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ANTI-STATIC GROUNDING DEVICE

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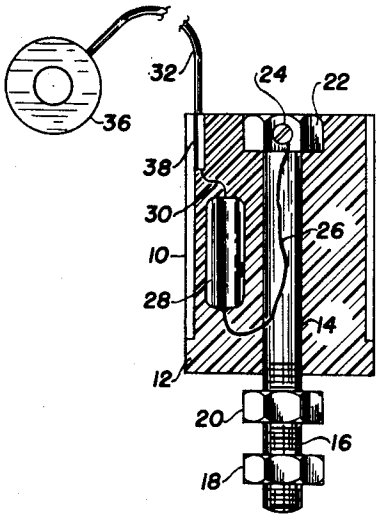


FIG. 2

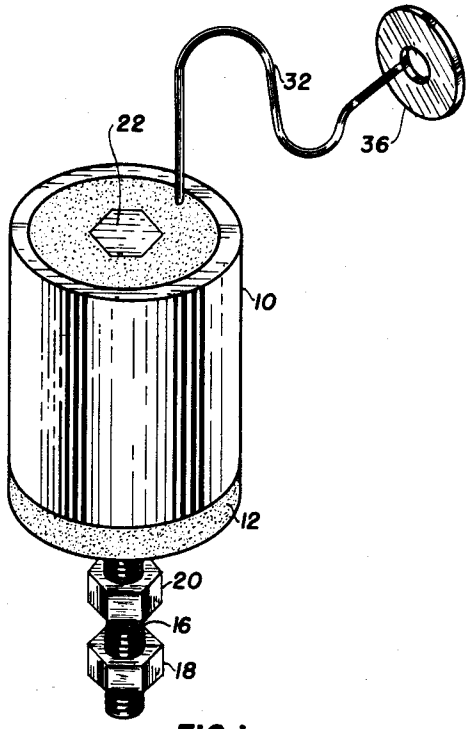


FIG. 1

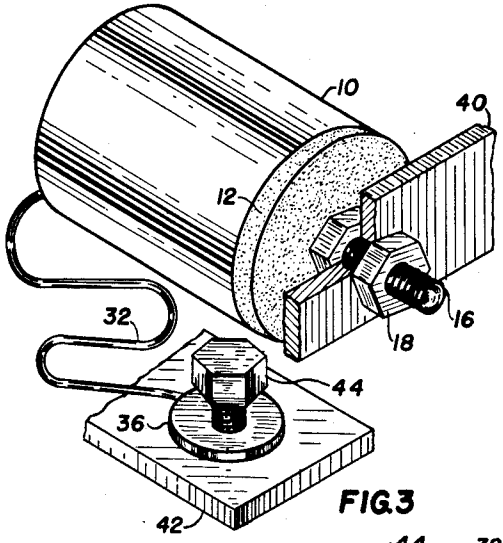


FIG. 3

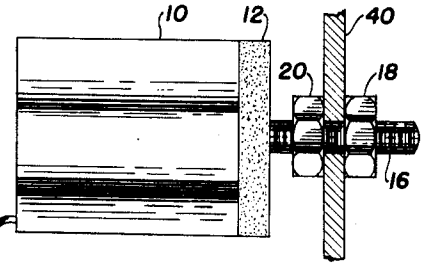
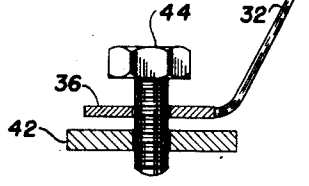


FIG. 4



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ANTI-STATIC GROUNDING DEVICE

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3 Claims. (Cl. 317—2)

This invention relates to an anti-static grounding device to be used between adjacent structural members which are made of different metals and which are subjected to conditions of both galvanic corrosion and the development of electrostatic potentials sufficient to cause arcing. More particularly, this invention relates to a device for connection between adjacent structural members made of different materials of construction which will discharge static electricity between the members as it develops and also stop the flow of galvanic current and consequent corrosion.

