



US00RE39467E

(19) **United States**
(12) **Reissued Patent**
Quinn et al.

(10) **Patent Number: US RE39,467 E**
(45) **Date of Reissued Patent: Jan. 16, 2007**

(54) **AIR DRYER RESERVOIR MODULE COMPONENTS**

FOREIGN PATENT DOCUMENTS

(75) Inventors: **Leonard A. Quinn**, Lagrange, OH (US); **Fred W. Hoffman**, Columbia Station, OH (US); **David J. Goodell**, Beaverton, OR (US)
(73) Assignee: **Bendix Commercial Vehicle Systems LLC**, Elyria, OH (US)

CN	2246605 Y	2/1997
DE	35 04 844	* 7/1987
DE	43 25 102	2/1995
EP	0 463 329	1/1992
EP	0 497 570	* 8/1992
FR	2 575 937	7/1986
JP	57-47056	* 10/1982
JP	60-022555	* 2/1985
JP	60-064616	* 4/1985
JP	62-149320	* 7/1987
WO	WO 98 09859	3/1998
WO	WO 98 12089	3/1998

(21) Appl. No.: **10/721,023**
(22) Filed: **Nov. 24, 2003**

OTHER PUBLICATIONS

Related U.S. Patent Documents

Reissue of:

(64) Patent No.: **6,585,806**
Issued: **Jul. 1, 2003**
Appl. No.: **09/571,897**
Filed: **May 16, 2000**

“Brakes of Commercial Vehicles: design and function; test and maintenance work” by Hans Peter Klug, Second Revised and enlarged edition; Wurzburg Vogel, 1990 (2 page article with 3 page translation attached).*

Primary Examiner—Frank M. Lawrence
(74) *Attorney, Agent, or Firm*—Calfee, Halter & Griswold LLP

U.S. Applications:

(63) Continuation of application No. 09/030,583, filed on Feb. 25, 1998, now Pat. No. 6,074,462, which is a continuation-in-part of application No. 08/993,931, filed on Feb. 18, 1997, now Pat. No. 5,917,139.

(57) **ABSTRACT**

(51) **Int. Cl.**
B01D 53/04 (2006.01)
B01D 53/26 (2006.01)

An air dryer and reservoir assembly for providing compressed air from an air compressor (20) on a heavy motor vehicle which includes an air dryer (14) connected to receive compressed air from the air compressor (20) and a secondary reservoir (12), including an integral purge volume (34), for storing compressed air which passes through the air dryer (14), with the air dryer (14) and the secondary reservoir (12) being securely attached to a housing (16) to form an air dryer reservoir module (10). A primary reservoir (18) for storing compressed air from the air dryer (14) is located remote from the air dryer reservoir module (10). A pressure equalizing mechanism (57) is disposed between the primary reservoir (18) and the secondary reservoir (12) for keeping pressure in the two reservoirs (12,18) equal. Components located within the housing (16) control air flow between the air dryer (14) and the primary and secondary reservoirs (18,12) and also monitor the pneumatic brake system circuits fed by the primary and secondary reservoirs (18,12).

(52) **U.S. Cl.** **95/121; 96/113; 96/136; 96/144; 96/147; 55/DIG. 17**

(58) **Field of Classification Search** **95/117–119, 95/121; 96/108, 109, 113–116, 130, 136, 96/143, 144, 147; 55/DIG. 17**

See application file for complete search history.

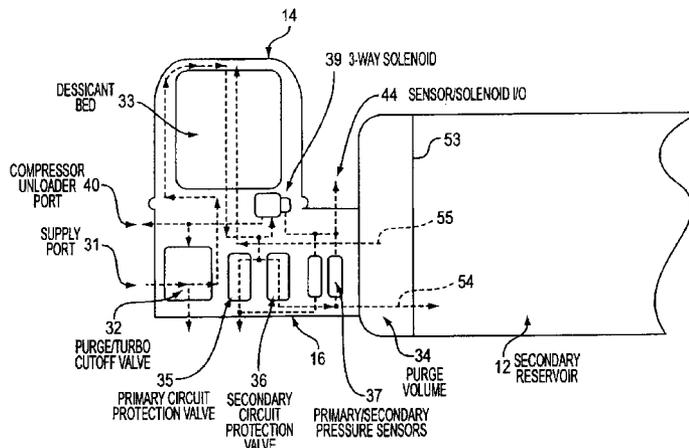
(56) **References Cited**

U.S. PATENT DOCUMENTS

3,080,693 A * 3/1963 Glass et al.
3,242,650 A * 3/1966 Crawford

(Continued)

