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PROTECTING DEVICE FOR TRANSFORMERS

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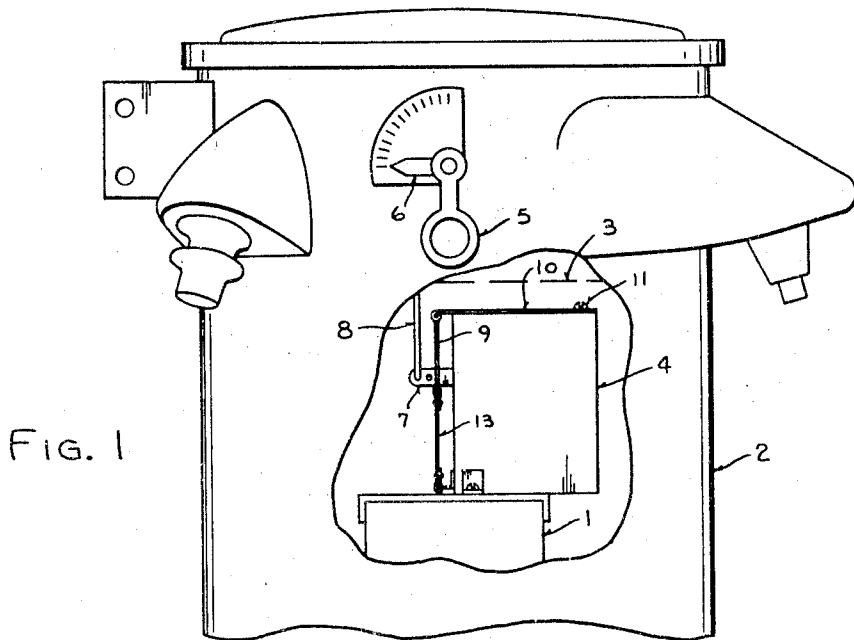


FIG. 1

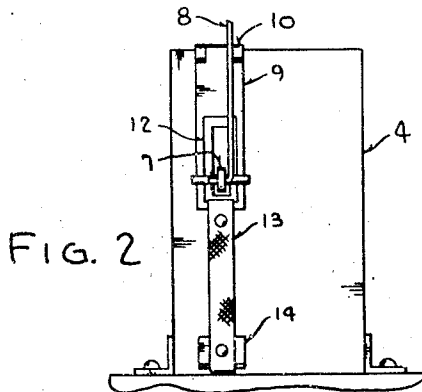


FIG. 2

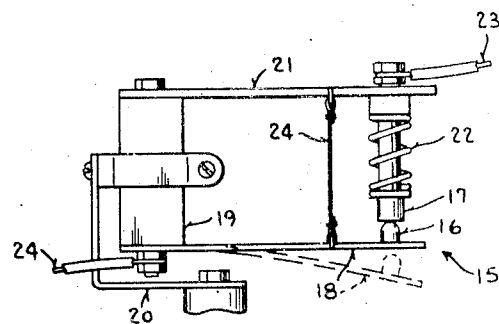


FIG. 4

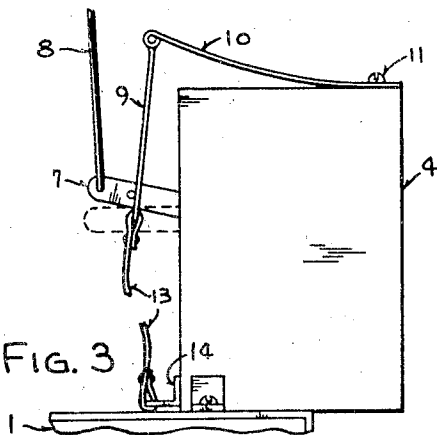


FIG. 3

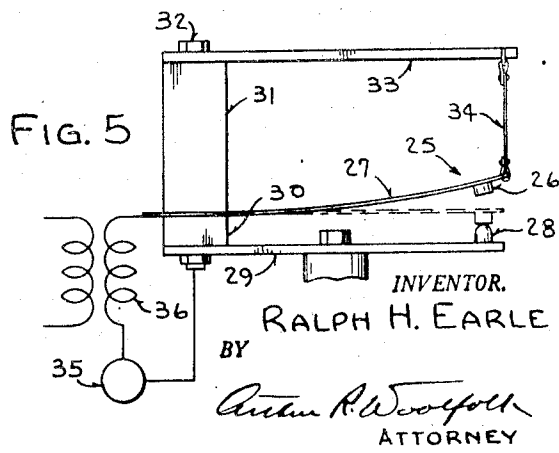


FIG. 5

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PROTECTING DEVICE FOR TRANSFORMERS

