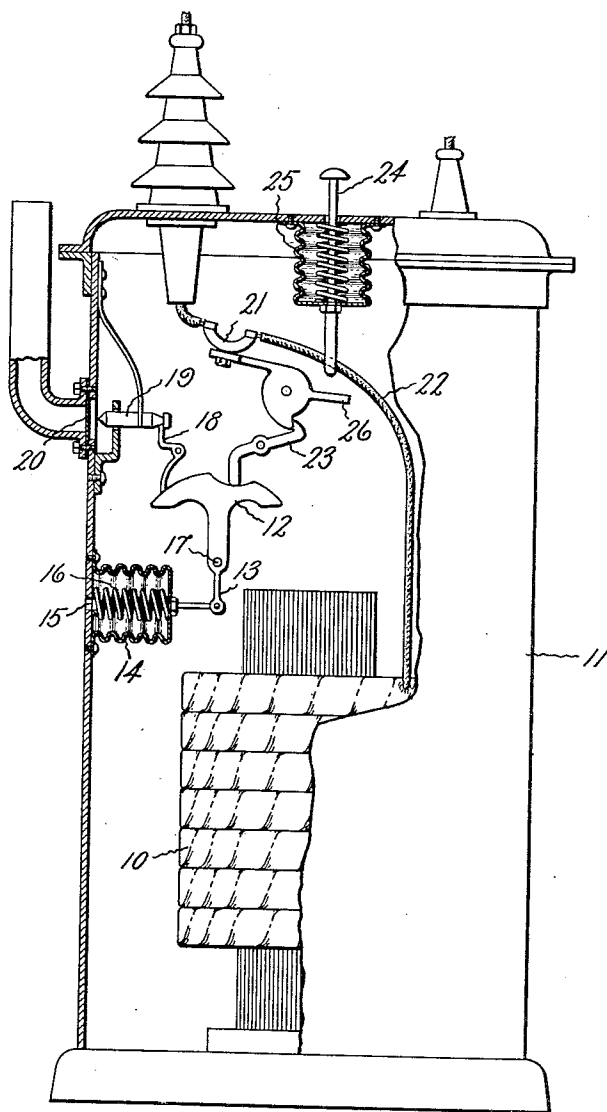


May 22, 1928.

E. D. TREANOR
ELECTRICAL APPARATUS

Filed April 6, 1926

1,670,697



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UNITED STATES PATENT OFFICE.

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ELECTRICAL APPARATUS.

Application filed April 6, 1926. Serial No. 100,153.

My invention relates to electrical apparatus and more particularly to safety appliances for encased electrical apparatus such as transformers of the type in which the casing is sealed and filled with an inert gas under heavy pressure. Inert gases such as helium and nitrogen and mixtures of such gases have been proposed for this purpose, the gas or gaseous mixture serving to insulate the electrical apparatus and to transmit the heat generated in the apparatus to its casing whence this heat is dissipated to the surrounding air. The insulating and heat conducting properties of the gas are improved as its pressure is increased and pressures up to ten or more atmospheres have been proposed. The gas pressure may become excessive and dangerous if its temperature becomes excessive due either to an overload on the apparatus or to accidental fire outside the apparatus casing. On the other hand, the gas pressure may become so low due to leakage from the casing as to impair its insulating properties to such an extent that operation of the apparatus will be unsafe. The general object of the invention is to provide safety appliances responsive to variations in the gas pressure and adapted to prevent damage to the apparatus or its casing as a result of the gas pressure reaching either an unsafe maximum or an unsafe minimum limit.

Other objects and advantages will appear from the following description taken in connection with the accompanying drawing which shows the invention as applied in connection with a casing filled with gas and containing electrical apparatus in the form of a transformer.

The particular embodiment of the invention shown in the drawing will be described in connection with a transformer 10 having a casing 11 which is tightly sealed and filled with a suitable gas adapted to provide insulation for the transformer and to transmit the heat generated in the transformer to the casing whence it may be dissipated to the surrounding air. The gas is preferably under heavy pressure to improve its insulating and heat conducting properties and this pressure may be as great as ten or more atmospheres if desired under normal operating conditions of the transformer.

