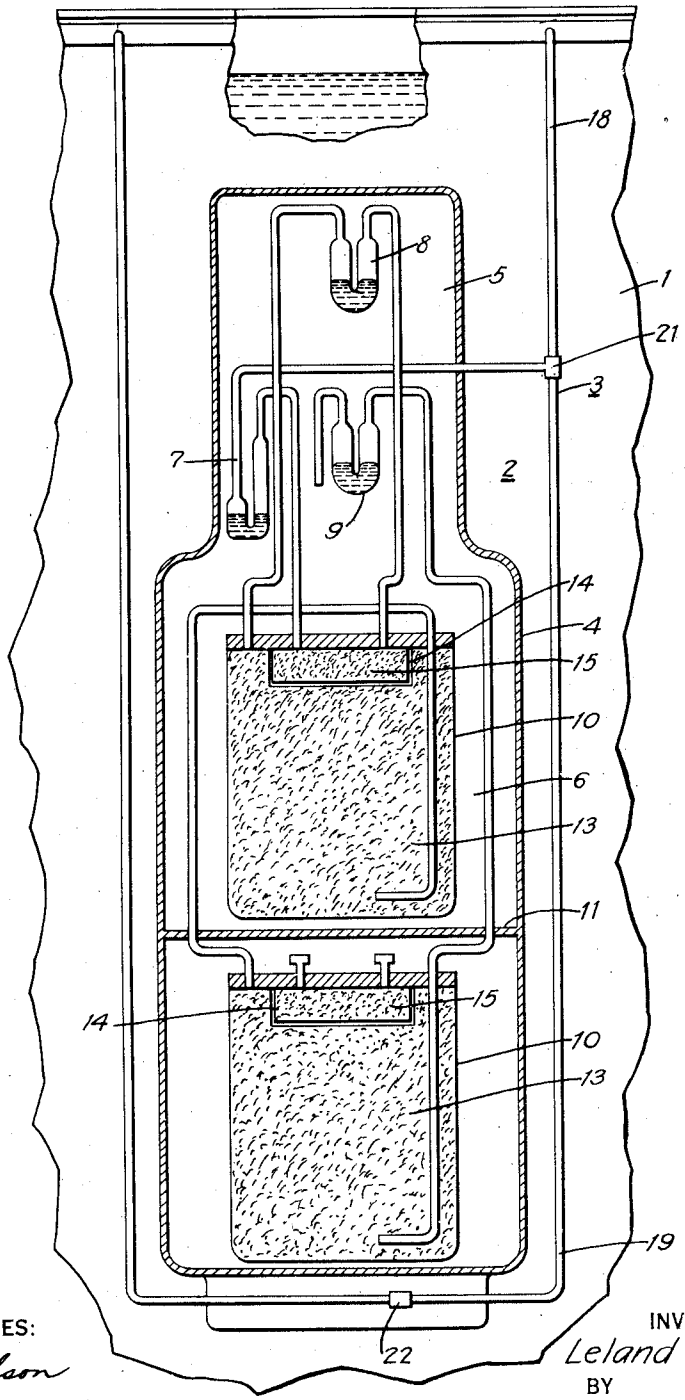
June 10, 1930. L. H. HILL 1,763,152

TRANSFORMER

Filed Dec. 4, 1924 2 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

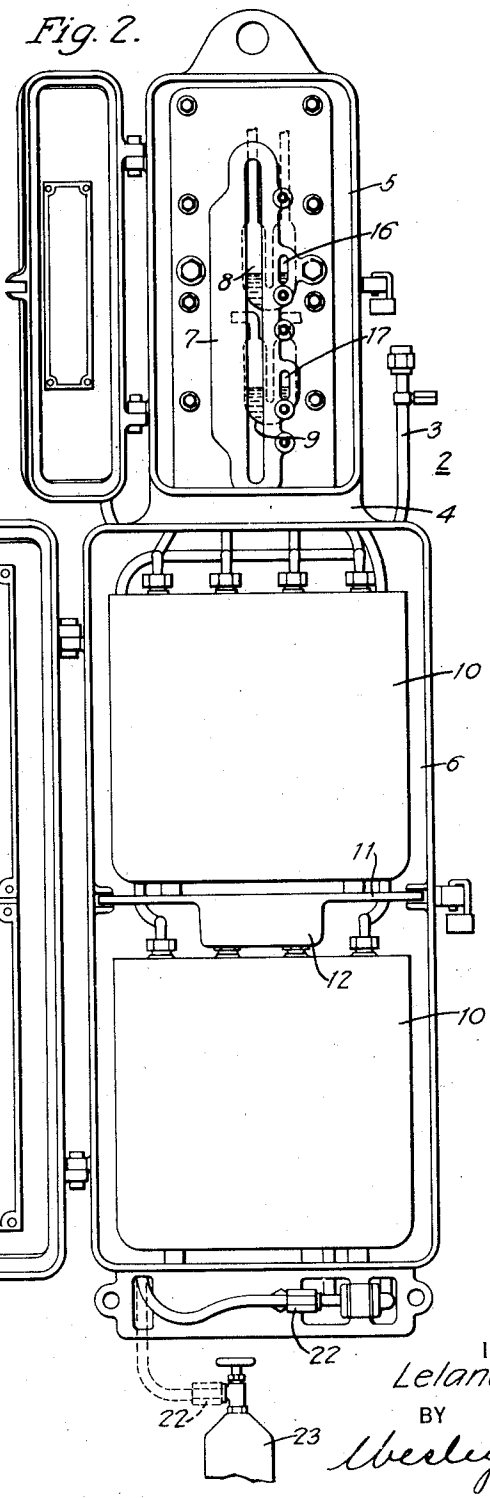
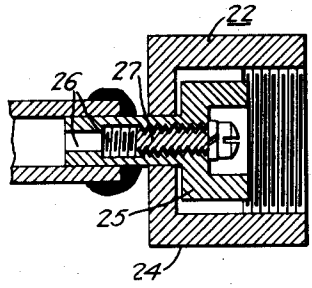


Fig. 3.



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UNITED STATES PATENT OFFICE

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TRANSFORMER

Application filed December 4, 1924. Serial No. 753,836.

My invention relates to transformers or other electrical devices having an inert atmosphere confined above an insulating fluid and particularly to the structural details of apparatus for treating the air or other gases entering such translating devices.

One object of my invention is to provide a device for treating air or gas in connection with electrical devices that shall combine the necessary chemical compounds, breathing regulators and liquid seals in a unitary structure.

A further object of my invention is to provide means for initially injecting an inert gas into an electrical device without affecting the operation of the air-treating device.

In the copending application of Rodman and Styer, Serial No. 2779, filed Jan. 16, 1925, there is shown and described a system wherein a liquid seal is placed between the deoxidizing chemical compound and the dehydrating chemical compound in an air or gas-treating device for "inert-aire" transformers and circuit interrupters.

In the application of A. W. Thompson, Serial No. 745,040, filed October 21, 1924, there are shown and described the structural details for a container for the chemical compounds necessary in such apparatus. In the application of A. H. Maude, Serial No. 755,839, filed Dec. 15, 1924, there is shown and described the use of a plurality of such cartons disposed in interchangeable series relation. In my copending application, Serial No. 608,791, filed December 23, 1922, there is shown and described the details of my "breathing" regulator. All of the foregoing applications are assigned to the Westinghouse Electric & Manufacturing Company.

