Nov. 17, 1964 J. H. WILLOX 3,157,730

VENTILATED PROTECTIVE ENCLOSURE FOR SURFACE MOUNTED TRANSFORMER

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FIG. 1

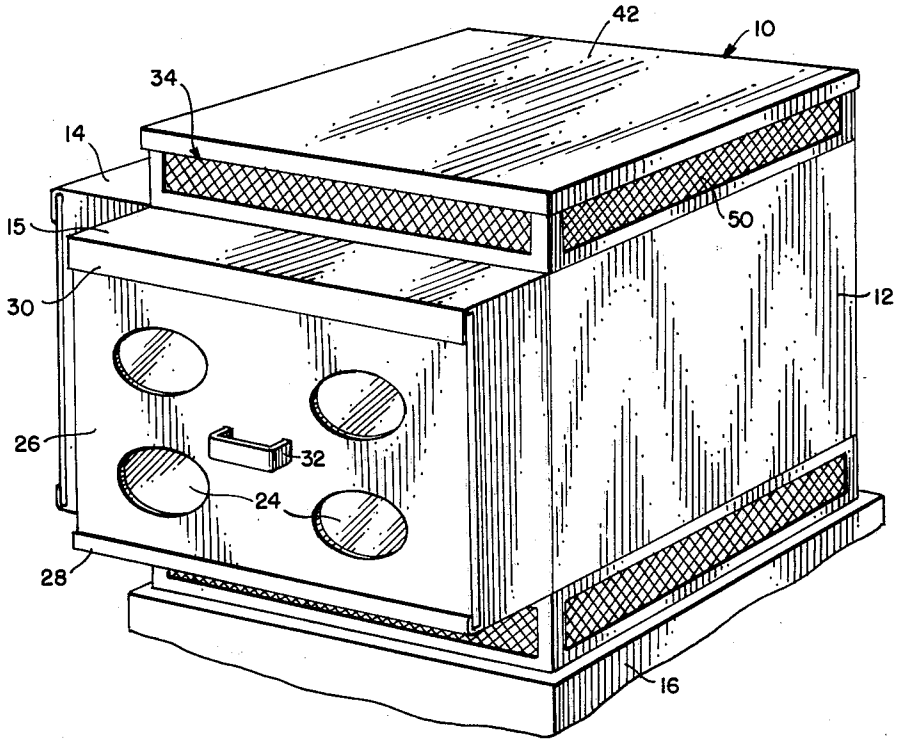


FIG. 2

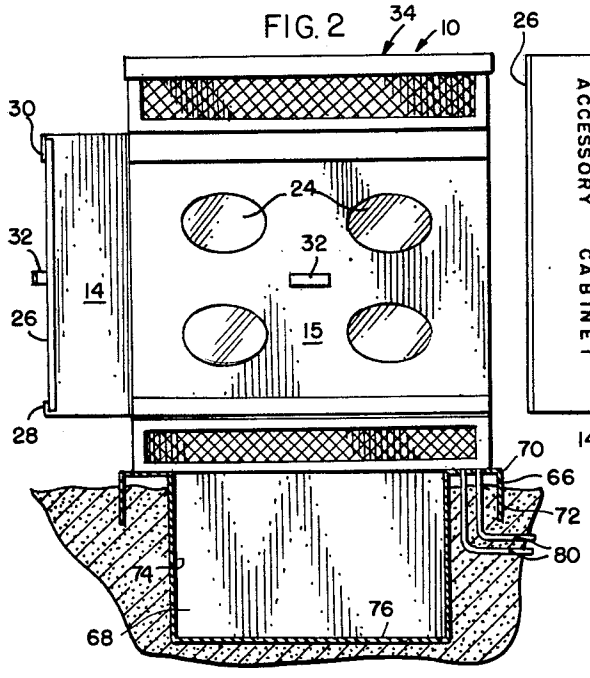
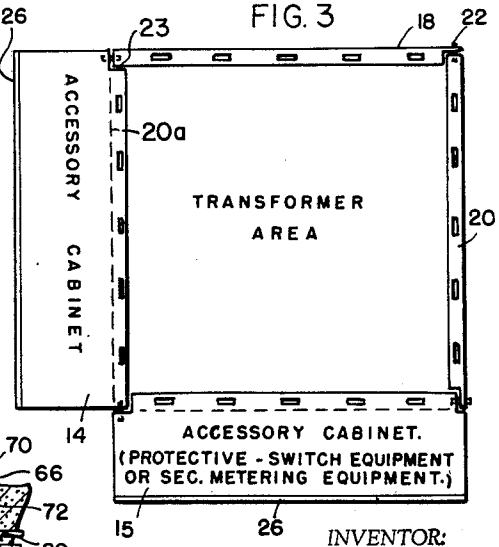


