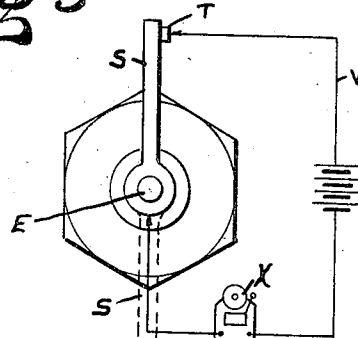
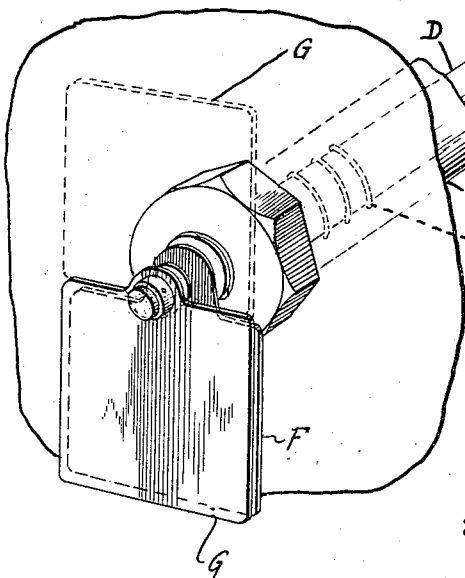
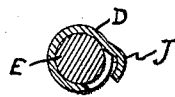
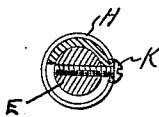
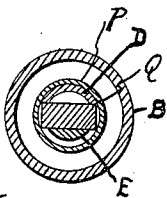
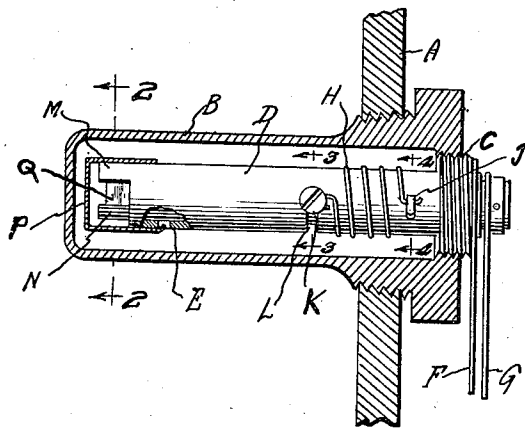


Jan. 30, 1923.

N. L. DOLPH.
TRANSFORMER TEMPERATURE INDICATOR.
FILED MAR. 26, 1921.

1,443,786.



Inventor
Norman L. Dolph

By William M. Swan
Attorney

UNITED STATES PATENT OFFICE.

NORMAN L. DOLPH, OF DETROIT, MICHIGAN.

TRANSFORMER TEMPERATURE INDICATOR.

Application filed March 26, 1921. Serial No. 455,870.

To all whom it may concern:

Be it known that I, NORMAN L. DOLPH, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a certain new and useful Improvement in Transformer Temperature Indicators, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to temperature indicators or trouble signals, especially adapted for use in transformers or similar electrical apparatus, whose load capacity is limited by a certain known maximum of operating temperature. My improved device is especially designed to obviate the necessity of close inspection of the individual transformers, some of which are often located upon poles or side walls fifteen or twenty feet above the ground or floor level, and which it would be inconvenient to approach closely and frequently, to ascertain whether or not the transformer is overheating. My invention, which has nothing to do with the details of the transformer from an electrical standpoint, is essentially an adjunct, which may be employed either to operate a fixed mechanical signal, whose variance from normal position as regards its signalling, when the transformer is overheated, may be easily observed from a distance, or to close an electrical signal circuit to indicate that the maximum temperature has been reached in the transformer parts, or, to open up the circuit to which the apparatus is applied, as by closing the circuit to the circuit breaker relay.

In the drawings, Figure 1 is an elevational view of my device, shown partly in section with respect to the adjoining wall of the transformer box;

Figure 2 is a sectional elevational view along the line 2—2 of Fig. 1, looking in the direction of the arrows;

Figure 3 is a similar sectional view taken on line 3—3 of Figure 1;

Figure 4 is a similar sectional view taken on line 4—4 of Figure 1;

Figure 5 is a perspective of my improved device in place on a fragmentary section of the transformer wall, showing in dotted lines the position of the trouble or alarm in-

dicator when the over-heating of the transformer has caused it to act; and

Figure 6 shows the application of my signal members to the closing of a circuit.

A indicates the wall of a transformer box, into a screw-threaded aperture in which there is designed to be removably inserted the tubular indicator container B, whose closed inner end dips into or is surrounded by the cooling oil with which it is the present practice to fill the transformer box. In the screw-threaded outer end C of this tubular shell there is adapted to be removably inserted the correspondingly threaded tubular section D, on whose outer end is mounted the normally concealed trouble-indicating member F. Within the tubular piece D is located the smaller diametered tube or stem E, whose outer end projects sufficiently beyond the outer end of the tube D so that it may carry the screen-piece G in a position to normally blank or conceal the trouble-indicating member F, and whose observable surface is preferably of a different color, and so that when functioning the two pieces F and G lie in closely parallel planes.

