Dec. 28, 1965 R. E. LEOBECK 3,225,962

METHOD OF AND MEANS FOR SUPPLYING ADDITIVE TO A FLUID

Filed July 16, 1964 4 Sheets-Sheet 1

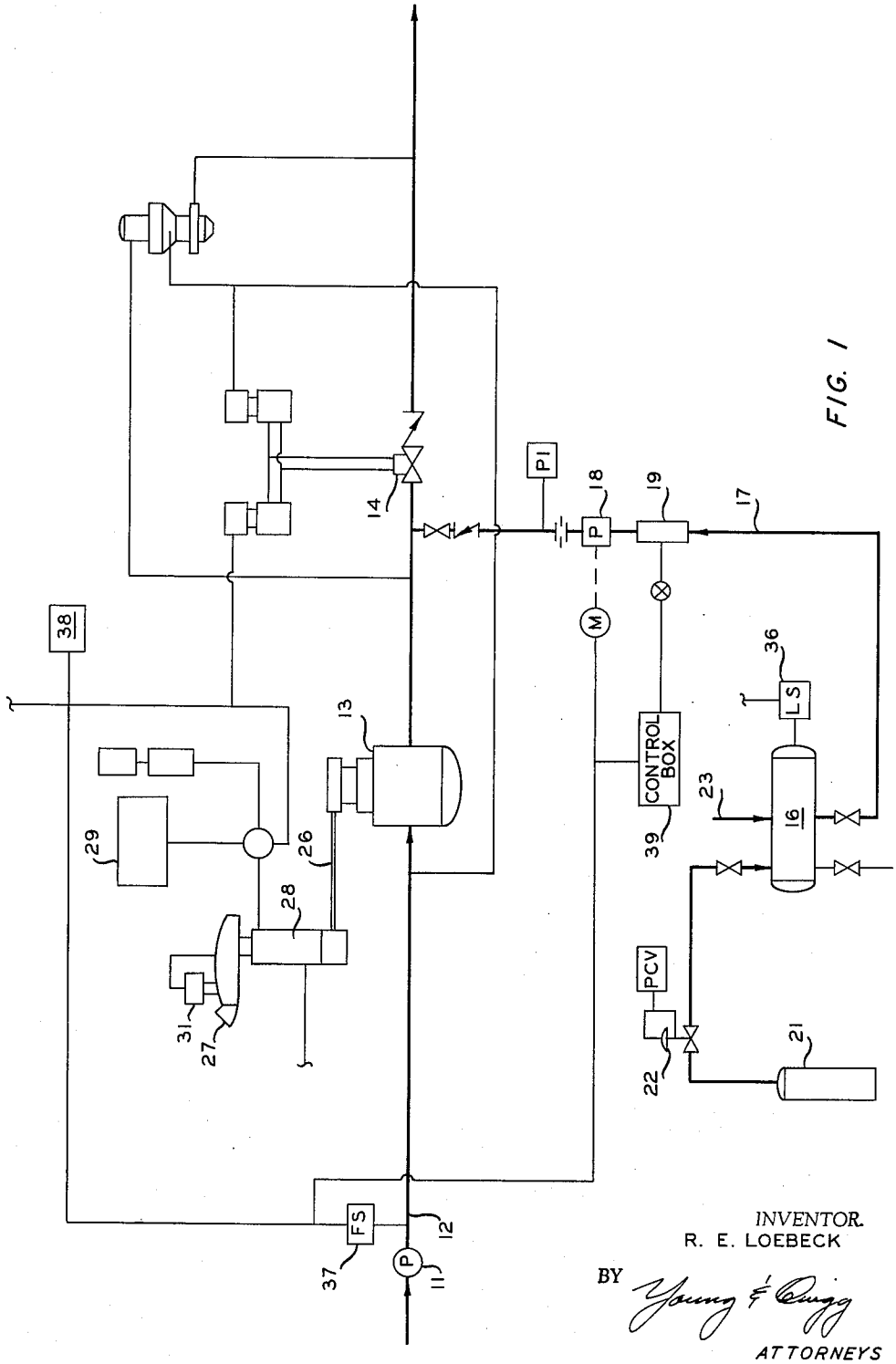

FIG. 1

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METHOD OF AND MEANS FOR SUPPLYING ADDITIVE TO A FLUID

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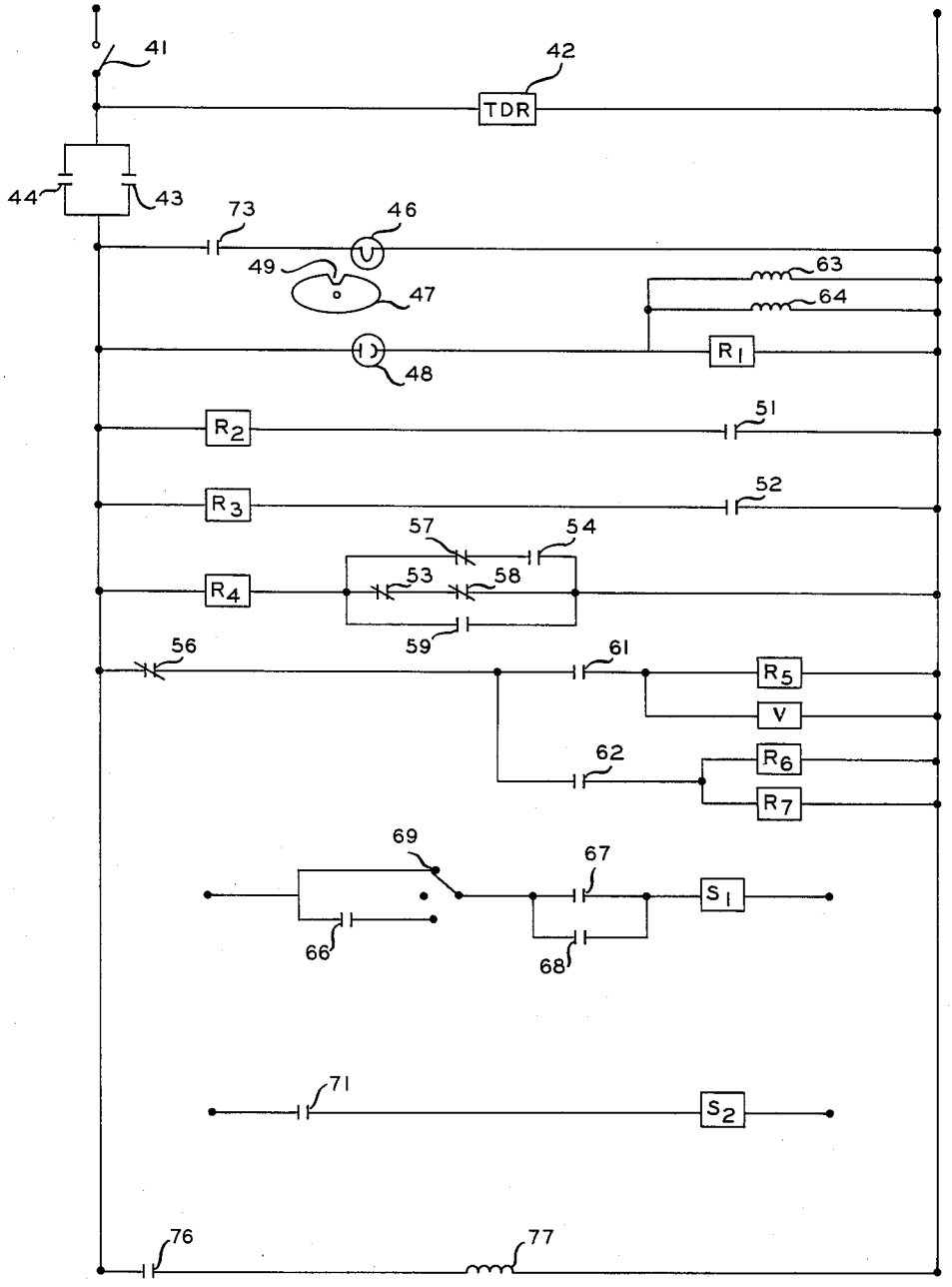

