferably electrical with the utilization of solid state sensors and switches that respond to permissible high and low operational liquid levels within the tank. As best illustrated in FIG. **3**, the high and low level sensors S1 and S2 are electronic probes **31** and **32**, the former controlling a normally closed switching circuit **33** and the latter controlling a normally open switching circuit **34**. The switching circuits **33** and **34** are of the usual solid state electric design, equivalent to mechanically operated float actuated switches. In any case, an electrical circuit is closed when a low liquid level is reached, and said closed electrical circuit is opened when a high liquid level is reached. Accordingly, the control means D includes a holding relay having an operating coil **35** adapted to energize a magnet that closes a motor switch **36**, and an inlet valve switch **37**, and a holding circuit switch **38**. Initial operation of the relay is by means of closing the switching circuit **34** when the probe **32** is momentarily exposed above the lowering liquid level, thereby closing a motor relay circuit **39** to the motor relay **21** so as to close the same and simultaneously closing an inlet valve circuit **40** to the solenoid coil **22** to open the valve. The initiated operational condition is maintained through the holding circuit switch **38** in series through the switch **33** that is subsequently opened by rising of the liquid level to cover the probe **31** thereby stopping the motor driven pump means A and closing the safety inlet valve B. Note particularly the grounding of the relay coil **21** through the overflow safety means F later described.

In carrying out this invention, the motor relay coil **21** and valve solenoid coil **22** are energized and the sensor circuitry activated by a D.C. power supply **45**, in the case illustrated having a grounded circuit, and each feed system being self-sufficient in this respect.

The outlet safety means E that is responsive to excess flow in the outlet C can vary in form and in its preferred form is a liquid level sensor utilized to detect depletion of liquid in flow outlet C at a greater rate than normally permissible. Accordingly, the means E comprises a float **46** operable in a chamber **47** to open a normally closed switch **48** in series in circuit **40**, and to open a normally closed switch **48'** in series in circuit **54** later described. The chamber **47** is in open communication through a connection **49** with the flow pipe **26** and is vented into the top of the closed tank **15**. The connection **49** is of greater flow capacity than the flow capacity of the pump **18**, so that the liquid level in chamber **47** will drop even though supplied with the full force of said pump. In practice, the flow capacity from pump **18** is adjusted by means of a gate valve **49'** that discharges into the tank **15**. Thus, the opening of switch **48** overrides the demand for liquid made by sensor **S2**; and to facilitate reactivation of the system in the event of a temporary depletion, a normally open push button switch **50** is provided to activate the motor relay **21** until such time as the flow pipe **26** is filled to thereby permit closing of switch **48**.

The overflow safety means F that is responsive to flooding of the holding means H can vary in form and in its preferred form is a liquid level sensor utilized to detect an excessive level of liquid in the tank **15**. The means F is preferably mechanical and independent of the electrical circuitry which can malfunction under adverse circumstances, as in the event of a catastrophe. As shown in its preferred form, the means F is a liquid level sensor utilized to detect the rise of liquid to the top of the tank **15**. Accordingly, the means F comprises a float **51** operable in a chamber **52** to open a normally closed switch **53** in series with relay coil **21** through a circuit **54**. The circuit **54** continues through the switch or switches **53** and extends to ground as shown. The chamber **52** is open into tank **15** well below the upper liquid level limit, and is vented into the top of the closed tank **15**. Therefore, the motor relay is inoperative in the event that the rise of liquid in standpipe **16** floods the holding tank **15**.

In accordance with the invention, the outlet safety means E and overflow safety means F are cooperatively operative to open the circuit **54** which normally grounds the relay **21**. As shown throughout the drawings the switch or switches **48'** are also in series in the circuit **54** to be opened by a lowering of liquid level to an abnormal level in the float chamber **47**. Therefore, the motor **19** is stopped simultaneously with closing of the valve B when any one of the switches **48'** is opened.

