Electrostatic transducer.

An electrostatic driver (10) comprises an acoustically transparent first electrode (12) an acoustically transparent second electrode (14) spaced apart from the first electrode (12) to define a space between the first and the second electrodes (12 and 14). A charged diaphragm (18) is suspended in the space between the first and the second electrodes (12 and 14). The first and the second electrodes (12 and 14) are partially insulated to generate A.C. and D.C. electric fields dissimilar in strength and form in the said space in which the diaphragm (18) is suspended to optimize the forces moving the diaphragm (18).
BACKGROUND OF THE INVENTION

1. Field of the invention

THIS INVENTION relates to wave propagating and receiving systems. Particularly, this invention relates to electrostatic drivers, particularly for loud speaker, earphones and microphone systems.

2. Brief description of the prior art

Electrostatic drivers in loud speaker and microphone systems are well known. In electrostatic driver, an electric field reflecting the wave form of the input voltage moves a charged diaphragm thus creating a speaker, earphones and microphone systems.

an electric field reflecting the wave form of the input voltage.

The first and second electrodes may be acoustically transparent grills or perforated plates, and may be straight or arcuate.

The diaphragm may be suspended in the space between the first and the second electrodes by means of a plurality of insulating elongate elements, the insulating elongate elements being stretched on the surface of either or both of the first or the second electrode, and providing precise spacing means between the diaphragm and the inner surface of the electrodes.

Typically, the elongate elements may be insulating strings which provide retaining means for holding and centering the diaphragm between the first and the second electrodes. The insulating strings also create separate sections of diaphragm forming separate driver units, each of which is capable of radiating waves in a slightly different angle and the separate driver units, forming collectively, a substantially improved radiating surface.

Suspension means may be provided for suspending the insulating elongate elements, such as strings. The suspension means may include holes, provided in the electrodes, through which the strings may be threaded and tensed.

Typically, the strings can be of any shape, dimension or cross-section.

In accordance with an alternative embodiment of the invention, instead of strings or other insulated elongate electrodes, a template may be stamped out of a suitable insulation material to form a pattern providing elongate sections for retaining and suspending the diaphragm in the space between the first and the second electrode, and thereby providing a plurality of multiple radiating units.

The diaphragm may be a single layer diaphragm or may be a diaphragm comprising a single or double film arrangement, the single or double film being coated with high or low resistance material, such as metal film, metal oxide and the like. If the coating is of a high resistance material there is very low distortion in the acoustical output but this coating is susceptible to charge losses due to moisture or pollution. In the case of low resistance coatings a small degree of distortion is induced but the charge loss is attenuated and therefore the use of the coating material is dependent upon the conditions in which the driver is used. Preferably, the coating may be provided between two layers of diaphragm material. In a typical arrangement of the diaphragm, there may be two diaphragm elements, one or both of which may be coated with a high or low resistance material, the coating typically lying between the two layers of the diaphragm elements.

OBJECTS OF THE INVENTION

In view of the foregoing, it is the aim of the invention to achieve the following objects, either alone or in combination:

- to provide an electrostatic driver upon which a higher voltage and the resultant higher field strength can be applied without arcing;
- to provide an electrostatic driver in which the tendency for arcing when the applied voltage is increased is substantially reduced;
- to provide novel electrodes for electrostatic driver which are capable of generating dissimilar AC and DC electric fields; and
- to provide a novel diaphragm for an electrostatic driver with improved characteristics.

SUMMARY OF THE INVENTION

According to the first aspect of this invention, there is provided an electrostatic driver which comprises:

- an acoustically transparent first electrode;
- an acoustically transparent second electrode spaced apart from the first electrode to define a space between the first and the second electrodes; and
- a charged diaphragm suspended in the space between the first and the second electrodes; characterised in that the first and the second electrodes are partially insulated to generate A.C. and D.C. electric fields dissimilar in strength and form in the said space in which the diaphragm is suspended to optimize the forces moving the diaphragm.

