June 16, 1964 H. SCHWERINER 3,137,806

DUSTPROOF STATIC ELIMINATOR

Filed Nov. 22, 1960

Fig. 1.

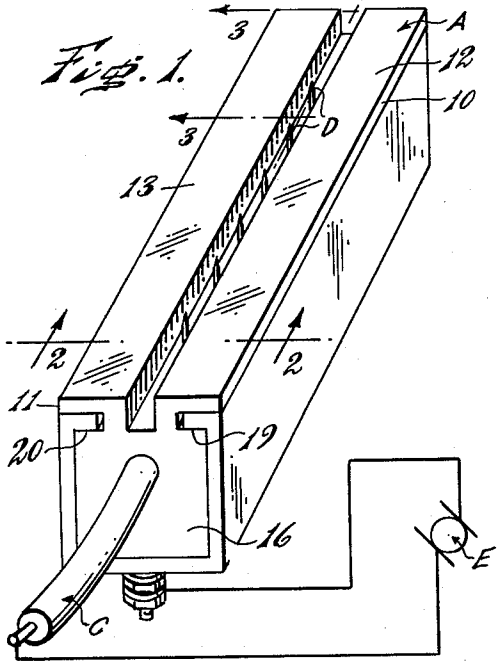


Fig. 2.

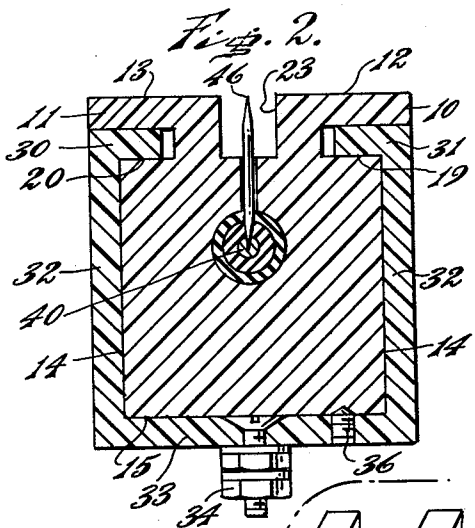


Fig. 3.

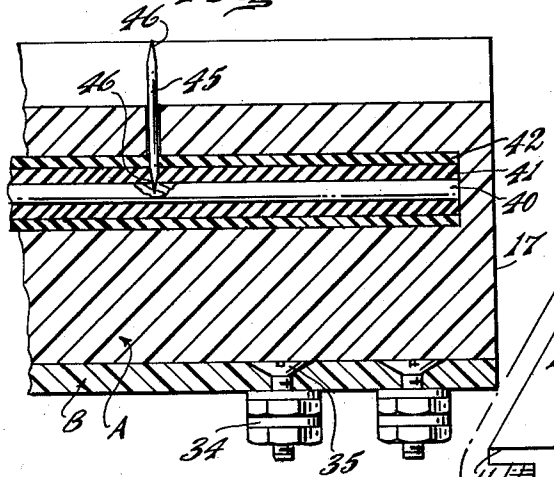
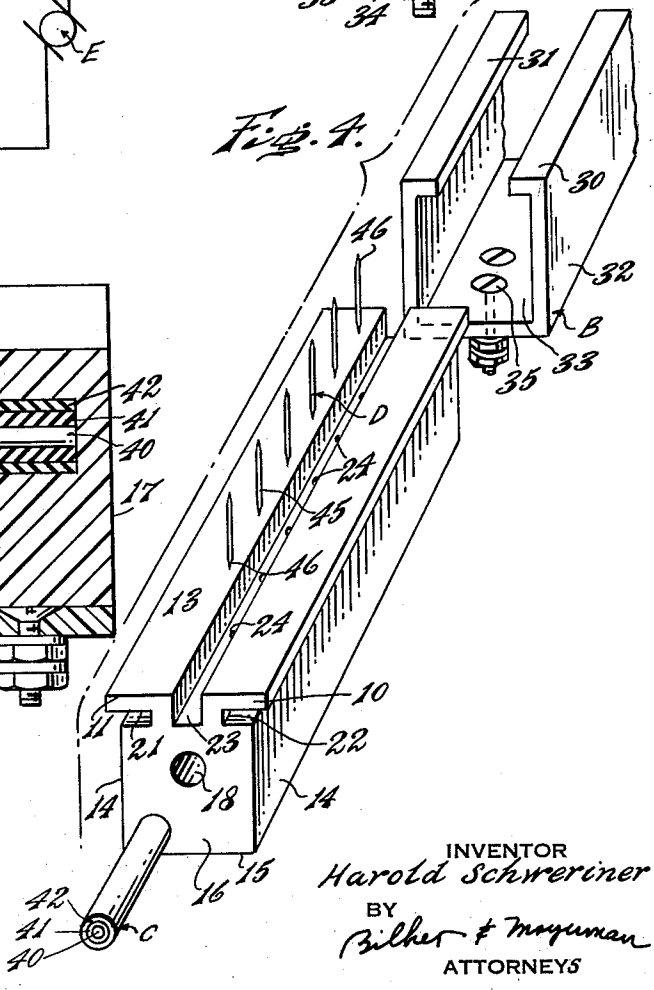


Fig. 4.