Referring now to the cooperative composite of liquid feeding units as shown in FIG. **2**, it will be observed that there is a multiplicity of units at one level, as well as units at various levels. However, there is but one liquid storage S and motor powered liquid lift or means A, a common motor relay circuit **39**, and a common flood safety circuit **54**. The energized side of the motor relay coil **21** is in parallel through circuit or circuits **39** with each and every relay switch **33** and is thereby operable upon demand from any one or all units. However, the grounded side of the motor relay coil **21** is in series through circuit **54** with each and every flood detecting switch **53** and is thereby effective to override any and all demand signals. Thus, any malfunctioning is limited to one but necessary motor controlling relay, known to be most reliable; said possible malfunctioning thereof being protected against by the flood controlled shut-off valve **29** that closes the vent **30** in case of continued flooding.

The plumbing of the cooperative composite in multiplicity form and at various levels involves the standpipe **16** and the footvalve **17** at the base of each level. As shown, the footvalve **17** at the base of each successively higher level is located immediately above the lateral pipe **23** of the next lower level, said pipe **23** extending horizontally to the multiplicity of holding means H, each controlled by a safety inlet valve B included in the elements A through F as hereinabove described. The vent **30** extends well above the lateral pipe **23** of the uppermost level, being openly connected to the storage tank **10** and to the multiplicity of holding means H at the one level (in each instance) by means of a lateral vent pipe **30'**. As illustrated in FIG. **2**, the individual safety feed systems remain independently operable while cooperating to the extent of being fed with liquid from a common underground storage tank S and through a common pump means A, and while protecting themselves individually as well as collectively in the event of any malfunction that might result in otherwise uncontrolled discharge of liquid.

In the event that either the outlet safety means E or the overflow safety means F is activated by an abnormal low or high liquid level respectively, a warning of these conditions is effected by an alarm means **100**; preferably in the form of an audible device. As shown, the means **100** is a bell that is electrically activated from the power supply **45** through normally open switches **101** and **102** as the means E and F and which are in each instance closed by lowering and/or lifting of the float **46** and/or **51** respectively. The switching circuits to the bell are in parallel so that there is a warning in case of the liquid level reaching an extreme in the holding tank **15**.

From the foregoing, it will be seen that an automated safety feed system is provided for safe handling of dangerous liquids, a system that is utilitarian singularly as well as in multiple cooperative form. The unit system is employed without change singularly or in plurality, and in all cases is independently protective, enhanced by the capability of being collectively protective; and all to the end that handling of said dangerous liquids is made as safe as possible, even under adverse conditions which might occur.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any modifications or variations that may appear to those skilled in the art:

Having described my invention, I claim:

1. A self-protective safety feed system for supplying liquid on demand from a storage tank, and comprising; a powered motor driven pump means, a liquid holding means receiving liquid through a supply pipe forced

from the storage tank by said pump means, a normally shut and power opened safety inlet valve in and controlling liquid flow through said supply pipe, a valve controlled liquid flow outlet pipe from and dispensing liquid out of said liquid holding means, and a motor power and safety inlet valve power control means having a liquid level sensor in a chamber in open communication with the outlet pipe and responsive to depletion of liquid in said outlet pipe, the power control means being activated by a liquid level sensor in said liquid holding means to power the motor driven pump means so as to force liquid through the supply pipe and to power the safety inlet valve so as to open and thereby admit liquid into the said holding means until the first mentioned sensor deactivates the said power control means to stop the motor and close the valve.

2. The self-protective safety feed system as set forth in claim 1 and wherein the liquid holding means is a liquid accumulator.

3. The self-protective safety feed system as set forth in claim 1 and wherein the liquid holding means is a fluid pressure supply device with liquid volume reserve.

4. The self-protective safety feed system as set forth in claim 1 and wherein the liquid holding means is an elevated vessel.

5. The self-protective safety feed system as set forth in claim 1, wherein the liquid holding means is an elevated vessel, and wherein the power control means includes low and high level liquid sensors within said vessel, the former to activate the inlet valve and motor driven pump means and the latter to deactivate the said inlet valve and motor driven pump means.

