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[57] **ABSTRACT**

A system for supplying gas, such as compressed air, from large capacity banks of storage containers having different pressure capacities. The gas is withdrawn first from the lowest pressure storage bank and later automatically from one or more successively higher pressure banks, if necessary to satisfy the demand. The demand pressure that is to be satisfied may be selected, and the system stops supplying gas automatically when the selected demand pressure is reached.

15 Claims, 3 Drawing Figures

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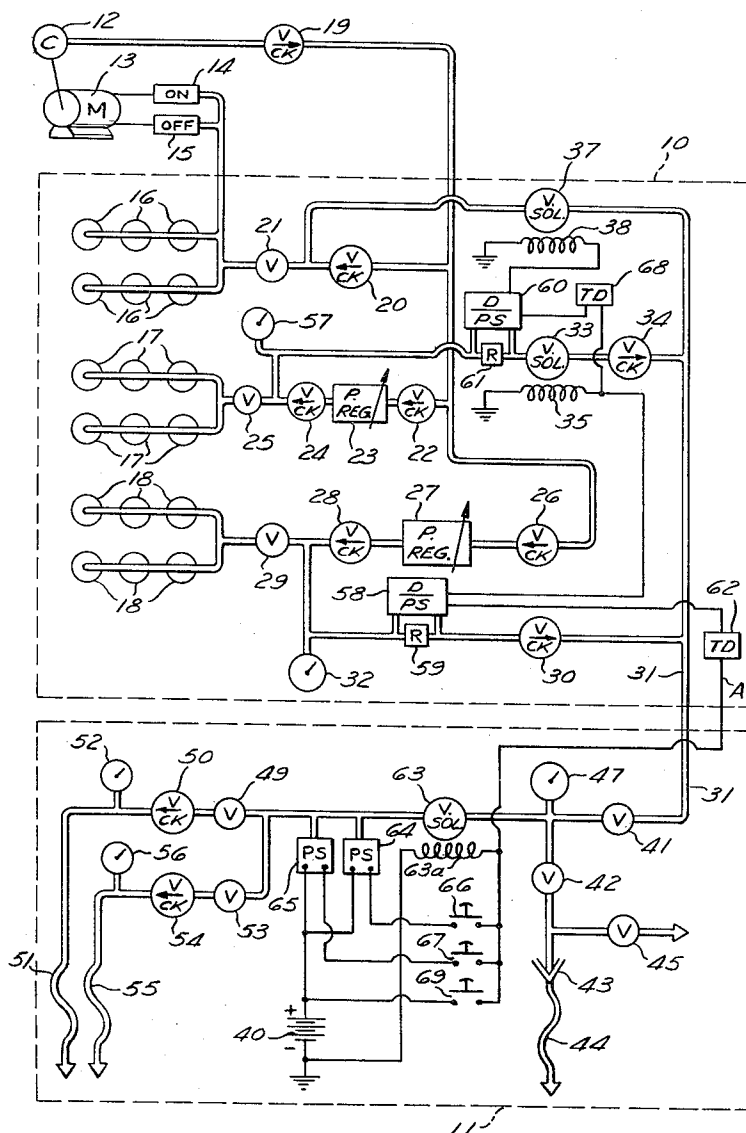
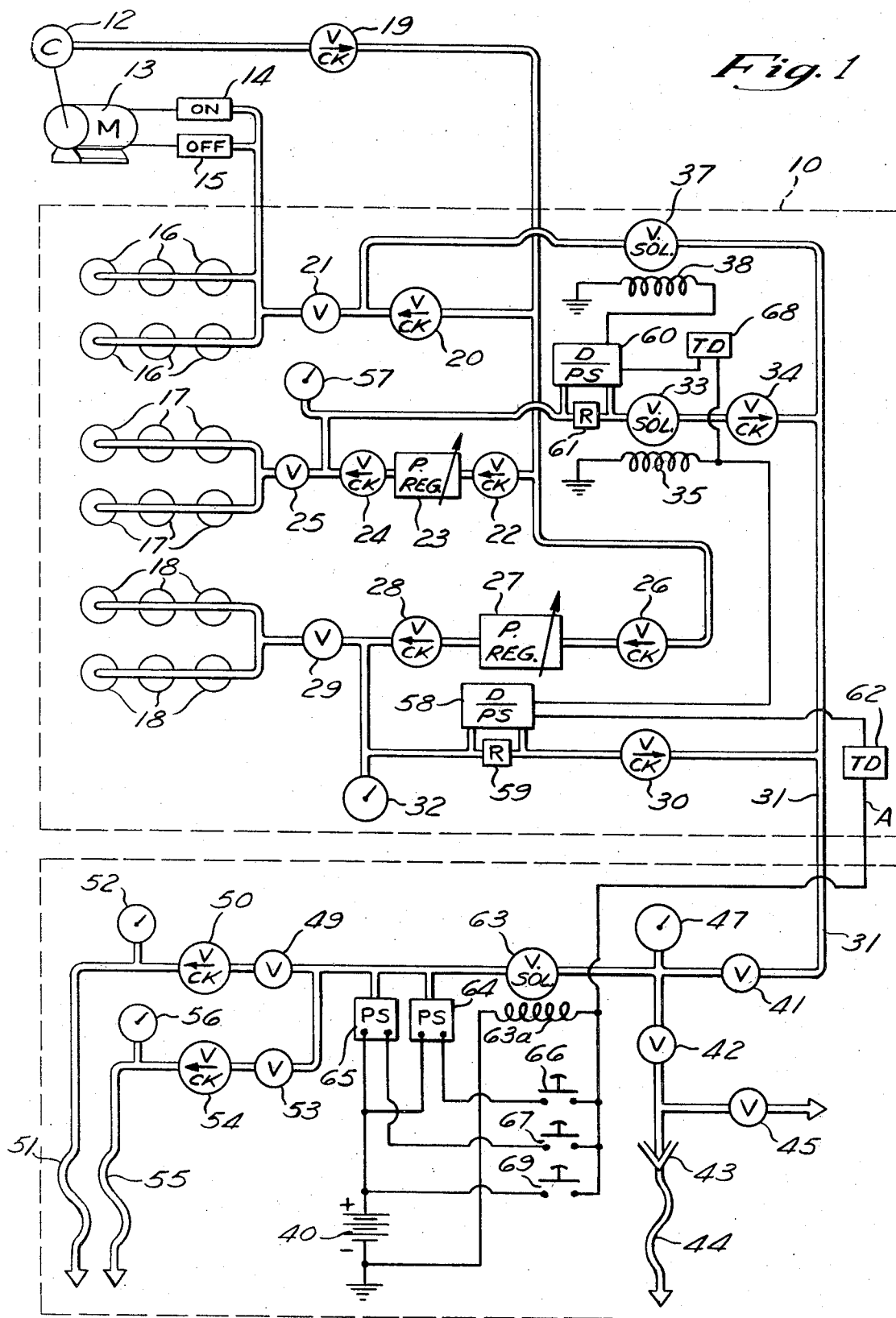
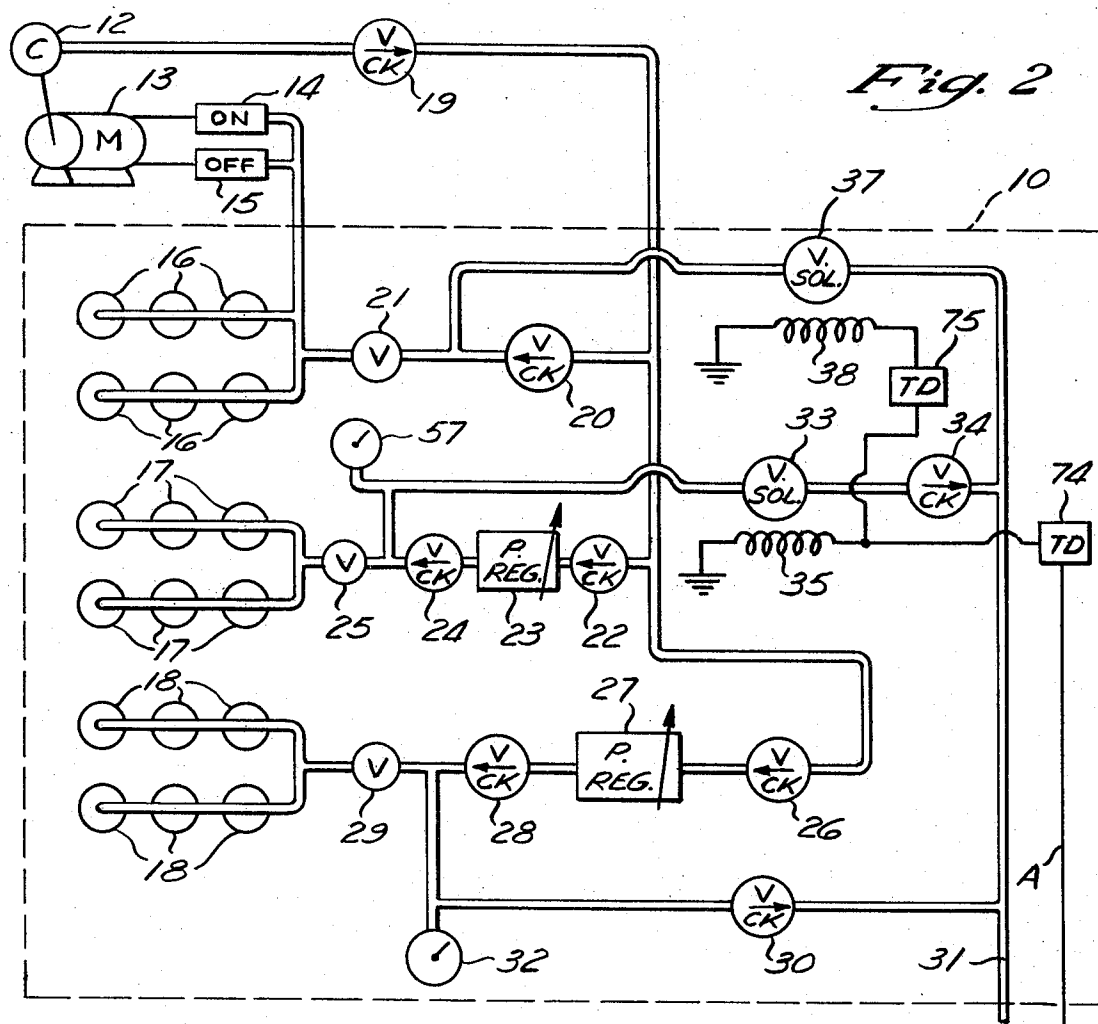
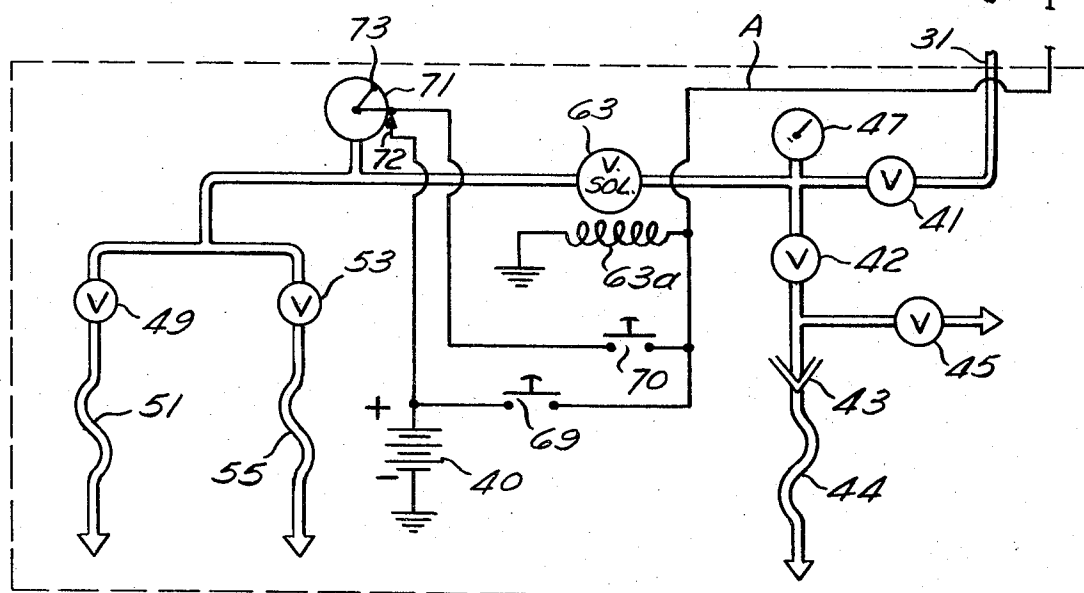