FIG. 2

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METHOD OF AND MEANS FOR SUPPLYING ADDITIVE TO A FLUID

Filed July 16, 1964 4 Sheets-Sheet 3

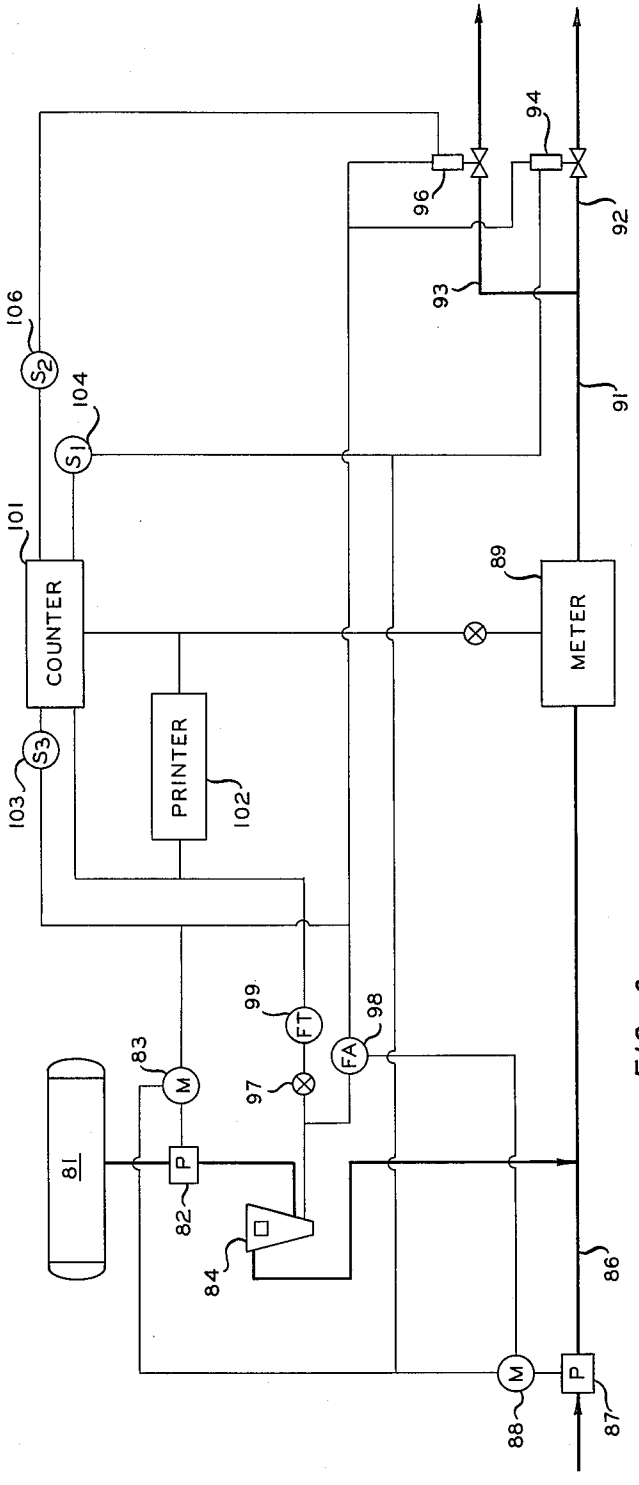

FIG. 3

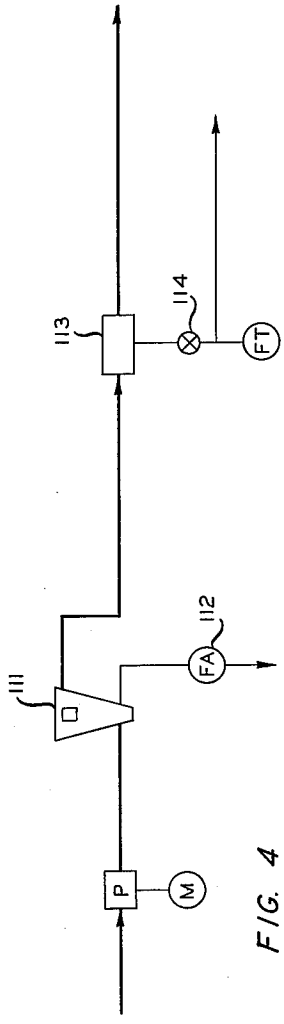

FIG. 4

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METHOD OF AND MEANS FOR SUPPLYING ADDITIVE TO A FLUID

