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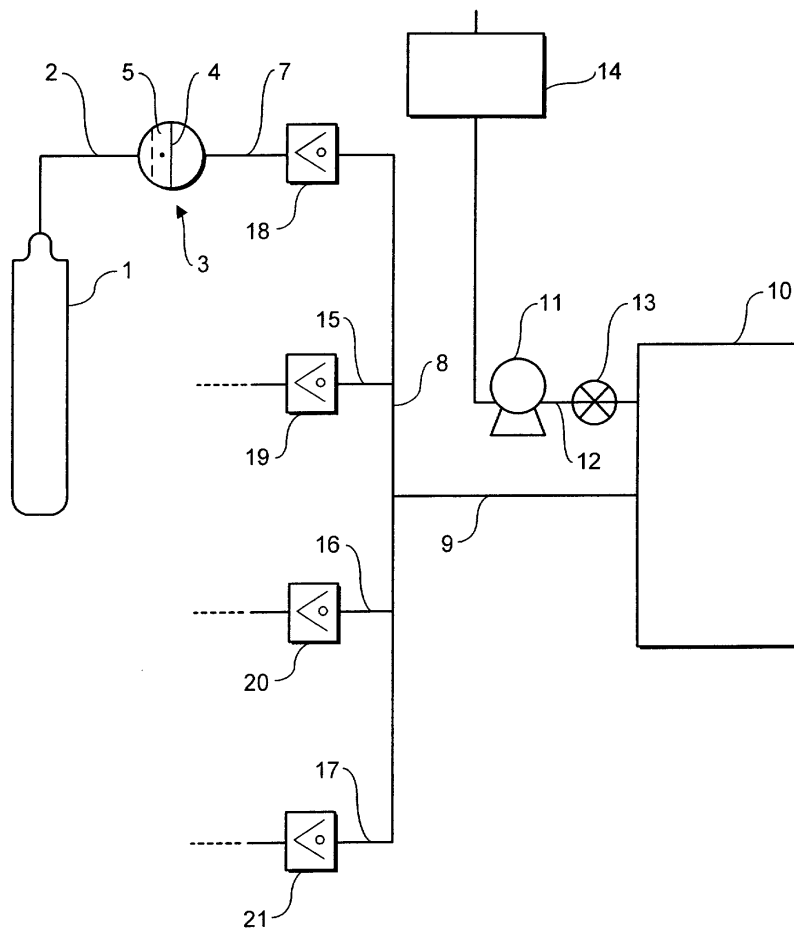
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(54) **Gas containment system**

(57) A gas containment system comprising a source of high pressure gas and means to regulate the supply of the gas to processing apparatus, wherein in the event

of failure of the regulatory means, means are provided to direct gas escaping from the regulatory means in to a chamber at sub-atmospheric pressure.



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Description

[0001] This invention relates to gas containment systems and, more particularly to systems which contain and preferably also abate gases which are accidentally released from apparatus due to, for example, component failure.

[0002] In the manufacture of semi conductor devices, numerous gases are employed for the manufacturing processes themselves and for the cleansing/conditioning of the apparatus in which the processing of the semi conductor devices take place. Many of these gases are dangerous in terms of their being toxic or pyrophoric.

[0003] The gases tend to be supplied to the semi conductor processing apparatus at elevated pressures either from a cylinder of pressurised gas or distributed from a bulk storage system for the gas. In both cases, the supply of gas to the apparatus at the pressures required therein is governed by a gas pressure regulator. Problems arise, however, in the event of failure of the pressure regulator or of other components present in the gas supply system.

[0004] In the case of the gas regulators themselves, they commonly incorporate a diaphragm on one side of which is a reference pressure, for example atmospheric, and on the other side is set the pressure required in the processing apparatus.

[0005] In the event of failure, for example rupture of the diaphragm, the gas is released at high pressure in the reference pressure side of the regulator and leaks to the atmosphere and can cause environmental damage or, in the case of pyrophoric gases, a fire.

[0006] It is common practice in the event of failure to vent the reference pressure side of the pressure regulator in to a duct to take the gas away from the working areas of the apparatus. However, such venting does not remove the problem of environmental: pollution and/or fire.

[0007] The invention is concerned with the provision of a gas containment system which can generally overcome such problems.

[0008] In accordance with the invention, there is provided a gas containment system containing a source of high pressure gas and means to regulate the supply of the gas to processing apparatus, wherein in the event of failure of the regulatory means, means are provided to direct gas escaping from the regulatory means in to a chamber at sub-atmospheric pressure.

