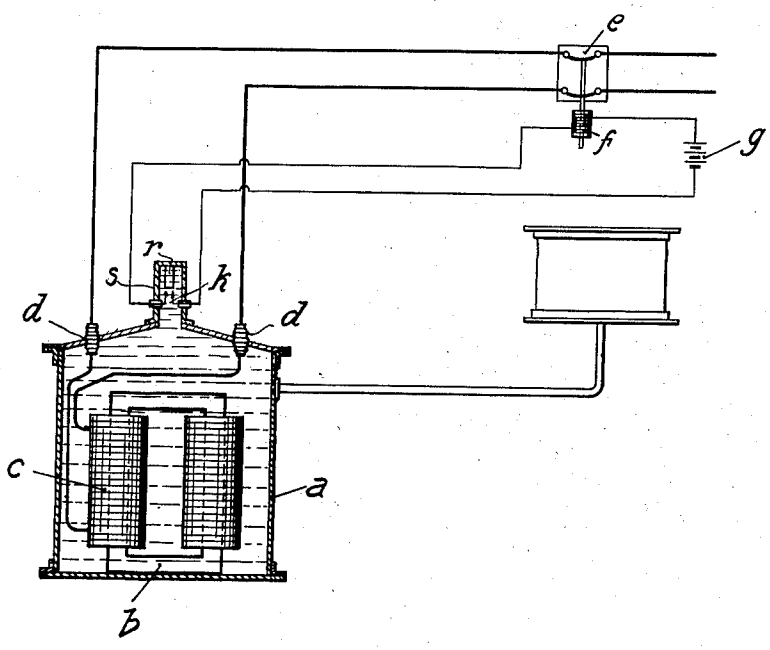
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CONTROLLING ELECTRIC APPARATUS

Original Filed Sept. 15, 1922



Inventor:
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by
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CONTROLLING ELECTRIC APPARATUS.

Original application filed September 15, 1922, Serial No. 588,457, and in Austria July 4, 1922. Divided and this application filed April 16, 1925. Serial No. 23,671.

My invention has reference to a method and means for protecting electric apparatus operating in an insulating liquid, such as oil transformers, oil switches, grounding throttling coils, resistances and the like, and it is one of the important objects of my invention to provide a device of very simple construction and great reliability, and adapted to operate before extensive injuries to the apparatus to be protected can occur by sparking, overloading or other disturbances.

My invention is particularly based on the fact that in the case of disturbances in the operation of the apparatus to be protected or in the case of sparking or other irregularities of operation, or whenever such irregularities are imminent, as well as in the case of any ebullition or fermentation processes in the oil, serving as an insulating liquid, bubbles of gases of decomposition are formed which can operate protective means, for instance an electric contact, either a working or a closed contact, which is adapted to switch out of circuit the apparatus to be protected, or which will operate an alarm or annunciator device indicating the disturbance, or which is adapted to effect both kinds of operations. The gases formed by decomposition may influence the protective means in different ways, this application constituting a division of my co-pending application Serial No. 588,457, filed September 15, 1922.

I may for instance utilize a variation of the specific gravity of the insulating liquid occurring in consequence of the unnormal conditions of working mentioned above to vary the operative conditions of the protective circuit.

A protective device embodying this invention is illustrated in the drawings annexed to this specification by way of example in a purely diagrammatic manner in elevation.

In the drawings a is a transformer casing, b is the core of the transformer, c are the windings, d are the leading-in insulations for the conductors, e is an oil switch with a releasing coil f and g is a source of current which, upon the operation of the safety device, excites the coil, opens the oil switch and causes the switching-out of the apparatus.

s is a tubular extension mounted on the top of the transformer vessel a. As shown in the drawing, the vessel a is completely filled with oil and the extension s is also filled with oil. This extension is open on top and a cylindrical float r partly immersed in the oil freely projects from the extension. Underneath and in close proximity to the bottom of the float r there are arranged the two contacts k of the protective circuit comprising the source of current g and the coil f of the oil switch.

