Dec. 24, 1940. G. J. HENRY 2,225,990

DEHYDRATOR

Filed Dec. 22, 1937

Fig. 1.

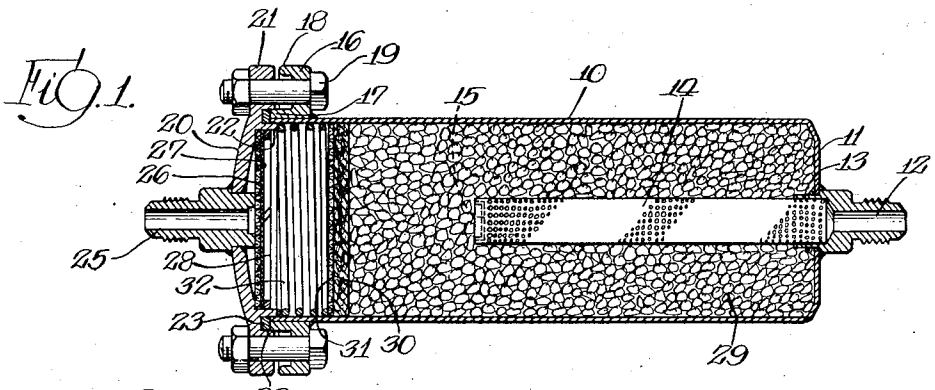


Fig. 2.

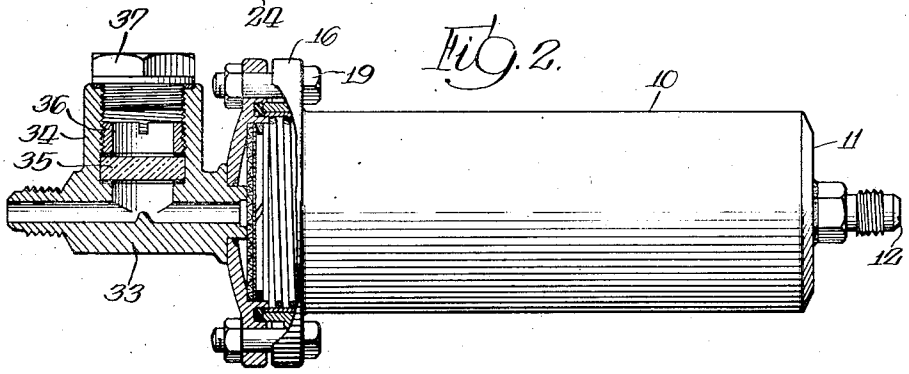


Fig. 3.

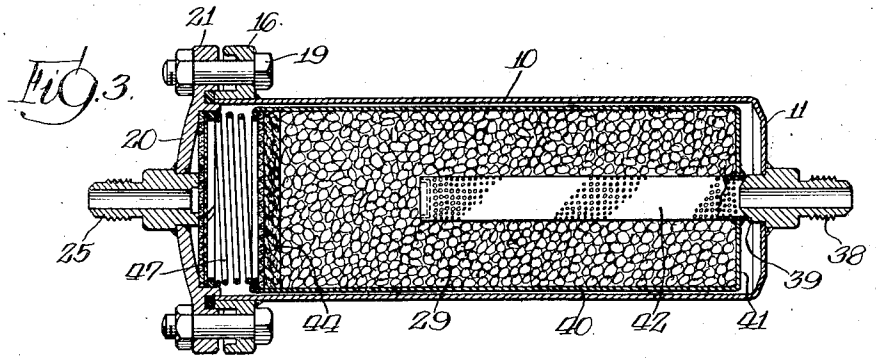
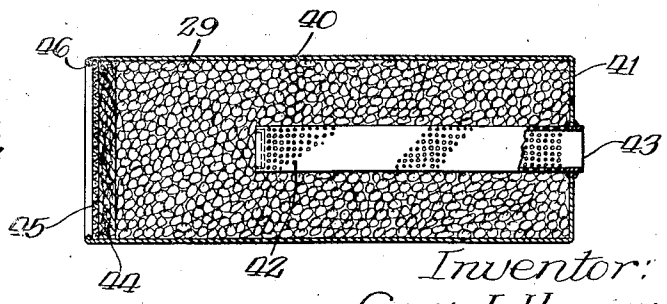


Fig. 4.



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Patented Dec. 24, 1940 2,225,990

UNITED STATES PATENT OFFICE

2,225,990

DEHYDRATOR

Guy J. Henry, Chicago, Ill.