[0009] Preferably, the regulatory means includes or comprises a gas pressure regulator. In such embodiments, the gas directing means is connected to the reference pressure side of the gas pressure regulator.

[0010] In preferred embodiments, the gas directing means from more than one gas containment system is connected to one chamber at sub-atmospheric pressure.

[0011] A non-return valve is advantageously present between the regulatory means and the chamber. This is

particularly advantageous when the gas directing means from more than one gas containment system is connected to a single chamber. In such cases, it is preferred for there to be a non-return valve for each gas containment system so that in the event of failure of, for example, a diaphragm in one of the containment systems, the reference pressure and hence the continued operability of the remaining undamaged gas containment systems will be unaffected.

[0012] It is to be noted that, as the reference pressure side of any pressure regulators in particular present in the gas containment system will be connected to a sub-atmospheric pressure, there will be a need to re-set the delivery set point pressure of the regulator to allow for the off-set pressure being altered. For example, adding 1 bar to the delivery (demand) pressure will return the actual delivered pressure to the original effective operational pressure.

[0013] The chamber of the gas containment system is preferably evacuated to sub-atmospheric pressure by means of a vacuum pump.

[0014] A pressure monitor in or otherwise associated with the chamber is advantageously provided to detect a failure in the regulatory means by measuring the resulting rise in pressure in the chamber.

[0015] Having collected any gas escaping through the gas containment system of the invention, there will generally be a need to abate the toxicity and/or flammability of the gases in situ in the chamber or, preferably, by directing the gas by means of its own inherent pressure and/or by means of a vacuum pump attached downstream of the chamber in to an abatement device in which the gases may be rendered harmless and made suitable for release to the atmosphere.

[0016] For a better understanding of the invention, reference will now be made to the accompanying drawing showing a schematic representation of a gas containment system of the invention.

[0017] With reference to the drawing, there is shown a gas containment system which comprises a source of high pressure gas in the form of a cylinder 1 linked by a pipe 2 to a gas pressure regulator 3. The regulator 3 has a diaphragm 4 separating a supply pressure chamber 5 from a reference pressure chamber 6.

[0018] The reference pressure chamber 6 of the regulator 3 is linked by pipes 7, 8 and 9 to a chamber 10 which is designed to be evacuated to sub-atmospheric pressures by means of a vacuum pump 11 linked to the chamber by means of a pipe 12. A valve 13 is provided to isolate the chamber 10 from the vacuum pump 11.

[0019] The exhaust side of the vacuum pump 11 is linked to an abatement device 14 in to which the gases directed from the chamber 10 can be rendered environmentally acceptable.

[0020] Further pipes 15, 16, 17 are also shown which respectively link three further pressure regulators (not shown) similar to the regulator 3 to the pipe 8. Each of the regulators 3, 15, 16, 17 may have their own inde-

pendent sources of pressurised gas or may be connected to a pressurised bulk storage gas system.

[0021] A non-return (or check) valve 18 is present in the pipe 7 to prevent any back flow of gas towards the regulator 3. Similar non-return (or check) valves 19, 20, 21 are present in the pipes 15, 16 and 17 respectively. 5

[0022] The benefit of the pressure of such non-return valves is primarily in a system with more than one gas regulator when failure of one regulator, and a consequent flow of gas through the corresponding non-return valve, will not affect the reference pressure in the other regulators by virtue of the presence of the non-return valves. 10

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Claims

1. A gas containment system comprising a source of high pressure gas and means to regulate the supply of the gas to processing apparatus, wherein in the event of failure of the regulatory means, means are provided to direct gas escaping from the regulatory means in to a chamber at sub-atmospheric pressure. 20
2. A system as claimed in Claim 1 in which the regulatory means includes or comprises a gas pressure regulator. 25
3. A system according to Claim 2 in which the gas directing means is connected to the reference pressure side of the gas pressure regulator. 30
4. A system according to any preceding claim in which gas directing means from more than one gas containment system is connected to one chamber at sub-atmospheric pressure. 35
5. A system according to any preceding claim in which a non-return valve is present between the regulatory means and the chamber. 40
6. A system according to any preceding claim in which the chamber is evacuated to sub-atmospheric pressure by means of a vacuum pump. 45
7. A system according to any preceding claim in which a pressure monitor associated with the chamber is provided to detect a failure in the regulatory means. 50
8. A system according to any preceding claim in which gas in the chamber is directed to an abatement device. 55

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