United States Patent

Risk

[15] **3,701,926**

[45] **Oct. 31, 1972**

[54] INTERNAL FUSE FOR TRANSFORMER

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[22] Filed: **Jan. 20, 1972**

[21] Appl. No.: **219,388**

[52] **U.S. Cl.** **317/15,** 337/204

[51] **Int. Cl.** **H02h 7/04**

[58] **Field of Search** 317/15; 337/204

[56] **References Cited**

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3,014,158	12/1961	Nelson et al.	317/15
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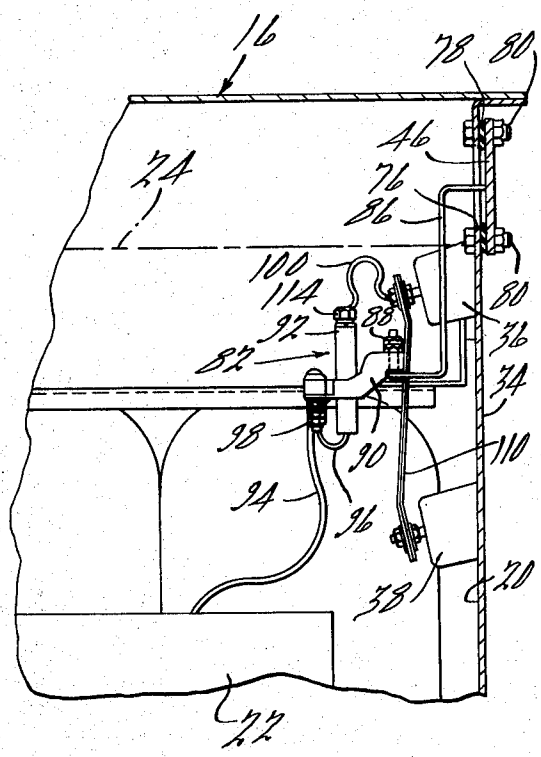
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[57] **ABSTRACT**

A fuse holder assembly which is particularly adapted to be utilized in conjunction with the protection system for the primary side of a transformer assembly wherein the fuse holder is mounted on a plate, the plate being supported on the face of the transformer casing. The fuse holder extends from the plate through an aperture in the transformer housing such that the fuse is supported below the level of cooling fluid within the transformer housing. The assembly of the present invention is suitable for use in connection with any type of fuse and also the transformer assembly includes a protective cover which encloses the area on which the plate is mounted to render the system tamper-proof.

10 Claims, 3 Drawing Figures



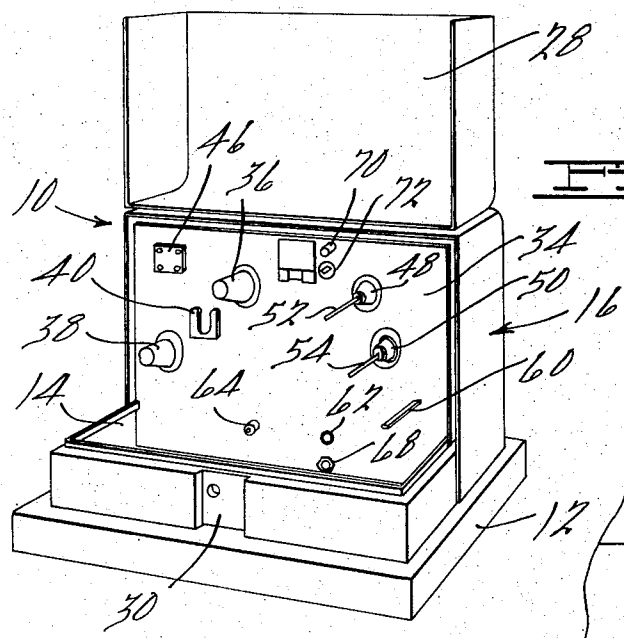


FIG. 1.

