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MAINTAINING THE RESISTIVITY OF INSULATING MEMBERS IN ENERGIZED ELECTRIC EQUIPMENT

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FIG. 1

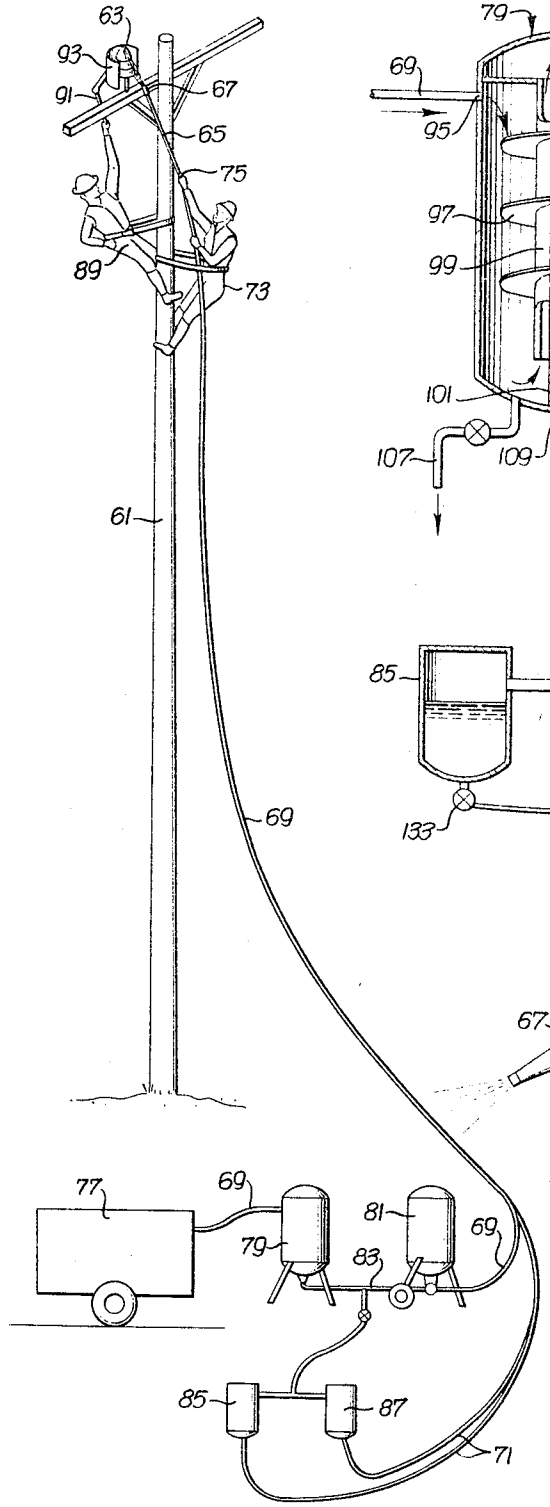
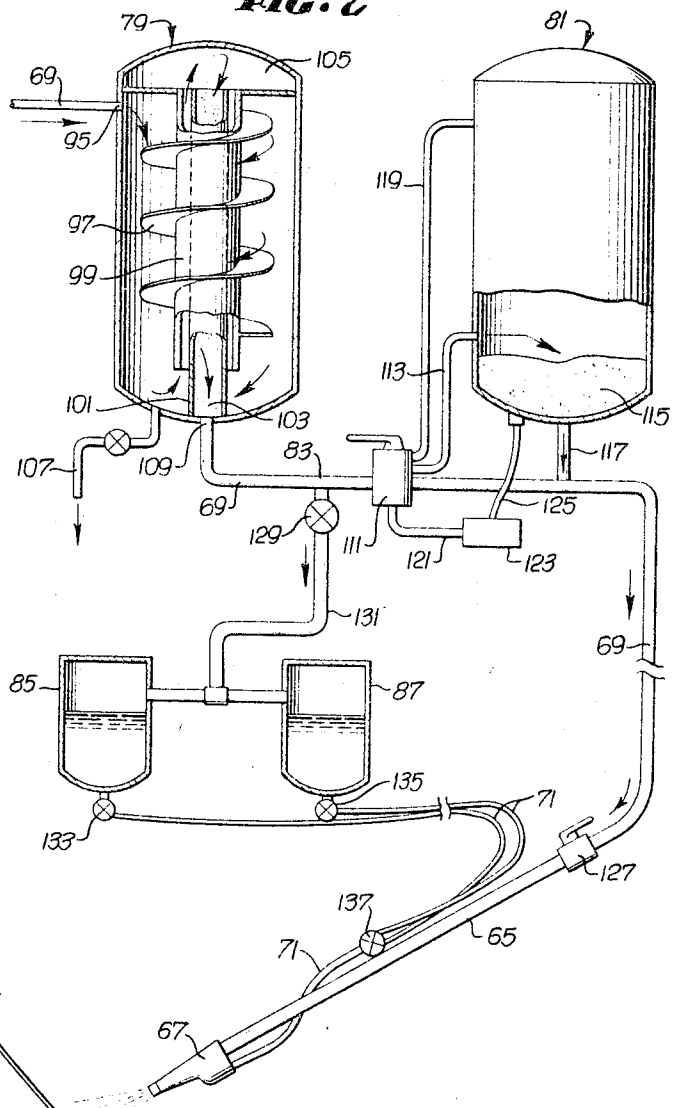