Filed July 16, 1964 4 Sheets-Sheet 4

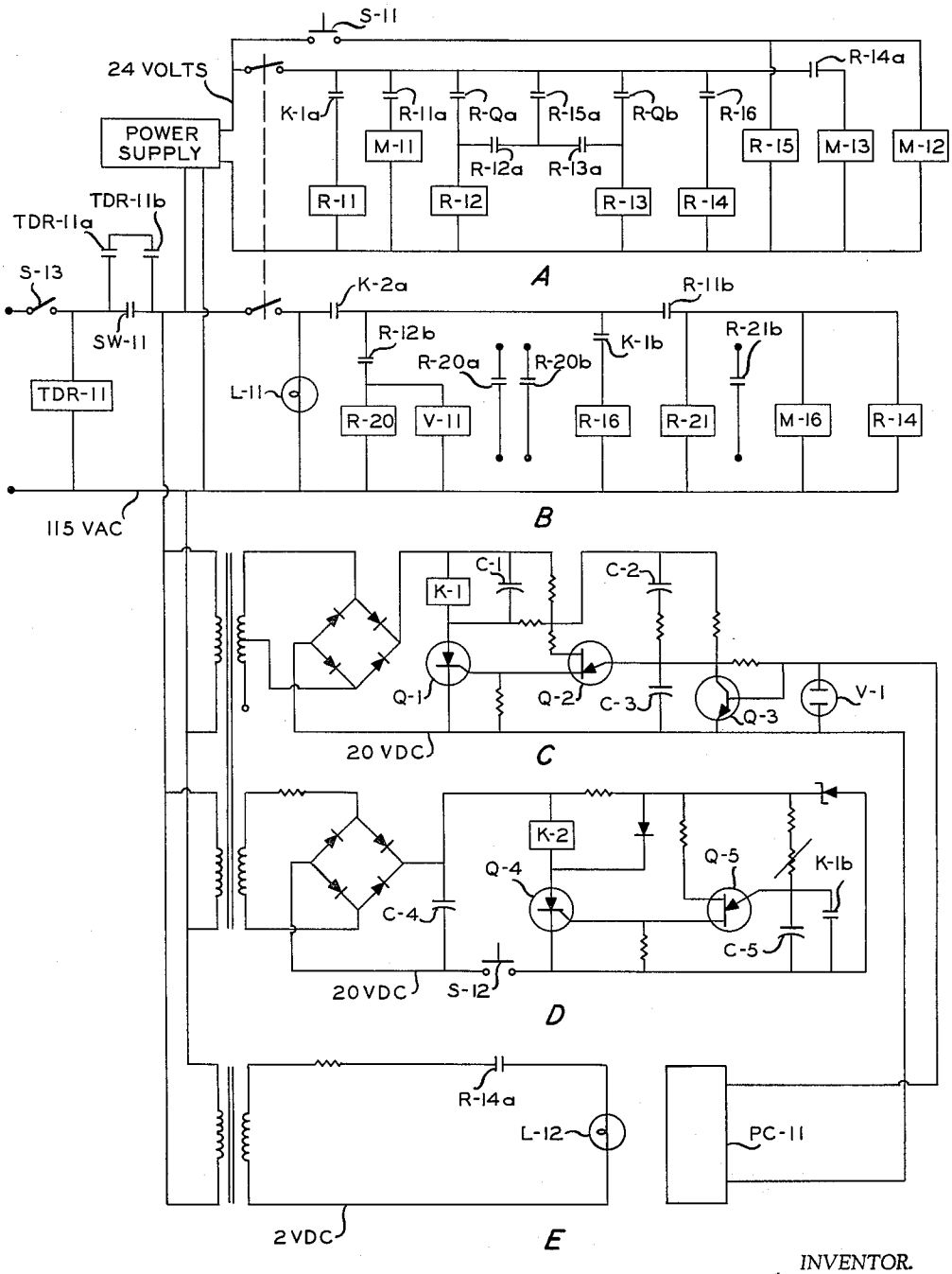

FIG. 5

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3,225,962

METHOD OF AND MEANS FOR SUPPLYING ADDITIVE TO A FLUID

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Filed July 16, 1964, Ser. No. 383,101
6 Claims. (Cl. 222—1)

