

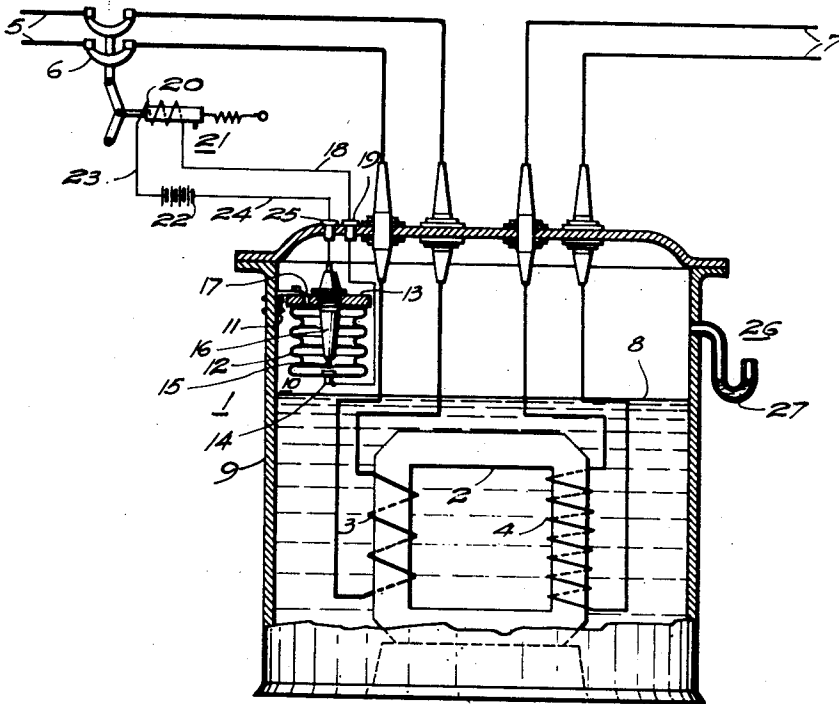
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PROTECTIVE SYSTEM FOR TRANSFORMERS

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PROTECTIVE SYSTEM FOR TRANSFORMERS

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This invention relates to electrical protective devices and particularly to means for protecting oil-immersed electrical translating devices, such as transformers.

5 Many faults which may occur within a transformer, such as the disintegration of insulating material, that results in an arc between the transformer windings, develop gradually. Such disturbances cause the further disintegration of the solid insulation and of the insulating oil and are accompanied by the evolution of gases which rise to the surface of the oil. Such arcs, when once started, are likely to continue until the disintegration of the insulation reaches such point that the current becomes sufficient to trip the line breaker and disconnect the transformer from the transmission line.

10 The continuance of a fault of the character described, from the time of its inception until the line circuit breaker operates to disconnect the transformer from the power line, does considerable damage to the transformer windings, thus necessitating much more extensive repairs thereto than is required if the transformer is disconnected from the power line upon the occurrence of the fault. It is, therefore, desirable to disconnect the transformer from the power circuit during the early stages of such fault.

15 An object of my invention is to provide means for disconnecting an electrical translating device, such as a transformer, from a power line upon the occurrence of an internal fault.

20 A further object of my invention is to provide means for disconnecting an electrical translating device upon the occurrence of an arc through the insulating material thereof.

25 My invention will be better understood by reference to the accompanying drawing in which,

30 The figure is a diagrammatic view of an embodiment of my invention applied to an electrical translating device, containing a fluid insulating material and a gaseous blanket above the liquid.

35 Referring to the drawing, a transformer 1 is illustrated having a magnetic core structure 2, and a plurality of inductively re-

lated windings 3 and 4. The winding 3 is shown connected to power-circuit conductors 5 by means of a circuit-breaker switch 6, and the winding 4 is shown as connected to power-circuit conductors 7. A switch may also be provided between the winding 4 and the conductors 7, if desired. The transformer is completely submerged in insulating oil 8 contained in a sealed transformer casing 9.

40 Within the sealed transformer casing 9, a pressure-operated switch 10 is supported by a bracket 11, and, in the form of the invention illustrated is above the level of the insulating oil 8. The pressure-operated switch 10 comprises a flexible diaphragm or collapsible member 12, affixed to a top wall 13, two cooperating contact members 14 and 15 and an insulating bushing 16 which extends, through the wall 13, into the space between the wall and compressible member 12 and is supported by the wall 13. The wall 13 has an opening 17 through which the space within the collapsible member 12 communicates with the space outside. The bottom part of the collapsible member carries one contact member 14, and the insulating bushing 16 carries the other contact member 15.