There are many applications of metal materials of construction wherein it is essential that different metals be used for adjacent structural members and same must be structurally connected to form a unit. The exposure of such a unit to conditions which promote the development of electrostatic potentials and also the build-up of galvanic currents presents a dual problem. By insulating the different structural members one from the other, the build-up of galvanic currents and corrosion of the metal parts can be eliminated. Not only is the corrosion of the metal materials of construction an undesirable feature, but the consequences due to an electrostatic discharge or arc where the structural members are located in an explosive atmosphere are immediately apparent. This invention is directed to a device for overcoming this dual problem.

The present invention comprises, therefore, an anti-static grounding device which incorporates an electrical resistor of a particular resistance which allows the high-potential static charge to bleed through the apparatus while at the same time the low-potential galvanic current is blocked. The result is the practical elimination of both static discharge and corrosion. The cargo tanks of ships used for the transportation and storage of petroleum products constitute an environment wherein the problems of corrosion and explosive hazard due to static discharge are readily apparent. The present invention is directed to means for preventing the accumulation of static charges in these systems without promoting galvanic corrosion.

A primary object of this invention is to provide an anti-static grounding device which prevents the accumulation of static charges between adjacent structural members of different metals while at the same time preventing the development of galvanic charge and corrosion.

Another object of this invention is to provide an anti-static grounding device which incorporates a resistance element which allows the high-potential static electrical charge to bleed through the device while preventing the flow of the galvanic current. These and other objects of the invention will become apparent as the description thereof proceeds.

To illustrate the problem, ocean-going tankers may have aluminum ladders and other aluminum parts in and around the steel cargo tanks. Normally, these aluminum parts are insulated from the steel parts of bulkheads to which they are attached in order to protect

them from corrosion during periods when the tanks contain sea-water ballast. However, static electricity may collect on the insulated aluminum parts through various activities which take place on board a ship. Static charges are developed in the liquid cargo during loading. Also, the wave motion of the liquid cargo within the cargo tank is conducive to the development of a static charge. Unless these static charges are dissipated, they may build up to the point of arcing, and in the event that the tank or environs contains petroleum vapor and air in explosive concentrations, an explosion is the result. A specific application of the device of this invention is to provide a means of grounding the aluminum members to steel members, as are found in the construction of sea-going vessels, without permitting galvanic corrosion to occur.

The invention is better understood by reference to the drawings wherein Figure 1 is an isometric view of one form of grounding device.

Figure 2 is a partial cross-sectional view of the embodiment shown in Figure 1.

Figure 3 is a side view showing the mounting of the device of this invention between an aluminum member to be grounded and a structural steel member that is insulated therefrom.

Figure 4 is an isometric view of the arrangements shown in Figure 3.

Referring to the drawings, the general arrangements of the parts are as follows:

Numeral **10** relates to an open-ended, tubular housing filled with an electrical insulating material **12**. Cap-screw **14**, having threaded portion **16** engaged by mounting nuts **18** and **20**, is imbedded within insulating material **12** so that its outer surface is spaced from tubular member **10**. Cap-screw **14** has enlarged portion **22** in the form of a hexagon bolthead. The top surface of head **22** may be imbedded in insulating material **12** or may be exposed. Screw **24** attaches lead-wire **26** to head **22**, and is connected to resistor **28** through lead **30** attaching to multi-stranded lead **32** which terminates in washer **36**. Multi-stranded lead **32** is welded or soldered to tubular member **10** as indicated at **38**. Similarly, washer **36** is welded or sodered to lead **32**.

Tubular member **10**, multi-stranded lead **32** and washer **36** are constructed of a metal which is highly resistant to corrosion, does not promote galvanic corrosion when connected to steel member **42**, and is at the same time a good conductor of electricity. For this purpose Monel metal is satisfactory. Cap-screw **16** is preferably constructed of a metal which is the same as one of the structural members to which the device is attached. Thus for mounting an aluminum ladder, cap-screw **16** should be constructed of aluminum.

