United States Patent [19]

Picard et al.

[11] **3,721,785**

[45] **March 20, 1973**

[54] **PRESSURE SWITCH DEVICE HAVING A PRESSURE DEPENDENT CIRCUIT FOR A COMPRESSOR**

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[52] **U.S. Cl.** ..... **200/148 B,** 200/148 E

[51] **Int. Cl.** **H01h 33/57**

[58] **Field of Search** ..... 200/148 E

[56] **References Cited**

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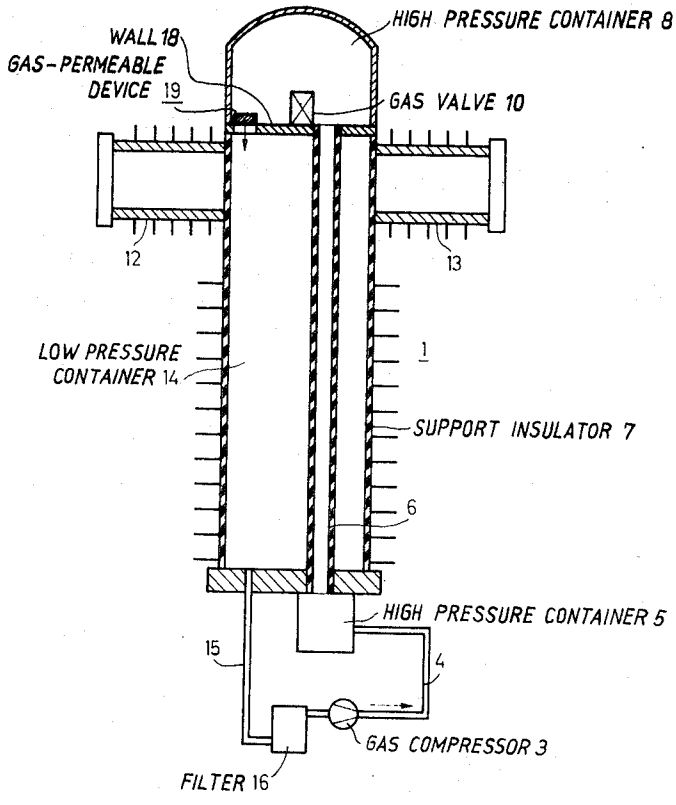
Attorney—Curt M. Avery, Arthur E. Wilfond, Herbert L. Lerner and Daniel J. Tick

[57] **ABSTRACT**

A pressure gas switch has a gas-permeable device which is a plate of porous material having an area with dimensions larger by at least one order of magnitude than the thickness of the plate.