6. A self-protective safety feed system for supplying liquid on demand from a storage tank, and comprising; a powered motor driven pump means, liquid holding means in the form of an elevated vessel receiving liquid through a supply pipe forced from the storage tank by said pump means, a normally shut and power opened safety inlet valve in and controlling liquid flow through said supply pipe, a valve controlled liquid flow outlet pipe from and dispensing liquid out of said liquid holding means, a motor power and safety inlet valve power control means having a sensor means in said liquid holding means and responsive to depletion of liquid therein and activated to power the motor driven pump means so as to force liquid through the supply pipe and to power the safety inlet valve to open and thereby admit liquid into the said holding means until the said sensor means deactivates the said last mentioned control means to stop the motor and close the valve, and including a liquid flow outlet safety means responsive to excessive flow in said outlet from the holding means and deactivating the motor and valve.

7. The self-protective safety feed system as set forth in claim 6, including a liquid flow outlet safety means comprising a float operated control deactivating the motor and safety inlet valve responsive to excessive flow depleting a normal level therein.

8. The self-protective safety feed system as set forth in claim 6, including a liquid overflow safety means responsive to flooding of the said vessel and deactivating the motor.

9. The self-protective safety feed system as set forth in claim 6, including a normally open vent and shut-off valve therefor closed by flooding of liquid to an excessively high level within said closed vessel.

10. The self-protective safety feed system as set forth in claim 6, wherein the liquid holding means is a closed vessel elevated with respect to placement of the storage tank, wherein a checkvalve is in the supply pipe immediately above the storage tank and faced to prevent return of liquid to said tank, wherein the sensor means includes low and high level liquid sensing means within said vessel, the former to activate the said power control means and the latter to deactivate the said power control means, a liquid flow outlet safety means comprising a float operated control deactivating the motor and safety inlet valve responsive to excessive flow depleting a normal level therein, a liquid overflow safety means comprising a float operated control deactivating the motor responsive to flooding of the said vessel, and a normally open vent and shut-off valve therefor closed by flooding of liquid to an excessively high level within said closed vessel.

11. An electrically energized self-protective safety feed system for supply of liquid on demand from a storage tank, and comprising; an electrically powered motor driven pump means, a liquid holding means receiving liquid through a supply pipe forced from the storage tank by said pump means, a normally shut solenoid opened safety inlet valve in and controlling liquid flow through said supply pipe, a valve controlled liquid flow outlet pipe from and dispensing liquid out of said liquid holding means, and an electrical power supplied motor power and safety inlet valve power control means having a liquid level sensor in a chamber in open communication with the outlet pipe and responsive to depletion of liquid in said outlet pipe, the power control means being activated by a liquid level sensor in said liquid holding means to electrically power the motor driven pump means so as to force liquid through the supply pipe and to electrically power the safety inlet valve so as to open and thereby admit liquid into the said holding means until the first mentioned sensor deactivates the said power control means to stop the motor and close the valve.

12. The electrically powered self-protective safety feed system as set forth in claim 11, wherein the liquid holding means is an elevated vessel, and wherein the power control means includes low and high level liquid sensing switch operating means within said vessel, the former closing a switch to electrically activate the said power control means and the latter opening a switch to deactivate the said power control means.

13. An electrically energized self-protective safety feed system for supply of liquid on demand from a storage tank, and comprising; an electrically powered motor driven pump means, a liquid holding means in the form of an elevated vessel receiving liquid through a supply pipe forced from the storage tank by said pump means, a normally shut solenoid opened safety inlet valve in and controlling liquid flow through said supply pipe, a valve controlled liquid flow outlet pipe from and dispensing liquid out of said liquid holding means, an electrical power supplied motor power and safety inlet valve power control means having a sensor means in said liquid holding means and responsive to depletion of liquid therein and activated to electrically power the motor driven pump means so as to force liquid through the supply pipe and to electrically power the safety inlet valve to open and thereby admit liquid into the said holding means until the said sensor means

deactivates the said last mentioned control means to stop the motor and close the valve, and including a liquid flow outlet safety means comprising a float operated control switch electrically deactivating the said motor and safety inlet valve responsive to excessive flow depleting a normal level therein.

14. The electrically powered self-protective safety feed system as set forth in claim 13, including a liquid overflow safety means comprising a float operated control switch electrically deactivating the motor responsive to flooding of said vessel.

