May 6, 1947. P. C. SMITH 2,420,207

ELECTRON GUN MOUNTING

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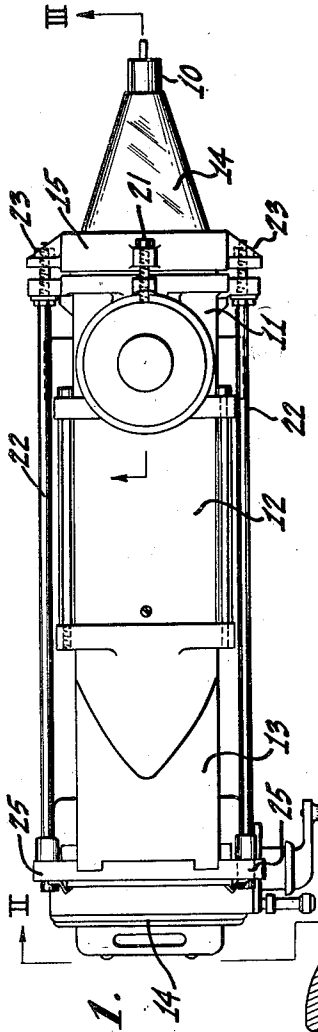
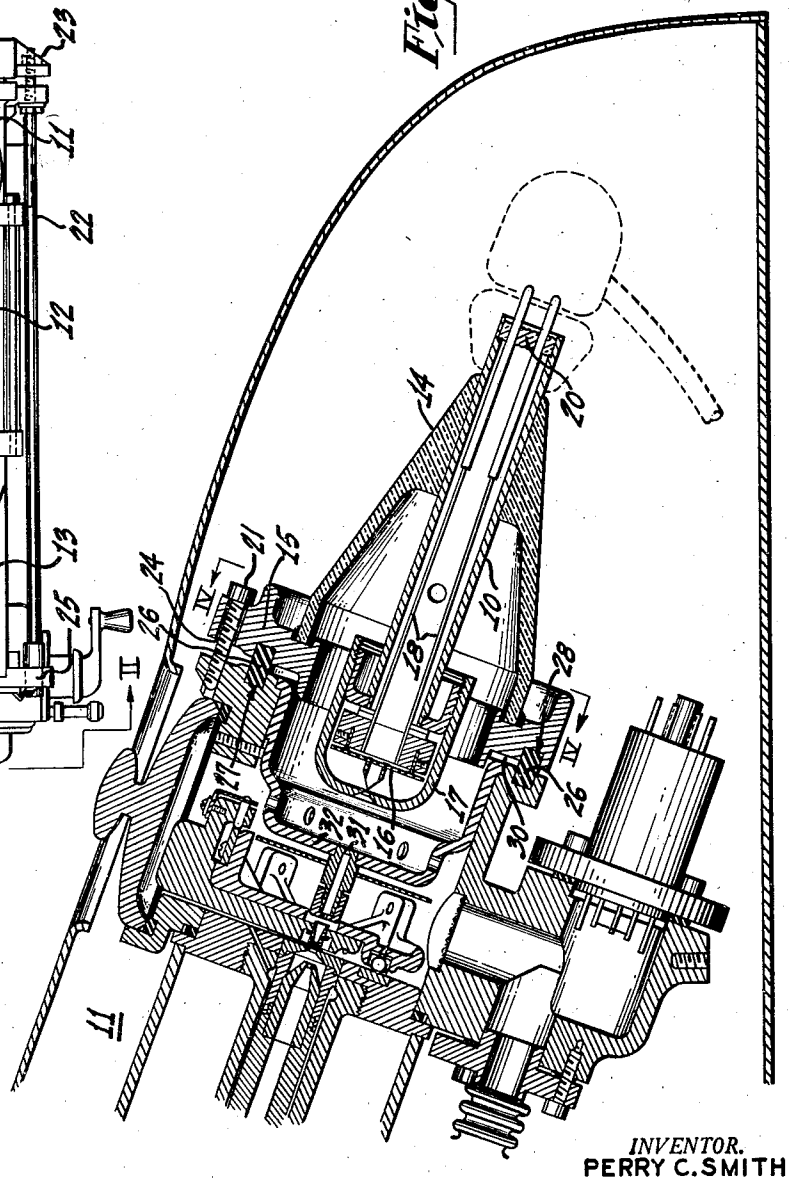


Fig. 1.