53 Claims, 6 Drawing Sheets



US RE39,467 E

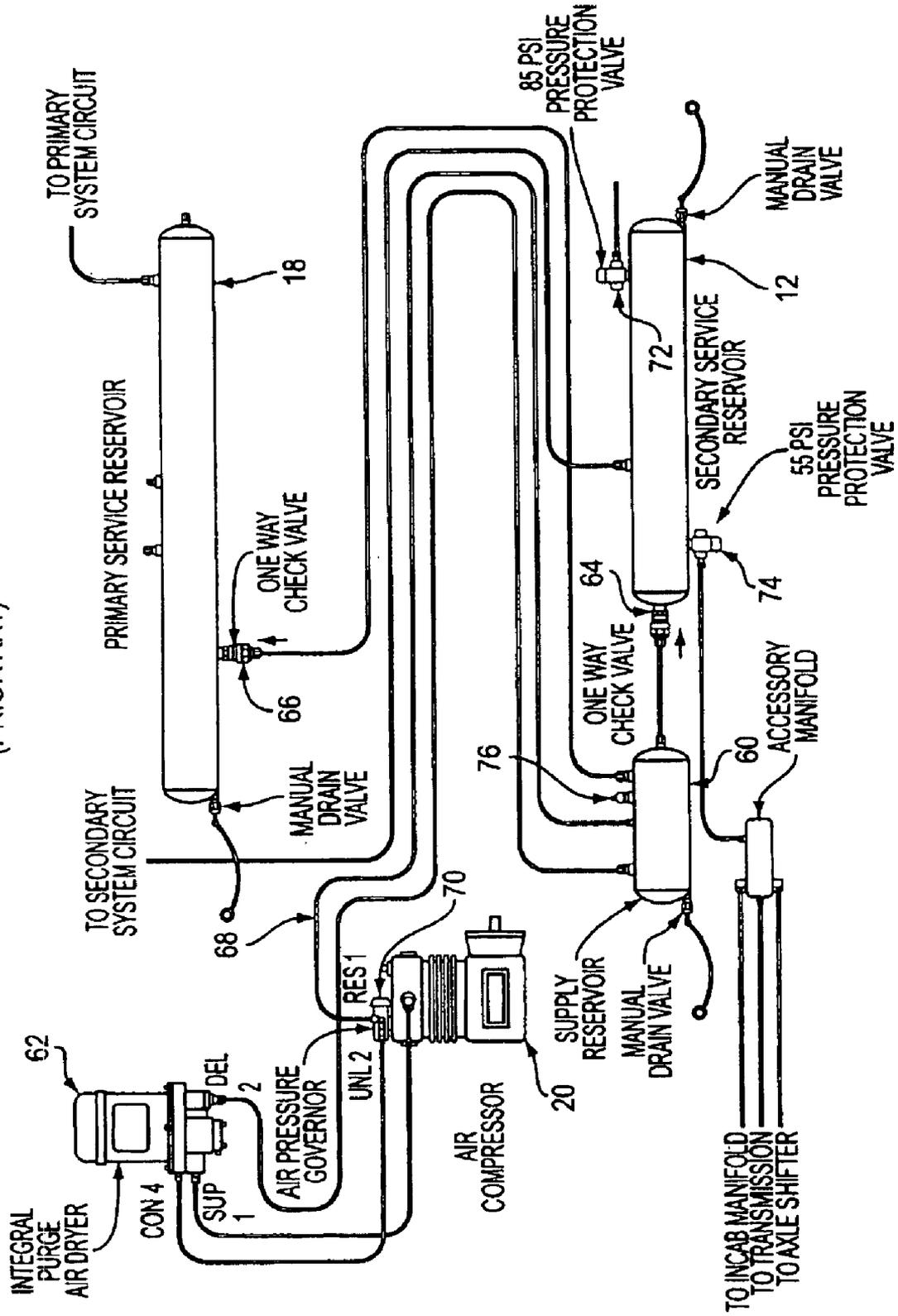
Page 2

U.S. PATENT DOCUMENTS

3,399,510	A	*	9/1968	Kauer, Jr. et al.	4,892,569	A	*	1/1990	Kojima
3,464,186	A	*	9/1969	Hankinson et al.	5,024,687	A	*	6/1991	Waller
3,572,008	A	*	3/1971	Hankinson et al.	5,110,327	A	*	5/1992	Smith
3,592,563	A	*	7/1971	Glass et al.	5,209,764	A	*	5/1993	Eberling
3,714,763	A	*	2/1973	Suzuki	5,286,283	A	*	2/1994	Goodell
3,831,353	A	*	8/1974	Toth	5,458,676	A	*	10/1995	Herlost et al.
3,937,622	A	*	2/1976	Hewitt et al.	5,458,677	A	*	10/1995	Vandermolen
4,272,265	A	*	6/1981	Snyder	5,522,150	A	*	6/1996	Schultz
4,285,702	A	*	8/1981	Michel et al.	5,575,541	A	*	11/1996	Elamin
4,326,489	A	*	4/1982	Heitert	5,607,500	A	*	3/1997	Shamine et al.
4,373,938	A	*	2/1983	McCombs	5,840,104	A	*	11/1998	Hashimoto et al.
4,403,587	A	*	9/1983	Mizuno et al.	5,851,269	A	*	12/1998	Strope
4,504,081	A	*	3/1985	Shimizu et al.	5,917,139	A	*	6/1999	Goodell et al.
4,572,725	A	*	2/1986	Kojima	5,961,694	A	*	10/1999	Monereau et al.
4,655,801	A	*	4/1987	Kojima et al.	5,980,615	A	*	11/1999	Roe
4,658,796	A	*	4/1987	Yoshida et al.	6,074,462	A	*	6/2000	Quinn et al.
4,713,094	A	*	12/1987	Yanagawa et al.	6,391,098	B1	*	5/2002	Thomas
4,714,483	A	*	12/1987	Koenig et al.	6,585,806	B1	*	7/2003	Quinn et al. 95/121
4,764,189	A	*	8/1988	Yanagawa et al.					

* cited by examiner

FIG. 1
(PRIOR ART)



