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JUNE 8, 1943.
BY A. P. C.

F. WEIGEND
SLUICING DEVICES FOR CORPUSCULAR RAY APPARATUS
Filed July 30, 1940

Serial No.
348,524
3 Sheets-Sheet 1

Fig. 1

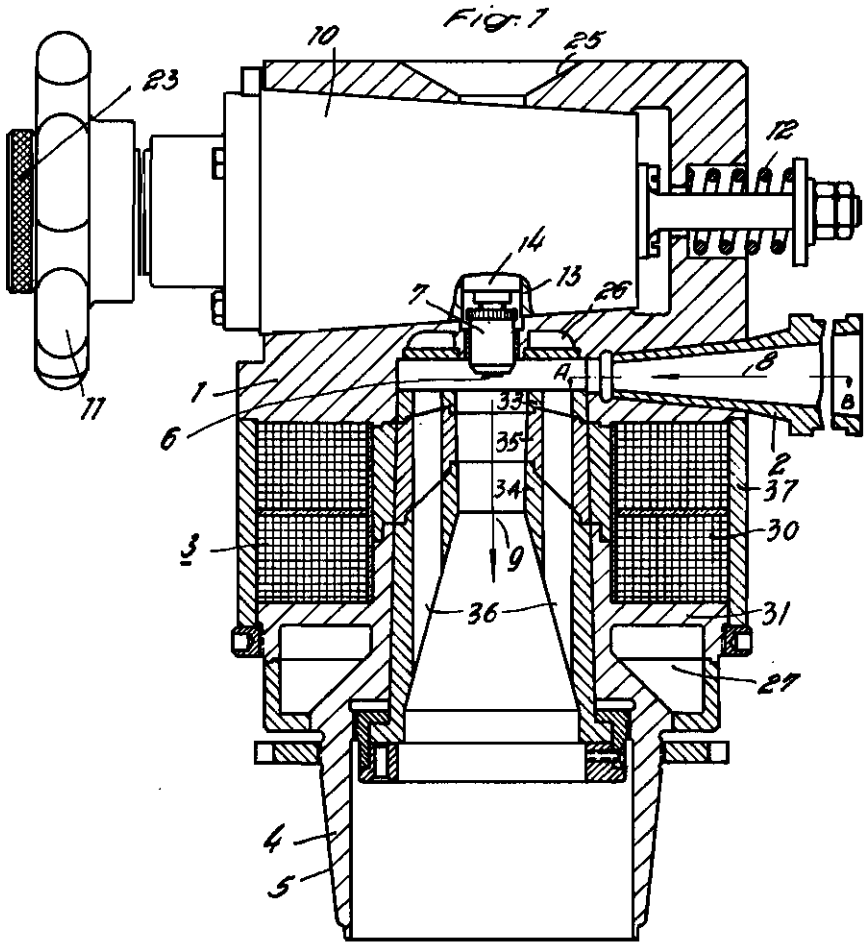

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Fig. 2

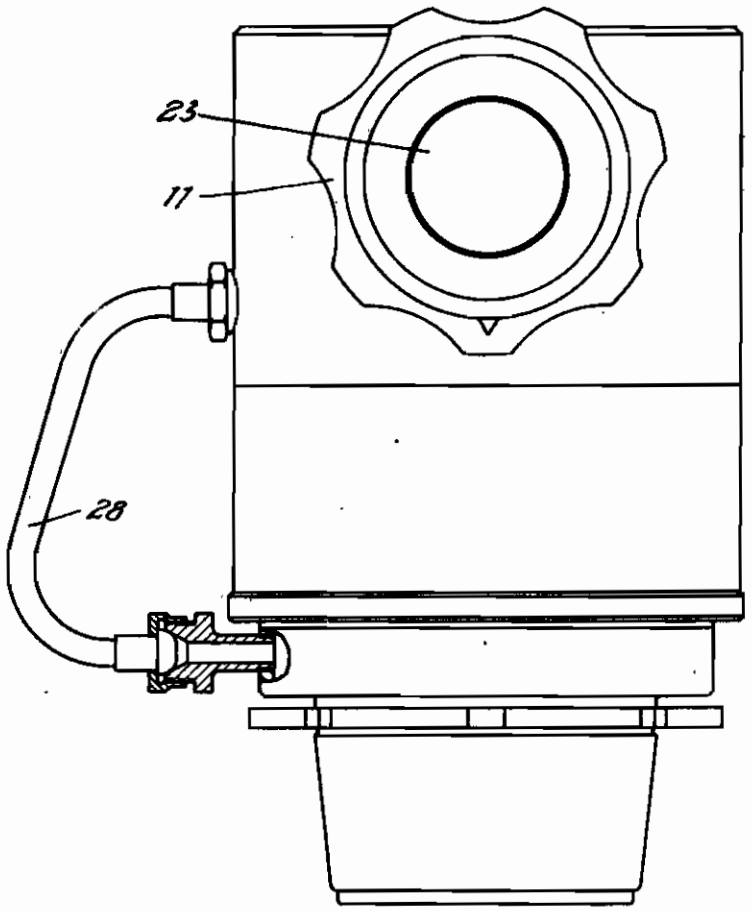

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Fig. 3

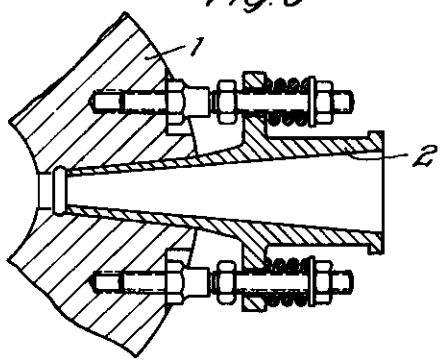


Fig. 4

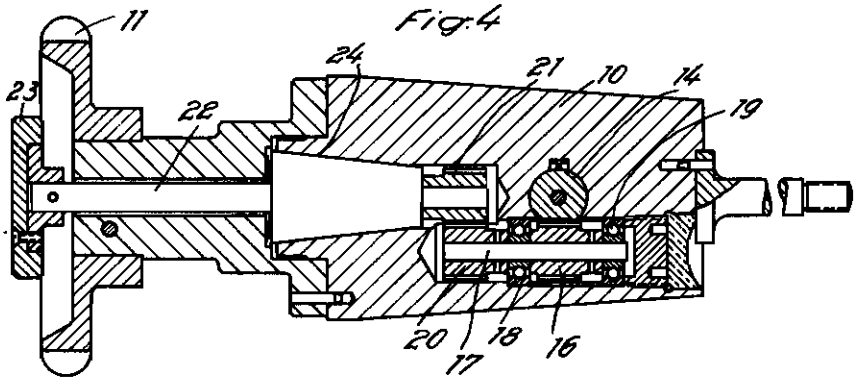


Fig. 5

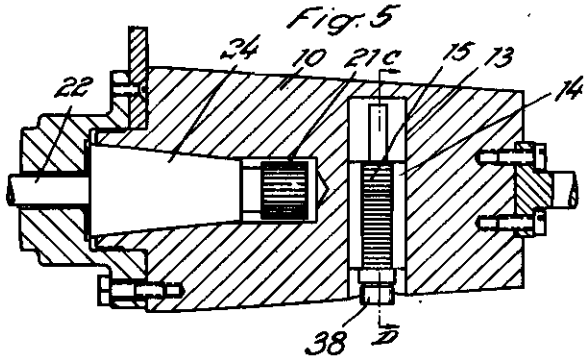
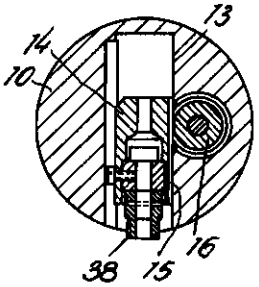


Fig. 6



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ALIEN PROPERTY CUSTODIAN

SLUICING DEVICES FOR CORPUSCULAR RAY APPARATUS

Franz Weigend, Berlin-Spandau, Germany; vested in the Alien Property Custodian

Application filed July 30, 1940

This invention relates to sluicing devices for corpuscular ray apparatus.

When operating corpuscular ray apparatus (oscillographs), particularly an electronic microscope, it is necessary to bring the bodies, for instance, the objects to be tested and diaphragms as well into and out of the vacuum chamber without impairing the vacuum. To introduce such objects into the vacuum chamber it has hitherto been usual to provide a cock in a cock casing extending through the apparatus. The cock plug is provided with a bore serving as a sluicing chamber and through which passes the ray, said bore enabling a communication with a bore of the cock casing extending outwardly as well as with the vacuum chamber. The prior sluicing device does not lend itself readily to such electronic microscopes which serve for the observation of surfaces.

The invention relates to a sluicing device for corpuscular ray apparatus whose construction differs from that described above in such manner as to be suitable for electronic microscopes of the last-mentioned type. Further, the invention relates to novel driving means which serve to bring the objects introduced into the sluicing chamber, such as, for instance, the object cartridge into the desired operating position after the sluicing chamber has been brought into communication with the vacuum chamber.

This improvement is also suitable for microscopes in which the rays pass through the object.

According to the invention a bore provided in the cock plug and closed at one end serves as a sluicing chamber. The object, for instance, the object cartridge is introduced into this bore and brought into the operating position by rotating the cock. In this sluicing device the electron rays do not pass through the bore for the reception of the cartridge as is the case with the prior sluicing device mentioned above. The cartridge according to the invention may be brought into such an operating position with the aid of simple means by moving it out of the bore that the electron rays entering the microscope substantially perpendicularly to its axis strike the object and are reflected by the latter into the optical system serving to magnify the object.