FIG. 3



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FIG. 4

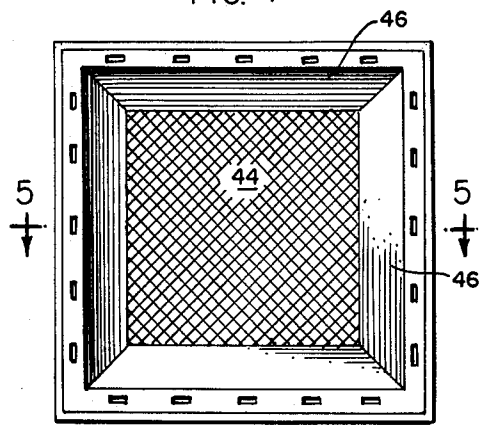


FIG. 8

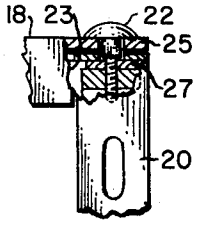


FIG. 5

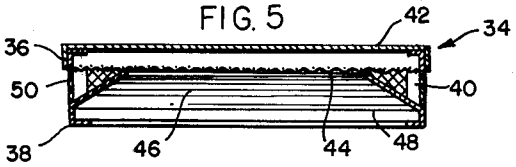


FIG. 6

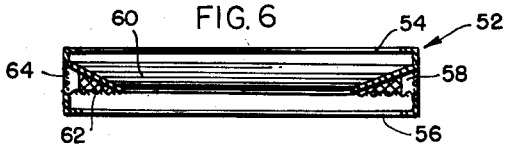
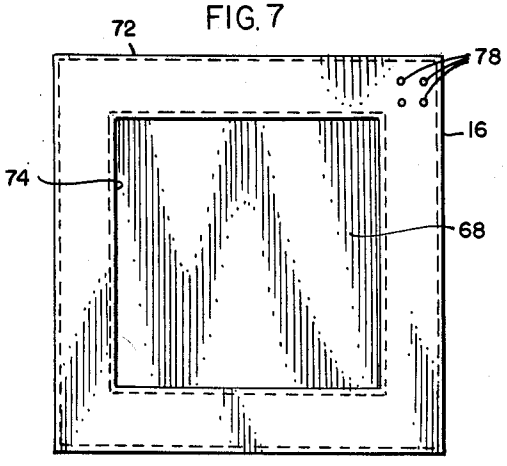


FIG. 7



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3,157,730

VENTILATED PROTECTIVE ENCLOSURE FOR SURFACE MOUNTED TRANSFORMERS

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10 Claims. (Cl. 174—16)

This invention relates in general to an enclosure and in particular to a protective enclosure for an electrical and distribution power transformer.

In recent housing and commercial developments, it has become quite common to eliminate the unsightly power and telephone poles and utilize underground wiring for all necessary service lines. Conventionally, the standard power line transformer is mounted high up on a pole to eliminate the possibility of physical contact therewith or the possibility of anyone tampering with or damaging the transformer. With the elimination of the conventional pole, it has become feasible to mount the transformer at ground level in close proximity to the houses or plants where service is desired. Due to the high voltage impressed upon the transformer, ground installations have created several problems as to safety, maintenance and appearance previously eliminated by the pole mounting. Of primary importance is the enclosing of the transformer in such a manner that injury or death to a human is virtually impossible. This is especially true for installations near private homes where children might play about the unit or project objects into it. Further, the unit might be struck by an implement, such as a power mower, to name only one of the more common hazards. The degree of protection required for the home is likewise required for installations at factories, office buildings, schools, etc. As often found in many other types of enclosures, protection must be provided against animals, such as bats, birds, squirrels, dogs, etc., all of which have been known to be the primary cause of damage and power failure by faulting the transformer.