In accordance with the present invention, I provide a unitary commercial device for providing inert gas for electrical devices which embodies the inventive ideas of the applications referred to above and, in addition thereto, certain improvements such as the disposition of the several constituent units in the case, the application of safety devices to prevent improper connection of the chemical cartons, and the provision of a pipe network such that the initial space in the electrical device may be filled directly from a container without disturbing the operation of the gas-treating device.

In the accompanying drawings,

Figure 1 is a fragmentary diagrammatic view, partially in elevation and partially in section, of a transformer embodying my invention.

Fig. 2 is a view in elevation of a gas-treating device embodying my invention.

Fig. 3 is a sectional view of a regulating valve constituting a detail of my invention.

My invention comprises, in general, a transformer 1, but which may be a circuit interrupter or other electrical apparatus, that is provided with a device 2 for treating the air or gas entering the transformer 1 so that the latter will be free from oxygen, together with a suitable pipe network 3 for connecting the translating device to the gas-treating device.

The air-treating device comprises a base 4 that is divided in two compartments or casings 5 and 6. In the casing 5, there is mounted a "breathing" regulator 7 and liquid seals 8 and 9. In the compartment 6 there is mounted a plurality of chemical containers 10 that are separated by a shelf 11 having a downwardly-projecting lug 12. In each of the chemical containers 10 there is a chemical compound 13 for deoxidizing air or gas passing therethrough and a container 14 for a chemical compound 15, such as calcium chloride, for dehydrating air or gas passing therethrough. A suitable chemical compound for deoxidizing air is described in the copending application of Aylmer H. Maude, Clarence J. Rodman, Charles A. Styer and William C. Wilharm, Serial No. 682,097, filed December 21, 1923, and assigned to the Westinghouse Electric & Manufacturing Company.