The sluicing device is preferably so designed that after the insertion of the object cartridge the cock plug may be brought into the position in which the sluicing chamber communicates with the vacuum chamber by rotating it 180°. To bring the object cartridge from this position into the operating position a drive serving to move the object cartridge out of the bore is preferably employed according to the invention which is arranged in the cock plug and is actuated exteriorly of the vacuum chamber. To this end, the object cartridge may be inserted in a sleeve which in turn is slidably arranged in the bore closed at one end. The sleeve itself is actuated according to the invention preferably through a shaft provided with a sealing cone. In order to ensure an adjustment of the object cartridge in both directions of movement it is preferable to effect a drive with the aid of gears and gear racks. A particularly simple device easy to operate may, for instance, be obtained if the driving device for moving the object cartridge into the cock of the sluicing device is so arranged that the axis of the driving shaft coincides with the axis of the cock plug. In this case the object cartridge may be actuated from one point.

The above-described drive for the object cartridge is also of advantage if the sluicing device is designed in such a manner that the electron ray passes in the operating position through the bore for the reception of the object cartridge, for also in this case the object cartridge may be raised and lowered without causing a jamming of the object cartridge in the water-cooled guide sleeve. A better exchange of heat is thus obtained, since the object cartridge may be brought nearer to the heat exchange surfaces than has hitherto been possible.

In the accompanying drawings is shown as an embodiment of the invention a sluicing device for an electronic microscope serving to observe surfaces of objects.

Fig. 1 is a cross-sectional view of the sluicing device;

Fig. 2 is a side elevational view thereof;

Fig. 3 is a sectional view on the line A—B of Fig. 1;

Figs. 4 and 5 are two longitudinal sectional views of the sluice cock with its inner parts, and

Fig. 6 is a cross-sectional view taken along the line C—D of Fig. 5.

Referring to the drawings, 1 denotes the casing enclosing the object sluicing device and which forms a part of the vacuum wall. In this casing is fitted the part 2 provided with a sealing cone and to which is secured the cathode (not shown) of the electronic microscope. The casing 1 is arranged on the objective lens 3 of the electronic microscope. The axis of this lens is perpendicular to the axis of the part 2. The lower end 4 of the objective lens is provided with a sealing cone 5 which fits in a corresponding wall

portion (not shown) of the electronic microscope. The electron ray passes through the part 2 in the direction as indicated by the arrow 8 and is reflected by the object 8 supported in the object cartridge 7, so that it enters the objective in the direction as indicated by the arrow 9.

A sluicing device provided with a cock plug 10 serves to sluice the object cartridge 7. The plug 10 may be rotated with the aid of a hand wheel 11 and is firmly held in position by a spring 12. In the plug is provided a bore 13 (Figs. 4, 5, 6) in which is arranged a sleeve 14 to which the cartridge 7 is threadedly attached. The sleeve 14 is so mounted in the bore 13 as to move in the upward and downward direction. To this end, the sleeve 14 is provided with a gearing 15 in the form of a toothed rack cooperating with a gear 16. The gear 16 is mounted on a shaft 17 arranged in the cock in parallel relation to the axis of the plug 10 and mounted in the two ball bearing 18, 19. On the left-hand end of the shaft 17 is mounted a gear 20 meshing with a second gear 21 which in turn may be rotated by means of a driving shaft 22 to be actuated exteriorly of the vacuum chamber. The adjustment is effected by the hand wheel 23. To seal the driving shaft 22, the sealing cone 24 is employed which is integral with the shaft 22.

To insert an object cartridge, the cock 10 is so adjusted by means of a hand-operated wheel 11 that the bore 13 is opposite to the opening 25 for introducing the object into the sleeve, so that the axis of the bore 13 coincides with the axis of the opening 25. In this operating position the cartridge 7 is screwed on the sleeve 14. The cartridge 7 is then within the bore 13 so that the cock 10 may be rotated by 180° to bring it into the position shown in Fig. 1, in which the axis of the bore 13 coincides with the axis of the objective 3. The object cartridge 7 is moved out of the bore 13 in the downward direction together with the sleeve 14 by rotating the hand-operated wheel 23 until it assumes the operating position shown in Fig. 1.

26 and 27 denote cooling ducts through which flows cooling water during the operation. 28 denotes the corresponding cooling water conduit. The arrangement is preferably so designed that the object cartridge may be shifted within the sleeve in parallel relation to its axis in order to compensate for the changes in position of the cartridges, due to the wear of the plug.

FRANZ WEIGEND.