Aug. 26, 1958 M. EISFELDT 2,849,619

ELECTRON MICROSCOPE HAVING A MULTIPLE-SPECIMEN CARRIER

Filed July 23, 1951 4 Sheets-Sheet 1

Fig. 1

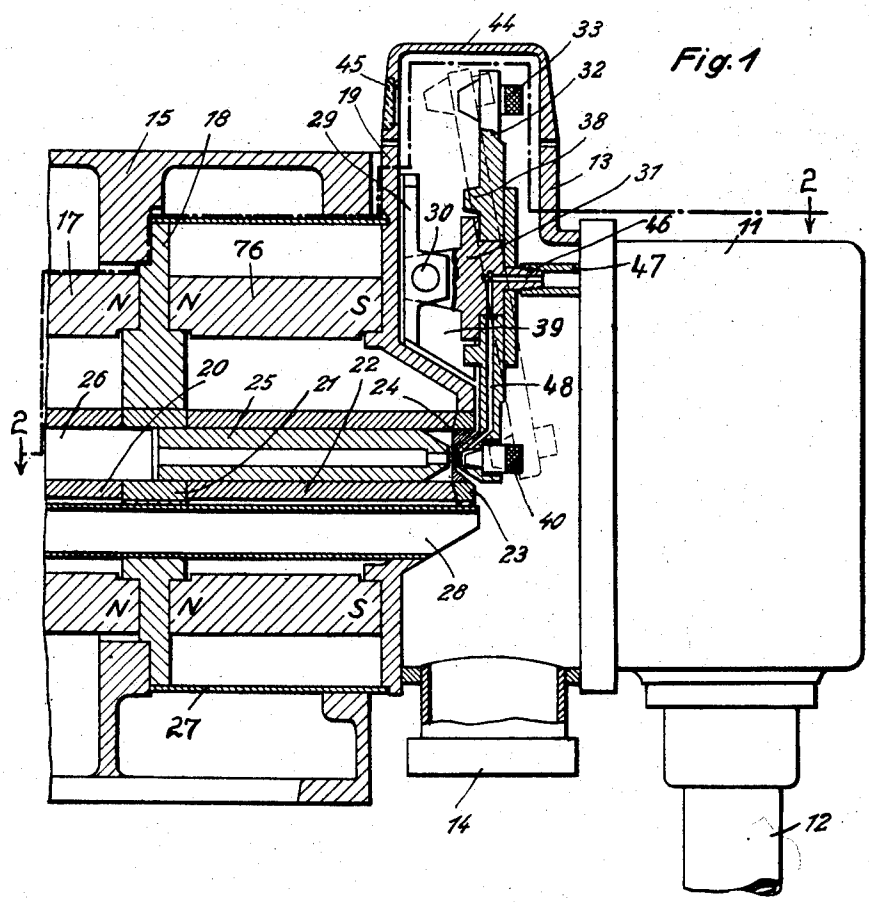

Fig. 4

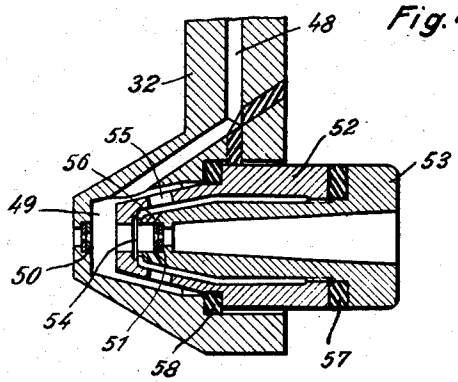

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Fig. 2