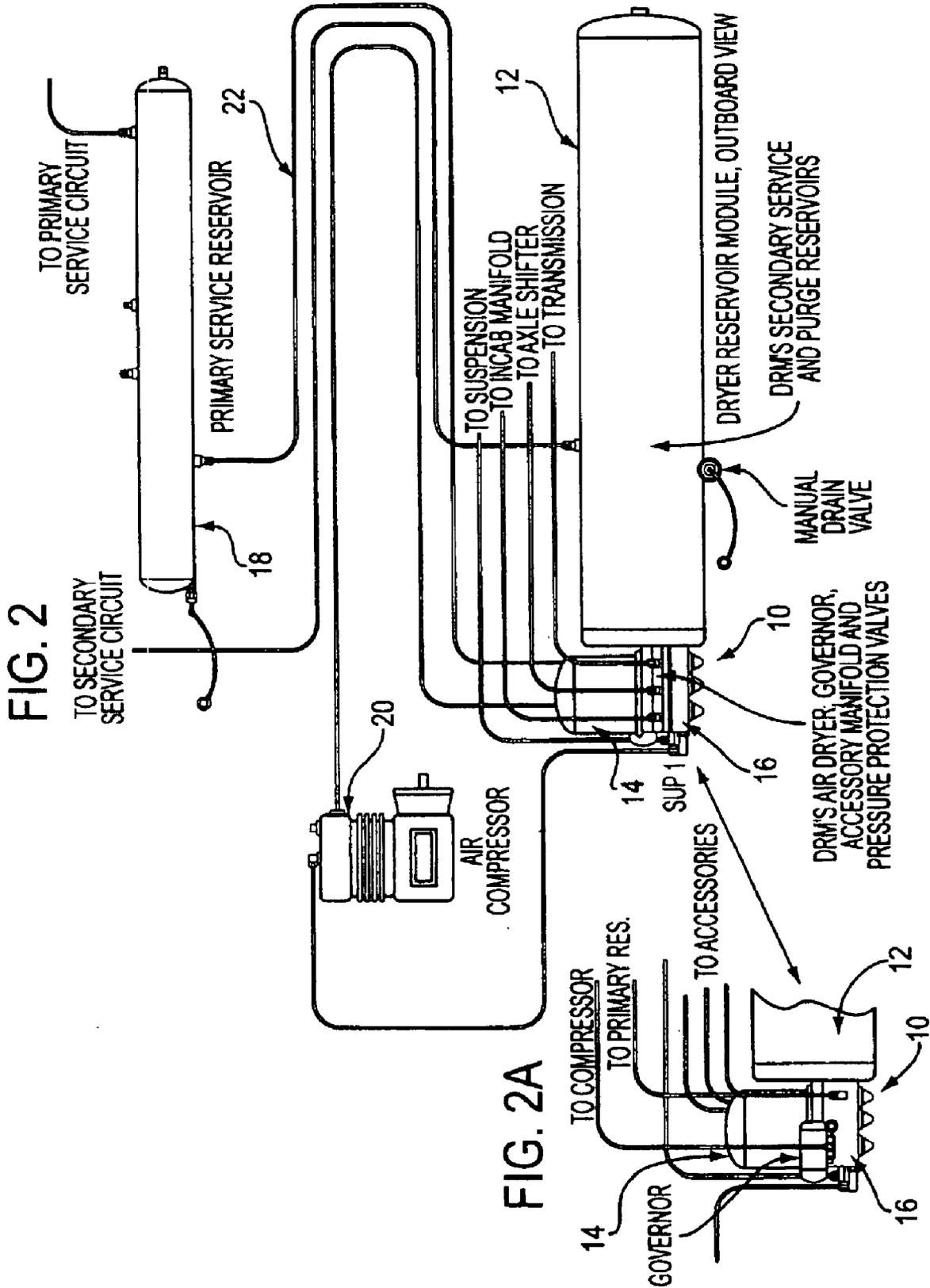


FIG. 3

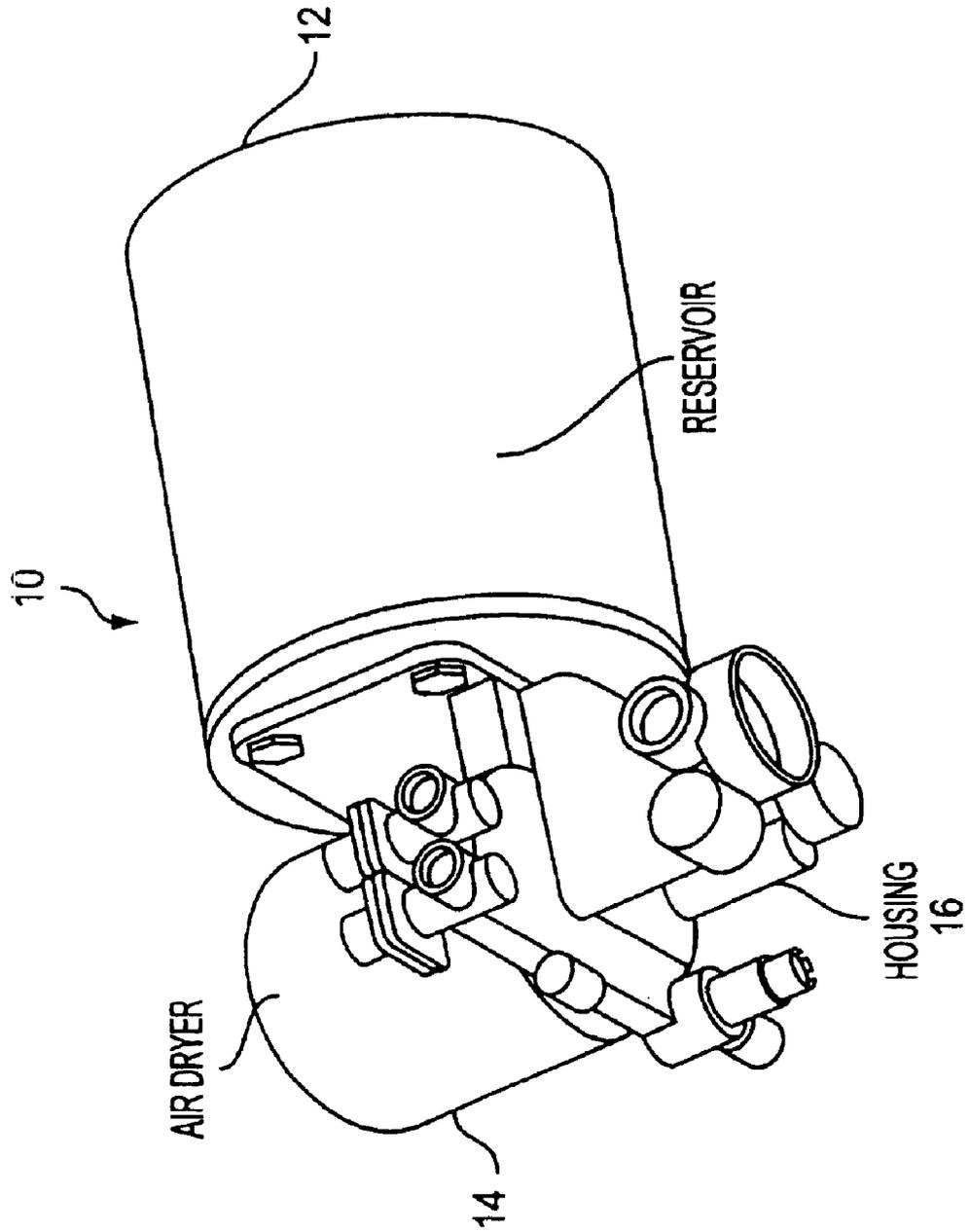


FIG. 4

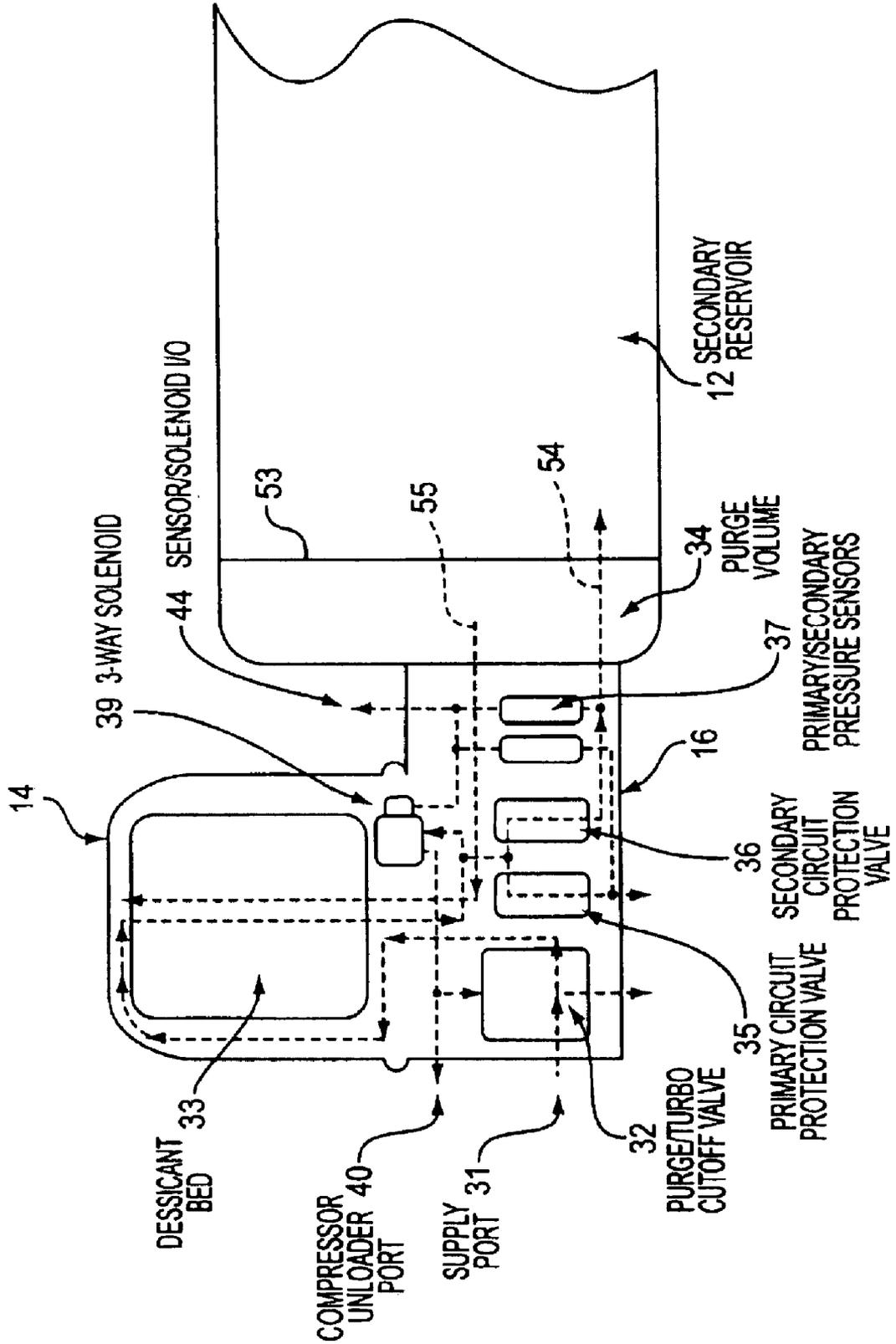


FIG. 5

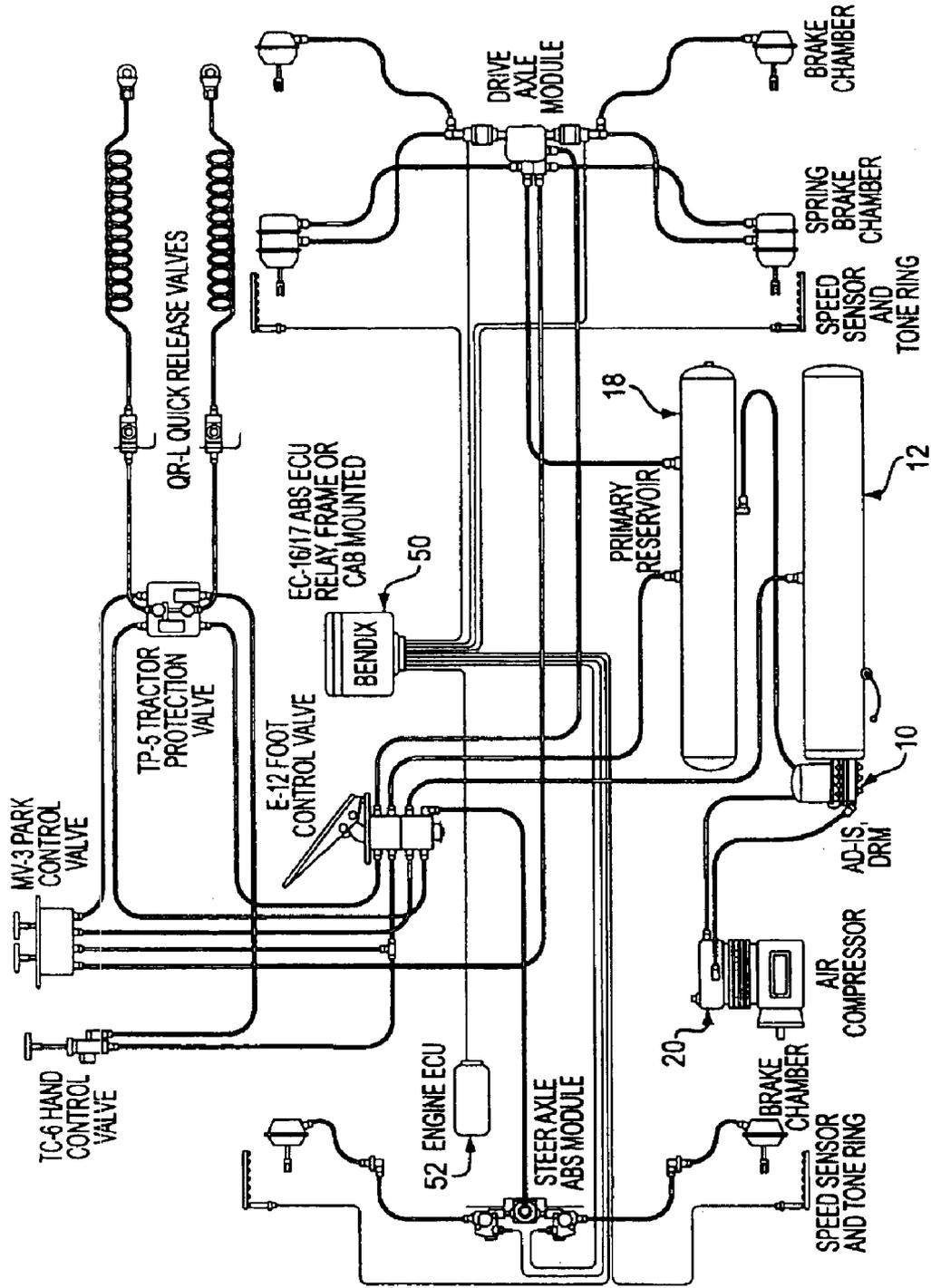
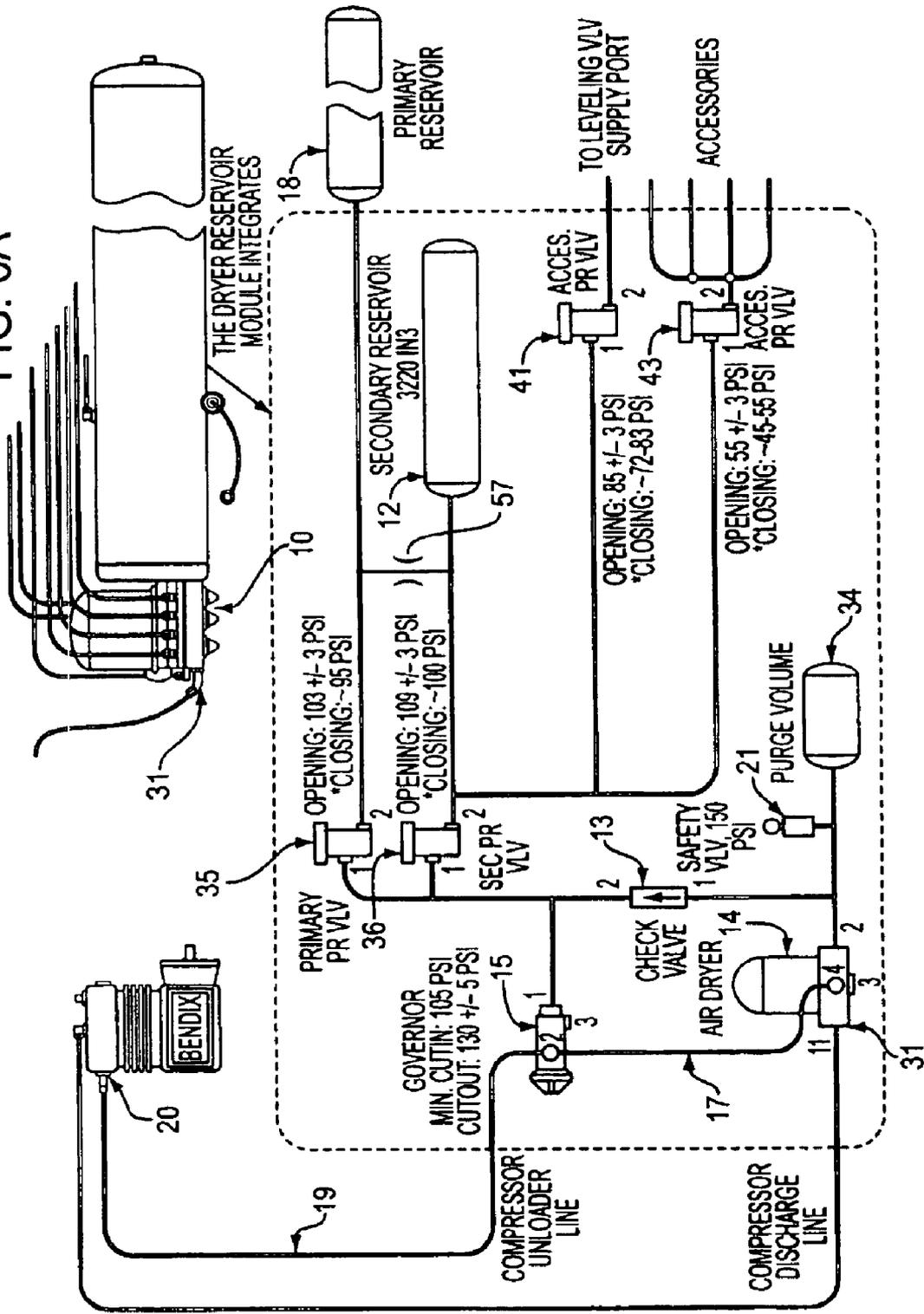


FIG. 6

FIG. 6A



THE DRYER RESERVOIR
MODULE INTEGRATES

PRIMARY
RESERVOIR

SECONDARY RESERVOIR
3/20 IN3

TO LEVELING VLV
SUPPLY PORT

ACCESSORIES

PRIMARY
PR VLV
OPENING: 103 +/- 3 PSI
*CLOSING: ~95 PSI

GOVERNOR
MIN. CUTIN: 105 PSI
CUTOUT: 130 +/- 5 PSI

SEC PR 2
VLV

CHECK
VALVE

SAFETY
VLV, 150
PSI

PURGE VOLUME

OPENING: 85 +/- 3 PSI
*CLOSING: ~72-83 PSI

OPENING: 55 +/- 3 PSI
*CLOSING: ~45-55 PSI

34

31

AIR DRYER RESERVOIR MODULE COMPONENTS

Matter enclosed in heavy brackets [] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 09/030,583, filed Feb. 25, 1998 now U.S. Pat. No. 6,074,462, which is a continuation-in-part of U.S. patent application Ser. No. 08/993,931, filed Dec. 18, 1997 now U.S. Patent No. 5,917,139.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to air dryers and more particularly to an air dryer and a reservoir, including a separate purge volume, constructed together as a module.

