PATENT SPECIFICATION 819,899

DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Improvements in and relating to Optical Microscopes.

We, C. BAKER OF HOLBORN LIMITED, a British Company, of 244 High Holborn, London, W.C.1, and MICHAEL GRANT LEES CURTIES, a British Subject, of the Company's address, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :

The invention relates to optical microscopes of the kind (hereinafter referred to as the kind described) having a plurality of actuating means for effecting respectively a plurality of different adjustments of the microscope during use thereof. Examples of such different adjustments are coarse focusing movements of the lens tube, fine focusing movements of the lens tube, focusing movements of the sub-stage condenser assembly, and adjustment of the intensity of the light used to illuminate a specimen under examination in the microscope.

It is an object of the invention to provide an improved microscope.

The invention provides an optical microscope of the kind described, in which each actuating means includes a manually operable control member, a plurality of which members are positioned and arranged in a group or cluster on a panel.

Preferably the control member for each of the actuating means which are adjusted during use of the microscope, that is during the examination of a specimen, is positioned and arranged in the group or cluster on the panel.

Preferably the microscope comprises a base member having a portion of its surface shaped and arranged to provide the panel.

Preferably one or more of the actuating means comprises a pivoted lever or arm and cam means for effecting pivotal movement of the lever or arm. The cam means may comprise a cam follower secured to the lever or arm and a cam surface, for example a helical cam surface, and the construction and arrangement being such that relative movement between the cam follower and the cam surface causes pivotal movement of the lever or arm about its pivot.

The cam surface is preferably provided by a helical groove in the peripheral surface of a driving member so that rotary movement of the driving member will cause relative movement between the groove and the lever or arm with consequential pivotal movement of the lever or arm as aforesaid, such rotary movement of the driving member being effected by adjustment of one of the aforesaid control members.

When it is desired to be able to effect fine adjustment to the microscope (e.g. for fine focusing movements of the lens tube, in addition to coarse focusing movements thereof), the control member of a fine-focusing movement actuating means may be arranged to effect movement of the coarse-focusing movement driving member, by means of a relatively fine screw, in the axial direction whereby very small pivotal movement of the lever or arm can be effected with a correspondingly fine movement of the lens tube.

Two specific examples of microscopes embodying the invention will now be described by way of example. The first example will be described with reference to the drawings filed with the Provisional Specification, which are somewhat diagrammatic and in which :—

Figure 1 is a longitudinal sectional view through the microscope, with parts of the mechanism omitted for the sake of clarity ; and

Figure 2 is a diagrammatic view illustrating the actuating means, and with reference to the accompanying drawing, hereinafter referred to as Figure 3, which is a perspective view of the microscope with the doors open.

In this example, the microscope is a research microscope and has six manually operable control members for effecting the following adjustments to the microscope.

(1) coarse focusing of the lens tube ;
(2) fine focusing of the lens tube ;
(3) backward and forward horizontal movement of the stage top ;
(4) transverse horizontal movement of a specimen under examination by the microscope ;
(5) focusing movement of the sub-stage condenser assembly ;
(6) adjustment of the intensity of the light used to illuminate the specimen.

The microscope is further described in our co-pending Application No. 13262/56 (Serial No. 819,900) of even date and comprises a rigid vertical back member 11 comprising two vertical L-sectioned pillars interconnected by a web which is mounted on a horizontal base member 12. Doors 10 are hinged to the back member 11 and the specimen to be examined is illuminated from a lamp 30 through a lens system 30^{1} having an aperture control and a reflector 30^{11}.

The base member 12 is of inverted box-shape, the front portion of the upper surface of that member being inclined downwardly to provide a panel 13 on which the various control members are mounted. In this example, each control member is provided as a circular knob having serrations on its peripheral surface to facilitate rotation thereof.

In this example, the lens tube 14 is carried by a slide member 15 which passes rearwardly through an aperture in the web of the back support 11 and which is mounted on a linear ball slide for vertical movement relative to the back member towards and away from the stage 16 of the microscope. One end of a vertically-extending connecting rod 17 abuts against the lower surface of a lug extending outwardly from the slide member 15 and the other end of that rod 17 abuts against one end 18 (see Figure 2) of a substantially horizontal lever 19 pivoted intermediate its ends. The other end 21 of the pivoted lever 19 carries a cam follower or followers which engages with a helical cam groove 23 in the surface of a generally cylindrical driving member 24. This member 24 extends through a lining bush 25 passing through the panel 13 and is provided with an axial counter-bore 26 which receives an annular dependent flange 27 on the control member 28 for effecting coarse adjustments of the lens tube 14. By rotating this control member 28 the driving member 24 will be rotated and will cause relative movement between the helical groove 23 and the lever 19, resulting in the lever 19 being tilted about its pivot. Such movement of the lever 19 will cause the vertical connecting rod 17 to be moved with consequent movement of the lens tube 14. If the end of the lever engaged by the rod 17 is moved downwardly, the weight of the slide member 15 will cause the rod 17 to remain in contact with the lever 19 and consequently the lens tube 14 will move downwardly and if that end of the lever 19 is moved upwardly the slide member 19 will be pushed upwardly by the rod 17 with consequential movement of the lens tube 14.