Fig. 3.



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Fig. 2.

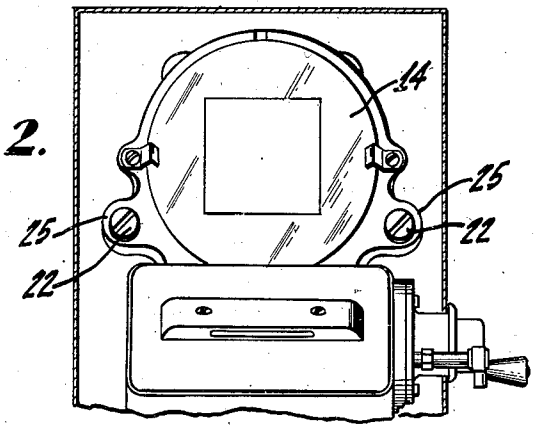
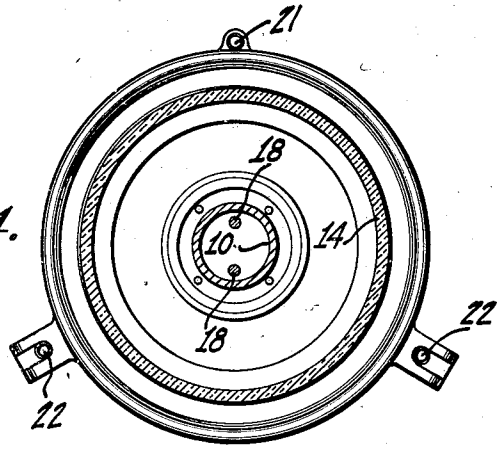


Fig. 4.



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ELECTRON GUN MOUNTING

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4 Claims. (Cl. 250—49.5)

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The present invention relates to electron microscopes and like devices and more particularly to a novel adjusting means for an electron gun.

In electron microscopes as heretofore constructed considerable difficulty attends the adjustment of the electron gun so that the center of the beam of electrons coincides with the axis of the microscope which passes through the aperture of the anode electrode. It has also been found difficult to obtain this axial adjustment while maintaining the required vacuum condition for proper operation of the instrument. Also, much time is lost in making readjustments following the demounting and remounting of the electron gun after replacing the cathode electrode.

Some of the objects of the present invention are to provide an improved adjusting means for the electron gun of an electron microscope; to provide a delicate adjusting means for an electron gun which can be operated quickly and accurately while viewing the electron beam on the fluorescent screen; to provide an electron gun adjustment which can be made without danger of losing the vacuum therein; to provide an electron gun adjustment located directly in front of the position assumed by the operator when using the microscope; and to provide other improvements as will hereinafter appear.

In the accompanying drawings, Fig. 1 represents a plan of the column assembly of an electron microscope equipped with an electron gun adjustment embodying one form of the present invention; Fig. 2 represents a fragmentary front elevation of the same; Fig. 3 represents a section on line 3—3 of Fig. 1; and Fig. 4 represents a section on line 4—4 of Fig. 3.

Referring to the drawings, one form of the present invention is shown as assembled upon the column of an electron microscope, which latter includes an electron gun 10, object chamber unit 11, magnetic lens system 12, and viewing chamber unit 13 with its glass window 14. The valving system (not shown) is located below the viewing chamber 13 for operative association therewith.

The electron gun 10 is carried by a housing 14 attached to a base in the form of an annular collar 15 which encircles the axially disposed cathode 16 which is mounted in the apertured tube 17, and electrically insulated from the main or central support of the gun. External connections are provided by leads 18 which extend through glass seals 20 at the rear end of the gun assembly.

