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GROUNDING DEVICE FOR ELECTRICAL CONDUCTORS

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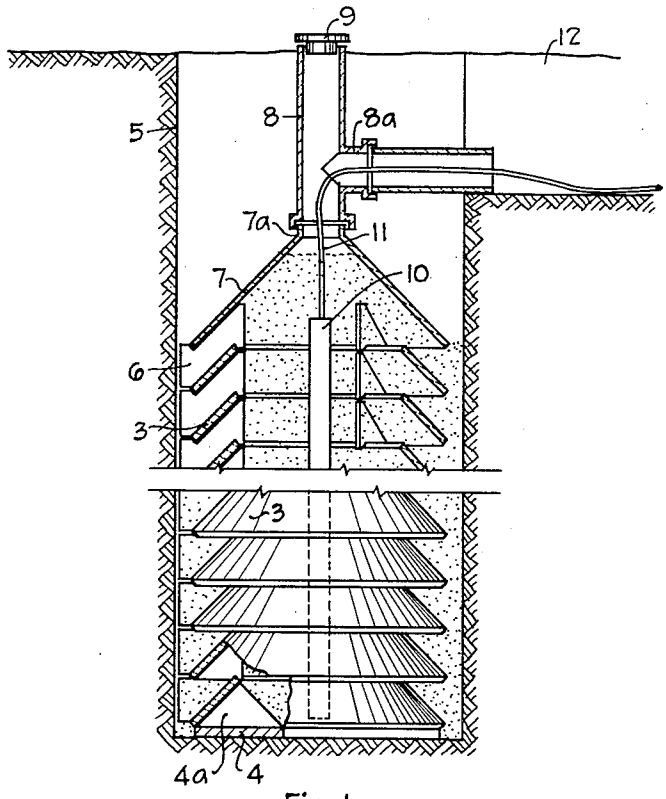


Fig. 1

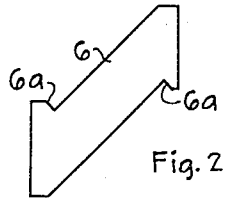


Fig. 2

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GROUNDING DEVICE FOR ELECTRICAL CONDUCTORS

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10 Claims. (Cl. 174—6)

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This invention relates to grounding devices for grounding various electrical conductors in various circuits, such as, for example, circuits used for combating metallic corrosion, sometimes known as cathodic protection.

This invention is of especial utility in the grounding of electric power lines or equipment wherein electric currents flow to the ground continuously or intermittently, causing electrolysis at the point of contact with the earth. It is also highly effective for preventing or limiting corrosion of underground pipe lines by a method involving establishing a potential difference between the pipe and the grounding device by means of an electric storage battery or other power supply rendering the grounding device anodic and causing the flow of an electric current. Such a system is, for example, described in U. S. Patent No. 2,053,214.

It has heretofore been common to use large masses of cast iron for such grounding devices. These have proven unsatisfactory, particularly when employed as anodes, because their efficiency declined rapidly as the oxides diffused into the adjacent soil, necessitating expensive maintenance or the frequent construction of new anode installations.

Within recent years anodes have been constructed of carbon rods surrounded by uncompacted, granular carbon, such as coke breeze. Such installations are designed to cause only the loose carbonaceous material, such as coke, to be consumed, without loss from the carbon rod. Diffusion between the coke and the soil, and the difficulty of adding makeup coke have in many cases greatly offset the advantage of this type of installation.

It is an object of this invention to provide an improved grounding device using uncompacted carbonaceous material in contact with the surrounding soil wherein such material can be added periodically to replace decomposed material without removing the device from the ground.

It is a further object to provide a ceramic container for carbonaceous material which will withstand corrosion and will exclude soil from the interior of the device, while permitting the introduction of make-up material.

Other objects will become apparent from the following description, taken in connection with the drawings forming a part of this specification, wherein:

Fig. 1 is a vertical sectional view of my improved grounding device, installed in the ground, parts being shown in elevation;

Fig. 2 is an elevational view of one of the spacers.

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Briefly, according to this invention, I provide a ceramic container made of a single piece or of sections, the container having openings, preferably arranged as louvered openings with overhanging, inclined sheds, arranged in a vertical tier, the top of the container extending to the ground surface or having a hood to exclude soil. An electrode extends vertically within the container and may be connected at its upper end to a wire or anode cable. Uncompacted carbonaceous material, such as coke breeze is introduced into the container through an opening in the top, filling the container and coming to rest in contact with the electrode and with the surrounding soil. The term "uncompacted" is, in the present specification and claims, intended to denote material consisting of discrete particles which are not united to form a coherent mass, whether or not it is subjected to external pressure.

The invention will be better understood by reference to the drawings, showing a preferred embodiment in which the container is constructed of a plurality of sections 3, made of any suitable ceramic, such as tile or any material not decomposed electrolytically and of frustro-conical shape. The bottom section rests on a supporting base plate 4 resting on the bottom of the hole 5 bored in the soil. Spacers 4*a*, formed integrally with the plate 4 center the bottom section. The sections 3 are spaced apart by means of three or more spacers 6 (see Fig. 2) having projections 6*a* for engaging the upper and lower edges of the sections. The uppermost section 7 is in the form of a hood having a smaller opening 7*a* fitting into the bottom of a tile soil pipe 8. The pipe 8 extends to the surface of the ground and is closed by a cover 9.