A second control member or knob 31, for effecting fine focusing movements of the lens tube 14, is mounted coaxially above the coarse focus control member 28 and is separated therefrom by a circular ball bearing 32. The second knob 31 is carried by a shaft 33 which extends coaxially through the driving member 24 and engages with an internal thread on a cylindrical member 34 which projects into an axially-extending bore of the driving member 24 and is carried by a plate 35 secured to the base member 12. A compression spring 36 extends between and abuts against the end of the cylindrical member 34 and an internal flange on the driving member 24.

On rotating the second knob 31 the shaft 33 will be rotated and due to its threaded engagement with the cylindrical member 34 will be moved axially. If the second knob 31 is rotated so that the shaft 33 moves upwardly, the compression spring 36 will urge the driving member 24 upwardly and will consequently cause the lever 19 to be tilted about its pivot and the lens tube 14 will be moved as aforesaid. If the second knob 31 is rotated so that the shaft 33 moves downwardly, the second knob 31 will press against the first knob 28 and force the driving member 24 downwardly against the bias of the spring 36 and will cause the lever 19 to be tilted about its pivot in the reverse direction.

The sub-stage condenser assembly generally indicated at 37 is similarly carried by a slide member which is mounted in a linear ball slide for movement towards and away from the stage of the microscope as described in the said co-pending patent Application No. 13262/56 (Serial No. 819,900). One end of a second vertically-extending connecting rod (not shown) abuts against the lower surface of the slide member and the other end of that rod abuts against one end 38 of a bow-shaped, substantially horizontal lever 39 pivoted intermediate its ends. The other end of this lever 39 carries a cam follower or

followers which engage with a helical groove 41 in the surface of a second generally cylindrical driving member 42. This member extends through a lining bush passing through the panel 13 and receives the control member 43 for effecting focusing movements of the sub-stage condenser assembly 37. The sub-stage condenser assembly is moved in the same manner as the lens tube.

As described in the said co-pending patent Application No. 13262/56 (Serial No. 819,900) the stage top is mounted on a horizontal stage plate carried by the base member 12 by two parallel, horizontally spaced linear ball slides for backward and forward horizontal movement relative to the microscope. A dependent flange is provided at the rear edge of the stage top to engage with one end 44 of the longer arm 45 of a pivoted bell-crank lever 46, that arm 45 extending substantially vertically. The end of the shorter horizontal arm 47 of the bell-crank lever 46 is engaged by an upwardly-directed lug 48 on one end of a horizontal lever 49 pivoted intermediate its ends. The other end of the pivoted lever 49 carries a cam follower or followers which engage with a helical cam groove 51 in the peripheral surface of a substantially cylindrical driving member 52. This member 52 extends through a lining bush 53 in the panel 13 and is provided with an annular counter-bore 54 which receives an annular flange 55 on the undersurface of the control member 56 for effecting horizontal movement of the stage top.

By rotating this knob 56 the lever 49 will be caused to tilt, due to the engagement of the pin and helical groove 51 and will consequently cause the bell-crank lever 46 to rotate about its pivot. The rotational movement of the longer arm 45 of the bell-crank lever 46 will cause the stage top to be moved horizontally.

In this example, a specimen under examination, e.g. a slide, is held in position on the stage top 65 by means of one or more clips 74 which extend forwardly over the stage top. These clips are carried by a horizontal member which is mounted on the stage plate by two parallel, vertically spaced ball slides for movement laterally relative to the microscope and the arrangement is such that lateral movement of the clips causes the specimen to be moved across the stage top.