2. Description of Prior Art

Air dryers have been used to dry the air in a heavy vehicle air brake system for many years. The advantages of clean and dry air in air brake systems has long been recognized, as moisture entrained in the air brake system may during cold weather operation cause the components of the air brake system to freeze, thus rendering the system inoperable. These prior art air dryers normally include a desiccant material through which the compressed air flows. When the vehicle air compressor has charged the vehicle air reservoirs to a sufficient pressure level, the compressor is unloaded so that the compressor no longer compresses air. When the compressor is unloaded, a signal is transmitted to a purge valve carried within the air dryer which causes stored compressed air to backflow through the desiccant at a controlled rate to regenerate the desiccant. The air used to regenerate the desiccant can be either from compressed air stored in an integral purge volume within the air dryer or from compressed air stored in a separate reservoir.

Most prior art compressed air systems for heavy vehicle air brake applications use three reservoirs which are separate from the air dryer. A compressor feeds compressed air to the air dryer which after flowing through the desiccant bed is fed to a remote supply reservoir. The supply reservoir is connected to feed compressed air to a primary reservoir and a secondary reservoir. The primary and secondary reservoirs feed pneumatic circuits which can control the air brake system of the vehicle. For protection from loss of air pressure the primary and secondary reservoirs each include a check valve in their pneumatic connections to the supply reservoir. A pneumatic control line extends from the supply reservoir to an air pressure governor which controls loading and unloading of the air compressor.

SUMMARY OF THE INVENTION

The present invention is for an air dryer and reservoir assembly, for providing compressed air from an air compressor for operating the brakes of a heavy motor vehicle, which includes an air dryer connected to receive compressed air from the air compressor, a secondary air reservoir separate from the air dryer, a housing containing pneumatic circuit components for controlling the flow of compressed air from the air compressor through the air dryer to the secondary reservoir having the air dryer securely attached to

one section thereof and the secondary reservoir securely attached to another section thereof for securing the air dryer and the secondary reservoir together as a unitary air dryer reservoir module. The compressed air brake system with the air dryer reservoir module also includes a primary air reservoir having a pneumatic connection to the housing disposed remote from the secondary air reservoir with the housing containing pneumatic circuit components for controlling compressed air flow between the air dryer and the primary air reservoir. Pneumatic circuit protection valves are disposed within the housing for monitoring the pneumatic circuits fed by the primary and secondary reservoirs. A failure detection means is also disposed within the housing for detecting a failure of the pneumatic circuits which are fed by the primary and secondary reservoirs and in the event of a failure of these pneumatic circuits the speed of the heavy vehicle is limited.

The herein disclosed air brake system's air charging and treatment sub-system referred to as the air dryer reservoir module provides for a simplified and cost effective air charging sub-system, using integrated components. The air dryer reservoir module is configured in a way that allows the elimination of the supply reservoir, which is used in the standard three reservoir system, while providing a means of simultaneously sensing both the primary reservoir and the secondary reservoir for air compressor and air dryer control.

The air dryer reservoir module integrates components such as pressure protection valves, the air compressor governor, pressure relief valves, pressure sensors and the like in a way that eliminates the need for the supply reservoir, the supply reservoir safety valve, several of the standard three reservoir system's external lines and many of its fittings. The reduction of components, fittings and pneumatic lines reduces potential failure modes. With respect to a standard three reservoir system, the air dryer reservoir module integrates the following components: air dryer, primary and secondary check valves, supply and secondary drain valves, supply reservoir safety valve, the compressor governor, auxiliary system pressure protection valves, and the supply and secondary reservoirs.

A purge volume can be built into the end of the secondary reservoir to which the air dryer is attached. An internal baffle separates the secondary reservoir volume from the purge volume. Internal communication passages connect the secondary reservoir and purge volume to the air dryer. The dryer reservoir module can also be constructed to equalize the pressure between the primary reservoir and the secondary reservoir, such that if the vehicle is parked for a given period of time the pressure cannot be replenished. Thereby limiting the use of the vehicle with a severely leaking reservoir.

BRIEF DESCRIPTION OF DRAWINGS

For a better understanding of the invention reference may be had to the preferred embodiments exemplary of the inventions shown in the accompanying drawings in which:

FIG. 1 is an illustration of a prior art three reservoir compressed air charging system;

FIG. 2 is an illustration of a compressed air charging system using an air dryer reservoir module according to the present invention;

FIG. 2A is an illustration of an inboard view of a portion of the compressed air charging system using an air dryer reservoir module shown in FIG. 2;

FIG. 3 is a perspective view of an air dryer reservoir module according to the present invention;

FIG. 4 is an illustration of an air dryer reservoir module according to the present invention showing some of its internal pneumatic flow paths and control components;

FIG. 5 is an illustration of an air dryer reservoir module according to the present invention used in a service brake system for a heavy motor vehicle;

FIG. 6 is a schematic illustration showing the components included in one embodiment of the air dryer reservoir module; and

FIG. 6A is a view of an air dryer reservoir module that integrates the components shown in FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings and FIGS. 2 and 3 in particular there is shown an air dryer reservoir module 10 according to the present invention. The air dryer module 10 provides compressed air received from an air compressor 20 for operating the brakes of a heavy motor vehicle. The air dryer module 10 includes an air dryer 14 connected to receive compressed air from the air compressor 20, a secondary air reservoir 12 separate from the air dryer 14, and a housing 16 containing pneumatic circuit components for controlling the flow of compressed air from the air compressor 20 through the air dryer 14 to the secondary reservoir 12 and a primary reservoir 18. The housing 16 has the air dryer 14 securely attached to one section thereof and the secondary reservoir 12 securely attached to another section thereof for joining the air dryer 14 and the secondary reservoir 12 together forming the unitary air dryer reservoir module 10. The compressed air brake system with the air dryer reservoir module 10 also includes the primary air reservoir 18 having a pneumatic connection 22 to the housing 16 disposed remote from the secondary air reservoir 12. The housing 16 also containing pneumatic circuit components for controlling compressed air flow between the air dryer 14 and the primary air reservoir 18. Pneumatic circuit protection valves are disposed within the housing 16 for monitoring the pneumatic circuits fed by the primary reservoir 18 and the secondary reservoir 12. A failure detection means is also disposed within the housing 16 for detecting a failure of the pneumatic circuits which are fed by the primary and secondary reservoirs 18,12 and in the event of a failure of these pneumatic circuits the speed of the heavy vehicle is limited.