Fig. 1





GAS SUPPLY SYSTEM

BACKGROUND OF THE INVENTION

My earlier-filed, co-pending U.S. Pat. application Ser. No. 338,846, filed Mar. 7, 1973, discloses and claims a system for supplying pressurized gas, such as compressed air, to a vessel that is to be filled.

The system of the present application is directed to modifications of the system of said earlier application, and also embodies many of the features of that earlier system.

SUMMARY OF THE INVENTION

This invention relates to a gas supply system in which pressurized gas may be withdrawn from banks of storage containers which are at different pressures, with the gas being withdrawn first from the lowest pressure bank and then automatically from the next higher pressure bank, and so on, until the tank or other vessel that is being filled reaches the desired pressure.

Another object of this invention is to provide such a system having provision for selecting the pressure to which the tank or other vessel is to be filled and for automatically stopping the filling when the vessel reaches the selected pressure.

Another object of this invention is to provide such a system having novel provision for controlling the automatic changeover from one bank of storage containers to the next higher pressure bank.

Further objects and advantages of this invention will be apparent from the following detailed description of certain presently-preferred embodiments thereof, which are illustrated schematically in the accompanying drawings in which:

FIG. 1 shows a first gas supply system in accordance with the present invention;

FIG. 2 shows an alternative embodiment of the supply portion in the present system; and

FIG. 3 shows an alternative embodiment of the utilization portion of the present system.

Before explaining the disclosed embodiment of the present invention in detail, it is to be understood that the invention is not limited in its application to the details of the particular arrangement shown, since the invention is capable of other embodiments. Also, the terminology used herein is for the purpose of description and not of limitation.