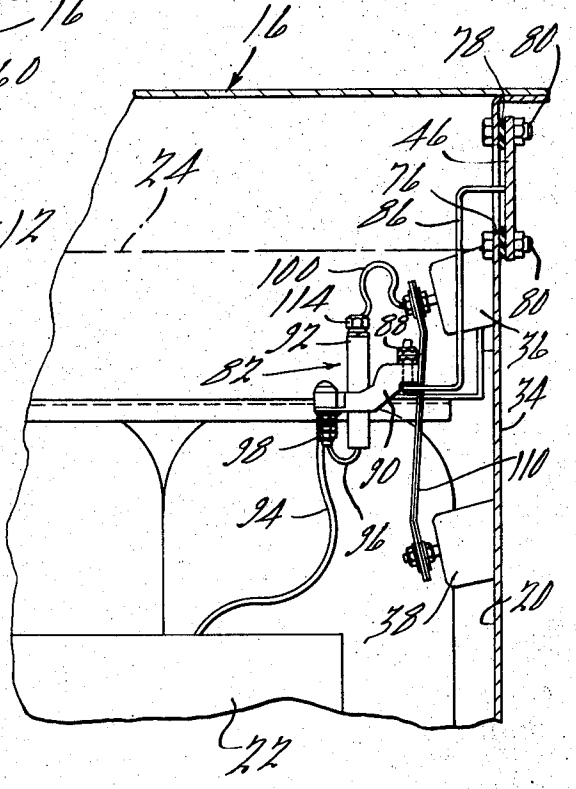


FIG. 2.

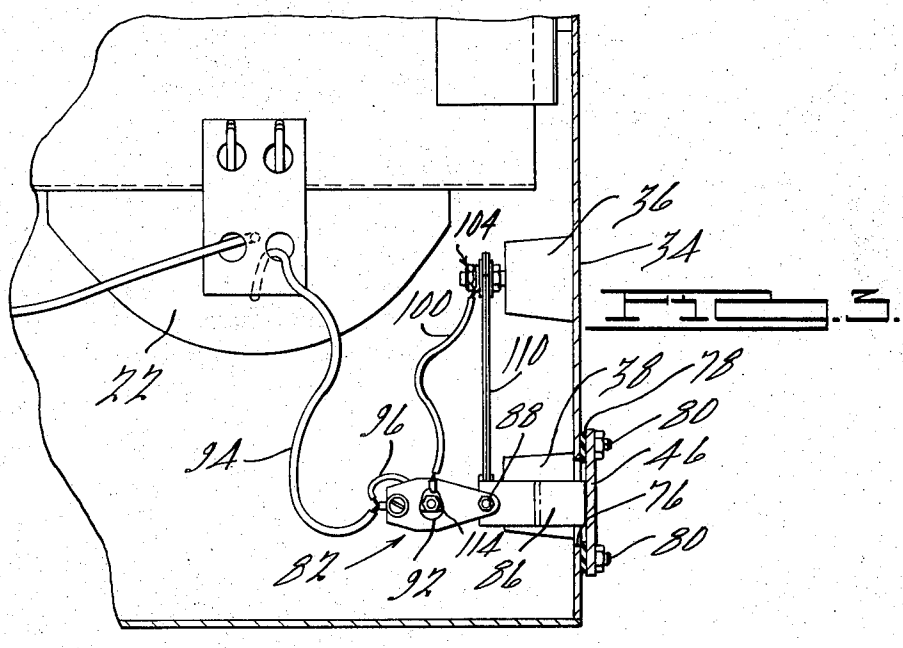


FIG. 3.

INTERNAL FUSE FOR TRANSFORMER

BACKGROUND AND SUMMARY OF THE DEVELOPMENT

This invention relates generally to a protective system for a transformer assembly and more particularly to a fuse assembly for a ground mounted transformer.

In the recent past, the use of ground supported transformer assemblies in home subdivisions has become more and more prevalent due to the desire to avoid overhead lines and interconnect the transformer with the user by means of underground cables. These transformer assemblies are mounted adjacent junctions of various property lines to afford a means by which a ground level transformer may be inconspicuously mounted to provide electrical service for several homes with the area. This trend has decreased the problems of accessability in servicing transformers of this type but has increased the possibility of unauthorized tampering with the transformer assembly. Further, a ground mounted transformer lends itself to a more simple fusing arrangement due to the fact that the fuse assembly does not have to be available for manipulation by a hot-stick, with the attendant complex mechanism necessary for insuring that the fuse is mounted below the level of the cooling fluid within the transformer.