The transverse movement of the clips is effected by means of a vertically-extending arm 57 provided with a lug 58 at its upper end which engages with the member carrying the clips. This arm 57 is carried by a horizontal, forwardly-extending rod 60 provided with a second arm 59 which extends horizontally and radially away from the rod. This second arm 59 carries a cam follower or followers which engages with a helical cam groove 61 (Figure 1) on the peripheral surface of a further substantially cylindrical driving member 62. This member is provided with a coaxial cylindrical extension 63 which passes coaxially through the driving member 52 and knob 56 for effecting horizontal movement of the stage top, and at its outer end engages with the control member or knob 64 for effecting horizontal movement of the clips.

By rotating this knob 64, the horizontal arm 59 will be rotated and will cause the rod 58 to rotate. Such rotation of the rod 58 will cause the vertically-extending arm 57 to pivot which will cause the clips to move horizontally.

It will be appreciated that the manner in which the vertical arm 57 engages the member carrying the clips and the manner in which the longer arm 45 of the bell-crank lever 46 engages the stage top, are such as to permit the two respective adjustments to the microscope to be made independently.

A further control member or knob 20 is mounted on the panel to control a variable resistor in order to adjust the intensity of the light used to illuminate the specimen.

In the second example the microscope is a so-called " Students Microscope ". In this type of microscope the only adjustments that need be made are coarse and fine focusing movements of the lens tube.

As in the previous example the microscope comprises a rigid back member and an inverted box-like base member. The lens tube is carried by a slide member mounted in a linear ball slide bearing for vertical movement relative to the back member towards and away from the stage of the microscope. The focusing movements of the lens tube are effected from two coaxial control knobs mounted as a pair one above the other on a control panel as described in the previous example. The two control knobs thus form a group of two control members.

The invention is not limited to the constructional details of the foregoing two examples.

WHAT WE CLAIM IS:—

1. An optical microscope of the kind described, in which each actuating means includes a manually operable control member, a plurality of which members are positioned and arranged in a group or cluster on a panel.

2. An optical microscope as claimed in Claim 1, in which the control member for each of the actuating means which are adjusted during use of the microscope, is positioned and arranged in the group or cluster on the panel.

3. An optical microscope as claimed in Claim 1 or Claim 2, in which the microscope comprises a base member having a portion

of its surface shaped and arranged to provide the panel.

4. An optical microscope as claimed in any one of Claims 1 to 3, in which one or more of the actuating means comprises a pivoted lever or arm and cam means for effecting pivotal movement of the lever or arm.

5. An optical microscope as claimed in Claim 4, in which the cam means comprise a cam surface and a cam follower secured to the lever, the construction and arrangement being such that relative movement between the cam surface and the cam follower causes pivotal movement of the lever or arm, as aforesaid.

6. An optical microscope as claimed in Claim 5, in which the cam surface is provided by a helical groove in the peripheral surface of a cylindrical driving member, whereby rotary movement of the driving member will cause relative movement between the cam surface and the cam follower, such rotary movement of the driving member being effected by adjustment of one of the aforesaid control members.

7. An optical microscope as claimed in any one of Claims 1 to 6, in which one of the actuating means is for effecting coarse focusing movements of the lens tube and a second actuating means is for effecting fine focusing movements of the lens tube.

8. An optical microscope as claimed in Claim 7, in which the coarse-focusing movement actuating means is as claimed in Claim 6, and in which the control member of the fine-focusing movement actuating means is arranged to effect movement of the coarse-focusing movement driving member, by means of a relatively fine screw, in the axial direction whereby very small pivotal movement of the lever or arm can be effected with a correspondingly fine-focusing movement of the lens tube.

9. An optical microscope as claimed in Claim 8, in which the lever or arm is pivoted about a horizontal axis, in which the lens tube is carried by a vertically movable slide member, and in which pivotal movement of the lever is transmitted to the slide member by a strut or rod.

10. An optical microscope as claimed in Claim 9, in which pivotal movement of the lever in one sense causes upward movement of the slide member and pivotal movement of the lever in the reverse sense permits downward movement of the slide member.

11. An optical microscope as claimed in any one of Claims 1 to 10, in which one of the actuating means is for effecting movement of the sub-stage condenser lens, said sub-stage condenser actuating means being as claimed in any one of Claims 4 to 6.

12. An optical microscope as claimed in Claim 11, in which the lever or arm of said sub-stage condenser actuating means is pivoted about a horizontal axis, in which the condenser lens is carried by a vertically-movable lens-carrier member, and in which pivotal movement of the lever is transmitted to the lens-carrier member by a strut or rod.

13. An optical microscope as claimed in Claim 12, in which pivotal movement of the said lever in one sense causes upward movement of the lens-carrier member and pivotal movement of the lever in the reverse sense permits downward movement of the lens-carrier member.