FIG. 1

Referring first to FIG. 1, the dashed line enclosure 10 contains the storage portion of this embodiment of the present system, and the dashed line enclosure 11 contains the utilization portion. In this embodiment, the pressurized gas in this system is compressed air, supplied by an air compressor 12 driven by an electric motor 13 whose energization is controlled by "on" and "off" pressure switches 14 and 15, respectively.

Three banks of relatively large capacity storage containers are shown in the storage portion 10 of the system: a first bank of storage containers 16 having a maximum pressure of 3,600 pounds per square inch; a second bank of storage containers 17 having a maximum pressure of 3,000 psi; and a third bank of storage containers 18 having a maximum pressure of 2,000 psi. It is to be understood that the number of banks of storage containers and their maximum pressures may differ from the particular example given.

The high pressure storage bank 16 is connected to the output of the air compressor 12 through two series-connected check valves 19 and 20 and a manual shut-off valve 21. The check valve 20 and the shut off valve 21 are individual to the high pressure bank of storage containers 16. The check valve 19 is common to all three banks of storage containers 16, 17 and 18. It enhances the safety of the system by preventing reverse flow back to the compressor 12 in case the usual return valve at the compressor fails.

The intermediate pressure bank 17 receives pressurized air from the air compressor 12 through check valves 19 and 22, a manually adjustable pressure regulator 23, check valve 24 and a manual shut-off valve 25. All of these are individual to the intermediate pressure bank, except the check valve 19.

The lowest pressure bank of storage containers 18 receives pressurized air from the air compressor through check valve 19 and, in series, a check valve 26, a manually adjustable pressure regulator 27, a check valve 28, and a shut-off valve 29, all individual to this low pressure bank.

The "on" and "off" switches 14 and 15 for the compressor motor 13 are both pressure-operated switches that are connected to sense the air pressure in the high pressure storage bank 16. Together they operate to keep the compressor 12 on whenever the air pressure in the high pressure storage bank 16 is below a predetermined value, and to turn off the compressor when the air pressure here reaches this value or a higher pressure, as desired.

The three banks of storage containers 16, 17 and 18 are filled automatically from the air compressor 12 as follows:

In practice, the bank of storage containers 18 will have the lowest air pressure and these will be filled first, via check valve 26, pressure regulator 27, check valve 28, and shut-off valve 29.

When the air pressure in the containers 18 reaches the air pressure in the bank which is at the next higher pressure, then both banks of containers will be filled simultaneously. For example, the intermediate pressure containers 17 usually will be at this next higher pressure, and these containers will be filled now via check valve 22, pressure regulator 23, check valve 24 and shut-off valve 25 while the container bank 18 is continued to be filled.

When the pressure in both banks of containers 17 and 18 reaches the pressure in the high pressure bank 16, all three banks of containers will be filled simultaneously.

Whenever the air pressure in the lower pressure bank 18 reaches the cut-off value determined by the setting of its pressure regulator 27, the latter will close and thereby stop the filling of this container bank. The remaining container banks 17 and 16 will continue being pressurized simultaneously until the pressure in the container tank 17 reaches the cut-off value for which its pressure regulator 23 is set to close. Following this, the air compressor regulator 12 continues to pressurize the container bank 16 until the maximum pressure for this bank is reached, at which time the cut-off switch 15 will turn off the compressor motor.

It is to be understood that there may be in the system any desired number of different banks of storage containers with different maximum pressures, as determined by individual pressure regulators.

The output from the lowest pressure storage container bank 18 is connected to the utilization portion of the system through the shut-off valve 29, a flow restriction 59, and a check valve 30 leading to an output line 31. A pressure gauge 32 senses the air pressure in the container bank 18. A normally-closed differential pressure switch 58 is connected across the flow restriction 59 and is operable to open when there is a predetermined pressure differential across this flow restriction.

The output from the intermediate pressure storage container bank 17 is connected to the same output line 31 through the shut-off valve 25, a flow restriction 61, a solenoid valve 33 and a check valve 34. A normally-closed differential pressure switch 60 is connected across the flow restriction 61 and is operable to open when there is a predetermined pressure drop across this flow restriction. The solenoid valve 33 is normally closed, and it is opened in response to the energization of its solenoid coil 35 through the differential pressure switch 58 associated with the output from the lowest pressure container bank 18. A pressure gauge 57 senses the air pressure in the container bank 17.

The output from the highest pressure storage container bank 16 is connected to the output line 31 through the shut-off valve 21 and a normally-closed solenoid valve 37, which is opened in response to the energization of its solenoid coil 38 through the differential pressure switch 60 associated with the output from the intermediate pressure container bank 17.

In utilization portion of the system, the line 31 is connected through a shut-off valve 41 and a remote fill shut-off valve 42 to a quick-disconnect fitting 43 to which a fill hose 44 may be connected. The air pressure in hose 44 is unregulated. This hose may be connected to a remotely located utilization device, such as an air tank. A vent valve 45 is connected to the unregulated air line ahead of the quick-disconnect fitting 43 for venting this line to the atmosphere when desired.