A central electrode 10 extends vertically through the central holes in the sections 3; it is retained in position by uncompacted carbonaceous material 11. The electrode 10 may be of metal or of compacted carbon or graphite. Any more or less porous material, such as crushed or granular carbon, either graphitic or non-graphitic, such as metallurgical coke, coke breeze, petroleum coke, natural or artificial graphite, or the like may be used. It will be noted that the hole 5 is of greater diameter than the container. The carbonaceous material, therefore, flows out through the peripheral openings between the louvers and forms an annular sheath surrounding the container. Cavitation of the mass is, however, prevented by the container.

A conductor or anode cable 11 is connected to the top of the electrode 10. When used for cathodic protection it passes through a branch

8a of the tile pipe into a trench 12, being connected to a suitable electrical circuit. It is, of course, also possible to lead the cable out above the ground. The device may be assembled in any desired manner: In the case of large installations it is preferable to emplace the base plate 4 separately and lower the sections consecutively, adding the carbonaceous material gradually; in other situations the container, except for the hood section, would be assembled and lowered as a unit into the hole. When carbonaceous material has been added up to the uppermost section 3 the hood 7 is placed into position and the soil pipe 8 is added, leading the cable 11 through each part as it is added.

Dirt back-fill is then put in place above the remaining hole to hold the soil pipe in alignment. With the back-fill and connections completed, carbonaceous material is then added through the pipe 8, filling it up to the top, and placing on the cover 9. Filling to the top is desirable, particularly with porous materials such as coke breeze, because it was found by experiment that an increase of pressure on the material, up to 0.3 lb. per sq. in. results in an appreciable decrease in the electrical resistance through the carbonaceous material.

Carbonaceous material is added periodically through the pipe 8 to replace that decomposed and thus maintain the desired pressure. The pipe 8 thus functions as a standpipe for maintaining pressure on the carbonaceous material.

I claim as my invention:

1. A ground connection comprising an electrode adapted to have a wire connected thereto, an apertured ceramic container surrounding said electrode, uncompacted carbonaceous material filling the space between said electrode and the apertures of said container, and downwardly and outwardly inclined louvers extending above the apertures of said container, whereby the carbonaceous material can flow out of the apertures and the inward encroachment of surrounding earth is prevented.

2. A ground connection comprising an electrode adapted to have a wire connected thereto, an apertured ceramic container surrounding said electrode, said container having an opening at the top through which solid material may be introduced, and uncompacted carbonaceous material filling the space between said electrode and the apertures of said container, said apertures being arranged as downwardly and outwardly inclined louvers, whereby the carbonaceous material can flow out of the apertures and the inward encroachment of surrounding earth is prevented.

3. A ground connection comprising an electrode adapted to have a wire connected thereto, a perforated ceramic container having a plurality of vertically spaced louvered openings inclined outwardly and downwardly adapted to permit the outward flow of material from the container and to prevent the inward encroachment of surrounding earth, a hood section at the top of said container having an upwardly extending supply pipe for replenishing carbonaceous material, and uncompacted carbonaceous material filling the space between said electrode and the louvered openings.

4. A ground connection comprising a central, vertical electrode adapted to have a wire connected thereto, a plurality of frustro-conical ceramic sections arranged in a vertical tier about said electrode and vertically spaced apart to provide louvered openings inclined outwardly and downwardly adapted to permit the outward flow of material from the container and to prevent the inward encroachment of surrounding earth, a hood closing the top of said tier of sections, and an opening at the top of the hood through which said carbonaceous material may be introduced.

5. A ceramic container for containing carbonaceous material and an electrode comprising a plurality of frusto-conical ceramic sections arranged in a vertical tier and vertically spaced apart to provide louvered openings inclined outwardly and downwardly, a hood closing the top of said tier of sections, and an opening at the top of the hood for the introduction of solid material.

6. The container according to claim 5 wherein the sections are spaced apart by ceramic spacers in engagement with the frustro-conical surfaces of adjoining sections.

7. A ground installation comprising an apertured ceramic container embedded in the ground in a hole of larger diameter than the container, an electrode within said container adapted to have a wire connected thereto, uncompacted carbonaceous material filling the space between said electrode and the earth surrounding the container forming an electrical circuit through the apertures in the container, and a standpipe extending above said ceramic container containing solids for imposing a pressure on said uncompacted material.

8. The ground installation according to claim 7 wherein the pressure is of the order of 0.3 lb. per sq. in.

9. A ground installation comprising a ceramic container provided with a plurality of vertically spaced louvered openings inclined outwardly and downwardly adapted to permit the outward flow of material from the container and to prevent the inward encroachment of surrounding soil, said container being embedded in the ground in a hole of larger diameter than the container, an electrode within said container adapted to have a wire connected thereto, and uncompacted, carbonaceous material filling the space between said electrode and the earth surrounding the container forming an electrical circuit through the openings in the container.

10. The ground installation according to claim 9 having a hood opening at the top of the container and beneath the ground surface an opening in said hood, and a supply pipe extending from said opening to the surface of the ground through which carbonaceous material may be added.

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