No 7.

"Electrokinetic Apparatus"

Docket No. 8780

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ELECTROKINETIC APPARATUS

In all of the applicant's former patent disclosures for producing relative movement between an electrode structure and the ambient fluid medium, metal electrodes are specified to be directed or indirectly. Sometimes, the electrodes are coated with various materials such as carbon, graphite, or the like, to improve their stability. In one such instance, Patent 7,736,921, the fluid, and the ambient medium are indicated only for the smaller of the two electrodes (the pointed electrode).

Recent experiments involving the use of electrically resistive materials for the large electrodes (the array of vanes) has revealed surprising results. This change has made it possible to reduce the applied voltages and sound densities several times that obtained from the use of bare metal electrodes. These improved results are obtained for two reasons:

1. Increased electric current density across the air gap without the danger of spark breakdown, hence the use of increased voltage gradients, and
2. Increased divergence of the electric field and the extension of the field (between the vanes) to the far edges of solid vanes.

In application 662,056, the main advantages are known and the specification for the electrode structure is specified to a single electrode (diode) structure. It is the purpose of the present application to cover specifically the use of electrically resistive materials in the fabrication of the vanes in the diode.
OBJECTS OF THE INVENTION

1. To provide relative movement between an electrode structure and the ambient fluid medium so as to impart a propulsive force to a vehicle (to which the structure is attached) for causing flow of the ambient fluid medium in the opposite direction.

2. To provide an electrode structure capable of creating an intense electric field without the possibility of electrical breakdown across the fluid gap.

3. To serve as an improved flow-control device comprised of a plurality of receptacles whereby increased velocity and improved electrical efficiency can be obtained in the fluid medium. An additional feature is that it can be used for water cleaning purposes.

4. To provide a pump for circulating the fluid which is relatively free from gas or bubbles which would cause sparking.

5. To provide an electroaerodynamic loadbreaker with improved acoustic and frequency response.

6. To provide a fan or pump for compatible fluids which is relatively free from explosion hazards.

7. To provide an electroaerodynamic fan having increased velocity and improved efficiency.

8. A fluid breakaway or interface preventative system which will prevent thermal shock from a fluid which is not dangerous to touch.

9. To provide electroaerodynamic devices with an electrode structure which is free from electrical hazards and is not dangerous to touch.
In air at atmospheric pressure, the spacing is about one-third of the normal electric breakdown distance between metal points. The sides of the equilateral triangle may range from 1/4 to 1/2" for 20 KV. This size of which depends upon the voltage used. For normal operation, a gap of 0.25" has been empirically determined, and the location of electrodes has been found to be effective in suppressing the high voltage power supply. Electrode #1 is a tungsten wire and electrode #2 is a gold strip. The potential difference is supplied by direct current by means of a transformer and the electric potential is measured with a potentiometer. The readings are taken at the intersection of the shaded area and the shaded line, showing the location of the shaded area and that of the potential-shaded area. Figure 1 is a diagramatic view of the shaded area and that of the potential-shaded area.

The above forces cause a flow of any insulating dielectric fluid medium generally.

1. Electric field - the force which exists in a fluid.
2. Electrostatic force - that force between the region of the fluid wire.
3. The electrostatic force causes dielectric breakdown, believed to be due to virtue of...

SPECIFICATIONS:
Because of the extremely high electric gradients developed, the ionizing envelope around electrode 1 is intensified for beyond that which would be possible with naked metal electrodes. It is this intensified ionization and electric gradient which results in increased air velocity and sound pressure (when modulated). It is the principal feature of this invention. It apparently is not covered in the prior art.

Fig. 1a is a graph showing the typical potential gradient found in the electrode structure of Fig. 1. If electrode 1 is considered to have zero potential at point A, this gradient may actually be found in service but still higher than gradient between B and C. There actually exists an electrical balancing action in the current between electrode 2 and C. This balancing action is shown in step 2a, to C, so that the current remains as point A to B is increased from zero to 3. The potential of step 2a to 3 is always increased and limited. This limitation prevents breakdown.

In Fig. 2, a first conductivity vessel 2a, 2b, 2c, and 2d, which are connected to the negative side of power supply 3. The wires grid, with wires positioned intermediate and forward of the vanes, is connected to the positive side of power supply 3. It is to be noted that, whereas in Fig. 2 the fine-wire grid is made positive and the vanes negative, the polarity may be reversed without affecting the airflow or affecting the sound density. The reverse polarity, however, produces an increase in noise, because of the nature of the negative grid points, in contrast to the fine wires. Such a reversal will impair the characteristics of the sound device 3. This characteristic may be reversed only by having the fine metal electrodes 4a and 4b completely exposed to partially conducting material forming vane 2a and 2b. This is possible by ensuring the presence of any point touching the vane 2a and 2b is normal to the surface of the vane 2a and 2b. No other contact is necessary at point C. Variations in the potential of another causes pressure waves which travel lengthwise in the direction of the vanes, passing between the vane 2a and 2b as indicated.
In Figs. 4 and 5, further breakdown protection is accomplished by providing a partially-conducting material in the emitting area of the electrodes 2a and 2b, respectively. In the previous instances, the partially-conducting material is shown to be electrostatically or chemically coated. In this instance, the partially-conducting material is shown to be coupled to the electrode 2a and 2b, respectively. The advantage of this arrangement is that the partially-conducting material is self-sustaining, and therefore, does not require external power to maintain its conductivity.

The partially-conducting material referred to in this specification can be fabricated in several ways. It may consist of a thin metallic film, or metallic coating, or metallic contact, or metallic paint, or metallic strip, or metallic layer. The partially-conducting material is homogenous, as defined in the specification, and it is found that volume conductivity should be, in the range from 0.1 to 100 ohm-cc.

It is important to distinguish in this present application between the term "electrode" and the term "partially-conducting material." In the present application, the term "partially-conducting material" is used to define the material that is part of the structure and is not electrically connected to the wires. The term "electrode" is used to define the material that is connected to the wires.
The use of partially-conducting zones serves still another purpose by increasing the retentivity of electrostatically precipitated particles. Ordinarily, particles precipitated upon (dry) metal electrodes under a certain amount of "bounce-off," particularly particles precipitated upon electrode deposits, bounce off and tend to stop and retain precipitation by the electrostatic force. If, however, the present invention, the partially-conducting zones are used, the electric gradient along the surface of the zones precipitaten a divergent field counteracted from the side of the zones which effect bounce-off.

The retentivity of electrostatically precipitated particles increases upon the retentivity of the present invention. The electrostatic field counteracted from the side of the electrodes upon those particles precipitated upon the electrode deposits of the present invention is caused by the electric gradient along the surface of the zones which effect bounce-off.