15. The electrically powered self-protective safety feed system as set forth in claim 13, wherein the liquid holding means is a closed vessel, wherein a checkvalve is in the supply pipe immediately above the storage tank and faced to prevent return of liquid to said tank, wherein the sensor means includes low and high level liquid sensing switch operating means within said vessel, the former closing a switch to electrically activate the said power control means and the latter opening a switch to deactivate the said power control means, a liquid flow outlet safety means comprising a float operated control switch electrically deactivating the motor and safety inlet valve responsive to excessive flow depleting a normal level therein, a liquid overflow safety means comprising a float operated control switch electrically deactivating the motor responsive to flooding of the said vessel, and a normally open vent and shut-off valve therefor closed by flooding of liquid to an excessively high level within said closed vessel.

16. In combination, a multiplicity of self-protective safety feed systems for separately supplying liquid on demand from a common storage tank and powered motor driven pump means, and each feed system including; a liquid holding means receiving liquid through a supply pipe forced from the storage tank by said pump means, a normally shut and power opened safety inlet valve in and controlling liquid flow through said supply pipe, a valve controlled liquid flow outlet pipe from and dispensing liquid out of said liquid holding means, and motor power and safety inlet valve controlled means having a liquid level sensor in a chamber in open communication with the outlet pipe and responsive to depletion of liquid in said outlet pipe, the power control means being activated by a liquid level sensor in said liquid holding means to power the motor driven pump means so as to force liquid through the supply pipe and to power its safety inlet valve so as to open and thereby admit liquid into the said holding means until the first mentioned sensor deactivates the said last mentioned control means to stop the motor and close its valve.

17. In combination, a multiplicity of self-protective safety feed systems for separately supplying liquid on demand from a common storage tank and powered motor driven pump means elevated at multilevels and each level fed with liquid from a common standpipe supplying liquid forced from the storage tank by said pump means, and each feed system including; a liquid holding means receiving liquid through a supply pipe forced from the storage tank by said pump means, a normally shut and power opened safety inlet valve in and controlling liquid flow through said supply pipe, a valve controlled liquid flow outlet pipe from and dispensing liquid out of said liquid holding means, motor power and safety inlet valve controlled means having a sensor means in said liquid holding means and responsive to depletion of liquid therein and activated to power the motor driven pump means so as to force liquid through the supply pipe and to power its safety inlet valve to open and thereby admit liquid into the said holding means until the sensor means deactivates the said last mentioned control means to stop the motor and close its valve, the supply pipes of each safety feed system extending laterally from said standpipe, and there being an upwardly faced checkvalve in said standpipe immediately above the storage tank and immediately above said laterally extending supply pipe at each level so as to prevent return of liquid through said standpipe and to said tank.

18. The combined multiplicity of self-protective safety feed systems as set forth in claim 17, wherein an electrically powered relay starts and stops the pump motor, and wherein the sensor means includes low and high level liquid sensing switch operating means within said holding means and a parallel electrical circuit therefrom to said relay to start and stop the motor.

19 The combined multiplicity of self-protective safety feed systems as set forth in claim 17, wherein an electrically powered relay starts and stops the pump motor, and wherein a liquid overflow safety means comprising a float operated control switch electrically in series with said relay deactivates the same responsive to flooding of the holding means to stop the motor.

20. The combined multiplicity of self-protective safety feed systems as set forth in claim 17, wherein an electrically powered relay starts and stops the pump motor, wherein the sensor means includes low and high level liquid sensing switch operating means within said holding means and with a parallel electrical circuit therefrom to said relay to start and stop the motor, and wherein a liquid overflow safety means comprising a float operated control switch electrically in series with said relay deactivates the same responsive to flooding of the holding means to stop the motor.

21. The combined multiplicity of self-protective safety feed systems as set forth in claim 17, wherein an electrically powered relay starts and stops the pump motor, wherein the sensor means includes low and high level liquid sensing switch operating means within said holding means and with a parallel electrical circuit therefrom to said relay to start and stop the motor, and wherein a liquid overflow safety means comprising a float operated control switch electrically in series with said relay deactivates the same responsive to flooding of the holding means to stop the motor.

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