The shut-off valve 41 is manually adjustable to provide a variable orifice for restricting the low rate and for restricting the pressure build-up of the gas supplied to the utilization portion of the system.

The output 31 from the storage portion 10 of the system is connected through the shut-off valve 41 to a solenoid valve 63. An air pressure gauge 47 is provided at the inlet side of this solenoid valve. The outlet of the solenoid valve 63 is connected through a hose shut-off 49 and a check valve 50 to a fill hose 51, which may be detachably connected to a tank to be filled. An air pressure gauge 52 reads the pressure in hose 51.

The outlet of the solenoid valve 63 also is connected through a hose shut-off valve 53 and a check valve 54 to another fill hose 55, which may be detachably connected to a second tank to be filled. An air pressure gauge 56 reads the air pressure in hose 55.

Any additional number of fill hoses may be connected to the outlet of the solenoid valve 63 through similar individual shut-off valves and check valves.

The output side of solenoid valve 63 is connected to a pair of pressure switches 64 and 65. Pressure switch 64 is normally closed, and it opens when the pressure at the outlet side of solenoid valve 63 reaches a predetermined value, such as 1,800 psi. Similarly, pressure switch 65 is normally closed, and it opens when the pressure at the outlet side of solenoid valve 63 reaches a higher predetermined value, such as 2,250 psi.

Pressure switch 64 is connected in series with a manually operated normally open switch 66 and the operating coil 63a of solenoid valve 63 across a battery 40.

Pressure switch 65 is connected in series with a manually operated, normally open switch 67 and the solenoid valve coil 63a across the battery 40.

It is to be understood that any desired number of such pressure switches may be provided, each designed to open at a particular predetermined pressure and each in series with an individual manual switch.

A manually operated, normally open, override switch 69 is connected in series with the solenoid valve coil 63a across the battery.

The positive terminal of battery 40 is connected through manual switch 69, or pressure switch 64 and manual switch 66, or pressure switch 65 and manual switch 67, to a line A leading to one side of a normally open time delay switch 62 in the supply portion 10 of this system. The opposite side of time delay switch 62 is connected through the differential pressure switch 58 to the operating coil 35 of solenoid valve 33. The time delay switch 62 closes automatically following the energization of line A by the closing of any of switches 66, 67 and 69, but switch 62 has a time delay that holds it open for a period long enough to permit the differential pressure switch 58 to open in response to the flow of gas from the lowest pressure container bank 18 through the flow restriction 59 to the now open solenoid valve 63 in the utilization portion of the system. As long as differential pressure switch 58 remains open, the coil 35 for solenoid valve 33 will remain de-energized.

When pressure switch 58 does close, it completes the energization circuit for the operating coil 35 of solenoid valve 33, causing the latter to open. Also, the closing of pressure switch 58 causes a second normally open time delay switch 68 to close, after a predetermined time delay long enough to permit the differential pressure switch 60 to open as a result of the gas flow from the intermediate pressure container bank 17 through the flow restriction 61 and the now-open solenoid valve 33 to the now-open solenoid valve 63 in the utilization portion of the system. As long as differential pressure switch 60 remains open, the coil 38 for the solenoid valve 37 will remain de-energized.

When switch 60 does close, coil 38 will be energized and solenoid valve 37 will be opened to connect the highest pressure container bank 16 to the outlet line 31 leading to the utilization portion of the system.

OPERATION

A tank to be filled is connected to a fill hose 51, for example, and the pressure to which this tank is to be filled may be selected in accordance with the opening pressure of one of the pressure switches 64 or 65. For example, if the tank is to be filled to 2,250 psi, then the operator closes switch 67 to connect the pressure switch 65 in series with the solenoid coil 63a across the battery. With pressure switch 65 in its normally closed condition, the closing of manual switch 67 completes an energization circuit for solenoid coil 63a, and solenoid valve 63 is opened to connect line 31 to fill hose 51. (Shut-off valve 41 has already been opened manually.)

Initially, gas flows from the lowest pressure storage container bank 18 through the flow restriction 59 to the output line 31. The flow of gas through the flow restriction 59 produces a pressure differential across it

that is sensed by switch 58, which opens as a consequence. The time delay switch 62 remains open during the time interval from the opening of solenoid valve 63 until after the pressure differential switch 58 has opened, so as to maintain solenoid coils 35 and 38 de-energized. At the end of this time interval, switch 62 closes.

If the gas pressure in the tank being filled at the fill hose 51 reaches the gas pressure of the container bank 18, the pressure differential across flow restriction 59 ceases to exist and therefore the pressure differential switch 58 closes. When this happens, with the time delay switch 62 now closed, the energization circuit for solenoid coil 35 is completed. Solenoid valve 33 opens in response to such energization of solenoid coil 35, thereby connecting the output of the intermediate pressure container bank 17 to the output line 31 leading to the utilization portion 11 of the system.