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9 Claims. (Cl. 116—114)

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In transformers and other electrical devices, gradual ageing of the insulation such as the cotton tape, takes place particularly when the transformer is immersed in oil which is always somewhat heated when the transformer is under load.

This invention has for its object the provision of means for protecting the transformer or other device by either opening the circuit of the transformer on the line or load side or by giving an indication such as a signal when the insulation has deteriorated to such a point as to render the device unsafe for further service.

In greater detail, objects of this invention are to provide a device which utilizes the same insulating material, such as the cotton tape, used in the transformer to control a switch whether of the circuit breaker type or of any other type to either open the switch to remove the transformer from the line or the load from the transformer or to close a switch to give a signal when the material has become embrittled or deteriorated to a predetermined degree with the device so arranged as to hold the tape or other material in the same heated oil that surrounds the transformer so that the tape or other material ages at the same rate as the insulation of the transformer. When the device operates it shows that the transformer is unsuitable for further service and must be either replaced or taken down for overhauling.

Embodiments of the invention are shown in the accompanying drawings, in which:

Figure 1 is a fragmentary view, partly broken away, showing one form of the device associated with a circuit breaker in the tank of a transformer.

Figure 2 is a front view of the device shown in Figure 1.

Figure 3 is a view showing the device after it has operated.

Figures 4 and 5 are views of further forms of the device.

Referring to Figure 1 it will be seen that a transformer 1 has been indicated as enclosed within a casing or tank 2 and submerged in a liquid dielectric such as oil. The oil extends above the transformer and may approximate the oil level indicated by the reference character 3. The reference character 4 indicates a circuit breaker which is automatically controlled in the usual way and may also be manually controlled from the exterior of the casing by means of an eyeletted handle 5 in accordance with the usual practice. The member 5 and its associated pointer 6 may serve as an indicating device to

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exteriorly indicate whether or not the circuit breaker is in open position. The circuit breaker may be connected in circuit in the primary or in the secondary of the transformer if desired.

The circuit breaker is provided with an operating lever 7 which is operated by means of a link 8 connected in any suitable manner to the external operating eyeletted member 5.

A control member indicated by the reference character 9 is provided. This control member is shown in Figures 1, 2, and 3. It consists of a strap-like metal member pivoted to one end of a leaf spring 10, the other end of which is fastened down as indicated at 11 in Figures 1 and 3. The member 9 is provided with a slot 12 through which the operating member 7 of the circuit breaker extends. A section of tape indicated by the reference character 13 is fixedly attached at one end to a bracket 14 and at the other end to the control member 9.

It will be seen from the description thus far given, that the operating member 9 is biased towards a position to alter the action of the circuit breaker by moving its operating member 7 to open position. The operating member 7, however, may be opened or closed manually by the arm 5 and may be opened automatically as long as the control member 9 occupies its normal position as shown in Figures 1 and 2. It is restrained against the biasing action of the spring 10 by means of the tape 13 under normal conditions.

The tape 13 preferably is a piece of the same insulating tape used in insulating the primary and secondary windings of the transformer. The tape, it will be noted, is also submerged in the oil or other liquid dielectric and is subjected to the same heating and ageing that the tape or insulating means of the transformer is subjected to in the normal operation of the transformer.

The purpose of this is to protect the transformer by rendering the circuit breaker inoperative when the ageing of the transformer has progressed to a certain predetermined point. This is obtained by having the tape normally restrain the biasing spring 10 but allowing the tape, when it has aged to a predetermined point, to disintegrate or break and release the operating member 9 and thus open the circuit breaker.