Referring to Fig. 2, the "breathing" regulator 7 is provided with a pair of apertures 16 and 17 through which the fluid level in the seals 8 and 9, respectively, may be observed. The "breathing" regulator 7 is connected to the translating device 1 in parallel through two pipes 18 and 19 having a T-con-

nection 21. In the pipe line 19 is disposed a union 22 that also serves as a regulating valve when disconnected from the pipe network and connected to a cylinder 23 of compressed gas for a purpose to be hereinafter described.

Referring to Fig. 3, the union 22 comprises an outer threaded sleeve 24 and a seat member 25, the latter being centrally perforated and threaded, as at 26, for the reception of a threaded screw 27. The amount of gas transmitted through the regulating valve 22 is limited to the seepage between the threads on the seat member 25 and those on the screw 27 thereby permitting a relatively high pressure to be applied to the union 22 without danger of that pressure being transmitted throughout the entire pipe network 3 to the electrical translating device 1 and the "breathing" regulator 7.

Referring particularly to Fig. 1, the "breathing" regulator 7 is connected to the T-joint 21, whereby the pressure within the transformer 1 is controlled in such manner that the remainder of the pipe member 3 and the gas-treating device 2 operate at substantially atmospheric pressure rather than under a pressure of approximately five pounds, such as is obtained in the electrical translating device 1. The "breathing" regulator 7 is, in turn, connected to the container 14 in the upper carton 10 in the casing 6 for containing the dehydrating chemical compound 15. The container 14 is connected to the liquid seal 8 that serves as a separating barrier between the dehydrating compound 15 and the deoxidizing compound 13. One or more of the containers 10 for the deoxidizing compound 13 may be connected in series relation between the liquid seals 8 and 9 without departing from the spirit of my invention. In the accompanying drawing, two of such containers 10 for deoxidizing compounds are shown so connected.

The liquid seal 9 is placed at the outer end of the series of units for the purpose of preventing the access of the atmosphere to the lower deoxidizing unit at times when the transformer 1 is not in the process of "breathing." The liquid seal 8 prevents the transfer of moisture between the chemical compounds 13 and 15 when no breathing occurs. Inasmuch as the chemical compound 13 requires a certain amount of water for its successful operation, that chemical would be rendered useless due to the absorption of its moisture by the dehydrating chemical compound 15 were it not for the presence of the liquid seal 8 therebetween.

Referring to Fig. 2, the cartons 10 are provided with threaded lugs for ready connection to unions on the pipe network 3. Inasmuch as it is only necessary that one of the dehydrating elements 15 be operated at a time, the projecting lug 12 on the shelf 11 prevents the accidental connection of the pipe line 3 to the dehydrating element 15 in the lower carton 10 since the lug covers the openings thereto and necessitates the removal of the top carton before the lower carton.

When an electrical translating device embodying my invention is initially placed in service, it is desirable to replace the air therein by inert gas. The union 22 is disconnected and reconnected to a cylinder of compressed nitrogen or the like that is allowed to circulate through one side of the pipe line 19 and out through the pipe line 18 and the disconnected portion of pipe 19 until nitrogen gas is discharged at the free end of the pipe line 19, adjacent to the union 22 whereupon it is again closed. Since the pressure in commercial containers of nitrogen and the like is extremely high, the gas would be blown through the breathing regulator 7 and the seals 8 and 9 with a loss of their fluid contents were it not for the special form of regulating valve 22.

Assuming that the transformer is in operation and that the gas space in the transformer 1 is increased by reason of the cooling of the insulating fluid or loss thereof, the pressure on the inside of the breathing regulator 7 becomes less than that on the outside. When the difference in pressures reaches a predetermined value a quantity of air is drawn through the fluid seal 9, the deoxidizing compound 13 the fluid seal 8, the dehydrating compound 15, the breathing regulator 7, the T-joint 21, and through parallel pipe lines 18 and 19 to the gas space above the oil in the transformer 1. The proportion of the gas traversing line 19 is small by reason of the regulating union 22. The air thus entering the transformer has been separated from its oxygen and water content and it is therefore an inert gas and harmless for use in connection with electrical devices where the insulating fluid must be kept free from water and hydrocarbon gas mixtures that are liable to explode.