In prior ground installation of outdoor type electrical transformers, sturdy security fencing generally has been utilized to isolate the transformer and the connecting cables. Not only does the exposed transformer and the fence provide an unsightly structure in a residential area, but considerable ground area is required to prevent children as well as adults from sticking sticks or rods through the fence and contacting the transformer. Further, the fenced-in areas collect leaves and paper blowing in the area, making a rather unsightly installation. In addition, they present a tempting challenge for children, making this arrangement a constant source of worry for the parents.

Subsequent enclosures for ground installation of outdoor type electrical transformers have taken various designs and configurations, all of which have suffered greatly either in safety, ease of service, ventilation, aesthetic value or a combination of these and other features. One of the primary considerations in determining the acceptability of a transformer enclosure, in addition to safety, is adequate ventilation since considerable heat is generated when the transformer is energized. Even though safety and ventilation are of the primary importance, considerable thought has been directed to the structure's ease of erection and overall outward appearance.

It is therefore the primary object of this invention to provide an improved protective enclosure for electrical transformers for ground installation which eliminates the shortcomings of prior enclosures of this type and provides maximum protection of human life as well as of the enclosed electrical equipment.

A specific object of this invention is to provide an improved enclosure for ground installation of an electrical transformer, or transformers, which is compact in size, easily erected, provides a substantial reduction in elevation by having a portion of the transformer below the level of the ground and provides a ventilation arrangement which readily permits the flow of cooling air about the transformer or transformers.

Another object of this invention is to provide an improved protective enclosure for an electrical transformer which completely encompasses the transformer and auxiliary equipment, is of prefabricated modular construction for ease of installation and provides sealed cabinet areas for access to the transformer, panel boards and instrumentation for servicing, yet is internally secured to eliminate the possibility of access by other than authorized personnel.

A further object of this invention is to provide an improved transformer enclosure having a self-stabilizing mounting base with a recessed well portion for housing the lower portion of the transformer and to facilitate installation of the entire structure.

Another object of this invention is to provide an improved protective enclosure for an electrical transformer which has a lower profile, presents a pleasant outer surface and design which will not degrade the aesthetic value of the surrounding features, materially lowers the center of gravity of the unit which increases overall stability, is rugged in construction yet is easily and economically manufactured.

For a better understanding of how the foregoing and other objects and advantages of the present invention are achieved, reference is made to the accompanying drawings and to the following description, throughout which like reference numerals represent corresponding parts, and in which:

FIG. 1 is a front perspective view of the transformer enclosure of this invention;

FIG. 2 is a partially sectioned view in side elevation illustrating the relationship of the upper portion of the transformer enclosure disposed above the surface of the ground with the lower supporting base portion disposed beneath the ground;

FIG. 3 is a top plan view of the transformer enclosure with the upper cover ventilation removed;

FIG. 4 is a bottom plan view of the upper cover ventilator;

FIG. 5 is a cross-sectional view taken along the line 5—5 of upper cover ventilator shown in FIG. 4;

FIG. 6 is a cross-sectional view, similar to that shown in FIG. 5 of a lower sill ventilator;

FIG. 7 is a top plan view of the supporting base; and

FIG. 8 is an enlarged view of a corner construction partly in section showing securement of side walls.

By way of generalization for a better understanding of the detailed description to follow, the invention is characterized by the novel arrangement and construction of an enclosure for completely encompassing an electrical transformer which is mounted at ground-level. The enclosure not only provides all of the required and necessary safety features to prevent injury to a human being but provides a baffle type ventilation system for air flow about the transformer to dissipate the heat generated and completely eliminates the possibility of any foreign objects coming directly into contact with the transformer. Another salient feature which characterizes the enclosure of this invention is the utilization of a self-stabilizing mounting base for the enclosure with a well portion for receipt of the lower portion of the transformer below the level of the ground.

