Oct. 26, 1965 H. FORWALD 3,213,937

DEHUMIDIFYING DEVICE

Filed Oct. 21, 1963

Fig. 1

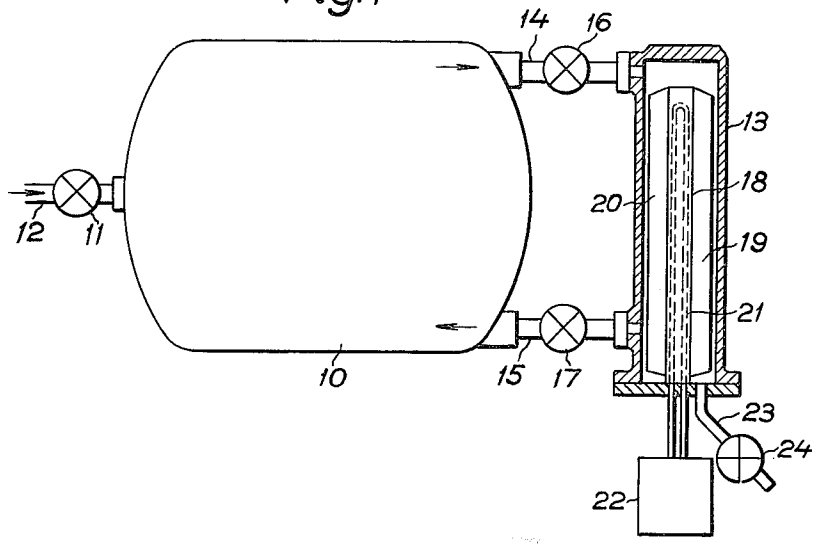
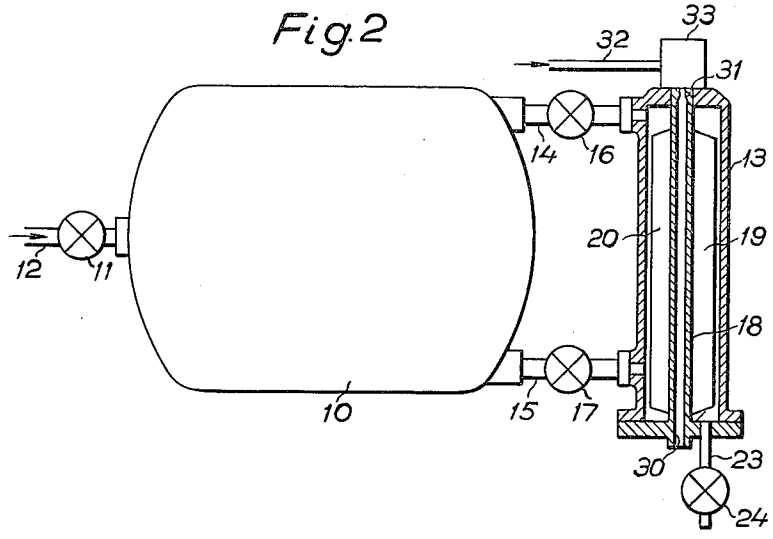


Fig. 2



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3,213,937
Patented Oct. 26, 1965

3,213,937

DEHUMIDIFYING DEVICE

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Filed Oct. 21, 1963, Ser. No. 317,678
Claims priority, application Sweden, Nov. 1, 1962, 11,724/62
5 Claims. (Cl. 165—132)

This invention relates to a dehumidifier for high pressure gas and more specifically relates to a dehumidifier for dehumidifying the high pressure air for a compressed air circuit breaker.

In accordance with the invention, an auxiliary chamber is hydraulically connected between upper and lower portions of a high pressure gas container. An auxiliary cooling means which may be of simple and inexpensive construction is then provided for the auxiliary chamber so that the temperature of the auxiliary chamber is reduced. This will then force drying of the gas within the auxiliary chamber and circulation of new gas from the main container to the auxiliary chamber so that cooling and drying continuously occurs without separate fans or chemical preparations directly associated with the main volume of compressed gas.

Accordingly, a primary object of this invention is to provide a novel dehumidifying system for compressed gas tanks.

Another object of this invention is to provide a novel dehumidifier for compressed gas which is simple in structure and is inexpensive.

These and other objects of the invention will become apparent from the following description when taken in connection with the drawings in which:

FIGURE 1 illustrates a first embodiment of the invention with the auxiliary cooling chamber shown in cross-section.

FIGURE 2 is similar to FIGURE 1 and shows an embodiment of the invention where the auxiliary cooling chamber is provided with an expansion nozzle for cooling.