8 Claims, 2 Drawing Figures



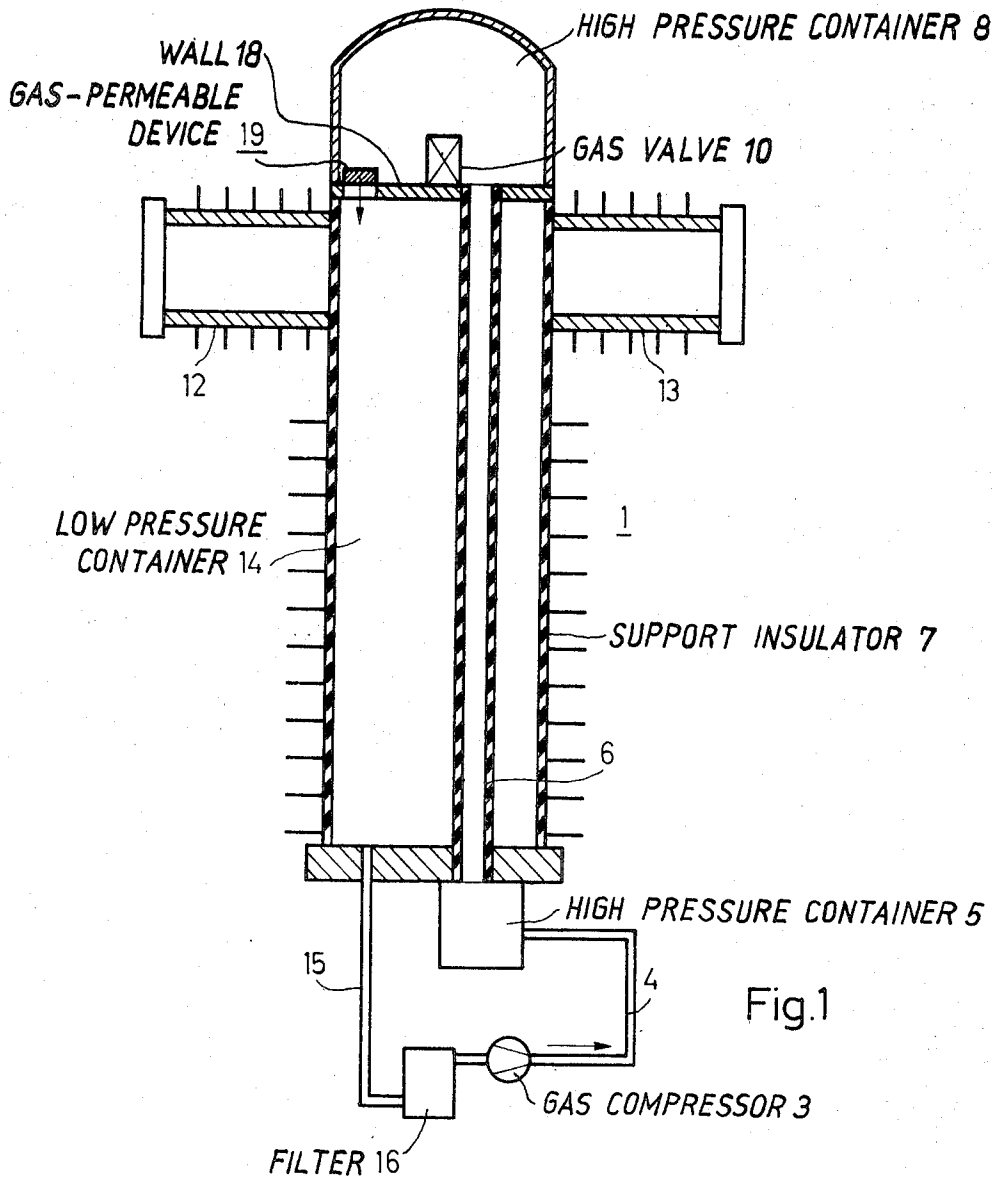

HIGH PRESSURE CONTAINER 8
WALL 18
GAS-PERMEABLE DEVICE 19
GAS VALVE 10
12
13
LOW PRESSURE CONTAINER 14
1
SUPPORT INSULATOR 7
6
HIGH PRESSURE CONTAINER 5
15
4
GAS COMPRESSOR 3
FILTER 16

Fig.1

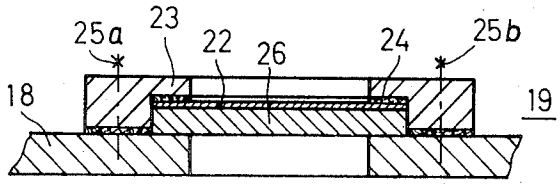

25a
23
22
26
24
25b
18
19

Fig.2

PRESSURE SWITCH DEVICE HAVING A PRESSURE DEPENDENT CIRCUIT FOR A COMPRESSOR

DESCRIPTION OF THE INVENTION:

The invention relates to a pressure gas switch. More particularly, the invention relates to a pressure gas switch having a compressor which transports the gas into a high pressure container. The compressor is switched on by a decrease in the gas pressure in the high pressure container.