Referring now to the drawings and more specifically to FIGS. 1, 2 and 3, the enclosure of this invention, denoted by the numeral 10, includes three primary sec-

tions; a housing section 12, cabinet sections 14 and 15 for accessories such as switching equipment and instrumentation, and a base section 16.

The housing section 12 provides substantially a hollow rectangular configuration and is of modular construction to permit the use of cabinets, if desired. The housing, as illustrated by the drawings, is by way of example only and is formed by adjacent side walls 18 and 20 with the opposing side walls being formed by the cabinet sections 14 and 15. The housing section may be formed from any suitable rigid material, such as, sheet metal or plastic, that will withstand the elements of the weather and normal external compressive forces. When an insulated enclosure is desired, suitable material is used, such as fibreglass. The external surface of the housing may of course be decorated to suit.

The side walls 18 and 20 and cabinets 14 and 15 are rigidly secured along mating edges thereof by a suitable fastener, such as, a bolt and wing nut combination or clips 22 which are releasable only from within the enclosure or when the cover ventilator, to be explained in detail, is removed. To accomplish securement of the adjacent walls and cabinets from within, each of the walls and cabinets are provided with a recess 23 along the full length of one edge 25 to receive in overlapping relationship the straight or square edge 27 of the adjacent joining wall 20 or cabinet. By providing an overlapping interlock at the corner junctures and by using an internal releasable securing device 22, the housing is completely sealed and is virtually tamper proof. It is to be understood that the securement of the side walls as illustrated and described is by way of example and that other methods may readily be used to accomplish the securement.

The cabinets 14 and 15 are usually identical in configuration, one or both of which may be provided with a plurality of windows 24 to permit viewing of the required equipment and instrumentation mounted therein on a panel 20*a* shown in broken lines. By providing a sealed cabinet as an integral part of the housing, ready access is provided for ease of installation, maintenance and repair of the connections, switches and instrumentation necessary for interconnecting one or more users with the transformer. The cabinets are provided with a forward or front panel 26 which functions as a door and may be secured in position by any suitable means and is illustrated in the drawings as being slidably retained by angle members 28 and 30 integrally formed on the cabinet side walls adjacent the upper and lower portions thereof. A suitable handle 32 is provided to aid in removing the door and any conventional locking device may be installed to limit access to the cabinets by only authorized personnel.

Referring now to FIGS. 4 and 5, a cover ventilator 34 is securely mounted on the upper edges of the side walls 18 and 20 and cabinets 14 and 15 to serve as a top or upper surface for the enclosure.

Referring more specifically to FIG. 5, the cover ventilator 34 is preferably formed from a suitable rigid material similar to that used for the side walls 18 and 20 and cabinets 14 and 15. The ventilator is formed in rectangular configuration and provides an upper frame portion 36 and a lower frame portion 38, each being formed from rigid structural members. The upper frame 36 and lower frame 38 are held in spaced apart relationship at their four corners by structural support members 40.

A top surface 42, formed from a solid sheet material, is rigidly secured to the upper surface of the upper frame portion 36 to cover the entire area therebetween. In similar manner, a sheet of perforated material or hardware cloth 44 is rigidly secured to the inner surface of the upper frame portion 36 to cover the entire area therebetween, but as readily seen in FIG. 5, the sheet 44 is spaced a substantial distance below the top surface

42, yet well above the lowest elevation of the upper frame portion.

Angularly disposed solid sheet side panels 46 are mounted in contiguous relationship within the space between the lower frame portion 38 and the perforated sheet 44. The panels 46, having a lower or bottom edge 48 thereof rigidly secured to the lower frame portion 38, slope inwardly terminating in contact with the sheet of perforated material 44. It is to be noted that the juncture of the upper edge of the side panels 46 and the perforated sheet 44 is at a higher elevation than the lower edge of the upper frame portion 36. Side walls 50 are formed between the upper frame portion 36 and lower frame portion 38 by completely covering the space therebetween with sheets of perforated material or hardware cloth 44.