FIG. 2



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MAINTAINING THE RESISTIVITY OF INSULATING MEMBERS IN ENERGIZED ELECTRIC EQUIPMENT

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6 Claims. (Cl. 51—8)

This application is a continuation-in-part of my application Serial No. 103,488, filed April 17, 1961, now abandoned.

This invention relates to a means for maintaining the resistivity of energized electric equipment and reducing the likelihood of injury to maintenance personnel due to electrical shock. More particularly, the means used for maintaining resistivity includes apparatus for spraying non-conductive coatings and the like on electric equipment wherein the operator of such apparatus is provided with controls which are entirely separated from the spray nozzle of the apparatus by non-conductive material.

Prior to my invention, difficulty was often experienced by maintenance personnel attempting to maintain the resistivity of high voltage insulators when the associated electrical equipment was energized. The likelihood that a spark would jump to an operator of maintenance apparatus working near such electrical equipment made such a job extremely hazardous. When electrical voltages are high a spark can jump a considerable gap of insulator material and, in fact, can travel a considerable distance in air, particularly if it contains a significant amount of water vapor. Also, often a significant amount of non-conductive coating material was wasted during the previous spraying operations due to the coating material being blown away by the wind.

Thus, in order to alleviate these problems and others in the prior art, it is a primary object of this invention to provide apparatus for spraying equipment near high voltage electricity which will permit an operator of the apparatus to control the spraying a safe distance from the high voltage electricity so that only non-conductive material is between the spray nozzle and the operator of the spraying apparatus.

A further object of this invention is to provide spraying apparatus in which a rod of non-conductive material is connected between the spray nozzle and the controls.

A still further object of this invention is to dehydrate the air used to spray fluid in apparatus to be used near high voltage electricity.

It is another object of this invention to provide a means for treating insulators while said insulators are supporting electrically energized wires.

Still another object of this invention is to provide a means for saving at least a portion of over-spray coating material.

These and other objects and advantages of this invention will hereinafter appear from the following illustrated description.

In the drawings:

FIGURE 1 is a schematic view of an embodiment of this invention having separate tanks for fluids and air connected by long tubes to the spraying means.

FIGURE 2 is a detailed, partially fragmented view of the apparatus shown in FIGURE 1.

When spraying electrically energized equipment with material to maintain resistivity it has often been found that air contains enough water that it too must be removed in order to provide a satisfactory non-conducting connection between the spray nozzle and the operator of the spraying equipment. FIGURES 1 and 2 illustrate a preferred embodiment of equipment utilizing compressed air and a means for removing the water from the air. Referring to the general schematic drawing in FIGURE 1,

telephone pole **61** supports the electrically energized equipment to be sprayed such as insulator **63** at the top of the pole **61**. Thus, the material being sprayed passes through the hollow non-conductive rod **65** and out spray outlet **67** onto the electrically energized equipment. The fluid being sprayed flows up a flexible conduit or pipe **71** and the air which causes the fluid to be sprayed out the spray nozzle **67** flows up a separate conduit pipe **69**. Thus, a spray operator **73** can hold an end of non-conductive rod **65** near the control **75** and spray material at a safe distance from spray nozzle **67**.