Referring to FIG. 1 there is shown a relatively standard prior art three reservoir pneumatic charging system for the brake system of a heavy motor vehicle. Most prior art compressed air systems for heavy vehicle air brake applications use a primary reservoir 18, a secondary reservoir 12 and a supply reservoir 60 which are separate from the air dryer. A compressor 20 feeds compressed air to an air dryer 62 which after flowing through the desiccant bed is fed to the remote supply reservoir 60. The supply reservoir 60 is connected to feed compressed air to the primary reservoir 18 and the secondary reservoir 12. The primary reservoir 18 and the secondary reservoir 12 feed pneumatic circuits which can control the air brake system of the vehicle. For protection from loss of air pressure the primary and secondary reservoirs each include a check valve, 66 and 64 respectively, in their pneumatic connections to the supply reservoir 60. A pneumatic control line 68 extends from the supply reservoir 60 to an air pressure governor 70, mounted on the air compressor 20, which controls loading and unloading of the air compressor 20. The secondary reservoir 12 also has attached thereto an 85 psi pressure protection

valve 72 and a 55 psi pressure protection valve 74 which feed accessories on the heavy vehicle. The supply reservoir 60 includes a safety valve 76 which is set for 150 psi. All three of the reservoirs 12, 18 and 60 include a manual drain valve which can be used for draining liquid from their respective reservoir.

Comparing FIGS. 1 and 2 illustrates the difference between the air dryer reservoir module 10 and the standard three reservoir system. The air dryer reservoir module 10 integrates components, eliminates pneumatic lines and connections as compared to a standard three reservoir system as shown in FIG. 1. The air dryer reservoir module 10 which is one of the air brake system's charging sub-systems is intended for use on heavy vehicles, such as tractors and trucks, and is configured as shown in the FIGS. 2 and 3. Manufacturing of the air dryer reservoir module 10 system is intended to be by conventional methods.

The air dryer reservoir module is different from the prior art in that it integrates charging system components in a way that eliminates components, pneumatic lines and pneumatic connections thereby reducing failure modes. The air dryer reservoir module 10 is thought to be the first of its kind to utilize the ABS/EBS brake system ECU to communicate system failures to the engine ECU to instruct the engine to limit vehicle speed. The air dryer reservoir module 10 concept eliminates the supply tank 60 thereby allowing the primary and secondary service tanks 12 and 18 to communicate directly with the integrated air dryer 14 through protection valves 35 and 36. This allows the protection valves 35, 36 to be integrated into the air dryer module 10, reducing external components and pneumatic lines.

Referring now to FIGS. 4 and 5, the air dryer reservoir module 10 operates as follows. Charge air from the air compressor 20 enters the air dryer reservoir module 10 at its supply port 31, flows through a purge valve 32 to the desiccant bed 33, fills the purge volume 34, flows through a purge orifice (not shown) and flows out a single check valve (not shown). This represents the same charge cycle as used in an AlliedSignal AD-9 or AD-IP air dryer. From the delivery of the single check valve the charge air flows to the supply of the primary protection valve 35 and secondary protection valve 36. Charge air pressure builds until the protection valves 35, 36 open, allowing air to flow to the primary reservoir 18 and the secondary reservoir 12. Charge air pressure continues to build until the pressure sensors 37 or a mechanical governor (not shown) reach cutout pressure. At cutout pressure the three way solenoid 39 or the mechanical governor opens, sending a control signal through compressor unloader port 40, unloading the compressor 20 and opening the purge valve 32 purging the air dryer 14. The purge cycle is the same as that of the AlliedSignal AD-9 or AD-IP air dryer. The air dryer reservoir module's 10 integrated component configuration makes it compatible with both integral purge and system purge type air dryer operation and both mechanical and electrical type governors. This allows a single dual function electric solenoid to control the air compressor 20 unloading function and to purge the air dryer 14 using both the primary and secondary service reservoirs 18 and 12 respectively. This configuration also allows both reservoirs 12, 18 to purge simultaneously thereby reducing the total system pressure drop required to regenerate the desiccant bed 33 with system purge type air dryer operation. Use of pressure protection valves 35 and 36 instead of single check valves 66 and 64 reduces compressor 20 cycling. Without the use of check valves 64 and 66 primary reservoir 18 and secondary reservoir 12 are common at pressures above the protection valves 35,36 opening

pressure. Therefore, pressure differentials do not develop between primary reservoir 18 and secondary reservoir 12 as air is consumed. Pressure differentials can develop in standard three reservoir system due to improperly sized reservoirs and use of accessory systems, causing the compressor to cutin before the air pressures in both reservoirs 12, 18 have dropped to the cutin pressure.

The air dryer reservoir module 10 can be designed to utilize service reservoir air to purge the desiccant, i.e., supply purge. The operation of the air dryer reservoir module 10 in a supply purge mode will be similar to that of an AlliedSignal AD-SP air dryer. The integral pressure protection valves 35, 36 will eliminate the need for externally plumbed protection valves. The internal protection valves 35 and 36, when open will allow air to flow back to a special two position three way system purge solenoid, located where the three way solenoid 39 is in the integral purge design. The special two position three way system purge solenoid will be controlled by the BBS ECU with inputs from the pressure sensors 37 through sensor/solenoid I/O 44. The system purge solenoid will be designed to communicate a control signal to the compressor 20 unloader and the air dryer purge valve 32 independently. At cutout pressure the system purge solenoid will unload the compressor and open the purge valve 32. The system purge solenoid will then close only the purge valve 32 after a predetermined amount of system air is used to purge the dryer's desiccant bed 33. At cutin pressure the system purge solenoid will then load the compressor 20 starting the cycle over.

Referring now to FIG. 6, the embodiment of the illustrated air dryer reservoir module 10 operates as follows. Charge air from the air compressor 20 enters the air dryer reservoir module 10 at its supply port 31, fills the purge volume 34, and flows out a single check valve 13. Check valve isolates the primary reservoir 18 and the secondary reservoir 12 from the output of air dryer 14. An over pressure safety valve 21 which is set for 150 psi is disposed at the outlet from air dryer 14. From the delivery of the single check valve 13 the charge air flows to the supply of the primary protection valve 35 and secondary protection valve 36. Charge air pressure builds until the protection valves 35, 36 open, allowing air to flow to the primary reservoir 18 and the secondary reservoir 12. Charge air pressure continues to build at the outlet of check valve 13 until a mechanical governor 15, which is connected to the outlet of check valve 13, reach cutout pressure. At cutout pressure, which is set at 130 ± 5 psi, the mechanical governor 15 opens, providing a pressure drop signal through line 19, unloading the compressor 20 and providing a pneumatic signal along line 17 for initiating purging of the air dryer 14 with the compressed air contained in purge volume 34. Compressor 20 remains unloaded until the pressure to governor 15 falls below the cutin pressure, which is set at 105 psi. At the cutin pressure the governor 15 closes and the compressor is loaded to again supply compressed air to the inlet 31 of air dryer 14.

The primary protection valve 35 is set to open at 103 ± 3 psi and to close at approximately 95 psi. The secondary protection valve 36 is set to open at 109 ± 3 psi and to close at approximately 100 psi. When both protection valves 35 and 36 are open, the primary reservoir 18 and the secondary reservoir 12 are in free fluid communication. Secondary reservoir 12 provides compressed air to a vehicle leveling supply port through an accessory protection valve 41 which is set to open at 85 ± 3 psi and to close at approximately 72 to 83 psi. Secondary reservoir 12 also provides compressed air to vehicle accessories through an accessory protection

valve 43 which is set to open at 55 ± 3 psi and to close at approximately 45 to 55 psi.