Although the ventilator 34, when viewed from all sides, appears to be of solid construction, the angular slope of the side panels 46 and the utilization of the perforated sheets 44 readily permits total flow of air or 360° ventilation for cooling the transformer yet retains all of the advantages of a solid sheet material cover in preventing foreign outside articles to come in contact with the transformer. Due to the angular arrangement of the side panels and the double use of the perforated material, any attempt to force anything, such as wire, into the transformer area is virtually impossible since three barriers of perforated material would have to be penetrated and the wire would have to make several angular turns before reaching the transformer.

Referring now to FIG. 6, a lower or sill ventilator 52 is secured to the lower edges of the side walls 18 and 20 and cabinets 14 and 15 to form a bottom wall for the enclosure as best seen in FIGS. 1 and 2. The sill ventilator 52 is of similar structure as the cover ventilator 34 and provides an upper frame portion 54 and a lower frame portion 56 formed from a substantially rigid structural member. The upper and lower frame members are held in spaced apart relationship by four corner spacer members 58. Side panels 60, identical to the side panels 46 of the cover ventilator, are disposed between the upper and lower frame members with the upper edge of the panels secured to the upper frame portion 54. The side panels slope inwardly and terminate at a point below the height of the lower frame portion 56. A sheet of perforated material or hardware cloth 62 is secured to the lower edge of the panel 60 and the lower frame portion 56 to cover the suface area therebetween. Side walls 64, between the upper and lower frame portion, are formed from similar sheets of perforated material or hardware cloth as sheets 62.

The sill ventilator 52, like the cover ventilator 34, appears to be of solid construction but readily permits the flow of air through the side walls 64 and sheet 62 to provide 360° cooling of the transformer yet readily defeats the passage of foreign objects to the transformer. The center area of the sill ventilator 52 is completely open through which the transformer is received.

Referring now to FIGS. 1, 2 and 7, the supporting or mounting base 16 has a mushroom shape or configuration to increase stability and to facilitate installation of the transformer. The supporting base, preferably formed from any corrosion resistant, rigid material, is composed primarily of two basic portions integrally formed together to provide a unitary member, an upper overhanging sill portion 66 and a central depending well portion 68. As best seen in FIG. 2, the sill portion 66 has a horizontally disposed upper member 70 which provides an upper flat surface, to which the sill ventilator of the enclosure is secured and an outer leg member 72 integral with the upper surface 70 which extends downwardly at right angles into the ground.

The well portion 68 has the side wall 74 integral with the upper member 70 and extends downwardly therefrom at right angles to a depth which substantially lowers the

transformer's height above the ground, and terminates on a solid bottom wall 76.

A plurality of openings 78 are formed through the upper member 70 of the base for passage therethrough of the underground cables and other conductor lines 80 associated with the electrical installation of the transformer.

The openings 78 may be suitably formed anywhere on the member 70 to facilitate connection of the underground cables. As seen in FIG. 2, the cables 82 pass upwardly between the side wall 74 of the well 68 and the downwardly extending outer leg 72. Two primary advantages are readily understood from this structural arrangement, first, the cables pass up through the member 70 directly to the inside of the enclosure and are not exposed to the elements of the weather or outside tampering, and secondly, the outer leg 72, extending downwardly a substantial distance in the ground, protects the cables from the possibility of severing or unintentional contact by a shovel or other ground engaging tools or elements.

The supporting base 16, in addition to providing protection for the cables, provides an extremely solid and stable support for the transformer since the bottom wall 76 of the well portion 68 usually extends sufficiently into the ground to rest on undisturbed earth.

The well portion provides sufficient internal dimensions to receive the lower portion of the transformer. It is readily understood that with the transformer seated on the bottom wall of the well, the center of gravity of the transformer mass is substantially lowered, the profile of the entire structure is lowered and the degree of stability is greatly increased, thus permitting extensive changing of grade subsequent to installation without affecting the transformer installation.

To those skilled in the art, it is readily apparent that the enclosure of this invention provides maximum safety and protection for both the transformer and human beings who might come in contact with it, yet provides an upper and lower ventilator which readily permits the flow of air for proper cooling of the transformer. Further, by permitting a portion of the transformer to be disposed within a well below the surface of the ground, the entire structure has a lower profile which is readily accepted in the more modern housing developments.