Although it is preferable to use the same tape as that used in insulating the primary and secondary windings of the transformer, it nevertheless is within the province of this invention to use any other insulating member in place of the tape 13, provided such member has substantially

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the same ageing characteristics as that of the insulation used in the transformer.

It is apparent, therefore, that normally the tape restrains the control member 9 and the parts occupy the position shown in Figures 1 and 2, allowing the circuit breaker to operate in its usual manner. However, after the tape has aged to a predetermined degree, it breaks under the action of the biasing member 10 and the control member 9 is moved, thus opening the circuit breaker. This condition is shown in Figure 3.

The invention may take other forms. For instance, a switch may be provided in series with the transformer and may be biased towards open position as shown in Figure 4. The switch is indicated generally by the reference character 15 and is provided with a movable contact 16 and a stationary contact 17. The movable contact 16 may be carried directly by a spring arm 18, if so desired. The fixed end of the spring arm 18 may be attached to an insulator 19 which, in turn, is supported from a bracket 20 or in any other suitable manner. The stationary contact 17 is slidably guided in a rigid metal arm 21 attached to the other end of the insulating member 19. The stationary contact 17 is urged downwardly by means of the compression spring 22 and is connected to one of the leads 23. The other lead 24 is connected to the fixed end of the spring 18 and to the transformer. A section of tape or other insulating member having the same ageing characteristics as the insulation used in the transformer normally restrains the spring arm 18 from outward motion and consequently normally holds the switch in closed position. This section of tape is indicated by the reference character 24. It is intended that the switch and the tape shall be submerged in the oil in the transformer tank as previously described. It is obvious, therefore, that in this last form of the invention, shown in Figure 4, that ageing occurs and the tape will rupture after it has aged to a certain degree and allow the switch to move to open position thus disconnecting the transformer from the line or disconnecting the load from the transformer depending on how the switch is connected in circuit with the transformer.

The invention may take still other forms. For example, in Figure 5 a switch has been shown which is normally open and which is biased towards closed position. The switch is indicated generally by the reference character 25 and is provided with a movable contact 26 carried by a spring arm 27 and a stationary contact 28 carried by a metal member 29 suitably insulated and supported. The spring arm is fastened at one end by means of the insulating spacers 30 and 31 and the tie bolt 32. The insulating member 31 carries a rigid metal member 33 which projects outwardly. A section of tape or other insulation having the same ageing characteristics as that used in the transformer is indicated by the reference character 34 and extends between the spring arm 27 and the fixed member 33. When the ageing of the tape progresses to a certain predetermined point corresponding to that of the ageing of the insulation of the transformer it will not sustain the pull of the biasing member 27 and consequently is ruptured and allows the switch to close. The switch may be connected in circuit with any suitable signaling means, such as the lamp indicated by the reference character 35. The lamp may be supplied from a winding 36 of the transformer or from an auxiliary transformer or any other suitable source.

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It will be seen that in all forms of the invention means have been provided for protecting the transformer by either opening the circuit of the transformer or by closing a signal circuit when the ageing of the insulation of the transformer has progressed to a predetermined point, which point is indicated by the ageing of a corresponding insulating member. This corresponding insulating member, in all forms of the invention, has substantially the same ageing characteristics as the insulation used in the transformer and inasmuch as it is submerged in the heated oil or liquid dielectric member, it obviously is subjected to substantially the same ageing factors as that of the insulation of the transformer.

It will be seen further that the device is very simple and can be used to alter the action of a circuit breaker, for instance, as by opening the circuit breaker, or by allowing a switch to either open or close to either disconnect the transformer or to give a signal as desired.

It will be noted that the pointer 6 is an indicator and normally occupies one position when the circuit interrupter is closed and the tape 13 is intact. However, when the tape is ruptured the circuit breaker is moved to open position and the indicator 6 is moved to an indicating position. Thus it is clear that the tape controls an indicator located externally of the transformer casing and will cause the indicator to give an indication when the tape is ruptured.