Application December 22, 1937, Serial No. 181,171

8 Claims. (Cl. 183—47)

The present invention relates to structures of the type employed for dehydrating fluids and has as a principal object the provision of an improved moisture-removing device to be used in refrigeration and air conditioning systems in which a gas such as methyl chloride or sulphur dioxide is circulated as a heat exchange medium.

A more specific object is to provide a dehydrating device which is characterized by a dispersion tube of such construction and arrangement as to insure efficient contact of the fluid with the treating agent.

An additional object is to provide a hehydrating device having an expansible compartment in which a granular dehydrating agent subject to expansion or contraction upon exposure to moisture containing gases is maintained in proper placement to insure adequate contact with the gases to be dehydrated.

A further object is to provide a device of the type described in which the treating agent is contained in a readily replaceable cartridge.

A still further object is to provide a fluid treating device which is equipped with means for observing the condition of the fluid undergoing treatment.

While the foregoing statements are indicative of the nature of the invention, other objects and advantages will be evident to those skilled in the art upon a full understanding of the improved fluid treating device.

A preferred embodiment of each feature of the invention is presented herein for the purpose of exemplification, but it will of course be appreciated that the invention is susceptible of incorporation in other structurally modified forms coming equally within the scope of the appended claims.

In the accompanying drawing:

Fig. 1 is a longitudinal sectional view of a device constructed in accordance with the invention;

Fig. 2 is a side view, partly in section, of a device similar to that shown in Fig. 1 and having a sight glass attached thereto;

Fig. 3 is a longitudinal sectional view of a modified form of the improved dehydrator in which an inner treating chamber is employed; and

Fig. 4 is a longitudinal sectional view showing the inner treating chamber of the device of Fig. 3.

In the embodiment of the invention shown in Fig. 1, the fluid-treating chamber is comprised of a cylindrical casing 10 having a closed inlet end 11 provided with an orificed inlet connection 12. The inlet connection has a cylindrical flange 13 extending through the end of the cylinder and inwardly thereof to form a connection with a fluid distribution member 14. The distribution member consists of a metallic cylinder of substantially less diameter than the treating chamber and having perforations of smaller size than the particles of treating agent which surround it. Closure 15 is provided in the unattached end of the distribution member. Any suitable method of attaching the distribution member to the flange 13 may be employed. For instance, the perforated distribution member may be soldered within flange 13, thereby forming a rigid support for the former. Inlet connection 12 likewise may be soldered or brazed to form a permanent connection with the closed end of the cylinder 10.

The opposite or outlet end of cylinder 10 is open and is provided with an annular flange 16, the latter having a relatively long inner leg 17 terminating adjacent the end of the cylinder to form a tongue or shoulder and an outer relatively short leg 18 which constitutes an abutment. Between the tongue and abutment portions the flange 16 is orificed to receive attaching bolts 19.

To the end of flange 16 and surrounding the open end of the cylinder is attached a removable casing head 20. This casing head has an outer flange 21 orificed to receive bolts 19 and an inner cylindrical flange 22 forming a channel 23 in which is carried a compressible gasket 24. The depth of channel 23 and the compressible depth of gasket 24 are greater than the distance between abutment 18 and flange 21. To secure the casing head to cylinder 10 the bolts 19 are tightened to cause the tongue or shoulder portions provided by leg 17 and the open end of the cylinder to enter channel 23 and bear against compressible gasket 24, the relation of the channel, gasket, and abutment 18 being such that distortion of the parts by excessive tightening of the attaching bolts is prevented. That is, abutment 18 contacts flange 21 before the limit of compression of gasket 24 is reached. The construction for forming this removable attachment of head 20 to casing 10 is described and claimed in my copending application, Serial No. 181,170, filed December 22, 1937, which application has since issued as Patent No. 2,183,614.

Casing head 20 is provided with an orificed outlet connection 25 rigidly attached thereto as by screw threads, brazing or other means.

Against the interior of the outlet casing 20 is positioned a relatively coarse screen 26 and this screen has positioned over it a relatively fine mesh

screen 27, the two screens acting to separate particles of solids from fluids leaving the apparatus. These separating screens are maintained in position by an annular split ring 28 which seats against the interior surface of the cylindrical flange 22.