The flow of gas now through the flow restriction 61 produces a pressure differential across it that causes the differential pressure switch 60 to open. The time delay switch 68 remains open during the time interval between the energization of solenoid coil 35 and the opening of switch 60, and after this delay interval it closes.

If the gas pressure in the tank being filled at the fill hose 51 reaches the pressure of the intermediate container bank 17, the pressure differential across flow restriction 61 disappears and then switch 60 closes, completing the energization circuit for solenoid coil 38. Solenoid valve 37 now opens to connect the output of the highest pressure container bank 16 to the output line 31 leading to the utilization portion 11 of the system.

Any time the gas pressure in the tank that is being filled reaches the 2,250 psi value for which pressure switch 65 is set, this switch will open and de-energize solenoid coil 63a, causing solenoid valve 63 to close automatically and end the tank filling operation. Also, such opening of the pressure switch will deenergize either solenoid coil 35 or 38 that may have been energized at that time, so as to close the respective solenoid valve 33 or 37.

If the user wants to fill a tank to the highest pressure available from the storage portion of the system, he simply closes switch 69 to open the solenoid valve 63, and the filling operation proceeds, as just described, from successfully higher pressure container banks. The filling can proceed until the user decides to open switch 69 or the pressure in the tank being filled reaches the pressure in the highest pressure container bank 16.

FIG. 2

FIG. 2 shows a modified embodiment of the storage portion 10 of the system, which is simpler than the FIG. 1 embodiment in that the latter's flow restrictions 59, 61 and differential pressure switches 58 and 60 are omitted. The other elements in FIG. 2 which correspond to those in FIG. 1 are given the same reference numerals as in FIG. 1, and the detailed description of their operation will not be repeated.

In FIG. 2, a normally-open time delay switch 74 is connected directly between the solenoid coil 35 and line A. Another normally-open time delay switch 75 is connected directly between solenoid coil 38 and the first time delay switch 74. Line A is connected in the

utilization circuit as shown in the lower part of FIG. 1.

The first time delay switch 74 is adjusted to provide a selected time delay between the instant when line A is energized (by the closing of any of the manual switches 66, 67 or 69) and the instant when switch 74 closes. This time delay interval is selected to approximate the estimated time it will take the lowest pressure container bank 18 to provide an effective filling operation. That is, following the energization of line A, the time delay switch 74 will remain open for the estimated time period it will take the gas pressure in container bank 18 to drop to about the same value as the tank that is being filled.

Similarly, the second time delay switch 75 is adjusted to remain open, following the closing of time delay switch 74, for a time interval that is estimated to closely approximate the time interval during which the intermediate pressure container bank 17 will be effective to continue the filling operation.

OPERATION

In the operation of the system which has a supply portion as shown in FIG. 2 and a utilization portion as shown in the dashed-line enclosure 11 at the lower part of FIG. 1, the closing of any of the manual switches 66, 67 or 69 (FIG. 1) will energize line A and open the solenoid valve 63 in the utilization portion of the circuit.

First, the gas will be supplied from the lowest pressure container bank 18 via check valve 30 to the output line 31 leading to the utilization circuit.

After a predetermined time period, the first time delay switch 74 will close, thereby energizing solenoid coil 35 and opening solenoid valve 33 to connect the output from the intermediate pressure container bank 17 to the output line 31. Check valve 30 prevents any of the gas output from container bank 17 from flowing to the lowest pressure chamber bank 18.

Then, after another predetermined time delay, the second time delay switch 75 will close, completing the energization circuit for solenoid coil 38. Solenoid valve 37 now opens to connect the output from the highest pressure container bank 16 to the output line. Consequently, the gas pressure in output line 31 will become higher than the gas pressure at the intermediate pressure bank 17, and check valve 34 will close. Also, check valve 30 will remain closed.

FIG. 3

FIG. 3 shows an alternative embodiment of the utilization portion 11 of the present system, which may be used with either the supply portion 10 shown in FIG. 1 or the modified supply portion shown in FIG. 2. Elements in FIG. 3 which correspond to those in FIG. 1 are given the same reference numerals, and the detailed description of the operation of these elements will not be repeated.

In FIG. 3 a normally-closed switch 72 and a single manual switch 70 are connected between the positive side of battery 40 and the solenoid valve coil 63a and line A. Switch 72 is operatively associated with a pressure gauge 71 that senses the gas pressure at the output side of solenoid valve 63. An actuator 73 is affixed to the pointer of this gauge and is adapted to open the switch 72 when the pointer reaches the angular position where this switch is located. Switch 72 is mounted

for arcuate adjustment about the dial face of the pressure gauge so that it can be set to be opened by the actuator 73 at any desired pressure, as sensed by the gauge.