The device is very compact and does not require any material amount of space within the tank of the transformer. It is easily installed and does not require any particular skill or care in its installation.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. In a device of the class described, an electrical instrumentality having insulation and surrounded by a medium, a section of the same insulation as that used in the electrical instrumentality surrounded by the said medium, biasing means stressing said section of insulation, and switch means arranged to operate when said section has deteriorated to a predetermined point through ageing.

2. In a device of the class described, an electrical instrumentality having insulation, a liquid medium surrounding said electrical instrumentality and arranged to be heated by said electrical instrumentality, a section of the same insulation as that used in said electrical instrumentality submerged in said liquid medium, a switch controlled by said section, and biasing means stressing said section, whereby said section is subjected to the same ageing as the insulation of said electrical instrumentality.

3. In a device of the class described, an electrical instrumentality having tape-like insulation, an insulating liquid medium surrounding said electrical instrumentality and acting as a cooling medium and arranged to conduct heat from said electrical instrumentality, a section of tape of the same material as that used in said electrical instrumentality, said section of tape being submerged in said liquid medium, whereby said section of tape is subjected to the same ageing effects as that used in said electrical instrumentality, means stressing said section of tape, and a switch controlled by said section of tape.

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4. In a device of the class described, an electrical instrumentality having insulation, an insulating liquid medium surrounding said electrical instrumentality and arranged to conduct heat away from said electrical instrumentality, a section of the same insulation as that used in said electrical instrumentality, said section being submerged in said liquid medium, a circuit breaker connected in circuit with said electrical instrumentality, control means for rendering said circuit breaker inoperative, and means biasing said control means towards circuit breaker inoperative position and simultaneously stressing said section, said section normally restraining said control means and arranged to release said control means when the ageing of said section has arrived at a predetermined point.

5. In a device of the class described, an electrical instrumentality having insulation, an insulating liquid medium surrounding said electrical instrumentality and arranged to conduct heat away from said electrical instrumentality, a section of the same insulation as that used in said electrical instrumentality, said section being submerged in said liquid medium, a normally open signal switch, and means biasing said signal switch towards closed position, said section normally holding said signal switch open against the action of said biasing means and arranged to release said signal switch when the ageing of said section has progressed to a predetermined point.

6. In a device of the class described, an electrical instrumentality having insulation, an insulating liquid medium surrounding said electrical instrumentality and arranged to conduct heat away from said electrical instrumentality, a section of the same insulation as that used in said electrical instrumentality, said section being submerged in said liquid medium, a normally closed switch connected in series with said electrical instrumentality, and means biasing said switch towards open position, said section normally holding said switch closed against the action of said biasing means and arranged to release said switch when the ageing of said section has progressed to a predetermined point.

7. A transformer construction comprising a casing, a transformer within said casing, a circuit breaker connected in circuit with said transformer, a cooling liquid dielectric filling said casing to a point above said transformer, said transformer having primary and secondary wind-

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ings provided with insulation, control means for altering the action of said circuit breaker and normally occupying an ineffective position, spring means biasing said control means towards a position to be effective to alter the action of said circuit breaker, and a section of insulation having substantially the same ageing characteristics as that used in said transformer and normally restraining said control means, said section of insulation being submerged in said liquid dielectric.

8. In a device of the class described, an electrical instrumentality having insulation, an insulating liquid medium surrounding said electrical instrumentality and arranged to conduct heat away from said electrical instrumentality, a section of the same insulation as that used in said electrical instrumentality, said section being submerged in said liquid medium, an indicator normally occupying a first position, means restrained by said section of insulation and operatively connected to said indicator, and biasing means for causing said indicator to move to a second position when said section of insulation has aged to a predetermined point.

9. In a device of the class described, an electrical instrumentality having insulation, an insulating liquid medium surrounding said electrical instrumentality and arranged to conduct heat away from said electrical instrumentality, a movable member normally occupying a first position, a section of insulation of the same characteristics as that of said electrical instrumentality normally restraining said member and submerged in said insulating liquid medium, and biasing means for causing said member to move to a second position when said section of insulation has aged to a predetermined point.

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