Further, it has been found desirable to provide a transformer with a fuse mounting assembly which is capable of receiving substantially all of the different types of fuses being marketed for this purpose. Thus, the owner of the transformer assembly can take advantage of competitive pricing by interchanging various types of fuses within any single type of transformer housing.

Ground mounted transformer assemblies have been the subject of other patents, for example, the Nesson et al U.S. Pat. No. 3,014,158, issued Dec. 19, 1961, wherein the transformer housing is mounted on a concrete pad and access doors are provided to render the connection points and service panel of the transformer assembly tamper-proof yet relatively accessible to an authorized serviceman. However, this transformer assembly uses a relatively complex fuse holder which is adapted to be rigidly mounted on the transformer housing and wherein a fuse is received within the confines of a tubular housing supported such that a portion thereof is below the level of the cooling fluid.

Moreover, this assembly requires a particular type of fuse and is relatively expensive to install. Further, the service personnel changing the fuse does not have any simple access to the interior of the transformer housing whereby the fluid level of the transformer may be checked simultaneously with replacement of the fuse. Under these circumstances it is possible that the fluid level within the transformer will not be checked at the time that the serviceman is replacing a fuse.

The assembly of the present invention, in the illustrated embodiment, contemplates the use of a standard type transformer housing which includes a primary and secondary coil mounted in magnetic coupling relation by means of a transformer core. The transformer is mounted on a concrete pad and includes a panel section which mounts the high voltage and low voltage terminals. Also, a punched aperture is formed in the panel section to provide access to the interior of the transformer housing. A lockable cover is supplied to render the panel inaccessible by unauthorized persons when the cover is closed and locked. However, the panel is readily accessible to service personnel who are authorized to have access to the panel.

The fuse assembly, in the preferred embodiment, includes a generally Z shaped bracket which supports a connection terminal for interconnecting one end of the fuse and one end of the primary winding. The other end of the fuse is connected to the exterior terminal, the Z shaped bracket being fixidly connected to a closure plate which is mounted on the exterior of the panel in closing relation to the aperture punched in the panel. The fuse leads are of sufficient length such that, when the access plate is removed, the fuse holder assembly may be removed from the interior of the transformer housing to a position wherein the fuse itself is approximately four or more inches out of the confines of the transformer housing. When the serviceman has removed the fuse holder assembly from the interior of the transformer housing, it will be readily apparent to the serviceman whether the cooling fluid level within the transformer housing is of sufficient height to insure that the fuse is immersed when properly positioned within the transformer housing. Experience will tell the service personnel what is a proper level for the cooling fluid or the proper level may be marked on a portion of the fuse holder assembly. Thus, any time the fuse is replaced, or if the fuse is to be removed for any other purpose including checking cooling fluid level, the fluid may be checked by the service personnel without a great deal of effort.

Further, the access aperture in the transformer housing may be positioned above the cooling fluid level to insure that no leakage occurs when the fuse is removed. Also, the position of the access aperture permits location of the fuse near the high voltage lead-in, a desirable position for the fuse. The design of the present invention also eliminates the need for a hand hole in the top of the transformer housing assembly, which hole would necessitate the use of a false cover for satisfactory appearance and tamper-proofing.

Accordingly, it is one object of the present invention to provide an improved fuse mounting assembly.

It is another object of the present invention to provide an improved fuse mounting assembly which is particularly adaptable to be utilized in conjunction with ground supported transformer assemblies.

It is a further object of the present invention to provide an improved fuse mounting assembly which is particularly suited for tamper-proof transformer assemblies.

It is still a further object of the present invention to provide an improved fuse assembly which inherently permits the operator to check the oil level within the transformer assembly.

It is still a further object of the present invention to provide an improved fuse mounting assembly which is particularly adaptable to insure that the fuse is supported below the cooling fluid level within the transformer assembly.

It is still a further object of the present invention to provide an improved fuse mounting assembly which enables the fuse to be replaced without lowering the oil or tipping the unit such that oil will not flow out of the transformer housing during fuse replacement.

It is still another object of the present invention to provide an improved fuse mounting assembly which is adapted to mount various types of fuses being sold for this purpose.

It is still a further object of the present invention to provide an improved fuse mounting assembly which does not require the use of a hotstick in order to extract the fuse from the interior of the housing assembly.

It is another object of the present invention to provide an improved fuse mounting assembly which permits location of the fuse near the high voltage lead-in.