It is desirable that the compressor of such pressure gas switches operate with a specific regularity, that is, at specific intervals, for example once a day, in order to prove the reliability of operation and, if necessary, to filter the gas transported by the compressor. For periodic operation of the compressor, the high pressure container may be provided with a gas-permeable device which reduces the gas pressure by releasing to the outside of the container a small, but defined, volume of gas per unit time. When nozzles are utilized for this purpose, extremely small cross-sections are required, and corresponding sensitivity is also required.

An object of the invention is to provide a pressure gas switch which functions without clogging or contamination.

An object of the invention is to provide a pressure gas switch of simple structure which functions with efficiency, effectiveness and reliability.

An object of the invention is to provide a pressure gas switch which eliminates clogging due to contamination caused by oil drops.

In accordance with the invention, a pressure gas switch comprises a gas-permeable device comprising a plate of porous material having an area whose dimensions are larger by at least one order of magnitude than the thickness of the plate.

The pressure gas switch of the invention provides, at the same gas permeability, a considerably greater area for the gas-permeable device, so that clogging and contamination are no longer a problem.

The area of the plate of gas-permeable material should be at least 5 cm^2, since in such case contamination which may be caused by oil drops no longer results in clogging. The porosity is preferably distributed at least nearly uniformly over the area of the plate.

The porous plate is preferably provided with a support plate having openings or pores whose cross-section is large compared to the cross-section of the openings or pores of the porous plate. In this manner, the stability of the porous plate need not be considered during the rating of the thickness thereof. Hence, plates which are not rated for the full pressure of the high pressure container may be utilized.

The support plate may also comprise porous material, provided its porosity is caused by considerably larger openings than those of the porous plate comprising the gas-permeable device. A support plate comprising sintered bronze, for example, has provided good results during testing.

The porous plate may comprise a sintered or cast metal, preferably cast iron, and is preferably less than 1 mm thick. In another embodiment of the invention, the porous plate comprises a ceramic material. The porous plate may also comprise a sinterable synthetic material.

To produce metal bodies by sintering, small particles of the respective metal are used which are combined through heat and pressure into a cohesive body. Depending on the size of the particles and the level of the applied pressure and on the temperature, the porosity of the finished metal body will be smaller or greater. To fulfill the requirements of the invention, the porosity should be relatively low since the pressure difference required for switching on the compressor is to be attained only after a relatively long time, for example, in the course of one day. This drop in pressure can also be obtained by plates which are made of cast iron since this material has, at the indicated small thickness, the desired permeability for the gases without requiring any special manufacturing process.

In order that the invention may be readily carried into effect, it will now be described with reference to the accompanying drawing, wherein:

FIG. 1 is a schematic diagram, partly in section, of an embodiment of a two stage pressure gas switch of the invention for high voltage; and

FIG. 2 is a schematic diagram, in section, on an enlarged scale, of the gas-permeable device of the pressure gas switch of the invention.

In the FIGS., the same components are identified by the same reference numerals.

FIG. 1 shows a two stage pressure gas switch 1 for 220 kilovolts. The switch has a closed gas system for sulphur hexafluoride SF_6 which is utilized as an extinguishing agent. The gas system includes a gas compressor 3 which energizes a high pressure container 5 at ground potential via a tube, duct, conduit, or the like, 4. An insulating tube 6 extends through a hollow support insulator 7 to a high pressure container 8 at high voltage potential.

The high pressure containers 5 and 8 store the sulphur hexafluoride at a pressure of, for example, 15 atmospheres. As a result, the gas flows into two switching chambers 12 and 13, when the switch is disconnected, and after a gas valve 10 in the high pressure chamber 8 is opened. The switching chambers 12 and 13 are part of the low pressure portion of the gas system, wherein the gas quenches the circuit-breaking arc of two switching paths which are electrically connected in series, and are not shown in detail in the FIGS.

The gas is transported from the switching chambers 12 and 13 to the interior 14 of the support insulator 7. The support insulator 7 is utilized as a low pressure chamber and has a pressure of, for example, 3 atmospheres. The gas is drawn from the low pressure chamber 7 by the gas compressor 3 via a duct, conduit, tube, or the like, 15 and a gas filter 16.

