20. An ion reflection surface according to claim **19** wherein at least one of the high-frequency signals is superimposed by a DC electrical signal.

21. An ion reflection surface according to claim **20** further comprising an additional DC signal which is supplied to at least one of the grid elements such as to establish an electric field component along the first direction.

22. An ion reflection surface according to claim **19** wherein the grid elements are metal wires.

23. An ion reflection surface according to claim **22** wherein the metal wires are rings around an axis of the cylindrical structure.

24. An ion reflection surface according to claim **23** wherein at least one DC voltage is applied to the at least one of the rings such as to create a DC electric field component along said axis.

25. An ion reflection surface according to claim **18** wherein the grid elements comprise windings of at least one pair of conductors wound helically around an axis of the cylindrical structure.

26. An ion reflection surface according to claim **1** wherein the first high-frequency electrical signal and the second high-frequency electrical signal originate from one electrical signal source.

27. A method of reflecting charged particles of both positive and negative polarities, the method comprising:

forming a reflective surface of electrically conductive grid elements spaced in a substantially regular manner in at least a first direction along the surface;

supplying alternating grid elements along the first direction with a first high-frequency electrical signal; and

supplying alternating grid elements interspersed between those grid elements which are supplied with the first electrical signal with a second high-frequency electrical signal having the same frequency as the first electrical signal at a different relative phase.

28. A method according to claim **27** wherein supplying the second electrical signal comprises supplying the second electrical signal such that it has a phase which is substantially opposite to the phase of the first electrical signal.

29. A method according to claim **27** further comprising supplying a DC electrical signal which is superimposed on at least one of the high-frequency electrical signals.

30. A method according to claim **29** further comprising supplying an additional DC signal to at least one of the grid elements such as to establish an electric field component along the first direction.

31. A method according to claim **27** wherein forming a reflective surface of electrically conductive grid elements comprises providing metal wire tips oriented perpendicularly to the reflection surface.

32. A method according to claim **27** wherein forming a reflective surface of electrically conductive grid elements comprises forming the surface in a substantially cylindrical shape.

33. A method according to claim **32** wherein the method further comprises guiding ions with the surface by injecting ions into the cylindrical surface such that the ions are reflected within the surface as they travel in a generally axial direction within a space defined by the surface.

34. A method according to claim **27** wherein forming a reflective surface of electrically conductive grid elements comprises forming a reflective surface in which the grid elements comprise windings of two metal wires wound to a double helix, the first wire being supplied with the first electrical signal and the second wire being supplied with the second electrical signal.

35. A method according to claim **34** further comprising guiding ions within the double helix by injecting ions into an entrance at one end of the cylindrical double helix and reflecting the ions from an inner surface of the double helix as they travel to an exit at the other end of the double helix.

36. A method according to claim **35** further comprising supplying a DC current to at least one of the wires such that a DC field is generated along the cylinder axis which influences the injected ions.

37. A method according to claim **36** further comprising influencing the injected ions with the DC field in such a way that a filter for ions within a predetermined range of mass-to-charge ratios is created.

38. A method according to claim **35** wherein reflecting electric DC potentials of identical sign are applied to both ends of the double helix to store ions inside the double helix by reflection on the inner surface and on the electric DC potentials at the ends of the double helix.

39. A method according to claim **38** wherein at least one of the reflecting DC potentials is switchable.

40. A method according to claim **39** further comprising operating the double helix and the reflecting DC potentials so as to temporarily store substance ions of a substance peak coming out of a chromatographic or electrophoretic separation device.

41. A method according to claim **35** further comprising maintaining a vacuum pressure in the range of 10^{-4} to 10^{-2} millibar within the double helix such as to thermalize kinetic energies of ions by collisions with gas molecules.

42. A method according to claim **35** further comprising guiding ions with the double helix into an ion trap.

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