The first and second electrodes may be acoustically transparent grills or perforated plates, and may be straight or arcuate.
BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described with reference to the accompanying drawings, in which:
- Figure 1 illustrates a schematic view of an electrostatic driver, in accordance with the first aspect of this invention;
- Figure 2 illustrates a schematic detailed view of a portion of the driver shown in Figure 1;
- Figure 3 illustrates the theoretical considerations relating to the fields generated in the electrostatic driver, shown in Figures 1 and 2;
- Figure 4 illustrates a typical film arrangement for a diaphragm of the electrostatic driver, shown in Figures 1, 2 and 3; and
- Figure 5 illustrates the different types of electrodes that may be used for constructing the electrodes for the electrostatic driver, illustrated in Figures 1, 2 and 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, an electrostatic driver, in accordance with this invention is indicated generally by the reference numeral 10.

The electrostatic driver 10 comprises an acoustically transparent first electrode 12, an acoustically transparent second electrode 14, uniformly spaced apart from the first electrode 12 to provide a space 16 between the first and the second electrodes. A charged diaphragm 18 is suspended in the space 16.

The first and second electrodes 12 and 14 can be acoustically transparent grills or perforated plates.

The diaphragm 18 is suspended in the space 16 by means of a plurality of insulating elongate elements 20, the insulating elongate elements 20 being stretched on the surface of the first or the second electrode 12 or 14, and providing precise spacing between the diaphragm 18 and the inner surface of the electrodes 12 and 14.

The elongate elements 20 are insulating strings which provide retaining means for holding and preferably centering the diaphragm 18 between the first and the second electrodes 12 and 14. The insulating strings 20 also create separate sections of diaphragm forming separate driver units, each of which are capable of radiating waves in a slightly different angle and the separate driver units, forming collectively, a substantially improved radiating surface, as particularly seen in Figure 2 of the drawings.

Suspension means (not shown) are provided for suspending the strings 20. The suspension can include holes (not shown), provided in the first and second electrodes 12 and 14, through which the strings 20 are threaded and tensioned.

The strings 20 can be of any shape, dimension or cross-section.
currently, the arcing characteristics that can be applied when turning the voltage to maximum remains unchanged.

Claims

1. An electrostatic driver which comprises
   an acoustically transparent first electrode;
   an acoustically transparent second electrode
   spaced apart from the first electrode to define a
   space between the first and the second electrodes;
   and
   a charged diaphragm suspended in the space be-  
   tween the first and the second electrodes;
   characterised in that the first and the second elec-  
   trodes are partially insulated to generate A.C. and
   D.C. electric fields dissimilar in strength and form
   in the said space in which the diaphragm is sus-  
   pended to optimize the forces moving the dia-  
   phragm.

2. An electrostatic driver as claimed in Claim 1, in
   which the first and second electrodes are acousti-  
   cally transparent grills.

3. An electrostatic driver as claimed in Claim 1, in
   which the first and second electrodes are acousti-  
   cally perforated plates.

4. An electrostatic driver as claimed in any one of
   the preceding claims, in which the first and sec-  
   ond electrodes and the diaphragm are flat planar
   elements.

5. An electrostatic driver as claimed in any one of
   Claims 1 to 3, in which the first and second elec-  
   trodes and the diaphragm are arcuate.

6. An electrostatic driver as claimed in any one of
   the preceding claims, in which the diaphragm is
   suspended in the space between the first and the
   second electrodes by means of a plurality of insu-  
   lating elongate elements, the insulating elongate
   elements being stretched on the surface of
   either or both of the first or the second electrode,
   and providing precise spacing means between
   the diaphragm and the inner surface of the elec-  
   trodes.

7. An electrostatic driver as claimed in Claim 1, in
   which the diaphragm is suspended in the space
   between the first and the second electrodes by
   means of a plurality of spaced apart insulating
   strings which provide retaining means for holding
   and centering the diaphragm between the first
   and the second electrodes.

8. An electrostatic driver as claimed in Claim 7, in
   which the insulating strings create separate sec-  
   tions of diaphragm forming separate driver units,
   each of which is capable of radiating waves in a
   slightly different angle and the separate driver
   units, forming collectively, a substantially im-  
   proved radiating surface.

9. An electrostatic driver as claimed in Claim 1, in
   which the diaphragm is a double film diaphragm
   coated with high or low resistance material.

10. An electrostatic driver as described herein sub-  
    stantially with reference to the accompanying
    drawings.
The present search report has been drawn up for all claims.

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