Initially, when switch 70 is closed the energization circuit for solenoid coil 63a and for line A is completed through the now closed switch 72. The gas pressure sensed by the pressure gauge 71 will gradually increase until it reaches the value corresponding to the angular position of switch 72. At this time the actuator 73 will engage and open the switch 72, thereby de-energizing the solenoid coil 63a and line A to terminate the filling operation.

The FIG. 3 circuit may have a manually operated "topping off" switch 69, the same as in FIG. 1, or this switch may be omitted.

The present system embodies many of the advantageous features of the system disclosed in my aforementioned U.S. Pat. application Ser. No. 338,846:

The successively higher pressure storage container banks 17 and 16 are used only when necessary to bring the tank being filled up to the desired final pressure. The initial filling is from the lowest pressure bank of storage containers 18, and in some cases the pressure here will be enough to bring the tank being filled up to the desired final pressure without the necessity of drawing any pressurized air from the higher pressure storage container banks. In this manner, the most efficient use is made of the banks of storage containers, with their different pressure capacities. Also, the lower pressure storage containers 18, which provide the initial filling, need not be as heavily constructed and expensive as the higher pressure storage containers used for "topping off."

Two or more tanks may be filled at one time through the respective fill hoses in the utilization portion of the system.

The refilling of the storage banks 16, 17 and 18 takes place whenever the pressure in the highest pressure bank 16 drops to a predetermined level effective to cause the "on" pressure switch 14 to turn on the motor for the air compressor 12. This may happen while one or more tanks are being filled at the fill hoses 51, 55.

When the air compressor is turned on, the banks of storage containers 16, 17 and 18 are re-filled as described in detail hereinbefore, with the lowest pressure bank being filled first.

The present system differs from my prior system in that it embodies features that make automatic the changeover from one bank of storage containers to the next in filling the tank or other vessel to the desired pressure. Also, the present system provides for the selection of this desired pressure and the automatic stopping of the filling operation when this pressure is reached.

I claim:

1. In a gas supply system having a plurality of banks of storage containers which store gas at different pressures and are all connected to a common outlet, means for withdrawing pressurized gas through said outlet first from the bank which is at the lowest pressure, and automatically operable means for withdrawing pressurized gas through said outlet from a second, higher pressure bank of storage containers following its withdrawal from said lowest pressure bank, said automatically operable means comprising a normally closed valve be-

tween said higher pressure bank of storage containers and said outlet, and means for opening said valve in response to a pressure drop in said lowest pressure bank to initiate the withdrawal of gas from said higher pressure bank after a time period following the initial withdrawal of gas from said lowest pressure bank,

the improvement wherein said last mentioned means comprises:

means providing a flow restriction between said lowest pressure bank and said outlet;
a differential pressure switch connected across said flow restriction to sense the flow therethrough;
and means responsive to the operation of said differential pressure switch when the flow through said restriction substantially ceases for opening said valve between said higher pressure bank and said outlet.

2. A gas supply system according to claim 1, wherein said valve is a solenoid valve having an operating coil in circuit with said differential pressure switch to have its energization controlled thereby, and said differential pressure switch is normally closed and is opened during the flow of gas from said lowest pressure bank through said flow restriction.

3. A gas supply system according to claim 2, and further comprising a check valve between said flow restriction and said outlet for preventing the flow of gas from said higher pressure bank into said lowest pressure bank.

4. A gas supply system according to claim 3, and further comprising:

power supply means in circuit with said operating coil and said differential pressure switch;

and means in said circuit and operable following the initiation of a demand for gas from said outlet to disconnect said differential pressure switch from said power supply long enough for said switch to open in response to the flow of gas through said flow restriction, and operable thereafter to connect said differential pressure switch to said power supply.

5. A gas supply system according to claim 4, wherein said last-mentioned means comprises a normally-open time delay switch in series with said differential pressure switch and said operating coil across said power supply, said time delay switch being operable to close after a time delay in response to the initiation of a demand for gas from said outlet.

6. A gas supply system according to claim 4, wherein said plurality of banks of storage containers includes a third bank which stores gas at a higher pressure than said second bank, and further comprising:

means providing a second flow restriction between said second bank of storage containers and said outlet;

a second differential pressure switch connected across said second flow restriction to sense the gas flow therethrough, said second differential pressure switch being normally closed and being opened during the flow of gas through said second flow restriction;

a normally closed second solenoid valve connected between said third bank of storage containers and said outlet and having an operating coil connected to said power supply through said second differential pressure switch:

means operable following the cessation of gas flow from said lowest pressure bank to said outlet for disconnecting said second differential pressure switch from said power supply long enough for said last-mentioned switch to open in response to the flow of gas through said second flow restriction, and operable thereafter to connect said second differential pressure switch to said power supply; and a check valve between said second flow restriction and said outlet for preventing the flow of gas from said third bank of storage containers into said second bank of storage containers.