This invention relates to supplying an additive to a fluid. In one aspect the invention relates to a method for supplying an additive to a fluid being delivered and to stop delivery of said fluid when said additive is not supplied. In one aspect the invention relates to means for dispensing a fluid and supplying an additive thereto and for preventing delivery of the fluid when the additive is not supplied. In another aspect the invention relates to LPG key stop dispensing apparatus including means for supplying an odorant at the time of delivery and for preventing delivery when the odorant is not supplied in normal amount.

The term "key stop loading" has been applied to loading facilities which allow customers to load their own delivery vehicles without supervision by the operator of the installation. Automated installations are being used in the loading of petroleum products into transport trucks, thus keeping transport equipment in operation 24 hours a day, even where continuous manning of loading racks is uneconomical. It is desirable to utilize such installations in the delivery of LPG. However, due to the type of use to which this product is put, for example, household heating and cooking, often it is necessary to supply an odorant to the LPG at the time of delivery to the transport truck. Where such deliveries are made without attendance of an operator of the loading facilitiy, it is desirable to provide a positive indication that the odorant has been supplied and to prevent delivery of unodorized product.

An object of my invention is to supply an additive to a fluid.

Another object of my invention is to provide a positive indication of the supply of an additive to a fluid and to prevent delivery of the fluid when the additive is not supplied in normal quantity.

Another object of my invention is to provide unattended LPG dispensing.

Another object of my invention is to dispene orodized LPG with a positive indication of the odorant supplied and to prevent delivery when the odorant is not supplied in normal quantity.

Other aspects, objects and the advantages of my invention are apparent in the written description, the drawing and the claims.

According to my invention, an additive is supplied to a fluid by transferring the fluid through a fluid conduit, introducing the additive into the fluid in the conduit, metering the flow of fluid in the conduit and the additive introduced theren, discontinuing the flow of fluid when a predetermined amount has been transferred and discontinuing the flow of additive when a predetermined amount has been injected into the fluid, discontinuation of the flow of fluid also discontinuing the flow of additive regardless of the amount supplied. Further according to my invention, an additive is supplied to a fluid by transferring a stream of the fluid through a fluid conduit, introducing the additive into the fluid conduit, dividing the stream into a major delivery stream and a minor delivery stream, stopping the flow of additive when a predetermined amount has been supplied, stopping flow of fluid in the major delivery stream when a first predetermined amount of fluid has been transferred, and stopping delivery in the minor delivery stream when the desired total amount has been transferred.

Further according to my invention, there is supplied means for dispensing a fluid, comprising a transfer conduit, a pump to transfer a stream of the fluid through the fluid conduit, means to introduce the additive into the fluid conduit, means to divide the stream into a major delivery stream and a minor delivery stream, a first control valve in the major delivery stream, a second control valve in the minor delivery stream, means to stop flow of the additive, first set stop counter means having a first switch to actuate the first control valve to closed position at a first predetermined value, a second switch to actuate the second control valve to closed position, stop the pump and actuate the means to stop flow of additive at a second predetermined value, second set stop counter means to actuate the means to stop the flow of additive at a third predetermined value, first and second ticket printing means, a first fluid meter for the stream in the fluid conduit, means actuated by the first fluid meter to produce electrical pulses at a rate proportional to the rate of flow of the stream of the fluid conduit and to transfer the pulses to the first set stop counter means to actuate the first counter means to count the pulses and to the first ticket printing means, a second fluid meter for the means to introduce additive into the fluid conduit and means actuated by the second fluid meter to produce electrical pulses at a rate proportional to the rate of flow of the additive and to transfer the pulses to the second set stop counter means to actuate the second counter means to count the pulses and to the second ticket printing means.

In the drawing, FIGURE 1 is a schematic representation of a delivery, odorizing and control system.

FIGURE 2 is a diagrammatic electrical circuit for the system illustrated in FIGURE 1.

FIGURE 3 is a schematic representation of another system according to my invention for delivery, odorizing and control.

FIGURE 4 is a schematic representation of a portion of another system according to my invention for delivery, odorizing and control.

FIGURE 5 is a detailed control system circuit.

In FIGURE 1, the liquefied petroleum gas from a source such as a storage tank, not shown, flows through pump **11** which delivers the stream of LPG through the fluid transfer conduit **12**. A positive displacement meter **13** and a control valve **14** are provided in conduit **12** Conduit **12** is extended beyond valve **14** to a point of delivery of LPG, such as a tank truck.

An odorant, such as ethyl mercaptan, is supplied from an odorant tank **16** through an odorant supply conduit **17** to fluid transfer conduit **12**. The odorant is supplied under pressure by an odorant pump **18** and the supply of odorant is metered by means of a positive displacement meter **19**. Odorant is supplied from tank **16** to pump **18** by pressure of a gas under pressure, for example, nitrogen, from a source such as nitrogen bottle **21**, and the pressure is regulated by pressure regulator **22**. Odorant is supplied to tank **16** from a source, not shown, through supply conduit **23**.

A mechanical drive **26** from meter **13** provides means whereby meter **13** operates one register of a dual ticket printer **27**, to provide means for recording the amount of fluid delivered. An electrical pulsing means **28** also is driven by mechanical drive **26** and supplies pulses to a dual set stop counter or meter **29**.