Within the transformer casing 11 is a cam 12 having an arm 13 connected to the

movable inner end of a flexible or collapsible member 14, the outer end of this collapsible member being connected by a gas tight joint to the wall of the transformer casing. The space within the collapsible member 14 communicates with the outside air through an opening 15 in the casing wall. The pressure of the gas in the transformer casing tends to compress the collapsible member 14 but is opposed by a spring 16. It is obvious that a change in the pressure of the gas will cause the collapsible member 14 to contract or expand and rotate the cam 12 about its pivotal support 17, the direction in which the cam 12 rotates depending upon whether the gas pressure increases or decreases. The cam 12 normally holds a pivoted latch 18 in engagement with a spring pressed pin 19. When the gas pressure increases, it will compress the collapsible member 14 against the spring 16 and rotate the cam 12 until, at a predetermined maximum pressure of the gas, the lower end of the latch 18 will drop over the end of the cam and release the spring pressed pin 19. This permits the pin 19 to be driven forward by its spring against a diaphragm 20 which normally closes an outlet in the transformer casing. The diaphragm 20 is of glass or other suitable material adapted to be ruptured when struck by the pin 19 so as to permit escape of the gas before the pressure in the casing becomes excessively and dangerously high.

The switch 21 interposed in the transformer lead 22 is normally held closed by a pivoted latch 23, the lower end of the latch resting against a depressed portion of the face of the cam 12. The same motion of the cam 12 which releases the pin 19 also moves the latch 23 to release the switch 21 and permit it to open, thus disconnecting the transformer and relieving it of its load.

When the gas pressure in the transformer casing 11 decreases, the spring 16 causes the collapsible member 14 to expand so as to move the cam 12 in a direction opposite to that which has just been described. This motion of the cam 12 moves the latch 23 so that at a predetermined minimum gas pressure the switch 21 is released and opens the transformer lead 22. Thus, the switch 21 is opened and the transformer is relieved of its load when the gas pressure reaches either a maximum or minimum value outside a predetermined safe range. With an

increasing gas pressure, the rupture of the relief diaphragm 20 may occur before or after or simultaneously with the opening of the switch 21 as desired, depending upon the shape of the latch controlling surface of the cam 12. After the switch 21 has been opened, it may be reclosed by a plunger 24 extending through the transformer casing and sealed to the casing by a flexible or collapsible seal 25. The movable contact member of the switch is forced into closed position by pressing the plunger 24 against a projection 26 on the switch.

A particular embodiment of the invention has been described to illustrate its principles and advantages but it will be understood that various modifications may be made and that the invention is not limited by this description except as defined in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A casing containing electrical apparatus, the casing being sealed and filled with gas, said casing having a normally closed outlet, means for opening said outlet to permit escape of gas, a switch connecting said apparatus to an outside circuit, and means responsive to the pressure of said gas for controlling the opening of said gas outlet and the opening of said switch.

2. A casing containing electrical apparatus, the casing being filled with gas, said casing having a normally closed outlet, means for opening said outlet to permit escape of gas, a switch connecting said apparatus to an outside circuit, and means responsive to the pressure of said gas for controlling the opening of said gas outlet when the gas pressure reaches a predetermined maximum limit and the opening of said switch when the gas pressure reaches a value in either direction outside a predetermined range.

3. A casing containing electrical apparatus, the casing being sealed and filled with gas, a switch connecting said apparatus to an outside circuit, and means responsive to the pressure of said gas for causing the opening of said switch when the gas pressure reaches a predetermined minimum limit.

4. A casing containing electrical apparatus, the casing being sealed and filled with gas, a switch connecting said apparatus to an outside circuit, and means responsive to the pressure of said gas for causing the opening of said switch when the gas pressure reaches a value in either direction outside a predetermined range.

In witness whereof, I have hereto set my hand this 1st day of April, 1926.

EDWARD D. TREANOR.