Referring first to FIGURE 1, I have shown therein a compressed gas tank **10** of any suitable type which is supplied with gas under pressure through a valve **11** in an input conduit **12**. Suitable outlet conduits (not shown) are then provided in tank **10** and are connected to those systems requiring the high pressure gas under pressure. By way of example, tank **10** could be connected to a compressed air circuit breaker in the usual manner.

In accordance with the invention, upper and lower regions of an auxiliary chamber **13** are permanently connected to respective upper and lower regions of tank **10** by upper and lower conduits **14** and **15** respectively. Thus, the pressure within chamber **13** will be the same as the pressure within chamber **10**. However, the volume of chamber **13** may be substantially smaller than the volume of chamber **10**. Suitable valve members **16** and **17** may then be placed in conduits **14** and **15** for use during defrosting as will be described hereinafter.

An auxiliary cooling means is then contained within tank **13** which is comprised of an elongated metallic member **18** which has cooling fins such as fins **19** and **20** radiating therefrom. A fluid conduit **21** is then embedded in member **18** and passes through tank **13** in a sealed manner to a fluid circulating means and heat exchanger system **22**. System **22** will then cause a small volume of cooling fluid to circulate through tube **21** so that the interior of chamber **13** is cooled, for example, by the order of 10° C. below the temperature of the gas in container **10**. Where a total gas volume of 3 cubic meters is to be cooled, it has been found that less than 50 watts of power is sufficient for the cooling system.

A drainage tube **23** having an outlet valve **24** is then provided at the bottom of container **13**, for draining condensed moisture from the container **13** at suitable intervals.

In operation, the compressed gas within container **13** will be cooled and fall toward the bottom of container **13**. This creates sufficient pressure to cause circulation of air from tank **10**, through conduit **14**, container **13**, and conduit **15**. If the gas coming into container **13** has a sufficiently high relative humidity (higher than some predetermined value which is to be prevented) condensation takes place on cooling fins **19** and **20**. This decreases the absolute humidity of gas going back into tank **10**.

If, for example, the relative humidity in tank **10** at the beginning of the process is 100%, this can be reduced to 50% to 60% by holding container **13** at a 10° C. lower temperature than the temperature of tank **10**.

The condensate formed will then run down flanges **19** and **20**, and, after sufficient accumulation, can be drained away through the drainage member **23**. This accumulation can be observed through a suitable window (not shown) in container **13**.

During frosting conditions, it is necessary to remove ice and frost from the fins **19** and **20**. For this operation, valves **16** and **17** are closed and the chamber **13** is heated and drained. Thereafter, the valves **16** and **17** are reopened and the dehumidifying action continued.

FIGURE 2 is similar to FIGURE 1 but shows the use of an expansion cooling system. Thus, in FIGURE 2, the cooling member **18** is provided with an opening **30** therethrough which has a nozzle **31** at the upper end thereof. A source of compressed air is then connected to conduit **32** which is in turn connected to pressure control means **33** which applies a suitable gas pressure to nozzle **31**. In operation, gas passing into channel **30** is expanded and thus cooled at nozzle **31** so the interior of chamber **13** may be suitably cooled.

Although I have described preferred embodiments of my novel invention, many variations and modifications will now be apparent to those skilled in the art, and I prefer therefore to be limited not by the specific disclosure herein but only by the appended claims.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows:

1. In combination with a compressed gas container, a dehumidifier therefor comprising an auxiliary container, an auxiliary cooling means, and a first and second conduit; said first conduit being connected between respective portions adjacent the tops of said gas container and said auxiliary container; said second conduit being connected between respective portions adjacent the bottoms of said gas container and said auxiliary container; said auxiliary cooling means being connected to said auxiliary container in heat exchange relationship for cooling gas in the interior of said auxiliary container, whereby to produce circulation of gas through said first conduit from the gas container to the auxiliary container and through the second conduit from the auxiliary container to the gas container.

2. The dehumidifier substantially as set forth in claim 1 wherein the ends of each of the conduits are substantially at the same level.

3. The dehumidifier substantially as set forth in claim 1 which includes first and second valve members connected in said first and second conduits respectively for selectively shutting off communication between the interiors of said compressed gas container and auxiliary container, respectively.

4. The dehumidifier substantially as set forth in claim 1 which further includes a drainage member connected in the bottom of said auxiliary container.

5. The dehumidifier substantially as set forth in claim

1 wherein said cooling means includes a conductive member having extending fins; said conductive member being contained within said auxiliary chamber.

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