In such a system air can be compressed by a standard air compressor **77** which compresses air to 100 pounds p.s.i. Thus, such compressed air would pass out the outlet line **69** into the air dryer **79** where a satisfactory amount of water is removed. Then this dehydrated air will pass into a metering reservoir **81** where a specified amount of abrasive material can be added to the air. From there the air, with abrasive material added to it, will pass up the air tube **69** as previously described. Between the air dryer **79** and the metering reservoir **81** is a diversion outlet **83**. This air under pressure can be diverted to grease reservoir **85** and solvent reservoir **87** so as to force predetermined amounts of grease and solvent out fluid tube **71** until it is sprayed out nozzle **67**. The grease is preferably a water-repellent material such as a pure carbon compound or a silicon-carbon compound in the form of a gel or viscous compound. The viscosity of the grease may be controlled by dispersing liquid hydrocarbon solvents therein. To protect against a possible fire or explosion the solvent may be a halogenated hydrocarbon.

This apparatus is illustrated in more detail in FIGURE 17. Thus, compressed air will enter from air pipe **69** into air dryer **79** through air dryer inlet **95**. Though various means for drying air could be used I have found this particular apparatus suitable for my purposes. After the air enters air dryer **79** at inlet **95** it passes down a spiral chamber **97** peripherally located within the air dryer **79**. Centrally located within air dryer **79** is a cylinder **99** within which is a hollow canister **101** containing drying particles **103**. I have found drying particles of aluminum oxide to be particularly satisfactory. This canister **101** is filled with these drying particles and is designed to fit snugly within cylinder **99**.

However, there is a small space between the outside walls of the canister **101** and the inside of the cylinder **99**. Thus, as the air travels down the spiral chamber **97** and reaches the bottom of the air dryer **79** it can pass up the inside walls of the cylinder **99** in the space between the canister **101** contained therein and the inside walls of the cylinder **99**. After the air has passed up the length of the cylinder it will reach an expansion chamber **105** at the top of the air dryer **79**. Since there is space between the aluminum oxide particles in the canister and the top and bottom of the canister have openings the air and the expansion chamber **105** will then pass down the canister between aluminum oxide particles within the canister and out the air dryer outlet **109**. After following this tortuous path in the air dryer **79** a sufficient amount of water will be removed from the air to prevent any high voltage electricity from passing through such air. Water that is removed from the air and collects at the bottom of the air dryer **79** can be let out through the water outlet **107**.

The now dehydrated air from the air dryer **78** will pass down air tube **69** to the metering valve **111**. By suitable adjustment of this metering valve **111** air can be made to flow through the feed line **113** into the metering reservoir **81**. Thus since the metering reservoir **81** is a closed container the abrasive powder **115** contained therein can be forced out outlet line **117** and into the air tube **69**. This abrasive powder **115** should be a material that is

soft enough not to scratch the glaze on the glass insulators. I have found that powdered calcium carbonate dolomite or nearly any carbonate or sulphate which is insoluble in water to be suitable for this purpose. If it is necessary to equalize pressure between the line **69** and the metering reservoir **81**, during the operation of this spraying apparatus, relief line **119** can be opened through valve **111** so as to form a recirculation system between the metering reservoir **81** and the line **69**. Sometimes it is found necessary to shake the powdered material contained within the reservoir **81** in order to permit it to be forced out the outlet **117**. Thus, an air piston operated agitator **123**, in turn, is connected through agitator connector **125** to the metering reservoir **121**, and when turned on shakes the powdered abrasive material **115** to a position where it can be forced out line **117**.

Thus, when the dehydrated air leaves the metering reservoir **81**, it will contain a predetermined amount of abrasive material in a powdered form and pass through air tube **69** until it reaches valve **127** where an operator can control the amount of dehydrated air containing the abrasive material which he desires to allow to be ejected out the spray nozzle **67**. It should be noted that the positions where the air control valve **127** is located and the spray nozzle **67** is located are connected entirely by the electrically non-conductive material of the hollow rod **65**. Thus, an operator can control the amount of air being sent to spray nozzle **67** witrout being near the spray nozzle. And because the air has been dehydrated it will not be able to conduct high voltage electricity back to an operator holding the rod **65** near the controls **127**.