Further, by utilizing a supporting base as described, installation of the base and underground cables may be completely installed prior to the final grading or finish landscaping of the area. The only subsequent steps to be taken to complete the entire installation is to set the transformer in place, connect the cables already extending through the mounting base, and mount the enclosure about the transformer. Prior ground level installations of transformers have generally required the final grading to be completed prior to installing the supporting base since conventional installations utilize a concrete slab for supporting the transformer and enclosure. Due to subsequent settling of the top soil and off center positioning of the transformer on the concrete slab of the conventional ground installations, the desirable vertical positioning of the transformer installation is generally not maintained. By using a well for the mounting base of the transformer, as described in this invention, vertical alignment of the transformer and enclosure at all times is assured since the well rests on a more solid subterrane, and the outer legs are embedded in the ground at a substantial distance from the well for additional stability.

Although the invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that many modifications and changes in various details may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

What is claimed is:

1. A rectangular enclosure of modular construction for a transformer comprising side walls of identical configuration disposed about the transformer, an upper ventilator supported on the upper edge of said side walls, a sill ventilator supporting the lower edge of said side walls and a mounting base comprising a central depending well portion having a solid bottom wall and side walls for the receipt and support of the transformer in position and an upper overhanging sill portion extending horizontally from the top of the side walls and in contact with the ground, said sill portion having an upper member providing a flat upper surface supporting the sill ventilator and apertured to receive underground cables extending upwardly therethrough within said enclosure and said sill portion having an outer leg member extending downwardly from the upper member to a substantial distance into the ground to protect the underground cables extending upwardly, means for securing said side walls to one another, the upper and sill ventilators to the side walls and the sill ventilator to said sill portion, said securing means comprising fastening elements releasable only from within the enclosure.

2. A protective enclosure of modular construction for a transformer to be surface mounted comprising a plurality of side walls of identical configuration disposed about the transformer, securing members releasable only from within interconnecting said side walls in contiguous relationship about the transformer, an upper ventilator secured to the upper edge of said side walls as a top wall of the enclosure, a horizontally apertured sill ventilator secured to the lower edge of the side walls as a bottom wall of the enclosure, and a mounting base for securing and supporting the transformer and enclosure in position including a central depending well portion recessed into the ground for receipt of the lower portion of the transformer and an upper overhanging sill portion integrally connected to the well portion and extending outwardly therefrom to provide an upper flat surface marginally supporting said sill ventilator and disposed in contact with the ground.

3. A protective enclosure of modular construction for a transformer to be surface mounted comprising a plurality of side walls disposed about the transformer, securing members interconnecting said side walls in contiguous relationship releasably accessible only from within the enclosure, an upper ventilator secured to the upper edges of said side walls as a top wall of the enclosure, a sill ventilator secured to the lower edges of the side walls as a bottom wall of the enclosure, and a mounting base portion for securing and supporting the transformer and enclosure in position including a central depending well portion recessed into the ground for receipt of the lower portion of the transformer and an upper overhanging sill portion integrally connected to the well portion and extending outwardly therefrom in contact with the ground and including an upper member for receiving underground cables vertically therethrough directly within said enclosure and said upper member having an upper surface for supporting the sill ventilator in secured relationship, said sill portion including an outer depending leg member integral with said upper member embedded marginally in the ground to protect the underground cables below said upper surface.

4. In combination with a protective enclosure for a transformer mounted at ground level, a supporting base comprising an upper overhanging sill portion disposed in a horizontal position in contact with the ground and having a plurality of openings therethrough adjacent to the periphery thereof for the passage directly into the enclosure of underground cables from beneath said sill portion, said sill portion including an upper member providing a flat upper wall surface releasably secured to said enclosure in supported relation and an outer leg member integrally formed about the periphery of the upper member and extending downwardly therefrom a substantial distance into the ground, and a depending well portion integrally formed with and centrally disposed within said sill portion for receipt of the lower portion of the transformer

well below the surface of the ground, and including a solid water impervious bottom wall disposed parallel to said flat upper wall surface.