Engaging about the cylinder D is a helical spring H, one end of which is anchored to the outer surfaces of D, as at J, while the other end is similarly attached to an anchoring screw K which projects through the slot L into the body of the inner stem piece E.

As brought out in Figs. 1, 3 and 4 particularly, the adjacent ends of the cylinder D and of the stem E are cut away in what might be described as an L-shape, and when they have been rotated relatively to one another so that the trouble indicator piece is blanked by the screen G and the spring H has been drawn to the desired degree of tension, the cut-away portions of the ends of the cylinder D and of the stem E, as M and N, are located diametrically opposite to one another in such a way as to leave a key-way or slight space between them. This space is then filled, and the two parts locked in position relatively to one another, by the insertion of an easily fusible plug or key Q, whose composition, by the use of desired proportions of such well-known elements as lead, tin, bismuth and cadmium, or other fair equivalents, may be regulated as desired with regard to its fusing or melting point. As long as the alloy within the transformer casing is not heated by the contained oil to or above this point, it remains in place and

functions to prevent relative rotative movement of the two parts D and E under pull of the spring H. As soon as the temperature of the oil has risen to the point at which fusing or melting of this plug or key takes place, however, it no longer operates to hold the cylinder D and stem E against rotation, and the pull of the spring H upon the inner tube or stem E while the outer tube D remains anchored against rotation by reason of its positioning in the wall A, results in the rotation of the stem E and its supported screw G, as regards the common axis of the cylinder D and stem E; thus uncovering the indicator F and rendering it easily observable to an inspector, who can at once climb up to the box and make such changes as are necessary in the electrical apparatus. So long, however, as the trouble indicator F is concealed by the screen G, he needs only to glance at it in passing.

When the trouble with the electrical apparatus has been remedied, the inspector removes the trouble indicator mechanism just described, as a unit, by unscrewing, and either puts in its place an indicator piece with a fresh fusible plug or key Q, or else, after winding up the cylinder D relatively to the stem E until the spring H is of the proper tension and putting in a new key Q, he is able to make use of the same signalling apparatus.

In order to prevent the material of the plug or key when melted from falling against and hardening in the inaccessible inner end of the container B, thus rendering it worthless for future re-use, I preferably employ a cap or thimble piece P, which fits over the cut-away end portions of the tube D and stem E and key Q, and which thus catches the fused or molten mass and prevents it from falling into the fixed containing cylinder B.

In Figure 6, I have shown a slightly modified form of construction, which employs the same parts as regards the relatively rotatable parts D and E normally held against pull of the spring by a fusible plug, but which substitutes for the indicator F and its screen G the swing of the lever S, when the fusible plug gives way, so as to engage the terminal T of the otherwise open circuit V and thus actuate the alarm bell X; so long as the fusible plug holds, the lever S is in the position shown in dotted lines.

What I claim is:

1. An indicator, having in combination with a pair of coaxially disposed signal-supporting members, resilient means for rotatively actuating one of said members relatively to the other, to effect an observable change in the relative positions of signal pieces carried by each, and a fusible locking member adapted to normally hold said signal-supporting members in tensioning

position relatively to said resilient rotating means, and upon its melting, due to the attainment of a predetermined temperature, to permit the spring to actuate said signal-supporting members as described.

2. In an indicator, the combination of a pair of coaxially disposed signal-supporting members, each of which is provided at its end with an observable signal piece, a spring member adapted to actuate one of said members relatively to the other, thereby effecting a change in the position of its signal piece relatively to the other, and a fusible key-piece serving to hold said coaxially disposed members in straining position, as regards said spring member until the surrounding temperature has attained a melting degree, then and thereby allowing the spring to rotatively actuate one of said coaxially disposed members relatively to the other.

3. An indicator, having in combination with an outer tubular member, a co-axially disposed stem member rotatably disposed therewithin, a spring with the ends of which said tubular member and said stem member are respectively connected, a fusible key-piece adapted to lock said stem member relatively to said tubular member in distorting position relatively to said spring until a predetermined temperature has been attained, and a normally screened signal member adapted to be uncovered by the rotation of said stem relatively to said tubular member upon its rotative response to the pull of said spring when the melting of the fusible key takes place.

4. In combination with a tubular member, a stem member rotatively engaging therewith and operatively connected with a normally inactive external signal, a spring member connected with said tubular member and said stem member and normally held in torsionally strained condition by the relative position thereof, and a fusible key-piece for holding said stem member against rotation relatively to said tubular member until a predetermined temperature has been attained.