If unnormal conditions of working such as spoken of above cause the formation of small bubbles of gases, vapors or fumes in the oil surrounding the coils c of the transformer, these bubbles will rise in the liquid and in ascending in the oil filling the extension s will cause a diminution of the specific gravity or in other words, a dilution of the medium wherein the float r is floating. Obviously such diminution of the specific gravity of the medium will cause the float r to sink deeper into the liquid, whereupon its bottom will come in contact with the contact pieces k whereby the protective circuit fed by the source g will be closed and the coil f will be excited, thereby opening the oil switch e and throwing out the apparatus.

The protective device according to this invention may be arranged at different places, either in the interior of the main oil receptacle or, in the case of transformers, in combination with expansion vessels contained therein, or special spaces, tubes or similar instrumentalities may be provided adapted for the reception of the contacting devices. The closing of the circuit may be effected both within as well as outside of the liquid.

The circuit to be controlled by the contacts referred to may excite either directly or by the medium of an intermediate relay the releasing coil of an oil switch which interrupts the endangered circuit. In the case of apparatus the circuit of which does not include an oil switch, as frequently occurs, for instance in the cases of transformers mounted in the field at wide distances apart, other provision should be made for the purposes of this invention.

Besides the form of construction herein shown and described, the invention is susceptible of a variety of other modifications and forms of application of the principle

of my invention all of which operate substantially in a similar manner. The means of connecting the contacting device with the releasing circuit and the switching means are open to changes and alterations without any material importance for the operation of the apparatus according to my invention which in its broad aspects comprises the operation of safety devices for electric apparatus or the like, adapted for operation by vapors, fumes, gases or similar emanations liberated and expelled from the insulating medium, and means adapted to be operatively influenced by such emanations, and connected to fuses or equivalent safety means, the instrumentalities shown and described in this specification as embodiments of these principles being susceptible of modifications without deviating from the spirit of my invention as set forth in the claims.

In the claims the term "gases" is meant to comprise also vapors and fumes.

I claim:—

1. Protective system for liquid-insulated electric apparatus comprising a container and a supply of insulating liquid, surrounding the apparatus to be protected, a protective circuit and a contact device adapted to be operated by a variation of the specific gravity of part of the insulating liquid occurring in consequence of a decomposition of such liquid, for varying the operative conditions of said circuit.

2. Protective system for liquid-insulated electric apparatus comprising a container for said apparatus, a supply of insulating liquid filling said container and surrounding said apparatus, a protective circuit, a contact included in the circuit and a float partly submerged in said liquid and adapted, on the specific gravity of said liquid being diminished by gases of decomposition developed therein, to descend and close said contact.

3. Protective system for liquid insulated electric apparatus comprising a container for said apparatus, a supply of insulating liquid filling said container and surrounding said apparatus, a protective circuit, a tubular extension on said container containing oil, a contact included in the circuit and a float partly submerged in said liquid and adapted, on the specific gravity of said liquid being diminished by gases of decomposition developed therein, to descend and close said contact.

4. The method of controlling abnormal working conditions of liquid insulated electric apparatus which comprises causing a decomposition occurring in the insulating liquid due to abnormal conditions to vary the specific gravity of part of the liquid, and causing such variation to vary the operative conditions of a protective circuit.

5. A protective system for liquid-insulated electric apparatus comprising a container for said apparatus, a supply of insulating liquid completely filling said container and surrounding said apparatus, a protective circuit, a tubular extension vertically mounted on top of and communicating with said container and containing a column of insulating liquid and a contact device immersed in the column of liquid in said extension and adapted to be actuated by variations of the physical state of said liquid for varying the operative conditions of said circuit.

6. A protective system for liquid-insulated electric apparatus comprising a container for said apparatus, a supply of insulating liquid in said container surrounding said apparatus, a protective circuit and a contact device comprising a float immersed in said liquid and adapted to be actuated by variations of the physical state of said liquid for varying the operative conditions of said circuit.

In testimony whereof I affix my signature.

MAX BUCHHOLZ.