Figures 3 and 4 illustrate one way in which the device of this invention may be used between an aluminum member **40** and a steel member **42**. Members **40** and **42** are electrically insulated from one another as indicated by their spaced relationship in Figures 3 and 4. On ships it is the practice to mount the ladders by means of rubber or plastic bushings which act as insulators. Since the invention does not relate to the manner of mounting the structural members to the ship or other structure, no details thereof are shown. The cap-screw **16** has been mounted through an aperture in the aluminum metal member and held in place by nuts **18** and **20**. Bolt **44** has been inserted through washer **36** to attach same to steel member **42** and normally would be drawn up tight.

As shown in the drawings, the entire assembly is molded and held together by insulating material **12**. For this purpose, any of the large number of plastics, resins and ceramic insulating materials used in the elec-

trical art may be used. Materials such as tar, cement, Bakelite, rubber, wax, etc. may also be used. Armstrong's A–1 epoxy resin is a suitable material for this purpose.

Resistor 28 may be of any of several known varieties of electrical resistor elements having a resistance of between about 750 to 1250 ohms and a current rating of about 5–10 watts. A 1000-ohm resistor having a current rating of 5 watts has been found to function quite satisfactorily between aluminum and steel structural members.

Various combinations of structural parts may be grounded by use of the device of this invention other than aluminum and steel. Thus the device may be used between copper and iron, copper and steel, magnesium and steel, or magnesium and iron, with appropriate changes in composition of the various elements of the device.

The invention is not to be limited to any particular combinations of materials of construction as long as they are different from each other, and are in such proximity as to create the hazards of corrosion, and static discharge. Also, the resistance value of resistor 28 may be varied somewhat for different combinations of structural parts to be grounded, and where different atmospheres or different conditions conducive to the development of static charges are present.

What is claimed is:

1. An anti-static grounding device for use between insulated structure members of different metallic materials of construction which comprises an open-ended tubular housing, an insulating material within said housing, a bolt member imbedded within said insulating material, said bolt member being spaced from said tubular housing and having one end thereof extending beyond one open end of said housing, means for attaching said device to a structural member on said extended end of said bolt member, a resistance element imbedded in said insulating material, an outer electrical lead attached to said tubular member, means at the end of said electrical lead to attach same to a second structural member, electrical leads imbedded in said insulating material to connect said bolt member to said resistance element and to said outer electrical lead, said electrical resistance having a resistance value sufficient to block the flow of galvanic current between said structural members and allow the flow of high-potential static charge therebetween, said bolt member being of the same material of construction as the structural member to which it attaches and said tubular housing and outer electrical lead being of the same material of construction as the structural member to which they attach.

2. An anti-static grounding device for attachment between an aluminum ladder and a structural steel member supporting same consisting of an open-ended tubular housing, a solid electrical insulation within said housing, an aluminum bolt member imbedded within said insulating material, said aluminum bolt member being spaced from said tubular housing and having one threaded end thereof extending beyond one open end of said housing, spaced lock-nuts on said threaded end, a resistance element imbedded in said insulating material between said bolt member and the inside wall of said housing, an outer electrical lead attached to said resistance member at one end and a steel washer attached to the extended end thereof, an inner electrical lead connected between said resistance element and said bolt member, said resistance element having a resistance value of between about 750 to 1250 ohms, said bolt member attaching to said aluminum ladder and said washer attaching to said structural steel member.

3. The combination including adjacent structural members of different metallic materials of construction in an environment promoting galvanic corrosion and the development of electrostatic potentials therebetween, means to connect said structural members one to the other, said means comprising an open-ended tubular housing, a solid insulating material within said housing, a bolt member imbedded in said insulating material, said bolt member being of the same material of construction as one of said structural members, said bolt member being spaced from said housing and having one end thereof extending beyond one open end of said housing, means to attach said bolt member to said structural member, an outer electrical lead attached to said tubular housing and to said second structural member, a resistance element imbedded within said insulating material, and electrical leads connecting said resistance to said bolt member and said outer electrical lead, said resistance element having a resistance value sufficient to block the flow of galvanic current between said structural members and allow the flow of high potential static charge therebetween.

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