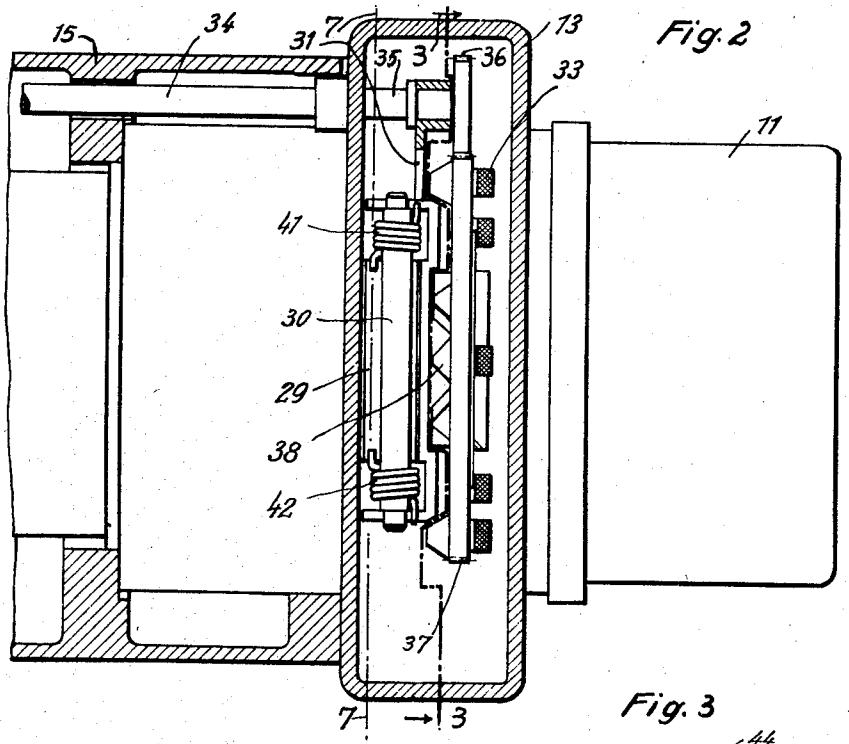
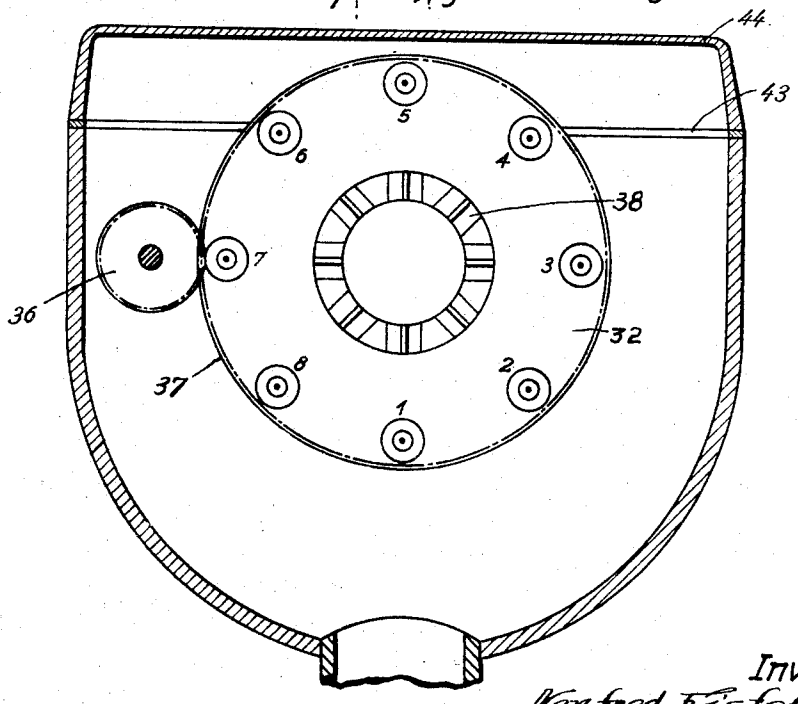


Fig. 3



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ELECTRON MICROSCOPE HAVING A MULTIPLE-SPECIMEN CARRIER

Filed July 23, 1951 4 Sheets-Sheet 3

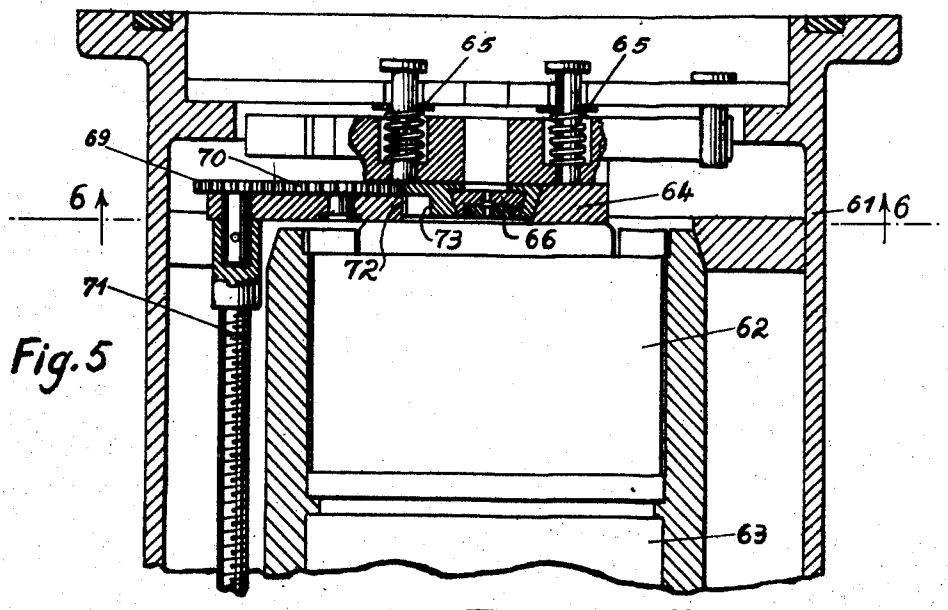
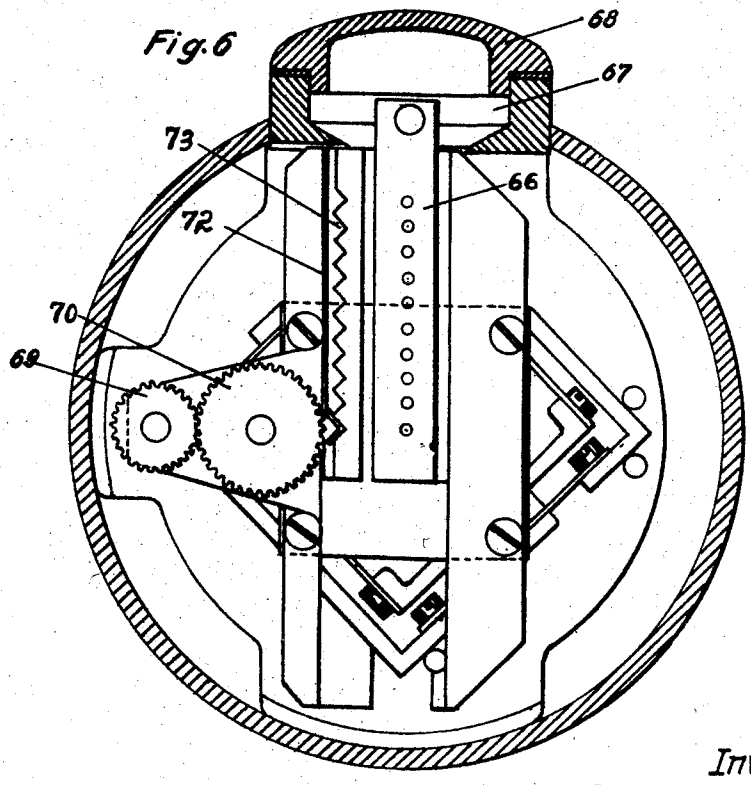