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DUSTPROOF STATIC ELIMINATOR

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This invention relates to static eliminators and to a method of assembling such eliminators. More particularly, it relates to dustproof extended-range air-ionizing static eliminators and to their assembly.

The need for eliminating static charges in the course of manipulating non-conductive materials is so well recognized as not to warrant further discussion herein. Static eliminators are utilized in industries which include, inter alia, printing, textile processing, paper converting and plastic manufacture.

A common type of static eliminator utilizes a field of ionized air to dissipate the static charge on any object passing therethrough. The field is created by impressing a high voltage, which may be of changing polarity, across an air gap—usually between a needle or point and a flat surface placed in proximity thereto. Such a prior art device is that shown in U.S. Patent No. 2,163,294. As shown therein, it is customary to use a row of needles having a common source of voltage located in fixed relationship to a surface or plate. It is in the gap between the needles and the plate that a field of ionized air exists when a high voltage exists on one with respect to the other.

In dusty atmospheres, dirt and dust accumulate in the space between the needles and the plate. When the gap is bridged, a short circuit results and the device is rendered inoperative. Therefore, periodic cleaning of these prior art devices was essential.

Furthermore, in the assembly and construction of the prior art devices, elaborate techniques were required to provide an array of needles adapted to be kept in fixed relationship to the plate and to each other. Often the needles were soldered to a common conductive rod with the use of special tools, jigs and fittings.

Additionally, in prior art devices, the field of ionized air existed almost entirely within the gap between the needle and conductive plate, spanning the linear distance therebetween.

Accordingly, it is an object of the present invention to provide a static eliminator which can be operated in a dusty atmosphere without any possibility of a short circuit developing due to accumulation of dust or other foreign matter.

It is an additional object of the invention to provide a static eliminator capable of creating an arcuate extended field of ionized air.

Still another object of the invention is to provide a method of assembling a static eliminator having a plurality of needles wherein the needles may be quickly assembled and retained in fixed relationship to a conductive surface.

The provision of an improved device of the character described that is easily and economically produced, which is sturdy in construction, and which is highly efficient in operation is also an object of the invention.

These and other objects of the invention will be apparent to those skilled in the art from the following detailed description of an embodiment thereof when read in conjunction with the accompanying drawing wherein:

FIGURE 1 represents a perspective view of an extended range dust-proof static eliminator embodying the invention as well as a diagrammatic representation of a typical circuit used in connection therewith.

FIGURE 2 represents a sectional view taken along lines 2—2 of FIGURE 1.

FIGURE 3 represents a partial sectional view taken along lines 3—3 of FIGURE 1.

FIG. 4 represents an exploded view of the static eliminator shown in FIG. 1.

Referring now to the drawing, with particular reference to FIGURES 1 and 4, the embodiment shown includes a non-conductive core A, which fits into a conductive housing B, a conductor C positioned within the core A to which are affixed a plurality of needles D. Also, as indicated in FIGURE 1, a source of high voltage, E, is provided.

The core A is generally rectangular in cross-section and is made of a non-conductive material, preferably a plastic such as, for example, polymers or copolymers of acrylic acid, condensation products of phenols and aldehydes, aminoplastics, polymers of halogenated hydrocarbons, polyamide resins, polyester resins, epoxy resins and allyl resins. As best shown in FIG. 4, this core includes upper ears **10** and **11** having, respectively, upper faces **12** and **13**. The core, being rectangular in shape, has sides **14** and a bottom **15** as well as ends **16** and **17**. An internal longitudinal bore **18** is provided which extends from end **16** toward end **17** and, as shown in FIGURE 3, terminates within the core some distance from end **17**. The ears **10** and **11** cooperate with shoulders **19** and **20** to form slideways **21** and **22**. Finally, the core is provided with a longitudinal slot **23** within which are a plurality of pin receiving apertures **24** extending from the bottom of the slot to the perimeter of bore **18**.

The conductive housing B is preferably made of a metal such as aluminum, brass, copper or steel. As shown in FIGURE 4, it includes flanges **30** and **31**, sides **32** and a bottom **33**. Conductive binding posts **34** are secured to the bottom **33** in a conventional manner as with machine screws **35**. The housing is also drilled and tapped to receive and retain a set screw **36** which is adapted to press against core A.

Conductor C is a conventional insulated wire which includes a conductive core **40** and a plurality of insulating layers such as inner layer **41** and outer layer **42**. The conductor should have a high dielectric breakdown rating, preferably on the order of 15,000 volts.

Needles D are all identical and includes a straight shank **45** and pointed ends **46**.