A wall 18 separates the high pressure container 8 from the low pressure container 14. In accordance with the invention, the wall 18 is provided with a gas-permeable device 19 which provides a defined porosity or permeability for the gas. The gas-permeable device 19 is shown in greater detail in FIG. 2. The gas-permeable device 19 comprises a porous plate 22 of cast iron having a thickness of 0.3 mm and a circular area having a diameter of 3 cm. The surface of the porous plate 22 facing the high pressure container 8 therefore has an area of approximately 7 cm^2.

As shown in FIG. 2, the porous plate 22 is pressed against a support plate 26 by a pressure ring 23. A packing 24 is interposed between the pressure ring 23 and the porous plate 22. The pressure ring 23 is pressed against the support plate 26 by screws 25*a* and 25*b*, shown schematically in FIG. 2. The support plate 26 comprises sintered bronze. The support plate 26 has the same surface area as the porous plate 22, but has considerably greater mechanical stability, due to its greater thickness. The gas permeability of the support plate 26 is greater than that of the porous plate 22 by at least one order of magnitude, since the cross-section of the openings or pores of said support plate is relatively greater than the cross-section of the openings or pores of said porous plate.

The porous plate 22 of the invention is positioned in the horizontally extending separating wall 18, between the high pressure container 8 and the low pressure container 14. This provides an opportunity for contaminations to be deposited on the porous plate 22. Tests extending over long periods of time have shown that the desired, sufficiently low, gas permeability remains equal to such an extent, due to the large area of the porous plate 22, that the work intervals of the gas compressor 3 are maintained with sufficient precision or exactness.

Furthermore, when its porosity is homogeneous, the porous plate 22 of the invention permits an adjustment of the gas permeability by the utilization of gas-impermeable masks which may be pressed, with the assistance of the pressure ring 23, against the surface of the porous plate 22 which faces the high pressure container 8. The gas-impermeable masks (not shown in the FIGS.) reduce the cross-section of the effective permeable area of the porous plate 22.

While the invention has been described by means of a specific example and in a specific embodiment, we do not wish to be limited thereto, for obvious modifications will occur to those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. A pressure gas switch device comprising a high pressure container and a gas compressor for transporting gas into the high pressure container, said compressor being switched on by a decrease in the gas pressure in the high pressure container, a switch comprising a gas-permeable device at the high pressure container for bleeding gas from said high pressure container to provide a determined slight decrease in the gas pressure in said high pressure container after a prolonged period of time, said gas-permeable device comprising a plate of porous material having a surface area having dimensions at least one order of magnitude larger than the thickness thereof, said switch providing periodic operation of said compressor.

2. A pressure gas switch device as claimed in claim 1, wherein the surface area of the plate of the gas-permeable device is at least 5 cm^2.

3. A pressure gas switch device as claimed in claim 1, wherein the gas-permeable device further comprises a support plate having openings having a large cross-section compared to the cross-section of the openings of the plate of porous material.

4. A pressure gas switch device as claimed in claim 1, wherein the plate of the gas-permeable device comprises sintered metal and has a thickness less than 1 mm.

5. A pressure gas switch device as claimed in claim 1, wherein the plate of the gas-permeable device comprises cast metal and has a thickness less than 1 mm.

6. A pressure gas switch device as claimed in claim 1, wherein the plate of the gas-permeable device comprises cast iron and has a thickness less than 1 mm.

7. A pressure gas switch device as claimed in claim 1, wherein the plate of the gas-permeable device comprises ceramic material.

8. A pressure gas switch device as claimed in claim 1, wherein the plate of the gas-permeable device comprises a sinterable synthetic material.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,721,785 Dated March 20, 1973

Inventor(s) KARL-HEINZ PICARD and HORST EGGERT

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading to the printed specification there should be included:

--Foreign Application Priority Data

July 17, 1970 Germany.....P 20 36 375.1--.

Signed and sealed this 13th day of November 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

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(5/69)

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