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ELECTRON MICROSCOPE DIAPHRAGM ARRANGEMENT WITH AUXILIARY DEVICE FOR X-RAY SPECTROSCOPY OF IRRADIATED SPECIMEN

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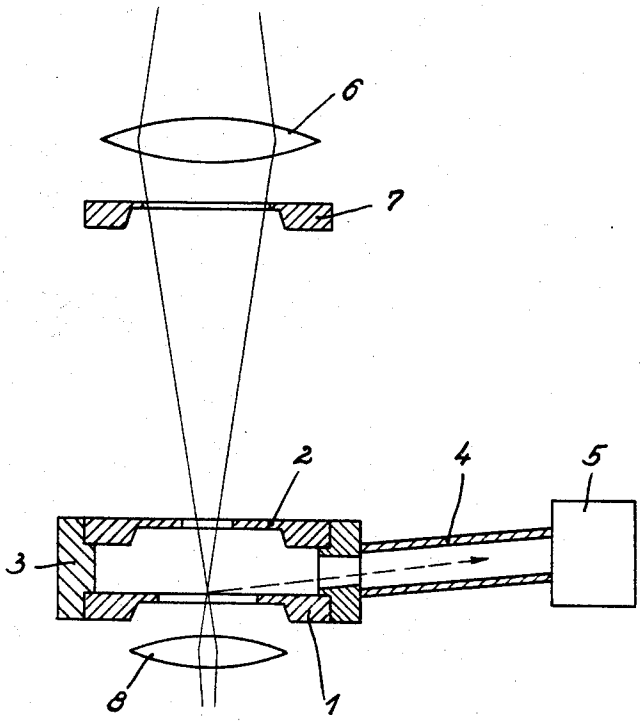

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3,086,114

ELECTRON MICROSCOPE DIAPHRAGM ARRANGEMENT WITH AUXILIARY DEVICE FOR X-RAY SPECTROSCOPY OF IRRADIATED SPECIMEN

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3 Claims. (Cl. 250—51.5)

This invention is concerned with a diaphragm arrangement for electron microscopes with an auxiliary device for X-ray spectroscopy of radiation permeable specimen.

Specimen in a permeating radiation electron microscope emit X-rays during the electron irradiation thereof. It has been proposed to carry out an elementary analysis of the specimen by spectral resolution of these X-rays with the aid of X-ray spectrometers cooperatively associated with the electron microscope. In order to comprehend for the spectral analysis specimen details as small as possible, the diameter of the irradiated specimen area is advantageously reduced to a few microns, which is in view of the simultaneously required high density of the illuminating current most advantageously achieved with the aid of a plural stage condenser.

Irradiated specimen exhibit a considerably lower X-ray yield than massive specimen, so that few electrons falling upon the massive parts of the specimen diaphragm produce already a stronger X-ray radiation than would be produced by more intensive irradiation of the specimen. In order to provide for a clean-cut spectral analysis, scattered electrons are therefore to be carefully kept away from the massive rim of the specimen diaphragm. However, scattered electrons originate abundantly, for example, at the condenser aperture diaphragm.

The invention avoids this disburbance by the provision of an auxiliary diaphragm disposed between the specimen and the condenser, the aperture of which is smaller than that of the object diaphragm, but large enough so that it is not impacted by the direct radiation of the illuminating beam. If the auxiliary diaphragm is centered with respect to the specimen diaphragm, the scattered electrons are kept away from the massive rim of the specimen diaphragm. In order to facilitate the centering, it is advantageous to dispose the preceding diaphragm so that it can be displaced perpendicularly to the electron beam.

An embodiment of the invention is shown in simplified diagrammatic manner in the accompanying drawing.

Ahead of the specimen diaphragm **1** is disposed the auxiliary diaphragm **2**. Both diaphragms are rigidly interconnected by means of the object cartridge **3**. The X-ray radiation enters into the spectrometer **5** through

the channel **4**. At **6** is provided the schematically indicated condenser lens and **7** indicates the aperture diaphragm; numeral **8** indicates the objective lens of the electron microscope. In this arrangement, unavoidable tolerances must be equalized or compensated by condenser tipping.

In order to satisfy particularly high requirements, it may in some cases be necessary to shield also the secondary scattering electron radiation of the auxiliary diaphragm. This may be obtained by the provision of further diaphragms positioned above the specimen. The diaphragm diameter must thereby increase in the irradiation direction, but must in all diaphragms remain smaller than the diameter of the specimen diaphragm.

Changes may be made within the scope and spirit of the appended claims which define what is believed to be new and desired to have protected by Letters Patent.

I claim:

1. A diaphragm arrangement for an electron microscope having an auxiliary device for X-ray spectroscopy of radiation permeable specimens, comprising a first apertured diaphragm which determines the cross-sectional area of the direct radiation of the illuminating beam, a second specimen diaphragm which is not impacted by the direct radiation due to the size of the aperture thereof, at least one auxiliary diaphragm disposed between said first and second diaphragms having an aperture of a size lying between the size of the apertures of the first and second diaphragms, said arrangement being constructed for the operative disposition of spectrometer means between said auxiliary and specimen diaphragms, said auxiliary diaphragm being effective to keep away from the specimen diaphragm scattered electrons originating at said first diaphragm and being not impacted by the direct radiation.

2. A diaphragm arrangement according to claim 1, wherein the auxiliary diaphragm arranged above the specimen diaphragm is displaceable in a plane extending perpendicular to the direction of the electron beam.

3. A diaphragm arrangement according to claim 1, wherein the size of the apertures of said auxiliary diaphragm and said specimen diaphragm increases in the direction of illumination.

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