The method of assembling the device, which method is generic to any static eliminator comprising a non-conductive longitudinal core containing a wire with which one end of a plurality of needles must make electrical contact, the other end of said needles being in spaced relationship to another conductor, may be as follows. Conductor C is inserted into the internal bore **18** of core A until it abuts end **17** as shown in FIGURE 3. No special preparation of the conductor is required such as stripping of insulation or the like. Thereafter, needles D are inserted in apertures **24** and pressed down until their lower pointed ends **46** pierce insulating layers **41** and **42** and are fixedly embedded in core **40**. Needles D thus are in electrical communication with core **40** while simultaneously preventing any motion of conductor C with respect to core A. The diameter of apertures **24** is preferably very slightly larger than the diameter of needles D so as to give a tight and positive fit. When the assembly is completed, the upper points **46** of needles D should be substantially level with faces **12** and **13** and not protrude beyond them. Because shanks **45** are exposed to air within slot **23**, an increased amount of air is ionized.

Housing B is assembled by merely affixing the binding posts **34**. As shown in FIGURE 2, the head of screw **35** is countersunk into the bottom **33** so that it is flush therewith.

The static eliminator is thereafter assembled by sliding

core A into housing B so that flanges **30** and **31** ride in slideways **21** and **22**. After the core A is fully encompassed in housing B it is secured thereto, for instance with set screw **36**.

In use the device is connected, as shown in FIGURE 1, to a source of high voltage, E. This voltage source may be any A.C. or D.C. power unit producing a high voltage electromotive force in the range of from about 2,500 to above about 10,000 volts and preferably yielding low amperages on the order of a few milliamperes. A unit designated as the Simco Midget Power Pack, Model SR165S4, has been found quite suitable although many other commercially available high voltage low current power sources may be equally satisfactory for this purpose.

The high potential which, in effect, is applied from sides **32** to pointed ends **46** causes a field of ionized air to exist which extends from needles D around faces **12** and **13** to sides **32** in an arcuate pattern. Thus a relatively extended field is available for use in commercial applications. Because the faces **12** and **13** are flat and at right angles to sides **32**, there is no possibility of dust accumulation causing a short circuit between needles and conductive sides.

It is thus seen that the device and method illustrated and described achieve the objects first stated above. It will be appreciated by those skilled in the art that the foregoing description merely illustrates the invention and that the same should not serve to unnecessarily limit or restrict it. Various modifications of the disclosed invention may be practiced without departing from the spirit and scope of the same.

What is claimed is:

1. An extended range dustproof static eliminator comprising a longitudinally extending hollow conductive outside housing; a longitudinally extending non-conductive core mounted within said housing including ear portions which project outwardly of said housing and bend back to shield one face thereof; an insulated conductor including insulation and a conductive portion mounted longitudinally within said core; a plurality of radial apertures in said core extending from said conductor to the exterior portion of said core which is between said ears; and a plurality of needles pointed at both ends mounted in and encapsulated by said apertures, each having one end in contact with the conductive portion of said conductor and one end projecting outwardly from said aperture.

2. The static eliminator of claim 1 wherein, further, said core includes a longitudinal groove between said ears and said needles extend out of said apertures into said groove.

3. The static eliminator of claim 2 wherein said housing is metallic and said core is made of an acrylic resin.

4. An extended range dustproof static eliminator comprising a hollow bar-shaped conductive housing having a longitudinal slot in one face thereof; a non-conductive, generally rectangular core mounted within said housing further including ear portions which extend outwardly through said slot in said housing and shield one face thereof; a longitudinal bore within said core extending from one end thereof toward the other; a plurality of aligned apertures extending radially from said bore to the exterior portion of said core between said ears; a wire including a conductor and a plurality of integral insulating layers mounted within said bore; and a plurality of needles mounted in said apertures each piercing said insulating layers at one end to make electrical contact with said conductor and extending outwardly from said apertures at the other end and being encapsulated thereby.

5. The static eliminator of claim 4 wherein further said core includes a longitudinal groove between said ears and said needles extend out of said apertures into said groove.

6. The static eliminator of claim 5 which further includes binding posts affixed to the exterior of said housing.

7. The static eliminator of claim 6 wherein said housing is metallic and said core is made of an acrylic resin.

8. An extended range dustproof static eliminator comprising a longitudinally extending, hollow, conductive outside housing; means for grounding said housing; a longitudinally extending non-conductive core mounted within said housing and conforming to the internal configuration thereof, including integral ear portions which extend transversely beyond the body of said core and shield one entire face of said housing; a longitudinally extending bore within said core adapted to receive a length of conventional insulated wire; a plurality of longitudinally aligned apertures in said core along the length thereof, each connecting the interior of said bore with aligned points on the surface of said core body intermediate said ear portions; an insulated wire adapted to be connected to a source of high voltage having a conductive center and integral insulation thereabout mounted within said bore; and a plurality of needles encapsulated in said aligned apertures, each having one end piercing said integral insulation and in electrical contact with said conductive center and the other end exposed between said ear portions; whereby said needles simultaneously serve as discharge points and means for fixing said insulated wire and whereby, further, a field is provided which extends from said needles, around said ears to the exposed portion of said conductive housing.

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