Fig. 5

Fig. 6



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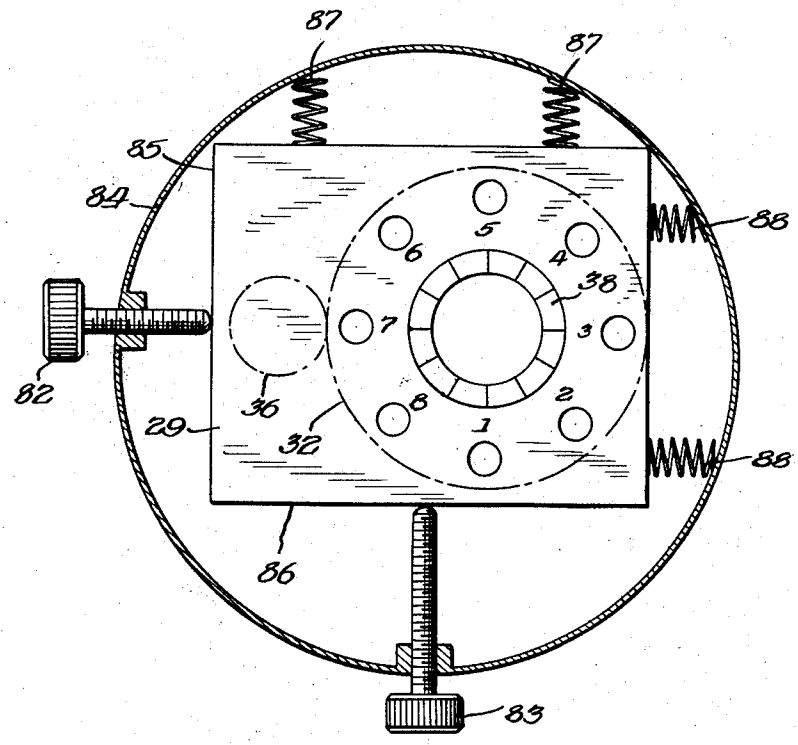
ELECTRON MICROSCOPE HAVING A MULTIPLE-SPECIMEN CARRIER

Filed July 23, 1951 4 Sheets-Sheet 4

Fig. 7.



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United States Patent Office 2,849,619
Patented Aug. 26, 1958

2,849,619

ELECTRON MICROSCOPE HAVING A MULTIPLE-SPECIMEN CARRIER

Manfred Eisfeldt, Berlin-Tempelhof, Germany, assignor to Siemens & Halske Aktiengesellschaft, Munich, Germany, a corporation of Germany

Application July 23, 1951, Serial No. 238,182
In Germany October 1, 1948

Public Law 619, August 23, 1954
Patent expires October 1, 1968

23 Claims. (Cl. 250—49.5)

This invention relates to electron microscopes and is particularly concerned with an electron microscope having a multiple-specimen carrier.

In electron microscopes there arises frequently the problem to undertake in quick succession a series of examinations of several specimens. Prior suggestions propose for such cases expedients which constitute incomplete solutions for the problem. Special specimen gates are usually provided which are adapted to receive for examination at any one time only a single specimen support or cartridge. If it is desired to undertake with such apparatus series investigations involving a plurality of specimens, it is therefore necessary to separately introduce each successive specimen.

There has been proposed, for use in connection with electron microscopes, a rotatably disposed multiple-specimen supporting device which permits to place the specimens carried thereby successively in position for examination. This proposed arrangement dispenses with the specimen gate. The individual specimen supports or cartridges are introduced into the apparatus by fully opening the vacuum chamber to the outside and successively directly placing the cartridges on the supporting device. The means for the lateral shifting of any specimen are in such apparatus so constructed that each specimen cartridge can be moved within its rotatable holder in one lateral direction against the force of a biasing spring.

The invention provides for use with electron microscopes a multiple-specimen supporting device which is disposed movable crosswise of the beam axis in two intersecting directions or planes, for the purpose of obtaining the lateral shifting of a specimen in its position of examination. The new arrangement results in a particularly simple construction, because it eliminates the necessity of providing special lateral shifting means for the individual specimen cartridge.

An object of the invention is to provide a base or carrier which is laterally shiftable and coacts with a holder adapted to receive a plurality of specimens. The holder, in turn, is adjustable relative to the carrier. It is possible, in accordance with the invention, to provide the new device with a multiple-specimen holder which is rotatable or linearly movable.

The invention is not inherently limited to electron microscopes; certain features may be used in other beam projection or beam deflection apparatus. For example, if an electron beam deflection tube is assumed, which does not have image-forming lenses in its beam path in back of the specimen, it will suffice to provide for displacement of the rotary holder or of the laterally movable holder in a plane perpendicular to the optical axis The conditions are different, for example, in an electron microscope which is provided with image-forming lenses. The objective nearest to the specimen is in such microscopes often so constructed that the actual lens range

is not centrally of the lens. With a simple rotary specimen holder a specimen would, in examination position, be in front of the objective, but its spacing from the effective lens range would be too great for utilizing the short focal length of such lens which is, for example, present in the case of pole shoe lenses.

This difficulty is easily overcome by the new device, simply by forming the laterally adjustable base member as a journal for a pivotal or swingable carrier and in turn journalling on such carrier the rotatable holder which receives the specimens. The swinging motion of the holder can then be controlled by cam means so as to shift a specimen, in its position for examination, in the direction of the objective. The result is a rotatable holder for receiving the specimen cartridges which can execute, in addition to its rotary motion, such a pivot motion that the cartridge which is to be placed in position for the examination of its specimen is rotated into the optical axis of the apparatus and is at the same time shifted in a direction axially of the objective. In order to obtain, incident to such displacement, the necessary structural rigidity, the invention contemplates the use of one or more springs for coaction with the pivotal part, so as to hold such part in all positions firmly against the cam means.

The invention also provides suitable indicia marks on the adjustable holder, e. g., numbers referring to the specimens, which can be observed through a sight window so as to ascertain at any time which of the specimens is in position for examination. The sight window may be provided near or within a door which serves for sealing an opening through which the specimens are placed on the adjustable holder.

The new device may, in accordance with another object, be constructed for executing series examinations of chemical reactions of specimens by introducing a reaction gas. The carrier which forms the journal for the adjustable specimen holder is for this purpose provided with a duct for feeding a gaseous medium through the holder to a specimen during the examination thereof. A number of such ducts may be provided in the specimen carrier, corresponding to the number of specimens or specimen cartridges or the like carried or supported by the holder, and the linear or rotary journal formed by the carrier with the holder may be constructed so as to operate as aswitching valve which controls the gas feed at any time only to the specimen disposed for examination.

The reaction chamber for the specimen under examination may be formed by two narrow shutters for the passage of the beam, which close the specimen chamber with respect to the remainder of the vacuum space. This feature may be particularly advantageously realized by disposing the chamber shutter for the beam inlet passage in the specimen cartridge, while the beam outlet shutter is disposed in the adjustable part, that is, in the rotatable holder which supports the specimen cartridges.

The objects indicated above and additional objects and features will appear more clearly from the description which will presently be rendered with reference to the accompanying drawings. These drawings show, by way of examples of the invention, in diagrammatic representation, embodiments of multiple-specimen supporting devices for coaction with electron microscopes equipped with magnetostatic lenses.

Fig. 1 is a partial longitudinal sectional view through an electron microscope equipped with the new device which forms a unit therewith;

Fig. 2 shows a sectional view taken perpendicular to the view of Fig. 1, approximately along the line 2—2 thereof;

Fig. 3 illustrates a sectional view of the chamber in which is disposed the new device, as seen when looking

in the direction of the arrows approximately along line 3—3 of Fig. 2;

Fig. 4 shows, in sectional view, a specimen support or cartridge and the associated part of the adjustable holder therefor;

Fig. 5 is a diagrammatic sectional view showing a modified embodiment of a specimen supporting device which is removable from the associated microscope;

Fig. 6 illustrates a transverse section through the arrangement of Fig. 5, showing the specimen holder and associated parts in plan view, as seen when looking in the direction of the arrows along line 6—6 of Fig. 5; and

Fig. 7 shows an example of adjusting means that may be provided along the line 7—7 in Fig. 2 for adjusting the specimen holder shown therein.

Numeral 11 in Figs. 1–3 indicate the beam-generating portion of the electron microscope. Connected with this portion 11 is a high-voltage cable 12 for conducting thereto the required current. Connected with the beam generator is a casing 13 forming a chamber in which is disposed the new multiple-specimen supporting device. From the casing 13 extends the exhaust duct 14 which terminates in a suitable, not illustrated vacuum pump. Numeral 15 indicates the frame or housing for the lens system. The microscope is assumed to be a two-stage electron microscope equipped with pole shoe lenses which are excited by annularly shaped permanent magnets 16 and 17. These permanent magnets are disposed between soft iron plates 18 and 19 which serve to conduct to the pole shoe lens system the magnetic flux. The lens system proper is formed by an inner tubular insert comprising the parts 20, 21, 22 and 23. The parts 20 and 22 are made of brass, and the parts 21 and 23 of magnetic material. These parts 20—23 are assembled to form a vacuum-tight tube or channel for the passage of the electron beam. The pole shoe systems are disposed inside of this vacuum tight tube.

In Fig. 1 there are visible the two pole shoes 24, 25 of the objective, and one pole shoe 26 of the projective. Numeral 27 designates a tubular shell which provides additional support for the two soft iron disks 18, 19. In order to obtain a good evacuation of the apparatus portion extending to the left of the illustrated parts, there is provided a tube 28 forming a duct which extends in parallel with the beam passage channel of the lens system.

The multiple-specimen supporting device comprises the base or mounting member 29 which is equipped with and coacts with associated adjusting means. Any suitable known adjusting means may be used for adjusting or moving the base member 29 in two mutually crossing or intersecting directions or planes, crosswise of the optical axis, against the pressure of suitable biasing springs. The shifing or adjusting means for the base member 29 may comprise a first guideway on which the member 29 is displaceable in one direction, and a second guideway underneath the first guideway for moving the first guideway, and therewith the base member 29, in the other direction. A biasing spring may be provided to bias the base member 29 on the first guideway in a normal direction, and similar spring means may be provided for biasing the first guideway in a normal direction on the second guideway. Suitable stop means may also be provided for limiting the displacement of the relatively movable parts. The adjustment motions may be transmitted to these parts by any desired and suitable drive or adjustment means, part of which extends to the outside in a vacuum-tight manner relative to the vacuum wall of the apparatus.

The adjusting means may, for example, take form as indicated in Fig. 7, showing in simplified manner only the essential parts referred to in the foregoing paragraph. Parts corresponding to parts shown in Figs. 1 and 2 are similarly referenced. Accordingly, numeral 29 designates the base member, 32 the specimen holder, and 38 are cams which will presently be described more in detail. These parts are disposed within the chamber of the microscope as indicated in Figs. 1, 2 and 3. Numeral 84 indicates the housing wall. Screws 82 and 83 operate respectively against the sides 84, 85 of the base member, the screws extending in vacuum-tight manner to the outside of the housing 84. Springs 87 and 88 operate respectively against the sides of the base member 29 lying opposite the sides 85, 86. Numeral 36 is the gear wheel also shown in Fig. 2, for rotating the specimen holder 32 having seats or sockets marked 1 to 8 for receiving specimen cartridges to be described later on. The base 29 and therewith the specimen holder 32 may be adjusted, by means of the screws 82, 83 in two mutually intersecting directions so as to place specimens in proper examining position.

The base member 29 forms a journal for a rotatable shaft 30 forming a pivot for the carrier 31. On the carrier 31 is journalled the turntablelike holder 32 which is adapted to receive a plurality of specimen cartridges, for example, eight cartridges, of which two cartridges 33 and 40 are visible in Fig. 1. The rotation of the holder is accomplished from the outside by means of the shaft 34 (Fig. 2) over a flexible shaft coupling portion 35 and gear wheel 36 which meshes with the gear teeth 37 provided peripherally of the rotatable holder 32.

On the side of the holder 32 which faces the base member 29 are provided annularly disposed cams 38 which coact with a relatively stationary bracket 39 extending from the base member 29 in such a manner that the holder 32 with its carrier 31 is caused to execute, in addition to its rotary motion under the control of the drive 34, also a pivotal or tilting motion about the axis 30, so that it assumes alternately the full-line position in a plane extending perpendicular to its axis and the dotted-line position in a plane extending at an angle to the axis, as indicated in Fig. 1. In the full-line position of the holder the cartridge 40 is in its operating position, that is, in its position for examination of the specimen, which position is reached responsive to the swinging motion of the holder about the axis 30, placing the envelope or cartridge as close as possible to the effective range of the objective.

In order to fix any of the cartridges firmly in operating position against shocks and vibrations, there are provided two strong springs 41, 42 which hold the cams 38 of the swingable parts 31, 32 firmly in engagement with the cam-controlled bracket 39.

Fig. 3 shows the rotatable holder as viewed in the direction of the beam generator 11. The concentric circles marked 1–8 designate the pocketlike portions of the rotatable holder 32 for receiving the specimen cartridges. The vacuum wall of the tube is, in the vicinity of the specimen supporting device, provided with a laterally facing specimen insertion or loading opening 43 which may be sealed by means of the door 44. A sight window 45 (see Fig. 1) may be provided in the door 44 through which may be seen the peripheral underside of the rotatable holder having the indicia numerals 1–8 indicated in Fig. 3. The numerals as viewed by the observer refer always to the diagonally oppositely disposed specimen cartridge, thus furnishing clear and positive information as to the cartridge which is at any time in operating position or in position for examination of its specimen.

A channel 46 (Fig. 1) is formed in an axial extension of the carrier 31, this channel coacting with means forming a feed duct 47 through which a gaseous medium may be fed during the electron optical examination. The feed duct may be carried to the outside in any suitable manner, for the purpose of injecting the desired gaseous medium. The rotatable holder 32 is provided with as many ducts 48 as there are specimen cartridges. The holder 32 forms with the carrier 31 a rotary valve seat which functions as a valve-switching means. The gaseous medium will thus be fed only to the cartridge containing the specimen which is at any time in position for examination.

The construction of the reaction chamber will be ap-

parent from Fig. 4. The chamber **49** is closed relative to the adjacent vacuum space, by two beam passage shutters **50, 51.** The beam inlet shutter **51** is, as shown, disposed within the cartridge comprising the parts **52, 53.** Clamped between these two parts is the specimen-carrying member **54.** The beam outlet shutter **50** is disposed in the corresponding pocketlike part of the specimen holder **32.** Bores **55, 56** are provided in the cartridge parts **52, 53** through which the reaction gas can reach the opposite side (right side, as seen in Fig. 4) of the specimen placed on the member **54.** Numerals **57, 58** designate suitable gaskets, for example, rubber sealing gaskets.

The rotatable holder **32** for the individual specimen cartridges is, in the above described embodiment, combined with the pivotally mounted carrier **31** and forms a unit therewith. The holder is loaded by inserting the individual cartridges through the opening **43** (Fig. 3).

In accordance with an object of the invention, the holder may be removable from the apparatus. A structurally particularly simple embodiment of this kind may be obtained by making the specimen holder removable from the carrier over a guideway along which it may be adjusted crosswise of the beam axis. It is of course also possible, and is contemplated by the invention, to journal the holder rotatably on the carrier. The wall of the beam projection apparatus may be provided with an opening through which the specimen holder may be inserted and removed alone or jointly with the carrier therefor. A suitable lid may be provided for sealing such opening.

Figs. 5 and 6 show an example of an embodiment which exhibits these features. Within the housing **61** are disposed two image-forming lenses operating with permanent magnet excitation, namely, the objective **62** and the projective **63.** Upon the upper side of the upper pole shoe of the objective is arranged the adjustable carrier **64** which is held against the pole shoe by means of the springs **65.** The means for shifting or adjusting the carrier in two directions crosswise of the beam axis has been omitted, to keep the drawing as simple as possible. Any suitable and approved means may be used for this purpose, in accordance with the corresponding part of the description of the previous embodiment. A multiple-specimen holder **66** is movably disposed on the carrier **64** by means of guideways. The holder may receive a plurality of specimens, one next to the other. A lateral opening **67** is provided in the casing wall of the lens bodies through which the specimen holder **66** may be inserted or removed for loading or for discharge purposes, after opening the sealing door or lid **68.** For the step-by-step displacement or adjustment of the holder there is provided a gear drive **69—70,** also comprising a drive shaft **71,** which is in any suitable and approved vacuum-tight manner extended to the outside and provided with a suitable handle. Associated with the bar-shaped part of the specimen holder **66** is a ratchet **73** cooperating with the spring **72.** The coaction of the spring with the ratchet transmits shocks which are felt on the handle of the drive, thereby signalling and indicating to the operator the positioning, in its operative position, of any specimen to be examined. If desired, there may be provided suitable indicating means for coaction with the drive, for directly, for example, visually, indicating to the operator the particular specimen which is at any time positioned for examination.

Gas-feed means may be provided in the embodiment shown in Figs. 5 and 6 analogous to those described in connection with Figs. 1–4.

The new multiple-specimen supporting device is particularly suitable for use in connection with electron microscopes and has been described in the foregoing in conjunction with such microscopes. However, it is understood that the invention is not inherently limited to electron microscopes, and that reference to such specific use has been made to indicate examples only.

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

I claim:

1. In an electron microscope, a multiple-specimen supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carrier for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination approximately relative to the electron beam, means for movably mounting said carrier for fine adjustment in two mutually intersecting directions extending crosswise of the beam axis, and second means for moving said carrier for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means.

2. The structure as set forth in claim 1, wherein the means for movably mounting said carrier includes a base member which is mounted for adjustment in said mutually intersecting directions, said base member constituting a support for said carrier and said holder being movably mounted on said carrier.

3. The structure as set forth in claim 1, wherein the means for movably mounting said carrier includes a base member which is mounted for adjustment in said mutually intersecting directions, said base member constituting a support for said carrier and said holder being rotataly mounted on said carrier.

4. In an electron microscope or the like, a chamber formed by walls of said microscope, a multiple-specimen supporting device disposed in said chamber, said device comprising a carrier, a holder for receiving a plurality of specimens for examination, means for movably mounting said holder on said carrier for movement in a plane extending perpendicular to the axis of the electron beam, means operable from the outside for moving said holder to position said specimens one by one selectively in approximate position relative to the electron beam path, means for thereafter positioning the respective specimen in accurate position for examination and means for indicating to the operator the specimen which has been positioned for examination in the beam path of said microscope.

5. In an electron microscope or the like, a chamber formed by walls of said microscope, a multiple-specimen supporting device disposed in said chamber, said device comprising a carrier, a holder for receiving a plurality of specimens for examination, means for movably mounting said holder on said carrier for movement in a plane extending perpendicular to the axis of the electron beam, means operable from the outside for moving said holder to position said specimens one by one selectively in approximate position relative to the electron beam path, means for thereafter positioning the respective specimen in accurate position for examination, and means for indicating to the operator the specimen which has been positioned for examination in the beam path, a duct being formed in said carrier, means for feeding a fluid medium to said duct, a passage being formed in said holder extending from each of the specimens thereon for alignment with said duct in said carrier when a specimen is positioned for examination so as to conduct said fluid medium to the corresponding specimen.

6. In an electron microscope or the like, a chamber formed by walls of said microscope, a multiple-specimen supporting device disposed in said chamber, said device comprising a carrier, a holder for receiving a plurality of specimens for examination annularly peripherally thereof, means for rotatably mounting said holder on

said carrier, means operable from the outside for rotating said holder to position said specimens selectively one by one relative to the electron beam path of said microscope, means for tiltably mounting said carrier, cam means extending from said holder, and stationary bracket means for camming coaction with said cam means when said holder is rotated for tilting said carrier to tilt said holder so as to move each specimen into its examining position closely adjacent a lens disposed in the beam path.

7. An electron microscope having a multiple-specimen supporting device disposed in a chamber formed therein, said device comprising a holder for removably receiving a plurality of envelopes each containing a specimen for examination, a carrier for supporting said holder, a base member for supporting said carrier, means for movably mounting said base member, means for movably mounting said carrier on said base member, means for movably mounting said holder on said carrier, means operable from the outside for moving said holder for the purpose of selectively positioning a specimen thereon in the electron beam path of said microscope, cam means extending from said holder, coacting stationary cam means extending from said base member, said cam means coacting incident to the movement of said holder for imparting a tilting motion to said carrier so as to tilt the same and therewith the holder thereon for the purpose of adjusting the selectively positioned specimen axially of the beam path, and means for moving said base to move the carrier thereon and therewith the holder on said carrier to adjust the selectively positioned specimen on said holder laterally of the beam path.

8. In an electron microscope, a holder for receiving a plurality of specimens for examination in the path of the electron beam, first means for moving said holder to position any selected specimen into approximate position relative to the beam path, and second means for thereafter moving said holder to position the selected specimen accurately relative to the beam path.

9. The structure defined in claim 8, comprising means cooperating with said first means for securing the selected specimen in the adjusted position relative to the beam path.

10. The structure defined in claim 8, comprising a carrier for rotatably mounting said holder.

11. In an electron microscope, a multiple-specimen supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carrier for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination relative to the electron beam, second means for movably mounting said carrier for fine adjustment in two mutually intersectiong directions extending crosswise of the beam axis for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means, said second means comprising a base member which is mounted for adjustment in said mutually intersecting directions, means for pivotally securing said carrier on said base member, and means for rotatably mounting said holder on said carrier.

12. The structure and cooperation of elements according to claim 11, comprising means for controlling the movement of said holder whereby any specimen which is moved in position of examination is advanced axially of the beam axis to place such specimen in close proximity to the lens disposed along said axis.