7. In a gas supply system having a plurality of banks of storage containers which store gas at different pressures and are all connected to a common outlet;

means for withdrawing pressurized gas through said outlet first from the bank which is at the lowest pressure;

automatically operable means for withdrawing pressurized gas through said outlet from a second, higher pressure bank of storage containers following its withdrawal from said lowest pressure bank, said automatically operable means comprising a normally-closed valve between said higher pressure bank of storage containers and said outlet, and means for opening said valve to initiate the withdrawal of gas from said higher pressure bank after a time period following the initial withdrawal of gas from said lowest pressure bank; and

a check valve between said lowest pressure bank and said outlet for preventing gas that is being withdrawn from the higher pressure bank from flowing into said lowest pressure bank;

the improvement wherein:

said normally-closed valve is a solenoid valve which opens when its operating coil is energized;

and said means for opening said solenoid valve comprises a time delay switch in circuit with the operating coil of said solenoid valve, said time delay switch being operable to remain open for a predetermined time period following the initial withdrawal of gas from said lowest pressure bank, and then closing to complete the energization circuit for the operating coil of said solenoid valve.

8. A gas supply system according to claim 7, wherein said plurality of banks of storage containers include a third bank which store gas at a higher pressure than said second bank, and further comprising:

a second normally-closed solenoid valve connected between third bank of storage containers and said outlet and operable to open when its operating coil is energized;

a second time delay switch in circuit with the operating coil of said second solenoid valve, said second time delay switch being operable to remain open for a predetermined time period following the initial withdrawal of gas from said second bank of storage containers, and then closing to complete the energization circuit for the operating coil of said second solenoid valve;

and a check valve between said second bank and said outlet for preventing gas that is being withdrawn from said third bank of storage containers from flowing into said second bank.

9. In a system for withdrawing pressurized gas from a storage source, the improvement which comprises:

an electrically operated utilization valve connected to receive pressurized gas from said source;

a plurality of pressure switches having individual electrical connections to said valve to control its operation, each of said pressure switches being operably connected to sense the gas pressure at the outlet side of said valve and being operable to open at different maximum pressures, respectively;

and manually operated means for selectively connecting said pressure switches individually in circuit with said valve to maintain the latter open until the gas pressure at its outlet side reaches the pressure for which the selected pressure switch is set to open and then to close said valve.

10. In a system for withdrawing pressurized gas from a storage source, the improvement which comprises:

an electrically operated utilization valve connected to receive pressurized gas from said source;

a pressure gauge operatively connected to the outlet side of said valve to sense the gas pressure thereat, an actuator operatively coupled to said gauge to move in accordance with said gas-pressure;

and a normally closed switch adjustably mounted at said actuator to be engaged and opened by the latter when the gauge reaches the pressure reading corresponding to the selected maximum pressure, said switch when opened being operable to close said valve.

11. In a supply system having a plurality of banks of storage containers which store gas at different pressures and are all connected to a common outlet, the improvement which comprises:

a utilization valve connected to said outlet to receive pressurized gas therethrough first from the bank of storage containers which is at the lowest pressure;

means controlling the opening and closing of said utilization valve and including switch means for selecting the maximum gas pressure to be permitted at the outlet side of said valve, said switch means being operable in response to the gas pressure at the outlet side of said valve to close said valve when the selected maximum pressure is reached;

and automatically operable means for passing pressurized gas to said outlet from one or more successively higher pressure banks of the storage containers following its withdrawal from said lowest pressure bank.

12. A gas supply system according to claim 11, wherein said automatically operable means comprises:

a normally-closed valve between each of said one or more higher pressure banks and said outlet;

and means for opening each said last-mentioned valve to begin the withdrawal of gas from the corresponding bank after a time period following the initial withdrawal of gas from the next lower pressure bank.

13. A gas supply system according to claim 12, and further comprising a check valve between said outlet and each bank of the storage containers except the highest pressure bank for preventing gas flow from a higher pressure bank to any lower pressure bank.

14. A gas supply system according to claim 13, wherein said utilization valve is electrically operated, and said means controlling the opening and closing of said utilization valve comprises:

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a plurality of pressure switches having individual electrical connections to said utilization valve to control its operation, each of said pressure switches being operably connected to sense the gas pressure at the outlet side of said utilization valve and being operable to open at different pressures, respectively; 5
and manually operated means for selectively connecting said pressure switches individually in circuit with said utilization valve to maintain the latter open until the gas pressure at its outlet side reaches the pressure for which the selected pressure switch is set to open. 10
15. A gas supply system according to claim 13,

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wherein said utilization valve is electrically operated, and said means controlling the opening and closing of said utilization valve comprises:

a pressure gauge operatively connected to the outlet side of said utilization valve to sense the gas pressure thereat, an actuator operatively coupled to said gauge to move in accordance with said gas pressure;
and a normally closed switch adjustably mounted at said pressure gauge along the path of movement of said actuator to be engaged and opened by the latter when the gauge reaches the pressure reading corresponding to the selected maximum pressure.

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