5. The combination, with a tubular member, of a stem member rotatably movable therewithin, observable signal pieces supported by each of said members, a spring member adapted to be held in condition of tension by and during the normal positioning of said stem relatively to said tubular member, and a member of low fusibility adapted to hold said members in such position during the prevalence of inferior thermal conditions thereabout, said stem member and its supported signal piece being adapted to be moved relatively to the tubular member and its signal piece by the action of said spring member upon the yielding of said holding member, due to its at-

tainment of a melting degree of temperature.

6. In combination with a fluid-containing member, a plurally-membered device adapted to engage therein, consisting of a pair of relatively movable and coaxially disposed members, each of which carries an externally observable signal piece, a thermally responsive element for normally locking them in inactive relative position, and a spring member held in a condition of tension while said coaxially disposed members remain in inactive relative position, adapted to actuate one of said members rotatively with respect to the other upon their release due to the giving way of said thermally responsive element, thereby effecting an observable change in the position of one of the signal pieces relatively to the other.

7. In combination with a pair of relatively movable members, externally observable signal pieces of accordingly changeable position supported thereby, a locking member of inferior thermal character for normally preventing relative movement of one of said members with respect to the other, a spring member so connected with each of said movable members as to be held in torsionally strained position while said members are held by said locking member in normally inactive position, and means for subjecting said locking member to the changes in the thermal conditions whose variations are to be watched, whereby upon the attainment of a predetermined degree of temperature the action of said locking member upon said relatively movable members is terminated, thereby permitting said spring member to effect an observable change in the relative position of their exposed parts.

8. In a safety device for oil-cooled transformers, the combination with a container adapted to be positioned in a circulation of cooling oil, of a stem member and an observable signal carried thereby rotatably contained therein, a spring member operatively connected with said members and under torsional strain while said members are in normal position relatively to one another, and a thermally fusible locking key normally serving to lock said members in such position, adapted to give way upon the attainment of a predetermined temperature communicated to it from the oil, thereby permitting the spring to cause an observable change in the position of said stem member and its supported signal.

9. In a safety device for oil-cooled transformers, the combination, with a container adapted to be positioned in the circulation of cooling oil, of a separable device extending into said container and comprising a relatively movable member, a temperature-controlled element normally holding said

movable member against movement, a spring operatively connected with the parts of said separable device and adapted to actuate said movable member upon the cessation of the holding action of said temperature-controlled element, due to the increased temperature imparted to it by the surrounding oil, and an observable signal piece carried by said relatively movable member.

10. An indicating device for transformers, comprising a heat-conducting container adapted to project into a heat-generating locality in said transformer, a movable member in said container, an observable signal piece carried thereby and means responsive to temperature changes within said container, for normally holding said movable member against movement and for releasing the same upon a predetermined rise in temperature, and spring means for actuating one of said members relatively to the other after said holding member has ceased to function, thereby effecting an observable change in the relative position of said movable member relatively to the container.

11. An indicating device for transformers, comprising a heat-conducting container adapted to project into a heat-generating locality in said transformer, a shaft provided with an observable outer end portion, projecting into said transformer, thermally responsive means for locking said parts against relative rotative movement, and a spring member held in torsionally strained position while said first-named members are in normal position, adapted to rotatively actuate said shaft upon the cessation of the locking action of said thermally responsive means.

12. In combination with a heat-conducting container adapted to project into a circulation of cooling fluid, a cylinder removably supported in said container, a stem rotatably positioned within said cylinder, an observable signal piece supported thereby, fusible locking means adapted to normally hold said stem against movement with respect to said cylinder, and a spring member adapted to rotatively actuate said stem member and consequently effect a change in the position of its supported signal upon the giving way of said fusible locking means.

13. The combination of a fluid-holding member, a heat-conducting container projecting into the interior of said fluid-holding member, a cylinder removably supported in said container and adapted to make contact therewith, a stem rotatably disposed within said cylinder, a spring connected at its ends with said cylinder and said stem respectively, a fusible link adapted to normally hold said stem against movement relatively to said cylinder and to hold the spring

in strained condition accordingly, the holding action of said link being terminated by its yielding because of the communication to it of a predetermined degree of temperature by the contents of said fluid-holding member, a signal adapted to be actuated by the consequent movement of said stem, and a removable cap on the cylinder adapted to receive the fused metal of the link.

- 10 14. The combination, with a fluid container, of a cylinder projecting thereinto, a stem having an observable end portion movably engaging in said cylinder, a thermally responsive locking key for normally hold-

ing said stem against movement relatively 15 to said cylinder, and a spring adapted to act upon said stem upon its release due to the softening of said locking key, for actuating said stem relatively to said cylinder, thereby effecting a change in the position 20 of the observable end portion thereof.

In testimony whereof, I sign this specification in the presence of two witnesses.

NORMAN L. DOLPH.

Witnesses:

WILLIAM M. SWAN,
JEFFERSON G. THURBER.