A further object of the present invention is to provide an improved fuse mounting assembly which eliminates the need for a hand hole in the top of the transformer housing assembly, and thus obviates the necessity for a false cover to cover the hand hole.

It is a further object of the present invention to provide an improved fuse mounting assembly which is inexpensive to construct, reliable in use, and extremely simple to install.

Further objects, features and advantages of this invention will become apparent from a consideration of the following description, the appended claims and the accompanying drawings in which:

FIG. 1 is a perspective view of a transformer assembly incorporating the features of the present invention and particularly illustrating mounting the cover plate of the fuse assembly on the panel;

FIG. 2 is a side view, partially in cross section, illustrating the details of the fuse mounting assembly incorporating the features of the present invention; and

FIG. 3 is a top view of the fuse mounting assembly of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1 there is illustrated a transformer assembly **10** which particularly illustrates a ground mounted transformer assembly. The assembly **10** includes a poured or preformed concrete pad **12** to provide the means on which the ground level transformer is permanently mounted. A cavity (not shown) in the pad is provided with suitable conduits affording means through which underground power supply and service lines are led to and from an accessible compartment **14** of the housing **16**.

The ground level transformer **10** comprises an inaccessible sealed welded steel compartment **20** within which a transformer **22** is mounted (see FIGS. **2** and **3**). The interior of the housing **16** is filled with a cooling fluid, preferably oil as is common in the art, to cool the transformer and other elements mounted within the housing **16**. The level of this cooling fluid is illustrated at **24** in FIG. **2**. Also, a hingidly mounted door **28** is provided to form a closure for the accessible compartment **14** of the transformer housing **16**. A lock is provided for the door **28**, the lock being adapted to engage the element **30** to preclude unauthorized access to the compartment **14** which contains the high voltage lines and other service features.

In studying the view of FIG. **1**, it will be noted that the accessible compartment **14** is generally divided into a high voltage and low voltage section, the high voltage section being generally to the left on a panel plate **34** and the low voltage section generally being to the right on panel **34**. The system includes a pair of high voltage bushings **36, 38** that extend through the panel **34** of the compartment **14**, each bushing including a conductor having one end disposed within the transformer housing **16** and inaccessible to either authorized or unauthorized persons, the other end of the conductor being mounted within the bushings **36, 38**. The high voltage section also includes a parking stand **40** to accommodate primary termination accessories which are installed either vertically or may be canted any angle to accommodate the tilt of the high voltage bushings. Further, the high voltage section includes an access plate **46** which mounts the novel fuse assembly to be described more particularly hereinafter.

Referring to the low voltage section, there are provided porcelain externally clamped secondary bushings **48, 50** which are externally clamped for fast and easy replacement. A pair of blades **52, 54** are tilted at a **60** degree angle from the vertical as is common in the art. The low voltage section further includes a stainless steel low voltage neutral blade **60** which is welded on to the tank. An insulated and externally grounded neutral may be provided as an option. The transformer assembly further includes a pair of ground pads **62, 64**, the pads being located close to the high voltage terminations for convenient grounding of the cable concentric neutral and tank. A third grounding pad and strap may be supplied when insulated low voltage bushing is required. The compartment **14** also includes a drain port **68** which is adapted to remove the cooling fluid from the interior of the housing **16**. Further, an oil fill and pressure vent plug **70** is provided adjacent the top of the panel **34** and the plug may be used to vent internal pressure before opening the transformer tank. The transformer tank may be opened by removal of an oil level plug **72** which may be used to provide a point of routine oil level inspection. However, as will be seen from a further description of the features of the present invention, the oil level inspection may be made in conjunction with replacement of fuses without the necessity of opening the plug **72**. Further, a greater area of visual inspection may be afforded by the removal of the plate **46**.

Referring now particularly to FIGS. **2** and **3**, there is illustrated the specific details of the high volt fuse assembly of the present invention. As seen from FIGS. **2** and **3**, the housing **16** is provided with an aperture **76** which may be punched in the sheet metal forming the front plate of the transformer housing **16**. The aperture is closed by means of a gasket **78** and the plate **46** described in conjunction with FIG. **1**. The plate at **46** is fastened to the front panel by means of a plurality of studs **80**. A fuse mounting assembly **82** is mounted to the plate **46** and depends therefrom such that the major protion of the fuse holder assembly is submerged below the level **24** of the cooling fluid within the transformer housing.