The air dryer reservoir module 10 is designed to accommodate the requirements of both FMVSS 121 and EEC regulation No. 13. The air dryer reservoir module 10 is also designed to interact with the ABS/EBS system's J1939/J1922 engine serial link to allow the limiting of vehicle speed in the event of a single circuit brake system failure, either primary or secondary. The air dryer reservoir module 10 reduces the number of OEM installed charging subsystem components, pneumatic lines and connections as follows: Major charging system components—four for air dryer reservoir module 10 vs. thirteen for a three reservoir system; pneumatic lines—three for air dryer reservoir module 10 vs. six for a three reservoir system; and pneumatic connections—thirteen for air dryer reservoir module 10 vs. thirty two for a three reservoir system.

FIG. 5 shows the air dryer reservoir module in a complete service brake system. The air dryer reservoir module 10 system can be designed to communicate pneumatic circuit failures through the ABS/EBS ECU 50 to the engine serial link (J1922/J1939) to instruct the engine to go into a "limp" mode. The intention of this feature is to provide a "nuisance" motivator to the operator to have the vehicle repaired. The system operates as follows: In the event of a failure of a pneumatic system which is supplied by either the primary reservoir 18 or the secondary reservoir 12 the air dryer reservoir module's 10 integral pressure sensors 37 communicates the system pressure status to the ABS/EBS ECU 50. The ECU 50 instructs the engine control module (ECM) 52 to limit vehicle speed if the vehicle is in excessive of a set limit.

Referring now to FIG. 4 there is shown the secondary reservoir 12 with an integral purge volume 34. A baffle 53 separates the purge volume 34 from the secondary reservoir 12. An internal tube 54 extends through the purge volume 34 to connect the reservoir 12 through connections within housing 16 to the air dryer 14. A connection 55 connects the purge volume 34 through connections within housing 15 to the air dryer 14. This construction eliminates external lines for connecting the air dryer 14 to the purge volume 34 and the secondary reservoir 12. External lines have the potential for leak points, and create customer handling and mounting concerns. Building the purge volume 34 required for the air dryer into the secondary reservoir 12 allows the use of a compact system purge air dryer desiccant cartridge and this minimizes the space required. Baffle 53 has tube 54 attached through it and the tube 54 extends through the purge volume 34 and terminates at the head of the reservoir. The head of the reservoir has attached to it the housing 16 which is integral with air dryer 14. The air dryer communicates with both volumes 12 and 34 via separate passages 54 and 55.

With a leaking reservoir 12 or 18 the dryer reservoir module 10 described above will recharge the surviving reservoir indefinitely, thereby holding off the spring brakes. The driver can choose to operate the vehicle with limited braking efficiency for an unlimited period of time even though one of the reservoirs does not hold pressure. In another embodiment the dryer reservoir module 10 can be constructed to equalize the pressure between the reservoirs 12 and 18, such that if the vehicle is parked for a given period of time the pressure cannot be replenished thereby limiting the use of the vehicle with a severely leaking reservoir.

As shown in FIG. 6 and described above, pressure protection valves 35 and 36 are used to supply compressed air

to the primary reservoir **18** and the secondary reservoir **12**. The pressure protection valves **35**, **36** are set to pressurize the primary reservoir **18** first, provided the same pressure exists within the primary and secondary reservoirs. At full system pressure the pressure protection valves **35**, **36** are open, insuring equal pressure in both the primary and secondary reservoirs **18** and **12**. However, the pressure protection valve opening pressure is dependent upon the downstream reservoir pressure, therefore, if the reservoir pressures are not equal the pressure protection valve which has the highest downstream pressure will open first. Parking the vehicle overnight or for extended periods of time may cause the primary and secondary reservoir pressures to become unequal. During recharging of the air system the secondary reservoir **12** may charge before the primary reservoir **18**. It may be desirable to limit the duration the vehicle can be operated in the condition where one reservoir has significantly reduced pressure. By using a pressure equalizing mechanism, such as a connecting line with a suitable orifice **57**, the pressures in the reservoirs **12** and **18** slowly become equal so that during recharging of the air system the primary reservoir **18** will charge first. Furthermore, if the primary reservoir **18** has become ruptured or has a severed leak, again the pressure in both reservoirs **12** and **18** will migrate to 0 psi; however, the primary reservoir **18** can be recharged, but the essential accessories and air suspension will not be pressurized because the secondary reservoir **12** cannot be recharged. The pressure equalizing mechanism **57** will cause the pressure in both reservoirs **12** and **18** to be equal, thereby charging the primary reservoir **18** first and limiting the use of the vehicle after a severe leak in either the primary or secondary reservoirs **18** and **12**.

What is claimed is:

1. A method for pressurizing and depressurizing a compressed air reservoir including a purge chamber in fluid communication with an air dryer, a service chamber in fluid communication with the air dryer, and a baffle defining the purge and service chambers, the method comprising:

pressurizing the purge chamber with first dried compressed air from the air dryer;

pressurizing the service chamber with second dried compressed air from the air dryer without commingling the first dried air and the second dried air; and

depressurizing the purge chamber to regenerate the air dryer.

2. The method for pressurizing and depressurizing a compressed air reservoir as set forth in claim **1**, further including:

depressurizing the service chamber to operate a compressed air system.

3. The method for pressurizing and depressurizing a compressed air reservoir as set forth in claim **1**, wherein the purge chamber is pressurized before the service chamber.

4. The method for pressurizing and depressurizing a compressed air reservoir as set forth in claim **1**, wherein pressurizing the service chamber includes:

controlling a valve between the service chamber and the air dryer.

5. The method for pressurizing and depressurizing a compressed air reservoir as set forth in claim **1**, wherein depressurizing the purge chamber includes:

transmitting the first dried compressed air from the purge chamber to the air dryer without commingling the first dried air and the second dried air.

6. A compressed air reservoir, comprising:

a purge chamber;

a service chamber;

a baffle defining the purge and service chambers;

a first passageway for transmitting first dried compressed air between a dryer and the purge chamber; and

a second passageway for transmitting second dried compressed air between the dryer and the service chamber, the second dried compressed air being transmitted between the dryer and the service chamber without passing through the first passageway.

7. The compressed air reservoir as set forth in claim **6**, further including:

a valve, which controls passage of the second dried compressed air between the dryer and the service chamber via the second passageway.

8. The compressed air reservoir as set forth in claim **7**, wherein the valve is a protection valve.

9. The compressed air reservoir as set forth in claim **6**, wherein the first dried compressed air in the purge chamber is transmitted to the dryer via the first passageway for regenerating a desiccant in the dryer.

10. The compressed air reservoir as set forth in claim **9**, wherein circuit components cause the first dried compressed air to pass from the dryer to the purge chamber before the second dried compressed air passes from the dryer to the service chamber.

11. The compressed air reservoir as set forth in claim **6**, wherein the second passageway is a tube between the dryer and the service chamber.

12. The compressed air reservoir as set forth in claim **11**, wherein the tube passes through the purge chamber.

13. The compressed air reservoir as set forth in claim **6**, wherein a volume of the purge chamber is smaller than a volume of the service chamber.

14. A compressed air reservoir, comprising:

a purge chamber;

a service chamber;

a baffle defining the purge and service chambers;

a first passageway for transmitting first dried compressed air between an air dryer and the purge chamber; and

a second passageway for transmitting second dried compressed air between the dryer and the service chamber, the second dried compressed air being transmitted between the dryer and the service chamber without passing through the purge chamber.

