pairs **17** the electrodes forming a pair are connected by resistors **18** of smaller resistance than those connecting the pairs **16**. This allows to superimpose hyperbolic field focussing. In other words, the pair resistor **18** has a very low value, the embodiment will become purely periodic field focussing. In an other extreme, when the pair resistors **18** are of equal resistance as the resistors connecting the pairs **16**, a purely homogeneous field without any focussing but with high resolving power will result.

[0087] **FIG. 9**(*a*) teaches an adjustable embodiment of the concept above. Also in this embodiment, always two adjacent electrodes form a pair. However, there are two independent voltage dividers chains, which independently supply the potential of the first electrode of each pair and the second electrode of each pair respectively. The voltage dividing resistors **16** have the same resistance in both chains. Each chain, however, also incorporates an adjustable resistor **19** which preferably are adjusted to the same value. If the resistance of the adjustable resistors **19** is adjusted to zero, then both plates of each pair will have the same potential, which results in a purely periodic field focusing. The field configuration is then equal to the situation illustrated in **FIG. 9**(*b*). If the resistance of the adjustable resistors **19** is adjusted to half the value of chain resistor **16**, then a essentially homogeneous field without any focusing properties will result. If the resistance of the adjustable resistors **19** is adjusted to some value in between the extreme cases just mentioned, a superposition of periodic field focussing and hyperbolic field focussing will result. This embodiment may of course be combined with the embodiment of **FIG. 8**(*a*) which uses electrode plates of different hole diameters in each pair.

[0088] **FIG. 10**(*a*) teaches an embodiment with sealed mobility drift cell and a series of cup-shaped electrodes. This embodiment uses also a superposition of periodic field focusing and hyperbolic field focusing.

[0089] **FIG. 10**(*b*) teaches a sealed embodiment of a purely periodic field focussing mobility drift cell using electrodes **10** with T-shape cross section and thin insulators **11**.

[0090] **FIG. 11** and **FIG. 12** illustrate in more detail the insulation and sealing between ring electrodes **10** which can be used in all (periodic, periodic hyperbolic, etc.) embodiments discussed so far. Insulating foils or thin plates **10** are used for electrical insulation. Seal rings **12** are used for vacuum sealing. Additional seal rings **9** may be used for positioning of the electrodes **10**. Instead of such rings, a tube may be used.

[0091] **FIG. 13**(*a*) teaches an embodiment with hyperbolic field focussing similar to the prior art embodiment in **FIG. 2**(*a*), but including a novel adjustable sliding tube electrode **21** in order to adjust the hyperbolic field inside the cup. This allows adjusting the focusing of the ion beam in respect to its transmission to the MS through the orifice **24**. It also allows determining the trade-off between focussing and mobility resolving power. Another possible embodiment involves replacing the sliding tube electrode with an electrode with hyperbolic shaped geometry.

[0092] **FIG. 13**(*b*) teaches a combination of hyperbolic field focusing and periodic field focusing, but instead of superimposing the two focusing fields, the focusing methods are applied serially. Hyperbolic field focusing, accomplished through the use of fixed electrode **20**, is used at the location of the pulsed ionization by laser **6** (or ion shutter for non-pulsed ionization methods), and periodic field focusing, accomplished through the use of ring electrodes **10**, is applied further downstream the mobility drift cell. This embodiment can of course be combined with any other embodiment discussed so far.

[0093] **FIG. 14** illustrates an embodiment of the ionization region with ionizing beam **6** entering through a windows **32** from behind the sample surface **5** and being redirected with a mirror **30** onto the sample. In the same way, the camera **31** serves to observe the ionization process via a mirror. A rotatable sample holder **40** allows turning several samples into the focus position of the ionizing beam **6** without removing the sample holder **40**. In this way, a number of samples may be sequentially analyzed. Many mechanical design variations are possible for this embodiment, particularly those using multiple mirrors, allowing the source of the ionizing beam to be positioned in a variety of positions; e.g., it may, for example, be positioned behind the sample holding surface.

[0094] In **FIG. 15**, an embodiment with a moving belt sample holder **41** which allows for manual or automatic sample deposition **42**, sample analysis or separation by mobility cells discussed in previous figures, and sample holder cleaning **43**. Ionizing beam **6**, electrodes **10**, insulating spacers **11** and sampling aperture **25** are also illustrated. This embodiment allows the ionizing beam to enter the drift cell essentially orthogonal to the drift cell axis. The sample holder of this embodiment allows one to sequentially expose several samples to the ionizing beam by positioning the samples at various locations on the moving belt. Rotation of the belt allows one to proceed from sample to sample for analyses. Many mechanical design variations are possible for this embodiment. For example, multiple mirrors can be used to allow for flexibility in the positioning of the source of the ionizing beam.

[0095] A number of variations on the instrumentation taught above are possible without deviating from the scope of the invention. For instance, the examples above all involve single orifice (i.e., single hole) electrodes. It is possible to utilize electrodes having multiple holes to make up the drift cell. The individual ion paths defined by these holes are different ion channels within which ion mobility can be performed. Various combinations of the electrode geometries taught above are possible. In this way, a multiple channel ion mobility instrument can be constructed. Additionally, a purely ion transport device can be constructed with the disclosed electrode geometries and configurations. Such a device can be used outside of the context of the basic ion mobility spectrometry method. For instance, such an ion transport device would find utility in any application where guiding ions from one instrument or area to another is desirable. For example, applications are possible to transfer ions from an ion source to a mass spectrometer.

[0096] Another notable advantage of using heterogeneous fields in the mobility drift cell as herein described is the increase in discharge voltage when operating the mobility cell close to the Paschen minimum. We have observed that one can apply higher voltages across the cell without causing a gas discharge.