Set stop meter **29** is constructed with an internal ratchet mechanism is such a manner that, when a register is set for the desired amount of delivery of the fluid, the correct amount of odorant also is set on a separate switching register. The ratio of the ratchet mechanism can be adjusted to provide for different ratios of odorant supply with respect to fluid delivery.

Odorant meter **19** is provided with electrical pulsing

means which transmit pulses to dual set stop meter **29** to actuate the meter and switching means associated with the desired odorant supply. The same pulses from meter **19** also are supplied to a step motor **31** to drive one register of ticket printer **27** which registers the amount of odorant supplied.

Mercaptan tank **16** has a level switch **36** associated therewith and connected in a circuit to stop delivery of LPG when the level in tank **16** reaches a point at which desired delivery cannot be expected to be maintained. A flow switch **37** is provided in conduit **12** and this switch also will cause shutdown of the delivery operations if the flow of fluid through conduit **12** is below a predetermined value.

A remote start-stop station **38** is provided at the desired point of loading. A control box **39** is provided at a suitable location.

FIGURE 2 is a simplified electrical circuit diagram for the operation as illustrated in FIGURE 1. The switch **41** is a manual switch located at start-stop station **38**. Closing of switch **41** actuates a time delay relay **42** resulting in immediate closing of contacts **43**. Contacts **43** open after a predetermined time delay and, in normal operation, the circuit is maintained by contacts **44** which are a part of flow switch **37** and which are closed when a desired rate of flow through conduit **12** is reached.

The electrical pulse generation means associated with meter **19** comprises an incandescent lamp **46**, a rotating disc **47**, and a photoelectric cell **48**. Disc **47** is turned by meter **19** at a speed proportional to the rate of flow of odorant through conduit **17**. As it rotates, the cut out portion **49** permits pulses of light to reach cell **48** from lamp **46**, thus pulsing relay R_1. The relay R_1 operates contacts **51** and **52** without delay both on closing and opening. Contacts **51** complete a circuit to relay R_2 which operates normally closed contacts **53** which open and close without delay. Contacts **52** complete a circuit to relay R_3 which operates contacts **54** which closes with a delay which is somewhat longer than the normal spacing between pulses through relay R_1. Relay R_4 similarly actuates normally-closed contacts **56** with a delay which is somewhat longer than the normal spacing between pulses. Therefore, upon start-up, contacts **56** are closed, relay R_4 being deenergized. Immediately upon start-up, however, relay R_4 is energized and will open contacts **56** unless contacts **53** are opened prior to the normal delay in the actuation of relay R_4. This occurs when the flow of mercaptan begins resulting in pulsing relay R_1 and relay R_2. When the flow of odorant stops prior to the delivery of the desired amount thereof, the pulsing mechanism, specifically disc **47**, ceases to operate and the system ceases to pulse. If the system stops with a blank portion of disc **47** between lamp **46** and electrical cell **48**, the contacts **53** of relay R_2 remain closed, contacts **51** being open, and relay R_4 opens normally-closed contacts **56**. If the pulsing mechanism stops with the cutout portion **49** between the lamp **46** and the photoelectric cell **48**, the contacts **53** are maintained open, but since relay R_3 remains energized through contacts **52**, the contacts **54** close after a suitable time delay and relay R_4 is actuated to open contacts **56**.

To prevent shutdown of the complete system when the pulsing mechanism of the odorant meter stops due to the normal amount of odorant having been delivered, contacts **57** and **58** are provided as shown and these contacts are opened by the portion of the set stop meter actuated by the odorant flow.

Contacts **59** are actuated by level switch **36** to shut the system down when an insufficient amount of odorant remains in tank **16**.

With the system energized and contacts **56** closed, actuation of set stop meter **29** to indicate a desired quantity of flow causes contacts **61** and **62** to close. Set stop meter **29** comprises a mechanism by which a first register is set to the desired delivery of LPG, thus setting, through a suitable ratchet mechanism, or electric circuitry, a similar register for the odorant. Each of these registers in set stop meter **29** is mechanically driven mechanism which, when driven to O actuates a suitable contact, contacts **61** being actuated by the odorant, along with contacts **57** and **58**, and contacts **62** being actuated by the LPG.

Therefore, as noted above, contacts **61** and **62** are closed when set stop meter **29** is set for a desired amount of delivery. Assuming normal operation, delivery continues until the desired amount of odorant is injected whereupon contacts **61** and **57** and **58** are opened. When the desired amount of LPG has been pumped, contacts **62** open. For normal operation, the odorant flow mechanism is adjusted to deliver the proper amount of odorant in slightly less than the amount of time required to deliver the corresponding amount of LPG. The pulsing circuits of the odorant portion of the set stop meter and to step motor **31** are illustrated schematically by the coils **63** and **64**, respectively.

Relay R_5 actuates contacts **66** in a circuit including starter S_1 for the LPG pump **11**. Also in this circuit are contacts **67** which are the normally-open contacts of flow switch **37**. Normally-open contacts **68** are actuated by time delay relay **42**, contacts **67** and **68** cooperating in the circuit with S_1 in a manner similar to the contacts **43** and **44** in the control circuit. The switch **69** is shown in the manual position but normally is operated in the automatic position wherein it is connected to the contact **66**.

A starter S_2 for the odorant pump **18** includes normally-open contacts **71** which are actuated by relay R_6. Relay R_7 controls contacts **73** to disconnect the circuit for lamp **46**.