15. An air reservoir for use on a motor vehicle, comprising:

a first section;

a [second] *purge* section;

a divider between the first and [second] *purge* sections;

a first connection connecting the first section to a source of compressed air; and

a second connection connecting the [second] *purge* section to the source of compressed air, the first connection not connecting the first section to the [second] *purge* section and the second connection not connecting the [second] *purge* section to the first section.

16. The air reservoir for use on a motor vehicle as set forth in claim **15**, wherein the divider creates an air-tight seal between the first and [second] *purge* sections.

17. The air reservoir for use on a motor vehicle as set forth in claim **15**, wherein a volume of the [second] *first* section is larger than a volume of the [first] *purge* section.

18. The air reservoir for use on a motor vehicle as set forth in claim 15, further including:

a valve for controlling communication between the [second] first section and the source of compressed air.

19. The air reservoir for use on a motor vehicle as set forth in claim 15, wherein the [second] first connection is routed through the [first] purge section.

20. The air reservoir for use on a motor vehicle as set forth in claim 19, wherein the [second] first connection is a tube.

21. The air reservoir for use on a motor vehicle as set forth in claim 15, wherein the first and second connections connect the first and [second] purge sections, respectively, to the source of compressed air via an air dryer.

22. An air supply system for a motor vehicle brake system, comprising:

a compressor for supplying compressed air;

an air dryer connected to receive compressed air from the air compressor, the dryer including a desiccant bed through which the compressed air flows for providing a dry compressed air source for operating the brake system; and

a reservoir, including:

a first section;

a [second] purge section;

a baffle defining the first and [second] purge sections; a first passageway connecting the first section to the source of the dry compressed air; and

a second passageway connecting the [second] purge section to the source of the dry compressed air, the dry compressed air being transmitted between the source and the [second] purge section without passing through the first section.

23. The air supply system for a motor vehicle brake system as set forth in claim 22, further including:

a housing having a first section connected to the dryer and a second section connected to the reservoir for joining the dryer and the reservoir as a unitary unit.

24. The air supply system for a motor vehicle brake system as set forth in claim 22, wherein:

a first portion of the dry compressed air is transmitted between the dryer and the first section via the first passageway; and

a [second] purge portion of the dry compressed air is transmitted between the dryer and the [second] purge section via the second passageway.

25. The air supply system for a motor vehicle brake system as set forth in claim 24, wherein:

the first portion of the dry compressed air is not transmitted to the [second] purge section; and

the [second] purge portion of the dry compressed air is not transmitted to the first section.

26. The air supply system for a motor vehicle brake system as set forth in claim 24, wherein the first portion of the dry compressed air is transmitted from the first section to the dryer for regenerating the desiccant bed.

27. The air supply system for a motor vehicle brake system as set forth in claim 26, wherein the [second] first portion of the dry compressed air is transmitted to the brake system.

28. The air supply system for a motor vehicle brake system as set forth in claim 26, wherein circuit components cause the [first] purge portion of the dry compressed air to be transmitted from the dryer to the [first] purge section via the [first] second passageway before the [second] first portion of the dry compressed air is transmitted from the dryer to the [second] first section via the [second] first passageway.

29. The air supply system for a motor vehicle brake system as set forth in claim 26, wherein a volume of the [first] purge section is smaller than a volume of the [second] first section.

30. The air supply system for a motor vehicle brake system as set forth in claim 24, further including:

a valve for controlling the transmission of the [second] first portion of the dried compressed air between the dryer and the [service chamber] first section.

31. The air supply system for a motor vehicle brake system as set forth in claim 30, wherein the valve is positioned within the second passageway.

32. The air supply system for a motor vehicle brake system as set forth in claim 22, further including a second reservoir connected to the source of the dry compressed air.

33. The air supply system for a motor vehicle brake system as set forth in claim 22, wherein the air dryer is remote from the reservoir.

34. A reservoir used in combination with an air dryer in a compressed air system, the reservoir comprising:

a first chamber for storing first compressed dried air used for regenerating a desiccant within the dryer;

a second chamber for storing second compressed dried air for use in a pneumatic system;

a baffle between the first and second chambers;

a first passageway for transmitting the first compressed dried air between the dryer and the first chamber, the first compressed dried air not being transmitted to the second chamber; and

a second passageway for transmitting the second compressed dried air between the dryer and the second chamber, the second compressed dried air not being transmitted to the first chamber.

35. The reservoir used in combination with an air dryer in a compressed air system as set forth in claim 34, further including:

a valve for controlling the transmission of the second compressed air between the dryer and the second chamber.

36. The reservoir used in combination with an air dryer in a compressed air system as set forth in claim 35, wherein the valve causes the first compressed dried air to be stored in the first chamber before the second compressed dried air is stored in the second chamber.

37. The reservoir used in combination with an air dryer in a compressed air system as set forth in claim 34, wherein the second passageway is a tube passing through the baffle.

38. The reservoir used in combination with an air dryer in a compressed air system as set forth in claim 37, wherein the tube passes through the first chamber.

39. An air reservoir for use on a motor vehicle, comprising:

a first section in independent fluid communication with a source of compressed air;

a [second] purge section in independent fluid communication with the source of compressed air; and

a divider between the first and [second] purge sections.

40. The air reservoir as set forth in claim 39, wherein the first section is not in independent fluid communication with the [second] purge section.

41. An air reservoir for use on a motor vehicle, comprising:

a first section;

a [second] purge section;

a divider between the first and [second] purge sections;

11

a first passageway independently fluidly connecting the first section to a source of compressed air; and

a second passageway independently fluidly connecting the [second] *purge* section to the source of compressed air, the first passageway not independently fluidly connecting the first section to the [second] *purge* section and the second passageway not independently fluidly connecting the [second] *purge* section to the first section.

42. The air reservoir for use on a motor vehicle as set forth in claim 41, further including:

- a valve for controlling the fluid communication between the [second] *first* section and the source of compressed air via the [second] *first* passageway.

43. The air reservoir for use on a motor vehicle as set forth in claim 41, wherein the [second] *first* passageway [is] passes through the [first] *purge* section.

44. The air reservoir for use on a motor vehicle as set forth in claim 43, wherein the [second] *first* passageway is a tube.

45. An air supply system for a motor vehicle brake system, comprising:

- a compressor for supplying compressed air;
- an air dryer connected to receive compressed air from the air compressor, the dryer including a desiccant bed through which the compressed air flows for providing a dry compressed air source for operating the brake system; and
- a reservoir, including:
 - a first section;
 - a second section;
 - a baffle defining the first and second sections;
 - a first passageway connecting the first section to the source of the dry compressed air; and

12

a second passageway connecting the second section to the source of the dry compressed air, the dry compressed air being transmitted between the source and the second section without passing through the first section during a first operating mode.

46. The air supply system as set forth in claim 45, wherein, during the first operating mode, a first portion of the compressed air is stored in the first section before a second portion of the compressed air is stored in the second section.

47. The air supply system as set forth in claim 46, wherein the second portion of the dry compressed air is transmitted from the first section to the second section during a second operating mode.

48. The air supply system as set forth in claim 47, wherein the first portion of the dry compressed air is transmitted from the first section to the dryer for regenerating the desiccant bed during the first operating mode.

49. *The air reservoir for use on a motor vehicle as set forth in claim 15, wherein the first section is a service section.*

50. *The air supply system for a motor vehicle brake system as set forth in claim 22, wherein the first section is a service section.*

51. *The air reservoir as set forth in claim 39, wherein the first section is a service section.*

52. *The air reservoir for use on a motor vehicle as set forth in claim 41, wherein the first section is a service section.*

53. *The air supply system as set forth in claim 45, wherein the first section is a service section.*

* * * * *