The cylinder 10 is packed with granular particles of a treating material as indicated at 29. These particles are packed around the distributing member 14 and the material is maintained in position by a retaining pad 30. A relatively coarse and rigid screen 31 backs up the pad 30 and these two retaining members are pressed against the body of treating material by a spring 32 which bears at one end against the base of cylindrical flange 22 of the casing head and bears at its other end against screen 31.

Where the apparatus is employed as a dehydrator the particles of treating material may be composed of a granular dehydrating agent such as activated alumina. Other treating agents such as anhydrous calcium chloride, calcium oxide, or the like, may be employed. The treating agent usually will be inert to the fluids passing through the dehydrator, but a treating agent having chemical activity with respect to constituents of the gas may be employed.

The activated alumina dehydrating agent tends to compact in time and upon this reduction in volume the retaining pad 30 is pressed inwardly of the cylinder to maintain the dehydrating agent in closely packed position about the distributing member. That is, the spring 32 always maintains the granular treating agent in closely packed position regardless of changes in volume. In some cases the treating agent may be employed which will increase in volume upon use and the resiliency of spring 32 will take care of this volume increase. The maintenance of the activated alumina in closely packed position about the distributing member insures that the fluid being treated will always have adequate contact with the activated alumina for removal of moisture.

In Fig. 2 is shown a dehydrator of the type illustrated in Fig. 1 but having an outlet conduit 33 which is provided with an upwardly extending section 34 having mounted therein a sight glass 35 through which fluids passing out of the dehydrator over a weir-like obstruction in the bottom of the conduit 33 may be observed. The sight glass is maintained in position by a hollow threaded sleeve 36 which is screwed into the cylindrical section 34. A cover cap 37 is provided as a safety device in case the sight glass should fail. It also serves as a protection for the sight glass when the latter is not in use. The condition of the refrigerant passing through the system may be determined from observation through the sight port, gas bubbles appearing after passage of the refrigerant through the dehydrating agent indicating a shortage of refrigerant.

This sight glass structure is of course not limited in its use to a dehydrator. It is equally applicable to strainers and other forms of treating equipment.

In the embodiment of the invention shown in Figs. 3 and 4 the closed end 11 of the cylinder 10 is provided with an inlet opening 38 which has a tapered exit section 39 extending into the interior of the cylinder. The dehydrating agent is contained in a separate inner shell or container 40. Container 40 has a closed end 41 into which extends the distributing member 42, the latter being of substantially the same construction as the distributing member 14 and extending slightly outwardly from the end of the inner container as shown at 43. The distributing member 42 may be welded into permanent position with respect to the bottom section 41. The sides of the container 40 are preferably though not necessarily imperforate.

The opposite end of the inner casing 41 is provided with a porous pad 44 and a relatively rigid screen 45 which act as a retaining unit for the activated alumina within the casing. The screen 45 is retained within the casing by turning over the open end of the casing as shown at 46 to form an inwardly extending bead of less diameter than the outside diameter of the screen.

Casing 40 fits somewhat closely within the interior of casing 10 and when the unit is assembled the nipple-like end 43 of the distributing member is placed in snugly encompassing relation with respect to the tapered end 39 of the inlet member. The interior or neck portion of the distributing member is preferably tapered to provide a close fit with the tapered portion of the inlet member and the entire inner casing is pressed firmly against the tapered end 39 by means of a spring 47 which bears at one end against the split ring 28 and at its other end against the screen retaining member 45. In this assembly the spring may have a dual function. It may maintain the inner unit in firm engagement with the inlet opening 38 to provide a fluid-tight fit therewith and it may also maintain the body of treating reagent in compacted position within the inner casing, even though the volume of the treating agent be reduced with use. As the volume of the treating agent diminishes the spring presses inwardly of the open end of the inner casing, whereby to always keep the filter pad pressed against the dehydrating agent.

As before stated, the treating agent which can be employed in the apparatus described may vary considerably. The more or less soluble dehydrants such as calcium chloride and calcium oxide primarily are intended for temporary use as quick-acting drying agents. The alkaline reaction of calcium oxide permits of its use widely as a neutralizing agent to remedy any unwanted acid condition which may exist in the system. Activated alumina is relatively insoluble and chemically inert which makes desirable its use as a permanent or semi-permanent dehydrating agent. The cartridge type of construction shown in Figs. 3 and 4 provides for ready refill of the treating agent by removal and replacement of the cartridge. Dispersion tubes 14 and 42 minimize the pressure drop through the apparatus and widely distribute the fluid passing through the treating material so as to insure efficient contact therewith. The inner container may be gasketed adjacent its open end with respect to the outer container to insure concentric positioning of the casings and additional fluid seals may be employed if desired to eliminate any possibility of leakage of fluid around the inner container. The inner container also may be positioned by providing a rigid bearing surface over its open end for engagement with the spring 47.

