quence, sample flow rates may be extended into higher ranges, far above the nanospray flow rate.

[0054] A very simple example of jet seperation, which is just one example for an aerodynamic lens is discussed below in connection with some of the embodiments in FIGS. **9***a-d.*

[0055] As still further additions or alternatives to the arrangement of regions **4** and **3** of the preferred embodiment, the ion funnel **48** may include auxiliary pumping of a boundary layer at one or more points inside the channel, the pressure drop along the channel may be limited, and so forth. To sustain a strong electric field along such a funnel **48**, these pumping slots could be used as gaps between thin plates at different potentials.

[0056] Referring again to FIG. **1**, the configuration of Region **2** (i.e. the region between the expansion chamber **40** and the exit orifice **70** to MS**1** **80**) will now be described in further detail.

[0057] The conduit **60** located in the vacuum chamber **50** and defining region **2** of the ion transfer arrangement is formed from three separate components: a heater **110**, a set of DC electrodes **120** and a differential pumping arrangement shown generally at **130** and described in further detail below. It is to be understood that these components each have their own separate function and advantage but that they additionally have a mutually synergistic benefit when employed together. In other words, whilst the use of any one or two of these three components results in an improvement to the net ion flow into MS**1**, the combination of all three together tends to provide the greatest improvement therein.

[0058] The heater **110** is formed in known manner as a resistive winding around a channel defined by the set of DC electrodes which extend along the longitudinal axis of the conduit **60**. The windings may be in direct thermal contact with the channel **115**, or may instead be separate therefrom so that when current flows through the heater **110** windings, it results in radiative or convective heating of the gas stream in the channel. Indeed in another alternative arrangement, the heater windings may be formed within or upon the differential pumping arrangement **130** so as to radiate heat inwards towards the gas flow in the channel **115**. In still another alternative, the heater may even be constituted by the DC electrodes **120** (provided that the resistance can be matched)—regarding which see further below. Other alternative arrangements will be apparent to the skilled reader.

[0059] Heating the ion transfer channel **115** raises the temperature of the gas stream flowing through it, thereby promoting evaporation of residual solvent and dissociation of solvent ion clusters and increasing the number of analyte ions delivered to MS**1** **80**.

[0060] FIG. **5** shows an embodiment of the shape depicted in FIG. **4***b* as the entry region of a pumped conduit of stacked plate electrodes with provisions **48** for improved pumping. It is to be understood that the plate electrodes shown could be operated on DC, alternating DC, or RF, with the pumping and an adequate shape of the entrance opening improving transmission in all cases.

[0061] Embodiments of the set of DC electrodes **120** will now be described. These may be seen in schematic form and in longitudinal cross section in FIG. **1** once more, but alternative embodiments are shown in closer detail in FIGS. **6** and **7**. In each case, like reference numerals denote like parts.

[0062] Referring to FIGS. **1** and **6**, the purpose of the DC electrodes **120** is to reduce the interaction of ions with the wall of the channel **115** defined by the DC electrodes **120** themselves. This is achieved by generating spatially alternating asymmetric electric fields that tend to focus ions away from the inner surface of the channel wall and toward the channel centerline. FIGS. **1** and **6** show in longitudinal cross-section examples of how ion transfer channel **115** may be constructed using a set of DC electrodes **120**, to provide such electric fields. Ion transfer channel **115** is defined by a first plurality of electrodes **205** (referred to herein as "high field-strength electrodes" or HFE's for reasons that will become evident) arranged in alternating relation with a second plurality of electrodes **210** (referred to herein as "low field-strength electrodes", or LFE's). Individual HFE's **205** and LFE's **210** have a ring shape, and the inner surfaces of HFE's **205** and LFE's **210** collectively define the inner surface of the ion transfer channel wall. Adjacent electrodes are electrically isolated from each other by means of a gap or insulating layer so that different voltages may be applied, in the manner discussed below. In one specific implementation, electrical isolation may be accomplished by forming an insulating (e.g., aluminum oxide) layer at or near the outer surface of one of the plurality of electrodes (e.g., the LFE's.) As shown in FIG. **6**, HFE's **205** and LFE's **210** may be surrounded by an outer tubular structure **215** to provide structural integrity, gas sealing, and to assist in assembly. In the preferred embodiment of FIG. **1**, however, the outer tubular structure may be omitted or adapted with holes or pores to enable pumping of the interior region of ion transfer channel along its length (via gaps between adjacent electrodes)—a process which will be described further below.

[0063] It will be appreciated that, while FIGS. **1** and **6** depict a relatively small number of electrodes for clarity, a typical implementation of ion transfer channel **115** will include tens or hundreds of electrodes. It is further noted that although FIGS. **1** and **6** show the electrodes extending along substantially the full length of ion transfer channel **115**, other implementations may have a portion or portions of the ion transfer channel length that are devoid of electrodes.

[0064] The electrodes are arranged with a period H (the spacing between successive LFE's or HFE's). The width (longitudinal extent) of HFE's **205** is substantially smaller than the width of the corresponding LFE's **210**, with the HFE's typically constituting approximately 20-25% of the period H. The HFE width may be expressed as H/p, where p may be typically in the range of 3-4. The period H is selected such that ions traveling through ion transfer channel **115** experience alternating high and low field-strengths at a frequency that approximates that of a radio-frequency confinement field in conventional high-field asymmetric ion mobility spectrometry (FAIMS) devices. For example, assuming an average gas stream velocity of 500 meters/second, a period H of 500 micrometers yields a frequency of 1 megahertz. The period H may be maintained constant along the entire length of the tube, or may alternatively be adjusted (either in a continuous or step-wise fashion) along the channel length to reflect the variation in velocity due to the pressure gradient. The inner diameter (ID) of ion transfer channel **115** (defined by the inner surfaces of the LFE's **205** and HFE's **210**) will preferably have a value greater than the period H.

[0065] One or more DC voltage sources (not depicted) are connected to the electrodes to apply a first voltage V_1 to HFE's **205** and a second voltage V_2 to LFE's **210**. V_2 has a polarity opposite to and a magnitude significantly lower than V_1. Preferably, the ratio V_1/V_2 is equal to −p, where p (as indicated above) is the inverse of the fraction of the period H