The contacts **76** represent the contacts of pulsing means **28** and the coil **77** represents the drive for the LPG portion of set step counter **29**.

In the embodiment of FIGURE 3, odorant is fed from an odorant tank **81** through an odorant pump **82**, driven by motor **83**, through a rotameter **84** and injected into the LPG delivery conduit **86**. The LPG product is delivered by LPG pump **87** which is driven by motor **88**, through positive displacement meter **89**. The combined stream fed through delivery conduit **91** divides to provide a first major delivery stream, conduit **92**, and a second minor delivery stream, conduit **93**. A first control valve **94** is provided in conduit **92** and a second control valve **96** in conduit **93**. Rotameter **84** is provided with means for delivering a proportional electrical signal from transmitter **97**, the signal being proportional to the position of the rotameter float and, therefore, to the rate of flow therethrough. Rotameter **84** is also provided with a flow alarm switch **98** which is actuated at a predetermined low rate of flow through rotameter **84**. The signal from transmitter **97** is fed into a flow integrator transmitter **99**, which is in the form of an analog to digital transducer, which produces an output pulse rate proportional to the strength of the signal from transmitter **97**. The signal from transducer **99** is fed to a set stop counter **101** and to a ticket printer **102**.

Meter **89** produces electrical pulses at a rate proportional to the flow of LPG through the meter and these pulses are transmitted to set stop meter **101** and ticket printer **102**.

Set stop meter **101** is similar to set stop meter **29** in the apparatus of FIGURE 1. Ticket printer **102** can be the same as ticket printer **27** of FIGURE 1 or, as illustrated, can be driven by pulses from both LPG and odorant flow rate meters, in which case it would be driven by a mechanical drive from meter **89**.

In operation, set stop meter **101** is set for the desired amount of LPG delivery, thus automatically setting the desired amount of odorant to be injected. When the desired amount of odorant has been injected, switch **103** is operated thus stopping motor **83**. When the desired total

flow of LPG is neared, a switch **104** is actuated, thus closing valve **94**, greatly reducing the rate of flow. When the desired total amount has been delivered, switch **106** is actuated, thus closing small valve **96** to stop flow completely. At the same time, pump **87** is shut down by cutting off motor **88**. If the flow of odorant through rotameter **84** at any time prior to delivery of the desired total amount becomes less than desired, switch **98** causes shutdown of the delivery equipment. The shutdown circuit of switch **98** is made inoperative by actuation of switch **103** when a desired total amount has been delivered.

In FIGURE 4 is illustrated a system wherein the odorant flows through a rotameter **111**, for actuation of the shutdown function when the rate of flow is low enough to actuate alarm switch **112**, and then continues through a positive displacement meter **113** which transmits electrical pulses from transmitter **114** to the set stop counter and ticket printer.

In the control system illustrated in FIGURE 5, there are provided control circuits A and B, pulse circuit C, time delay circuit D and electrical pulse generation circuit E. Pulse circuit C, time delay circuit D and electrical pulse generation circuit E form a part of a VAF meter and pulse transmitting apparatus manufactured by Vloeistofmeetapparatenfabriek N.V., Rotterdam. The control system is suitable for use in connection with the system illustrated in FIGURE 1 and the circuits are suitable for long operating periods at high pulse rates.

Control circuit A includes contacts K–1*a* of relay K–1 in circuit C, relay R–11, contacts R–11*a* of relay R–11, stepping motor M–11 of a counter, contacts RQ*a* and RQ*b* which are part of reset counter M–12, relay R–12, contacts R–12*a* of relay R–12, contact R–15*a* of relay R–15, relay R–13, contacts R–13*a* of relay R–13, relay R–14 and contacts R–14*a* of relay R–14, contacts R–16*a* of relay R–16, relay R–15, stepping motor M–13 of a counter and reset counter M–12 and reset switch S–11.

Control circuit B includes contacts K–2*a* of relay K–2, indicator light L–11, relay R–20, contacts R–12*b*, relay R–20, LPG valve V–11, contacts K–1*b* of relay K–1, relay R–21 and relay R–21, contacts R–11*b* of relay R–11, odorant meter M–16 and relay R–14. Contacts R–20*a* of relay R–20 are in a loading pump shut-down circuit, contacts R–20*b* in a reheater pump circuit and contacts R–21*b* of relay R–21 in an odorant pump circuit, as shown.

Pulse circuit C includes relay K–1, condensers C–1, C–2 and C–3, and resistors, rectifiers, transistors and filters, as shown.

Circuit D includes relay K–2, contacts K–1*b* of relay K–1, condensers C–4 and C–5 and resistors, rectifiers and transistors and reset switch S–12, as shown.

Circuit E includes contacts R–14*a* of relay R–14, lamp L–12 and photocell PC–11.

The overall control circuit also includes start switch S–13, time delay relay TDR–11, contacts TDR–11*a* and TDR–11*b* and contacts SW–11 of a flow switch.