The structure described and illustrated herein for the purpose of explanation may be changed considerably without departing from the scope of the invention as defined in the appended claims.

I claim:

1. A dehydrator for insertion in a fluid line, comprising a casing having spaced inlet and outlet openings and adapted to receive a quantity of

a granular dehydrating agent between said openings, a perforated distributing tube which provides a hollow unobstructed passage throughout its length for the free flow of a fluid and extends inwardly of said casing from said inlet opening into a position where it is adapted to be imbedded within said granular dehydrating agent, a porous retention member in said casing adjacent said outlet opening and spaced from said distributing tube, which retention member packs the dehydrating agent against and about the distributing tube and a spring resiliently engaging said retention tube.

2. A dehydrator, comprising an outer casing having spaced inlet and outlet openings, and a readily replaceable inner dehydrating agent casing having an internal distributing conduit extending outwardly therefrom into axially separable sealed abutment with the inlet opening of said outer casing.

3. A dehydrator, comprising a casing having a closed end provided with an inlet opening and an open end provided with a removable outlet head, a distributing member extending inwardly a substantial distance from said inlet opening and forming an unobstructed passage throughout its length for the free flow of a fluid, a dehydrating agent retention member in said casing and spaced from said distributing member, and a spring bearing against said outlet head on one end and said retention member on the other end.

4. A dehydrator, comprising a casing having a closed end provided with an inlet opening and an open end provided with a removable outlet head, a readily replaceable inner dehydrating agent carrying casing having a closed end provided with an inlet opening and an open end provided with a dehydrating agent retention member, a distributing member in said inner casing which has a fluid tight but readily separable fit at the inlet opening end of the inner casing with the inlet opening in the outer casing, and a spring bearing on one end against said outlet head and against said retention member on the other end.

5. A dehydrator, comprising an elongated casing having spaced inlet and outlet openings at its ends, a perforated dispersion tube which extends a substantial distance longitudinally of the casing from said inlet opening and provides a hollow unobstructed passage throughout its length for the free flow of a fluid, a quantity of a granular dehydrating material packed within the casing about the dispersion tube and extending beyond the end of the dispersion tube toward said outlet opening, and a porous retention member for the dehydrating material, which member maintains the dehydrating material packed about the tube and is positioned between the material and said outlet opening.

6. A replaceable cartridge of a granular dehydrating agent, for insertion in the casing of a dehydrator, comprising a tubular shell which is provided at one end with a centrally apertured end wall and at the other end with a porous retention member, a perforated dispersion tube secured to the end wall about the aperture and extending a substantial distance longitudinally of the shell toward the porous retention member, and a quantity of a granular dehydrating material packed within the shell about the dispersion tube and beyond the end of the latter up to the retention member, said shell being provided about the aperture in the end wall thereof with a projecting rim which is adapted to interfit with a complementary formation on the inlet end of the casing of the dehydrator in axially separable relation to the latter.

7. A replaceable cartridge of a granular dehydrating agent, for insertion in the casing of a dehydrator, comprising a tubular shell which is provided at one end with a centrally apertured end wall and at the other end with a porous retention member, a perforated dispersion tube secured to the end wall about the aperture and extending a substantial distance longitudinally of the shell toward the porous retention member, and a quantity of a granular dehydrating material packed within the shell about the dispersion tube and beyond the end of the latter up to the retention member, said shell being so constructed at the location of the aperture in the end wall thereof as to interfit with a complementary formation on the inlet end of the casing of the dehydrator in axially separable relation to the latter.

8. A dehydrator for insertion in a fluid line, comprising a cylindrical sheet metal casing provided at one end with a fixed end wall which is centrally apertured, a filtering screen positioned under pressure in the opposite end of the casing, a hollow unobstructed cylindrical tube which is closed at one end and is perforated throughout its length, said tube being arranged longitudinally within the casing with its closed end in proximity to the filtering screen and its open end rigidly secured to the fixed end wall of the casing about the edge of the aperture in the latter, whereby to provide a passageway throughout its length for the free flow of fluid, and loose granular dehydrating material packed tightly by the pressure on the screen about the tube between the latter and the cylindrical wall of the casing and also between the end of the tube and the screen.

GUY J. HENRY.