Basically, the fuse holder assembly includes a generally Z shaped bracket **86** which is stamped and formed of sheet metal. The bracket is welded, at its upper end, to the plate **46** and the lower end is provided with an aperture which is adapted to receive a bolt **88**. The bolt **88** is utilized to fasten a bracket arm **90** to the lower end of the bracket **86**, and bracket **90** forms an insulated support and connection assembly for a fuse **92**.

The lower end of the fuse is interconnected with one lead **94** of the primary winding and the lower conductor **96** by means of a second bolt assembly **98**. The upper end of the fuse **92**, including conductor **100**, is connected to the input bushing **36** by means of a further connector assembly **104**. Thus, the electrical path from the primary winding includes conductor **94**, conductor **96**, this latter connection being made by the bolt assembly **98**, the fuse **92**, and finally the conductor **100**.

The circuit for the particular transformer illustrated includes a strap **100** which is fabricated of laminated aluminum to interconnect both high voltage terminals **36**, **38**. In practice, the input to the particular transformer in question may be, for example, connected to bushing **38** and the output to the next transformer down the line from the power supply is derived from high voltage bushing **36**. Thus, the strap **110** must carry the entire current load being absorbed by the individual loads downstream, away from the generating plant, while the conductor **100** merely has to carry the current being utilized by the particular resident connected to the transformer **10**. Thus, the conductor **100** can be of substantially less cross sectional area than the strap **110**.

When it is desired to change the fuse **92**, the nuts **80** are removed and the plate **46** is moved away from the face plate of the transformer housing **16**. The plate **46** is moved sufficiently away from the face plate of housing **16** to permit the plate **46** to be tilted clockwise as seen in FIG. **2**. This will permit the operator to move the vertical section of the bracket **86** through the aperture **76** and ultimately remove the bracket **90** and fuse **92** from the interior of the housing. It will be noted that the oil level will appear as a smear on the vertical section of the bracket **86**. The conductors **94** and **100** are of sufficient length to permit the entire assembly, including the bracket **90** and bolt assembly **98**, to be removed at least four inches from the face plate **34**, forming part of transformer housing **16**. The fuse is then replaced by manipulating bolt assemblies **98** and upper assembly **114**. The fuse holder assembly is then replaced in the interior of the transformer housing below the oil level by extending the fuse assembly back through the aperture and into the oil. The plate **46** is again fastened to the base plate **34** by means of the nuts **80**.

While it will be apparent that the preferred embodiment of the invention disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In a transformer assembly having a housing with a panel, a winding supported in said housing and cooling fluid within the housing for cooling the winding, the improvement comprising a fuse assembly for protecting the winding against an excess electrical condition comprising means defining an opening in the panel above the level of the cooling fluid, closure plate means attached to said opening defining means for closing said opening, a fuse, and bracket means having a ribbon element attached at one end thereof to said plate means, said fuse being supported by the other end of said ribbon element below the level of said cooling fluid.

2. The improvement of claim **1** wherein said panel is a vertical panel.

3. The improvement of claim **1** wherein said fuse is removed from said housing when said plate means is detached from said opening defining means and removed therefrom a sufficient distance.

4. The improvement of claim **3** wherein said fuse includes a conductor attached thereto and is supported relative to said other end by said conductor.

5. The improvement of claim **4** wherein said bracket assembly includes a further bracket element attached at one end thereof to the other end of said ribbon element and at the other end to said conductor for supporting said fuse.

6. The improvement of claim **3** wherein said strip element is formed generally in a Z-shape including a central portion, said central portion being of sufficient length to submerge said fuse in the cooling fluid.

7. The improvement of claim **6** wherein the panel is vertically disposed with said central portion generally parallel thereto, said housing including means for lockably enclosing said panel.

8. The improvement of claim **7** wherein said central portion provides an indication of the fluid level within the housing upon removal of said central portion from said housing.

9. The improvement of claim **8** wherein said fuse is removed from said housing when said plate means is detached from said opening defining means and removed therefrom a sufficient distance.

10. The improvement of claim **9** wherein said fuse includes a conductor attached thereto and is supported relative to said other end by said conductor.

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