In operation, start switch S–13 is closed, energizing time delay relay TDR–11, thus closing contacts TDR–11*b* until flow switch SW–11 is closed by product delivery flow. Circuit E sends pulses to pulse circuit C and thus to time delay circuit D and the entire system is shut down if the pulse rate becomes too slow. This is accomplished by opening of contacts K–2*a*. When the counter **31** (see FIGURE 1) has totaled the preselected number of pulses representing flow of odorant, the odorant pump is shut down by actuation of relay R–14 and contacts R–21*b* of relay R–21. At the same time the odorant meter is shut down and relay R–14 cuts off power to circuit E by opening contacts R–14*a*. The delivery pump is shut down when the reset counter has reached its preselected total by opening contacts R–20*a* which disconnects the pump circuit, contacts R–20*b* which disconnects the reheater pump and valve V–11 is closed. This also shuts down the odorant pump by actuation of relay R–21 to open contacts R–21*b*. Relay R–11 is energized from the pulse circuit by contacts K–1*a* and energizing the odorant step motor M–11. Light L–11 is an alarm light indicating odorant failure. Switch S–11 operates the counter reset.

It will be recognized that many of the details of circuits of FIGURE 5 are not described in detail but the operation of the circuit is readily apparent to one skilled in the art.

Throughout the disclosure, the drawings of mechanical equipment and electrical circuits have been greatly simplified to illustrate the principles of the invention without involving details of a commercial operation which would, of course, require a very great deal of additional description which can readily be supplied by one skilled in the art. Each of the functions of the elements of my invention can be performed by a commercially available item of equipment. The various relays and switches are, of course, too well known to need additional description. The odorant metering and pulsing equipment including meter **19**, lamp **46**, disc **47**, photoelectric cell **48**, etc., can be supplied by a VAF combination including a meter and pulse transmitting apparatus, available from Vloeistofmeetapparatenfabriek N.V., Rotterdam, and described in their brochure "Volumemeters." The positive displacement meter **13** can be a type W28 positive displacement flow meter manufactured by A. O. Smith and described in the bulletin 126–C of the A. O. Smith Corporation. The valve **14** can be a number 590 control valve manufactured by Ralph N. Brodie Company, San Leandro, California. The set stop counters can be separate counters for the odorant and LPG metering, but preferably a single apparatus is used having interconnected odorant and LPG registers to permit setting of both by a single operation. Suitable instruments for use as separate counters or meters are those manufactured by Veeder-Root, Inc., Hartford, Connecticut, for example series 1804, 1601, A180707, A180608, 1697, etc. Preferably, however, two set stop mechanisms are interconnected by a mechanical ratio mechanism, such as a ratchet mechanism, gear mechanism, etc., so that setting the desired amount of LPG also sets the proper amount of odorant. A suitable ticket printer is made by said Ralph N. Brodie Company and two of these printers can be connected together so that a long form ticket can be inserted for simultaneous printing of both LPG and odorant amounts.

The flow alarm or shut down system of FIGURE 4, can, of course, be applied to the complete system as illustrated in FIGURE 1.

Reasonable variation and modification are possible within the scope of my invention which sets forth method and apparatus for incorporating an additive into a fluid which is being dispensed, and for metering the fluid and additive and controlling the amounts delivered and stopping delivery when the additive is not delivered properly.

I claim:

1. A method for supplying an additive to a fluid, comprising the steps of:

transferring a stream of said fluid through a fluid conduit;

introducing said additive into said fluid in said fluid conduit;

metering the flow of said stream of fluid in said fluid conduit and producing a first signal representative of the rate of flow of said stream;

metering said additive introduced into said fluid conduit and producing a second signal representative of the rate of flow of said additive;

integrating said first signal and actuating a first electrical circuit responsive to the occurrence of a first predetermined value of the integration of said first signal;

actuating a second electrical signal responsive to the

occurrence of a second predetermined value of the integration of said first signal;

integrating said second signal and actuating a third electrical circuit responsive to the occurrence of a predetermined value of the integration of said second signal;

reducing the rate of flow of said fluid responsive to said actuation of said first electrical circuit;

discontinuing transfer of said fluid responsive to said actuation of said second electrical circuit;

discontinuing the injection of said additive responsive to said actuation of said second electrical circuit when said actuation of said second circuit occurs before said actuation of said third circuit; and

discontinuing the injection of said additive responsive to said actuation of said third electrical circuit when said actuation of said third circuit occurs before said actuation of said second circuit.

2. A method for supplying an additive to a fluid, comprising the steps of:

transferring said fluid through a fluid conduit;

introducing said additive into said fluid in said fluid conduit;

dividing said stream of said fluid into a major delivery stream and a minor delivery stream;

metering the flow of said fluid in said fluid conduit and producing a first signal representative of the flow of said fluid;

metering said additive introduced into said fluid conduit and producing a second signal representative of the rate of flow of said additive;

integrating said first signal and actuating a first electrical circuit responsive to the occurrence of a first predetermined value of the integration of said first signal;

actuating a second electrical circuit responsive to the occurrence of a second predetermined value of the integration of said first signal;

integrating said second signal and actuating a third electrical circuit responsive to the occurrence of a predetermined value of the integration of said second signal;

discontinuing transfer of said fluid through said major delivery stream responsive to said actuation of said first electrical circuit;

discontinuing transfer of said fluid through said minor delivery stream responsive to said actuation of said second electrical circuit;

discontinuing injection of said additive responsive to said actuation of said second electrical circuit when said actuation of said second circuit occurs before said actuation of said third circuit; and

discontinuing injection of said additive responsive to said actuation of said third electrical circuit when said actuation of said third circuit occurs before said actuation of said second circuit.