45 The contact members 14 and 15 are adapted to close a circuit from a battery 22, through the winding 20 of the electromagnet 21 for operating the circuit breaker 6, to a circuit-opening position. The circuit of the electromagnet 21 may be traced from one side of a source of electrical energy 22, through conductor 23, winding 20, conductor 18, contact members 14 and 15, and conductor 24 to the other side of the source. The conductor 18 extends through a bushing 19 in the transformer casing, and the conductor 24 extends through bushings 25 and 16. The contact members 14 and 15 are adjustable and may be set a fixed distance apart.

50 The space above the oil is connected to the outside atmosphere through a valve or "breather" 26, which may be of any suitable construction but which is illustrated as having the form of a U-tube that contains mercury 27 to a desired level, in accordance with the pressures at which it is desired to operate

the transformer. The operation of the system is as follows:

Under normal operating conditions, an increase in the load upon the transformer causes an increase in the temperature and the volume of the oil and a corresponding gradual increase in the temperature and the pressure of the gas above the oil. Because of the vent 17 in the wall 13, there is an interchange of air between the inside and the outside of the collapsible member 12 to equalize the pressure therebetween. As the pressure on opposite sides of the member 12 is the same, no movement of the collapsible member results.

When any sudden increase in pressure occurs, due to rapid evolution of gas caused by an arc or a short circuit between turns of the windings, the collapsible member 12 is compressed to cause engagement of contact member 14 and contact member 15. This causes a current to traverse the winding 20 of the electro-magnet 21 to effect operation of the circuit interrupter and thus disconnect the transformer from the power circuit conductors 5 before any great damage is done. The operation of the pressure-operated switch 10, is, therefore, dependent upon the rate of change in pressure within the casing.

When the pressure of the gas above the oil reaches a predetermined value, the mercury in the U-tube will be forced down in the longer arm of the U-tube to permit enough gas to escape to keep the pressure within the casing 9 at a safe value. If the pressure within the casing drops below a predetermined value, air will be taken into the casing through the U-tube. The pressure within the casing may vary between predetermined maximum and minimum values, depending upon the setting of the "breather".

Since modifications may be made in the apparatus and circuits illustrated without departing from the spirit of my invention, I do not wish to be limited otherwise than by the scope of the appended claims.

I claim as my invention:

1. In combination, a sealed casing containing oil, a translating device submerged therein, a power circuit connected to said translating device, a circuit-interrupting means for disconnecting the translating device from the power circuit, an electro-responsive means for actuating said circuit interrupting means, and means responsive only to a rapid increase in pressure within said sealed casing for actuating the aforementioned electro-responsive means.

2. In combination, a sealed casing containing oil, a translating device submerged therein, a power circuit connected to said translating device, a circuit-interrupting means for disconnecting the translating device from the power circuit, an electro-mag-

net for actuating said interrupting means, and means responsive to a fault within said casing for actuating the aforementioned electro-magnet, said means comprising a collapsible member responsive only to a rapid increase in pressure within said casing, a contact member associated with said collapsible member, a stationary contact member located within the collapsible member and so positioned as to be engaged by the contact member associated with the collapsible member upon a predetermined rate of change in the pressure condition within said sealed casing, the collapsible member being so biased as to normally keep the contact members apart.

3. In combination, a sealed casing containing oil, a translating device submerged therein, a power circuit connected to said translating device, and means responsive only to a rapid rise in pressure within the sealed casing for disconnecting the translating device from the power circuit.

4. In combination, a sealed casing partially filled with oil, a translating device submerged therein, a power circuit connected to said translating device, circuit-interrupting means for disconnecting the translating device from the power circuit and means responsive to a fault within the casing for actuating the electro-responsive means comprising a collapsible member disposed within said casing, means for permitting the gradual equalization of pressures inside and outside the collapsible member, a movable contact member associated with the collapsible member, a stationary contact member located within the collapsible member and so positioned as to be engaged by the movable contact member upon a rapid change in pressure within the sealed casing.

5. In combination, a sealed casing partially filled with oil, a translating device submerged therein, a power circuit connected to said translating device, an electro-responsive means for disconnecting the power circuit from the translating device, means responsive to a fault within the casing for actuating the electro-responsive means comprising an enclosed collapsible member disposed within said casing, an opening in the collapsible member to permit the equalization of the pressures within and without the collapsible member, a movable contact member associated with the collapsible member, a stationary contact member located within the collapsible member and so positioned as to be engaged by the movable contact member when a sudden increase in pressure occurs within the casing.

In testimony whereof, I have hereunto subscribed my name this Twenty First day of March, 1929.

ROY L. BROWN.