For adjustably mounting the gun 10, the collar 15 is arranged to be attached to the object chamber unit 11, by a cap screw 21 and two elongated bolts 22 passing through the collar 15 to respectively receive nuts 23. It should be noted that the cap screw 21 passes through a hole in the collar of larger diameter than the threaded shank of the screw in order to provide a clearance 24 whereby the collar 15 can have a movement relative to the screw 21 for a purpose presently to be described. The end of the screw 21 threads into the object unit 11 so that when the cap or head of the screw engages the collar 15, the parts will be firmly held against separation while allowing the collar to have a desired angular swing with respect to the axis of the screw 15. As shown, the bolts 22 traverse the collar 15 at diametrically opposite points, these points being at the extremities of a collar diameter at right angles to the diameter which includes the cap screw 21, and so form a tripodlike arrangement. The shanks of the bolts 22 parallel the respective sides of the column and are supported respectively by ears 25 projecting laterally from the front end of the viewing chamber unit 13. The ends of the bolts 22 protrude through the ears 25 and are provided with screw driver slots, or equivalent, so that each can be readily manipulated to tighten or loosen the bolts 22 as required for exact adjustment of the electron beam.

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For the purpose of preventing the vacuum from being broken during adjustment of the electron gun, a relatively thick gasket 26 of rubber or equivalent resilient material is interposed between the opposed faces of the gun base collar 15 and the object chamber unit 11 and has its end portions respectively seated in relatively deep grooves 27 and 28 formed in the respective parts 11 and 15. The length of this gasket 26 is such as to provide the clearance 30 necessary to permit the collar 15 of the gun mounting to swing angularly without engaging the unit 11 as an obstruction to such adjusting movement. During any such adjustment the resilience of the gasket allows it to be firmly compressed and thereby resist leakage of air to the interior of the gun.

In operation the user can view the projected beam upon the fluorescent screen and if found to be out of alinement with the axial line of the microscope column, either of bolts 22, or both, may be either loosened or tightened as required. This action causes the collar 15 to tilt, in relation to the cap screw 21, in a direction to bring the center of the optimum beam into coincidence with the aperture 31 in the anode electrode 32.

The compression of the gasket 26 during this adjustment effectually maintains the desired air-tight seal, and at the same time permits the two freedoms of movement, which in turn permit optimum adjustment of the beam. When adjusted for optimum electron radiation, the mechanical center lines of the gun and of the column of the microscope are not necessarily coincidental.

I claim as my invention:

1. In an electron microscope having a column and an anode electrode provided with an aperture, an electron gun, a base for said gun, a one point connection between said base and said column, said connection providing a lost motion, means to swing said base angularly with respect to said connection to adjust the beam of said gun to aline with said aperture, and means to prevent air leakage during said swinging operation.

2. In an electron microscope having a column and an anode electrode provided with an aperture, an electron gun, a base for said gun, a one point connection between said base and said column, said connection providing a lost motion, means to swing said base angularly with respect to said connection to adjust the beam of said gun to aline with said aperture, and a resilient gasket interposed between said base and said column to prevent air leakage during said swinging operation.

3. In an electron microscope having a column and an anode electrode provided with an aperture, an electron gun, a base for said gun, a one point connection between said base and said column, said connection providing a lost motion, two adjusting devices connected to said base at points respectively spaced from said one point connection to form a tripodlike support for said base,

supports respectively for said devices adjacent the viewing chamber end of said column, whereby said devices can be conveniently operated by the user of the microscope to adjust the beam of said gun into alinement with said anode aperture, and a resilient gasket between said base and column forming a clearance between said parts and sealing said column against air leakage.

4. In an electron microscope having a column and an anode electrode provided with an aperture, an electron gun, a base for said gun having a through hole near the upper part of said base and on a line passing vertically of said base, and two through holes located respectively at opposite sides of said line, a cap screw traversing said first hole to anchor said base to said column, said screw being of less diameter than said hole to provide a clearance for angular swing of said base, two bolts respectively passing through the remaining holes, means anchoring said bolts whereby rotation of said bolts varies the distance of each side of said base from said column, and a resilient gasket between said base and column to space said parts and serve as a seal.

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