As noted previously, between the air dryer **79** and the metering reservoir **81** there is a diversion outlet **83**. Thus, by opening the diversion valve **129** compressed air can flow down diversion conduit **131** into grease reservoir **85** and solvent reservoir **87**. This air will tend to force the grease and solvent in these reservoirs out the fluid tubes **71**. The proportion of grease and solvent which flows in the fluid tubes **71** is controlled by adjusting grease valve **133** and solvent valve **135**. The grease and solvent become mixed after they pass valve **137**. Mixing valve **137** is also located near the end of the non-conductive rod **65** which is remote from the spray nozzle **67**. Therefore, an operator spraying with this equipment can control the amount of fluid being sprayed without being near the spray nozzle **67**. The fluid in line **71** and the air in line **69** merge at spray nozzle **67** which can be adjusted to vary the proportion of fluid to air. Thus, the fluid containing grease and solvent and the dehydrated air containing abrasive particles are sprayed in the quantity and proportion desired by varying the aforementioned valves.

Referring to FIGURE 1, in order to avoid waste of fluid due to wind diverting the spray a shield operator **89** can hold a shield **93** by means of a non-conductive shield handle **91**.

While a particular embodiment of this invention has been illustrated and described, modifications thereof will readily occur to those skilled in the art. It should be understood, therefore, that the invention is not limited to the particular arrangement disclosed but that the appended claims are intended to cover all modifications which do not depart from the true spirit and scope of the invention.

I claim:

1. Apparatus for cleaning and spraying fluids in order to maintain the resistivity of outdoor insulators comprising a source of compressed air, means for removing sufficient water from said compressed air to dehydrate the air so as to make it substantially electrically non-conductive, means for adding metered quantities of powdered abrasive cleaning material to said dehydrated compressed air, means for diverting a portion of said dehydrated compressed air so as to add coating fluid to said mixture of abrasive cleaning material and dehydrated compressed air, means for spraying said mixture of fluid, abrasive cleaning material and dehydrated compressed air, and spray regulation means separated from the spraying means by electrically non-conductive material, said spray regulation means controlling the amount of mixed fluid, abrasive material and dehydrated compressed air ejected out the spraying means.

2. Apparatus as defined by claim **1** wherein the means for removing sufficient water from the compressed air is a closed container containing aluminum oxide particles positioned in the path through which said compressed air to be dehydrated flows.

3. Apparatus as defined by claim **1** wherein the means for adding metered quantities of powdered abrasive material to the dehydrated compressed air is a valve regulated container having control valves wherein powdered abrasive material is released in response to variations in air pressure caused by the opening of control valves.

4. Apparatus as defined in claim **1** wherein the means for diverting a portion of said dehydrated compressed air so as to add coating fluid to the mixture of abrasive material and dehydrated compressed air includes a vessel for holding fluid, said vessel having at least one fluid outlet for fluid contained therein, said vessel having an air inlet which communicates with said dehydrated compressed air and fluid contained in the vessel, means for controlling the amount of air entering said air inlet of the vessel, the flow of said fluid from the vessel through the fluid outlet being responsive to changes in air pressure within the vessel caused by variations in the amount of air entering the vessel.

5. A combined cleaning and liquid coating spray apparatus comprising a source of compressed air, an air dehydrator, a vessel containing abrasive cleaning particles, a reservoir containing electrically non-conductive liquid coating solution, an elongated hollow rod made of electrically non-conductive material, a spray nozzle mounted on one end of said hollow rod, conduit means providing a passageway for compressed air from said source of compressed air to said air dehydrator, passageways for moving dehydrated air from said air dehydrator to said vessel containing abrasive cleaning particles and to said reservoir containing liquid coating solution, a passageway for moving dehydrated compressed air containing cleaning particles from said vessel through said hollow rod to said spray nozzle, and a passageway for forcing liquid coating solution from said reservoir to said spray nozzle so that a mixture of said compressed dehydrated air containing cleaning particles and said liquid coating solution can be dispersed from said spray nozzle and valve control means for regulating the relative amount of air containing cleaning particles and liquid coating solution that is sprayed, said valve means being near said hollow rod in a location which is remote from said spray nozzle.

6. A combined liquid spraying and cleaning apparatus as defined in claim **5** including a receptacle containing solvent which is connected by conduit means to the air dehydrator and also to said spray nozzle so that solvent can be mixed with said liquid coating solution.

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