3. A method for supplying an additive to a fluid, comprising the steps of:

transferring said fluid through a fluid conduit;

introducing said additive into said fluid in said fluid conduit;

metering the flow of said fluid in said fluid conduit and producing a first signal representative of the rate of flow of said fluid;

metering said additive introduced into said fluid conduit and producing a second signal representative of the rate of flow of said additive;

integrating said first signal and actuating a first electrical circuit responsive to the occurrence of a predetermined value of the integration of said first signal;

integrating said second signal and actuating a second electrical circuit responsive to the occurrence of a predetermined value of the integration of said second signal;

discontinuing transfer of said fluid responsive to said actuation of said first electrical circuit;

discontinuing injection of said additive responsive to said actuation of said first electrical circuit when said actuation of said first circuit occurs before said actuation of said second circuit; and

discontinuing injection of said additive responsive to said actuation of said second electrical circuit when said actuation of said second circuit occurs before said actuation of said first circuit.

4. Means for dispensing a fluid and for supplying an additive thereto, comprising:

a fluid transfer conduit;

a pump to transfer a stream of said fluid through said fluid conduit;

means to introduce said additive into said fluid conduit;

means to divide said stream of said fluid into a major delivery stream and a minor delivery stream;

a first control valve in said major delivery stream;

a second control valve in said minor delivery stream;

means to stop flow of said additive;

first set stop counter means having a first switch to actuate said first control valve to closed position at a first predetermined value and a second switch to actuate said second control valve to closed position, stop said pump and actuate said means to stop flow of said additive at a second predetermined value;

second set stop counter means to actuate said means to stop flow of said additive at a third predetermined value;

a first fluid meter for said stream in said fluid conduit;

means actuated by said first fluid meter to produce electrical pulses at a rate proportional to the rate of flow of said stream in said fluid conduit and to transfer said pulses to said first set stop counter means to actuate said first counter means to count said pulses;

means actuated by said first fluid meter to actuate a first ticket printing counter;

a second fluid meter for said means to introduce said additive into said fluid conduit; and

means actuated by said second fluid meter to produce electrical pulses at a rate proportional to the rate of flow of said additive and to transfer said pulses to said second set stop counter to actuate said second counter to count said pulses, and to second ticket printing means.

5. Means for dispensing a fluid and for supplying an additive thereto, comprising:

a fluid transfer conduit;

means to introduce said additive into said fluid conduit;

means to divide said stream of said fluid into a major delivery stream and a minor delivery stream;

means to stop flow in said major delivery stream;

means to stop flow in said minor delivery stream;

means to stop flow of said additive;

first set stop counter means having a first switch to actuate said means to stop flow in said major delivery stream at a first predetermined value and a second switch to actuate said means to stop flow in said minor delivery stream, stop said means to transfer said fluid through said fluid conduit and actuate said means to stop flow of said additive at a second predetermined value;

second set stop counter means to actuate said means to stop flow of said additive at a third predetermined value;

first fluid meter means for said stream in said fluid conduit;

means actuated by said first fluid meter means to actuate said first set stop counter means to integrate the flow of said fluid;

a second fluid meter means for said means to introduce said additive into said fluid conduit; and

means actuated by said second fluid meter means to integrate the flow of said additive and to actuate said

second counter means responsive to said integrated value of said flow of said additive.

6. Means for dispensing a fluid and supplying an additive thereto, comprising:

a fluid transfer conduit;

a pump to transfer a stream of said fluid to said fluid conduit;

an additive conduit communicating with said fluid conduit;

an additive pump to force additive through said additive conduit into said fluid conduit;

a major delivery stream conduit communicating with said third conduit;

a minor delivery stream conduit communicating with said fluid conduit;

a first control valve in said major delivery stream conduit;

a second control valve in said motor delivery stream conduit;

a first electrical switch to actuate said first control valve to closed position;

a second electrical circuit to actuate said second control valve to closed position, stop said pump to transfer said fluid and stop the additive pump;

a third electrical circuit to stop said additive pump;

first set stop counter means having a first switch to actuate said first electrical circuit at a first predetermined value and a second switch to actuate said second electrical circuit at a second predetermined value;

second set stop counter means having a switch to actuate said third electrical circuit at a third predetermined value;

a first positive displacement meter for said stream in said fluid conduit;

means actuated by said first positive displacement meter to produce electrical pulses at a rate proportional to the rate of flow of said stream in said third conduit and to transfer said pulses to said first set stop counter means to actuate said first counter to count said pulses;

a second positive displacement meter for said means to introduce additive into said fluid conduit;

means actuated by said second fluid meter to produce electrical pulses at a rate proportional to the rate of flow of said additive and to transfer said pulses to said second set stop counter means to actuate said second counter to count said pulses;

a flow switch in said fluid conduit;

means actuated by said flow switch to discontinue transfer of said fluid when the flow in said flow conduit falls below a predetermined value;

a tank for said additive;

a level switch associated with said tank to discontinue transfer of said fluid when the level in said tank falls below a predetermined minimum value; and

means actuated by the rate of flow of said additive to discontinue transfer of said fluid when said rate of flow of said additive falls below a predetermined minimum value.

References Cited by the Examiner

UNITED STATES PATENTS

2,540,618	2/1951	Hazard	222—26
2,952,209	9/1960	Scholin	222—66 X
3,042,258	7/1962	Mayes	222—66

LOUIS J. DEMBO, *Primary Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,225,962 December 28, 1965

Robert E. Loebeck

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, line 1, and in the heading to the printed specification, line 4, name of inventor, for "Robert E. Leobeck", each occurrence, read -- Robert E. Loebeck --; in the heading to the four sheets of drawings, line 1, for "R. E. LEOBECK", each occurrence, read -- R. E. LOEBECK --; column 9, line 18, for "motor" read -- minor --.

Signed and sealed this 10th day of January 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents