CLAIMS

What is claimed is:

1. An ionization gauge to measure pressure comprising:

an anode structure comprising a mesh grid defining an ionization volume in which electrons impact gas molecules and atoms;

an electron source that emits electrons;

a first collector electrode to collect ions formed by collisions between the electrons and gas molecules and atoms, to provide a gas pressure output; and

a first shade outside of the ionization volume, the first shade being located between the electron source and the first collector electrode, one of the first collector electrode and the electron source being located inside the anode structure, and the other of the first collector electrode and the electron source being located outside the anode structure.

2. The ionization gauge of Claim 1, wherein the mesh grid is a cylindrical mesh grid.

3. The ionization gauge of Claim 1 or 2, wherein the source that emits electrons is a hot cathode.

4. The ionization gauge of Claim 3, wherein the hot cathode is a ribbon filament having a flat surface oriented at about 90° with respect to the first collector electrode, such that the surface area of the filament facing the collector is minimized.

5. The ionization gauge of any one of Claims 1-4, wherein the source that emits electrons is located outside the anode structure and the first collector electrode is located inside the anode structure, and the ionization volume is inside the anode structure.

6. The ionization gauge of Claim 5, further including a second collector electrode located inside the anode structure.

7. The ionization gauge of Claim 5, further including a third collector electrode located outside the anode structure, in between the first shade and the anode structure.

8. The ionization gauge of any one of Claims 1-4, wherein the source that emits electrons is located inside the anode structure and the first collector electrode is located outside the anode structure.

9. The ionization gauge of any one of Claims 1-8, further including an envelope surrounding the electron source, the anode, and the first collector electrode.

10. The ionization gauge of Claim 9, further including a second shade located between the envelope and the electron source, such that atoms sputtered off the envelope are inhibited from depositing on the electron source.

11. An ionization gauge to measure pressure comprising:

an anode structure comprising a mesh grid defining an ionization volume in which electrons impact gas molecules and atoms, the ends of the grid defining the ends of the ionization volume;

a hot cathode electron source that emits electrons, the electron source being positioned at an end of the ionization volume; and

a collector electrode to collect ions formed by collisions between the electrons and gas molecules and atoms, to provide a gas pressure output, the collector electrode extending along a collector axis through the ionization volume, the collector axis extending through the ends of the ionization volume.

12. The ionization gauge of Claim 11, wherein the mesh grid is a cylindrical mesh grid.

13. A method of measuring pressure with an ionization gauge comprising:

emitting electrons from an electron source, the electrons colliding with gas molecules and atoms inside an anode structure comprising a cylindrical mesh grid that defines an ionization volume;

locating a first shade outside of the ionization volume between the electron source and a first collector electrode, one of the first collector electrode and the electron source

being located inside the anode structure, and the other of the first collector electrode and the electron source being located outside the anode structure; and

collecting ions formed by collisions between the electrons and gas molecules and atoms on the first collector electrode to provide a gas pressure output.

14. The method of Claim 13, wherein the pressure is in a range of between about 10^{-1} Torr and about 10^{-4} Torr.

15. The method of Claim 13, wherein the electron source that emits electrons is a hot cathode.

16. The method of Claim 15, wherein the hot cathode is a ribbon filament having a flat surface oriented at about 90° with respect to the first collector electrode, such that the surface area of the filament facing the collector is minimized.

17. The method of Claim 13, wherein the electron source that emits electrons is a microchannel plate.

18. The method of Claim 13, further including locating the source that emits electrons outside the anode structure and locating the first collector electrode inside the anode structure.

19. The method of Claim 18, further including locating a second collector electrode inside the anode structure.

20. The method of Claim 18, further including locating a third collector electrode outside the anode structure, in between the first shade and the anode structure.

21. The method of Claim 13, further including locating the source that emits electrons inside the anode structure and locating the first collector electrode outside the anode structure.

22. The method of any one of Claims 13-21, further including surrounding the electron source, the anode, and the first collector electrode with an envelope.

23. The method of Claim 22, further including locating a second shade between the envelope and the electron source, such that atoms sputtered off the envelope are inhibited from depositing on the electron source.

24. A method of measuring pressure with an ionization gauge comprising:

emitting electrons from a hot cathode electron source positioned at an end of an ionization volume, the electrons colliding with gas molecules and atoms inside an anode structure comprising a cylindrical mesh grid that defines the ionization volume; and

collecting ions formed by collisions between the electrons and gas molecules and atoms on a collector electrode to provide a gas pressure output, the collector electrode extending along a collector axis through the ionization volume, the collector axis extending through the ends of the ionization volume.

25. The method of Claim 24, wherein the pressure is in a range of between about 10^{-1} Torr and about 10^{-4} Torr.

CLAIMS

What is claimed is:

1. An ionization gauge to measure pressure comprising:

an anode structure comprising a mesh grid defining an ionization volume in which electrons impact gas molecules and atoms;

an electron source that emits electrons;

a first collector electrode to collect ions formed by collisions between the electrons and gas molecules and atoms, to provide a gas pressure output; and

a first shade outside of the ionization volume, the first shade being located between the electron source and the first collector electrode, one of the first collector electrode and the electron source being located inside the anode structure, and the other of the first collector electrode and the electron source being located outside the anode structure, electric fields directing electrons from the electron source around the first shade and into the ionization volume.

2. The ionization gauge of Claim 1, wherein the mesh grid is a cylindrical mesh grid.

3. The ionization gauge of Claim 1 or 2, wherein the source that emits electrons is a hot cathode.

4. The ionization gauge of Claim 3, wherein the hot cathode is a ribbon filament having a flat surface oriented at about 90° with respect to the first collector electrode, such that the surface area of the filament facing the collector is minimized.

5. The ionization gauge of any one of Claims 1-4, wherein the source that emits electrons is located outside the anode structure and the first collector

electrode is located inside the anode structure, and the ionization volume is inside the anode structure.

6. The ionization gauge of Claim 5, further including a second collector electrode located inside the anode structure.

7. The ionization gauge of Claim 5, further including a third collector electrode located outside the anode structure, in between the first shade and the anode structure.

8. The ionization gauge of any one of Claims 1-4, wherein the source that emits electrons is located inside the anode structure and the first collector electrode is located outside the anode structure.

9. The ionization gauge of any one of Claims 1-8, further including an envelope surrounding the electron source, the anode, and the first collector electrode.

10. The ionization gauge of Claim 9, further including a second shade located between the envelope and the electron source, such that atoms sputtered off the envelope are inhibited from depositing on the electron source.

11. An ionization gauge to measure pressure comprising:

an anode structure comprising a mesh grid defining an ionization volume in which electrons impact gas molecules and atoms, the ends of the grid defining the ends of the ionization volume;

a hot cathode electron source that emits electrons, the electron source being positioned at an end of the ionization volume; and

a collector electrode to collect ions formed by collisions between the electrons and gas molecules and atoms, to provide a gas pressure output, the collector electrode extending along a collector axis through the ionization volume, the collector axis extending through the ends of the ionization volume.

12. The ionization gauge of Claim 11, wherein the mesh grid is a cylindrical mesh grid.

13. A method of measuring pressure with an ionization gauge comprising:

emitting electrons from an electron source, the electrons colliding with gas molecules and atoms inside an anode structure comprising a cylindrical mesh grid that defines an ionization volume;

locating a first shade outside of the ionization volume between the electron source and a first collector electrode, one of the first collector electrode and the electron source being located inside the anode structure, and the other of the first collector electrode and the electron source being located outside the anode structure, electric fields directing electrons from the electron source around the first shade and into the ionization volume; and

collecting ions formed by collisions between the electrons and gas molecules and atoms on the first collector electrode to provide a gas pressure output.

14. The method of Claim 13, wherein the pressure is in a range of between about 10^{-1} Torr and about 10^{-4} Torr.

15. The method of Claim 13, wherein the electron source that emits electrons is a hot cathode.

16. The method of Claim 15, wherein the hot cathode is a ribbon filament having a flat surface oriented at about 90° with respect to the first collector electrode, such that the surface area of the filament facing the collector is minimized.

17. The method of Claim 13, wherein the electron source that emits electrons is a microchannel plate.

18. The method of Claim 13, further including locating the source that emits electrons outside the anode structure and locating the first collector electrode inside the anode structure.

19. The method of Claim 18, further including locating a second collector electrode inside the anode structure.

20. The method of Claim 18, further including locating a third collector electrode outside the anode structure, in between the first shade and the anode structure.

21. The method of Claim 13, further including locating the source that emits electrons inside the anode structure and locating the first collector electrode outside the anode structure.

22. The method of any one of Claims 13-21, further including surrounding the electron source, the anode, and the first collector electrode with an envelope.

23. The method of Claim 22, further including locating a second shade between the envelope and the electron source, such that atoms sputtered off the envelope are inhibited from depositing on the electron source.

24. A method of measuring pressure with an ionization gauge comprising:

emitting electrons from a hot cathode electron source positioned at an end of an ionization volume, the electrons colliding with gas molecules and atoms inside an anode structure comprising a mesh grid that defines the ionization volume; and

collecting ions formed by collisions between the electrons and gas molecules and atoms on a collector electrode to provide a gas pressure output, the collector electrode extending along a collector axis through the ionization volume, the collector axis extending through the ends of the ionization volume.

25. The method of Claim 24, wherein the pressure is in a range of between about 10^{-1} Torr and about 10^{-4} Torr.

26. A method as claimed in Claim 24, wherein the mesh grid is a cylindrical mesh grid.

27. A method as claims in Claim 24, whrein the hot cathode electron source is a heated cathode filament.

28. A method as claimed in Claim 27, wherein the heated cathode filament is formed in a loop.

29. A method as claimed in Claim 24, wherein the hot cathode electron source is a disc cathode thermionic emitter.

30. A method as claimed in Claim 24, further including surrounding the electron source, the anode structure and the collector electrode with an envelope.

31. The ionization gauge of Claim 11, configured to operate in a pressure range of between 10^{-1} and Torr 10^{-4} Torr

32. The ionization gauge of Claim 11, wherein the hot cathode electron source is a heated cathode filament.

33. The ionization gauge of Claim 32, wherein the heated cathode filament is formed in a loop.

34. The ionization gauge of Claim 11, wherein the hot cathode electron source is a disc cathode thermionic emitter.

35. The computer gauge of Claim 11, further including an envelope surrounding the anode structure, the electron source and the collector electrode.