In the event that the temperature of the insulating oil increases and the gas space in the transformer 1 is reduced to an amount to create a pressure above the setting of the "breathing" regulator 7, a certain amount of gas is expelled through the units in the reverse order. For practical purposes, the "breathing" regulator 7 is designed to permit gas to enter the transformer 1 when the pressure therein is a quarter of a pound lower than atmospheric pressure, but it does not permit the release of gas from the electrical device until the pressure therein exceeds atmospheric pressure by approximately five pounds.

It will thus be seen that I have provided a unitary device for providing dry and inert gas for electrical transformers, circuit interrupters and the like, wherein an inert gas is

confined above the level of the customary insulating fluid.

I do not wish to be restricted to the specific arrangement of parts herein set forth as various modifications thereof may be effected without departing from the spirit and scope of my invention. I desire therefore that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. In a gas-treating device, a container, paths connected in parallel for conducting gas to the container, a breathing regulator for controlling the pressure within the container and connected in series relation to the parallel paths, and means constituting a portion of one of the parallel paths by which the parallel paths may constitute direct entrance and exit paths to the container independently of the breathing regulator.

2. In a gas-treating device, a container, paths connected in parallel for conducting gas to the container, a breathing regulator for controlling the pressure within the container and connected in series relation to the parallel paths, and a connection in one of the parallel paths by which the parallel paths may be made into direct entrance and exit paths to the container independently of the breathing regulator.

3. In combination, a container partially filled with a gas, means for treating the gas entering the container, and a breathing regulator connected between the container and the treating means whereby the latter operates at substantially atmospheric pressure regardless of the pressure within the container.

4. In combination, a container partially filled with a gas, means for deoxidizing gas entering the container, and a breathing regulator connected between the container and the deoxidizing means whereby the latter operates at substantially atmospheric pressure regardless of the pressure within the container.

5. In a gas-treating device, a plurality of interchangeable chemical containers, a plurality of chemical compounds in each container, a pipe network for connection to the container, and means associated with one of the containers for preventing the connection of one of the chemicals in another container to the network.

6. In a gas-treating device, a plurality of interchangeable chemical containers disposed in vertical alinement, a plurality of chemical compounds in each container, a pipe network for connecting the containers, and means associated with the upper container for preventing the connection to the network of one of the chemical compounds in the adjacent lower container.

7. In a gas-treating device, a plurality of interchangeable chemical containers disposed in vertical alinement, a plurality of chemical compounds in each container, a pipe network for connecting the containers, and a shelf for the upper container having means for preventing the connection to the network of one of the chemical compounds in the adjacent lower container.

8. In a gas-treating device, the combination with a breathing regulator comprising a casing having a plurality of apertures, of a plurality of chemical compounds and a plurality of seals for separating the chemical compounds from the atmosphere and from one another, the seals being so disposed with respect to the breathing regulator that their conditions are discernable through the apertures in said casing.

9. In a gas-treating device, the combination with a breathing regulator comprising a casing having a plurality of apertures, of a plurality of chemicals and a plurality of fluid seals for separating the chemical compounds from the atmosphere and from one another, the seals being so disposed with respect to the breathing regulator that their fluid levels are discernable through the apertures in said casing.

10. The combination with an electrical device comprising a container, of a gas-treating device comprising a casing containing a chemical carton containing different chemical compounds, a second casing containing a breathing regulator and a plurality of fluid seals, and a pipe network for connecting the chemical carton, seals, breathing regulator and the container.

11. The combination with an electrical device comprising a container, of a gas-treating device comprising a chemical carton containing different chemical compounds, a breathing regulator, a plurality of fluid seals and a pipe network for connecting in order the container, the breathing regulator, one chemical compound, a fluid seal, another chemical compound and a fluid seal communicating with the atmosphere.

12. The combination with an electrical device comprising a container, of a gas-treating device comprising a chemical carton containing a deoxidizing and a dehydrating chemical compound, a breathing regulator, a plurality of fluid seals and a pipe network for connecting in order the container, the breathing regulator, a unit of dehydrating compound, a fluid seal, a unit of deoxidizing compound and through a second fluid seal to the atmosphere.

13. The combination with an electrical device comprising a container, of a gas-treating device comprising a chemical carton containing a deoxidizing and a dehydrating chemical compound, a plurality of fluid seals and a connecting network for connecting in order

the container, a unit of dehydrating compound, a fluid seal, a unit of deoxidizing compound and through a second fluid seal to the atmosphere.

In testimony whereof, I have hereunto subscribed my name this 24th day of November, 1924.

LELAND H. HILL.