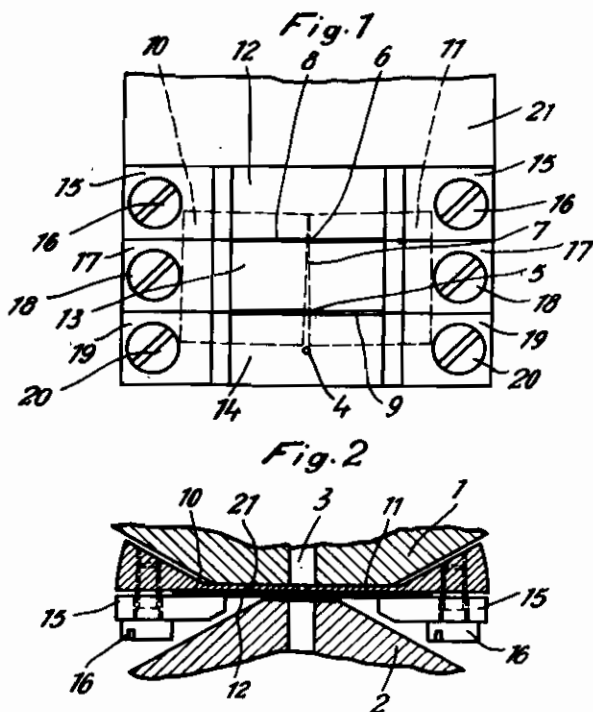


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DIAPHRAGMS FOR ELECTRON OPTICAL APPARATUS
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DIAPHRAGMS FOR ELECTRON OPTICAL APPARATUS

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This invention relates to diaphragms to be inserted in the path of ray of electron optical apparatus.

Such diaphragms, particularly diaphragms employed in electronic microscopes, often require a very small diameter in the case of a considerable diaphragm thickness (mass thickness). As is well known it has hitherto been possible to provide by the mechanical method the diaphragm with a bore of a diameter amounting only to 50 μ . The object of the invention consists in manufacturing diaphragms having effective openings of smaller dimensions. This may be accomplished according to the invention by employing the point of crossing of two slits as a diaphragm. In this manner it is possible to provide the diaphragm with channels, the dimensions of which amount only to a few μ in the case of a considerable diaphragm thickness. The diaphragm itself consists of two slits which are in turn made, for instance, of sheets of tantalum of 0.1 mm. having a ground and polished edge. The grinding is preferably effected in a plane perpendicular to the plane of the sheet of metal, and the ground surface must be polished in order to attain an accurate diaphragm channel even in the case of the smallest diaphragm dimensions to be adjusted. The diaphragm aperture is preferably formed by so crossing two narrow slits as to be perpendicular to each other. The slit width is preferably adjusted by the use of a dissecting microscope and the sheets forming the slits are then fastened by a clamping device.

According to the invention also a multiple cross-slit diaphragm may be made in a simple manner. To this end, the arrangement is so designed that one slit may be so adjusted as to assume the form of a wedge and that two or more slits lying perpendicularly to the wedge-shaped slit are formed of three or more sheets of metal. The wedge-shaped slit may be carried out in such a manner that the two sheets of metal forming the same abut at one end thereof and are opened at the other end, for instance, $1-2 \times 10^{-2}$ mm.

Such a multiple cross-slit diaphragm is shown by way of example in the accompanying drawings. In this embodiment a diaphragm arrangement is involved which may be inserted in the path of ray of an electronic microscope.

Fig. 1 shows a top view of a diaphragm arrangement and Fig. 2 a cross-sectional view thereof. 1 and 2 denote the pole shoes of the

magnetic lenses of an electronic microscope (not shown). 3 is the channel for the passage of the electron ray. In this path of ray is inserted a diaphragm arrangement. This arrangement has a mechanically adjusted diaphragm aperture 4 having a width of, for instance, 50 μ and two cross-slit diaphragms 5 and 6, the width thereof amounting, for instance, to 10 μ and 3 μ respectively. The two cross-slit diaphragms are formed of the slits 7, 8 and 9. To form the slit 7, two sheets of metal 10 and 11 are employed which are adjusted as shown in a wedge-shaped manner. The slits 8 and 9 are formed of the three sheets of metal 12, 13 and 14.

The adjustment of the wedge-shaped slit 7 is effected by means of a dissecting microscope. The sheets of the wedge slit are then fastened by means of a grip member 15 with the aid of the screws 16. The slit 8 is then adjusted by the dissecting microscope with the aid of the sheets 12 and 13 and then fastened with the aid of the corresponding grip members 17, 18. Also the slit 9 may then be adjusted with the aid of the sheet 14 and is fastened by the grip members 19, 20.

By adjusting on the one hand the wedge-shaped slit 7 as described above and by selecting on the other hand the position of the slits 8 and 9 with respect to the wedge-shaped slit 7, it is possible to obtain diaphragms having the same dimensions in both main directions. The fact that the two centers of gravity of the diaphragms are displaced from each other in the two main directions by about $\frac{1}{8}$ mm. and that the diaphragm has a square cross-section has hardly any influence on the quality of the microscopical image.

Without rendering the adjustment of the diaphragm too difficult it is possible to provide the diaphragms with channels having as small a diameter as 3×10^{-3} mm. 21 denotes a slidable diaphragm reed, in whose lateral parts are secured the set screws 16, 18 and 20. The entire device may be displaced by a diaphragm reed in the main direction of the wedge-shaped slit 7 so that the diaphragm channels 4, 5 and 6 may be inserted at will in the path of ray of the electronic microscope. The single diaphragm openings 4, 5 and 6 lie on a straight line coinciding with the direction of displacement so that the passage from one diaphragm to the other is facilitated to a great extent.

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