13. In an electron microscope, a multiple-specimen supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carrier for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination relative to the electron beam, second means for movably mounting said carrier for fine adjustment in two mutually intersecting directions extending crosswise of the beam axis for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means, said second means comprising a base member, means for rotatably mounting said holder on said carrier, cam means extending from said holder, a relatively stationary bracket for coaction with said cam means whereby any specimen which is moved in position for examination is advanced axially of the beam axis to place it in close proximity to a lens disposed along said beam axis, and spring means for exerting pressure on said pivotally secured carrier to hold the cam means thereof in firm engagement with said relatively stationary bracket.

14. In an electron microscope, a multiple-specimen supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carrier for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination relative to the electron beam, second means for movably mounting said carrier for fine adjustment in two mutually intersecting directions extending crosswise of the beam axis for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means, an opening being formed in a wall forming said chamber, for loading said specimen holder, means for sealing said opening, indicia marks carried by said holder to designate the respective specimens supported thereby, and a sight window in said sealing means for observing said indicia marks from the outside to ascertain the specimen which is at any time positioned for examination.

15. In an electron microscope, a multiple-specimen supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carrier for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination relative to the electron beam, second means for movably mounting said carrier for fine adjustment in two mutually intersecting directions extending crosswise of the beam axis for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means, a passage being formed in said holder, and duct means for feeding fluid medium by way of said passage to a specimen which has been positioned for examination.

16. In an electron microscope, a multiple-specimen supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carrier for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination relative to the electron beam, second means for movably mounting said carrier for fine adjustment in two mutually intersecting directions extending crosswise of the beam axis for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means, a plurality of passages being formed in said holder, one for each of the specimens supported thereby, a duct being formed in said carrier for alignment with any one of said passages, and means for feeding fluid medium to said duct for flow thereof through one of said passages to the specimen which has been positioned for examination.

17. In an electron microscope, a multiple-specimen

supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carrier for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination relative to the electron beam, second means for movably mounting said carrier for fine adjustment in two mutually intersecting directions extending crosswise of the beam axis for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means, a cartridge for each specimen, there being recesses formed in said holder forming individual seats for receiving the respective cartridges, each seat having a bottom wall, and a beam inlet shutter for each cartridge disposed in the bottom wall of the associated seat therefor.

18. In an electron microscope, a multiple-specimen supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carrier for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination relative to the electron beam, second means for movably mounting said carrier for fine adjustment in two mutually intersecting directions extending crosswise of the beam axis for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means, a cartridge for each specimen, there being recesses formed in said holder forming individual seats for receiving the respective cartridges, each seat having a bottom wall, a beam inlet shutter disposed in each cartridge, each cartridge forming with the bottom wall of its seat a chamber, a duct being formed in said holder for conducting a gaseous medium to each such chamber.

19. In an electron microscope, a multiple-specimen supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carrier for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination relative to the electron beam, second means for movably mounting said carrier for fine adjustment in two mutually intersecting directions extending crosswise of the beam axis for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means, a cartridge for each specimen, there being recesses formed in said holder forming individual seats for receiving the respective cartridges, each seat having a bottom wall, a beam inlet shutter disposed in each cartridge, each cartridge forming with the bottom wall of its seat a chamber, passages being formed in said holder which terminate in the respective cartridge chambers for conducting fluid medium thereinto, a duct being formed in each cartridge for communication with the passage in said holder which terminates in the associated cartridge chamber.

20. In an electron microscope, a multiple-specimen supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carrier for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination relative to the electron beam, second means for movably mounting said carrier for fine adjustment in two mutually intersecting directions extending crosswise of the beam axis for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means, said holder being removable, and means forming a door in a wall of said chamber for gaining access to said holder.

21. In an electron microscope, a multiple-specimen supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carried for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination relative to the electron beam, second means for movably mounting said carrier for fine adjustment in two mutually intersecting directions extending crosswise of the beam axis for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means, and guideway means for disposing said holder on said carrier for straight-line motion crosswise of the beam axis.

22. In an electron microscope, a multiple-specimen supporting device, said device being disposed within a chamber of said microscope formed by walls thereof, said device comprising a movable holder for receiving a plurality of specimens, a carrier for supporting said holder, first means for moving said holder to dispose any one of said specimens for examination relative to the electron beam, second means for movably mounting said carrier for fine adjustment in two mutually intersecting directions extending crosswise of the beam axis for the purpose of adjusting said holder to obtain final positioning relative to the beam axis of any specimen which has been placed in approximate position of examination by moving said holder by said first means, said means for moving said holder comprising a gear, drive means for said gear, a ratchet operated by said gear for moving said holder, and a spring actuated by said ratchet for transmitting signals to the operator which indicate the positioning of said specimens.

23. In an electron microscope, a holder for receiving a plurality of specimens for examination in the path of the electron beam, first means for moving said holder to position any selected specimen into approximate position relative to the beam path, second means for thereafter moving said holder to position the selected specimen accurately relative to the beam path, and a carrier for mounting said holder for rectilinear motion thereon.

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