5. In combination with a protective enclosure for a transformer to be surface mounted, a supporting base comprising an upper overhanging sill portion in contact with the ground and providing an upper member having a horizontal flat upper wall surface for supporting the enclosure and having an outer leg member integrally formed on the periphery of the upper member, and extending downwardly therefrom at right angles to penetrate the ground a substantial distance for engagement with the ground, a plurality of openings through said upper member adjacent the periphery thereof within said outer leg member for the passage of underground cables from beneath into the enclosure, and a downwardly extending well portion integrally formed with and centrally located within the upper member for receipt of the lower portion of the transformer.

6. In combination with a protective enclosure for a transformer to be surface mounted, a mounting base comprising an upper overhanging sill portion in contact with the ground and having an upper member providing a flat upper wall surface disposed in a horizontal position for supporting the enclosure, said sill portion including an outer leg member integrally formed on the periphery of the upper member and extending downwardly therefrom at right angles to extend a substantial distance into the ground, a plurality of openings through said flat upper wall surface adjacent the periphery thereof for the passage of underground cables from therebeneath directly into the enclosure, and a downwardly extending well portion recessed into the ground integrally formed with and centrally located in the sill portion for receipt of the lower portion of the transformer well below the surface of the earth, said well portion comprising side walls and a solid bottom wall, the side walls of said well portion being parallel to the outer leg member and the bottom wall of said well portion being parallel to said flat upper wall surface.

7. An enclosure for a transformer to be surface mounted comprising a plurality of side walls, securing members interconnecting the side walls in contiguous relationship about the transformer, an upper ventilator including upper and lower frame members secured together in spaced relationship, a solid sheet member secured and covering the upper surface of the upper frame member, a perforated sheet member secured to said upper frame member in spaced relationship below said upper sheet member, inwardly sloping side panels having their lowermost edge secured to said bottom frame member with the upper edges thereof terminating on said perforated sheet member and perforated side walls mounted between said upper and lower frame members, said lower frame member secured to the upper edge of said enclosure side walls, a sill ventilator secured to the lower edge of the enclosure side walls as a bottom wall of the enclosure and a base portion for securing and supporting the transformer and enclosure in position.

8. The invention as called for in claim 7 wherein said sill ventilator comprises an upper and lower frame member secured together in spaced relationship, inwardly sloping side panels having their upper edge secured to the upper frame member, lowermost edge of said side panels terminating inwardly and slightly above the lower frame member, a perforated sheet member secured and disposed between the lower edge of the side panels and the lower frame member and perforated side walls mounted between said upper and lower frame members.

9. A protective enclosure of modular construction for a transformer to be mounted substantially at ground level comprising a plurality of side walls of which one or more form an instrumentation cabinet, securing members releasable only from within the enclosure interconnecting the side walls in contiguous relationship about the transformer, an upper ventilator including an upper frame member, a lower frame member, support members maintaining said upper and lower frame members in spaced relationship, a solid upper sheet member secured to the upper frame member covering the area defined by the frame members, a perforated sheet member secured to said upper frame member in spaced relationship below said upper sheet member, inwardly and upwardly inclined side panels having their lowermost edge secured to said lower frame member with the upper edges thereof terminating on said perforated sheet member, and perforated side walls mounted between said upper and lower frame members to permit the flow of air upwardly through the perforated sheet from within the enclosure then over the side panels and out through the side walls, said lower frame member being secured to the upper edge of said enclosure side walls, a sill ventilator secured to the lower edge of the enclosure side walls as a bottom wall of the enclosure and a base portion for securing and supporting the transformer and enclosure in position including a centrally disposed well portion recessed into the ground for receipt of the lower portion of the transformer and an upper portion integrally connected to the well portion and extending outwardly therefrom in contact with the surface of the ground.

10. The invention as called for in claim 9 wherein said sill ventilator comprises an upper and lower frame member secured together in spaced apart relationship, inwardly sloping side panels having their upper edge secured to the upper frame member, the lowermost edge of said side panels terminating inwardly and slightly above the lower frame member, a perforated sheet member secured and disposed between the lower edge of the side panels and the lower frame member and perforated side walls mounted between said upper and lower frame members.

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