14. An optical microscope as claimed in any one of Claims 1 to 13, in which one of the actuating means is for effecting backward and forward movements of the stage top relative to the microscope, said stage-top actuating means being as claimed in any one of Claims 4 to 6.

15. An optical microscope as claimed in Claim 12, in which the lever or arm of said stage-top actuating means is pivoted about a horizontal axis, in which pivotal movement of the lever is transmitted to the stage top by a bell-crank lever pivoted about a horizontal axis, one end of the bell-crank lever engaging with the lever and the other end of the bell-crank engaging with the stage top or a member secured thereto.

16. An optical microscope as claimed in any one of Claims 1 to 15, in which one of the actuating means is for effecting transverse movement of a specimen mounted on the stage top.

17. An optical microscope as claimed in Claim 16 in which a clip or clips are provided for securing a specimen in position on the stage top and in which the specimen moving actuating means is for effecting transverse movement of the clip or clips thereby to move the specimen, as aforesaid.

18. An optical microscope as claimed in Claim 15 in which the specimen-moving actuating means comprise a horizontal arm, secured to extend radially from a pivotally mounted horizontal rod which carries a vertically extending arm which engages with the clip or clips, or with a member which carries the clip or clips, whereby pivotal movement of the rod causes transverse movement of the clip or clips, such pivotal movement being effected by adjustment of the driving member or the specimen-moving actuating means.

19. An optical microscope substantially as hereinbefore described with reference to, and illustrated in, the drawings accompanying the Provisional Specification.

20. An optical microscope having a plurality of actuating means for effecting respectively a plurality of mutually different adjustments of the microscope, each of which actuating means includes a manually operable control member, the control mem-

bers being positioned and arranged in a group or cluster on a panel substantially as hereinbefore described with reference to, and illustrated in, the accompanying drawing.

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PROVISIONAL SPECIFICATION.

Improvements in and relating to Optical Microscopes.

We, C. BAKER OF HOLBORN LIMITED, a British Company, of 244 High Holborn, London, W.C.1, and MICHAEL GRANT LEES CURTIES, a British Subject, of the Company's address, do hereby declare this invention to be described in the following statement :—

The invention relates to optical microscopes of the kind (hereinafter referred to as the kind described) having a plurality of actuating means for effecting respectively a plurality of mutually different types of adjustment of the microscope during use thereof. Examples of such mutually different types of adjustment are coarse-focusing movements of the lens tube, fine-focusing movements of the lens tube, focusing movements of the sub-stage condenser assembly, and adjustment of the intensity of the light used to illuminate a specimen under examination in the microscope.

It is an object of the invention to provide an improved microscope.

The invention provides, in one of its aspects, an optical microscope of the kind described, in which each actuating means includes a manually operable control member, a plurality of which members are positioned and arranged in a group or cluster, or as a pair, at the front of the microscope (i.e. the side of the microscope which is nearest to the user of the microscope).

Preferably at least one of the actuating means comprises a mechanical linkage system or systems, the or each system comprising a pivoted lever or arm which co-operates with a helical cam surface (e.g. a screw) so that movement of the cam surface causes pivotal movement of the lever or arm about its pivot.

The cam surface is preferably provided by a wall of a helical groove in the peripheral surface of a driving member so that rotary movement of the driving member will cause relative movement between the groove and the lever or arm with consequential pivotal movement of the lever or arm as aforesaid, such rotary movement of the driving member being effected by adjustment of one of the aforesaid control members.

When it is desired to be able to effect fine adjustments to the microscope (e.g. for fine focusing movements of the lens tube, in addition to coarse-focusing movements thereof), a second control member, as aforesaid, may be arranged to effect movement of the driving member, by means of a relatively fine screw, in the axial direction whereby very small pivotal movement of the lever or arm may be effected with a correspondingly fine adjustment to the microscope.

Two specific examples of microscopes embodying the invention will now be described by way of example. The first example will be described with reference to the accompanying drawings in which :—

Figure 1 is a longitudinal sectional view through the microscope, with parts of the mechanism omitted for the sake of clarity ; and

Figure 2 is a diagrammatic view illustrating the actuating means.

In this example, the microscope is a research microscope and has six manually operable control members for effecting the following adjustments to the microscope :

(1) coarse focusing of the lens tube ;
(2) fine focusing of the lens tube ;
(3) backward and forward horizontal movement of the stage top ;
(4) transverse horizontal movement of a specimen under examination by the microscope ;
(5) focusing movement of the sub-stage condenser assembly ;
(6) adjustment of the intensity of the light used to illuminate the specimen.

The microscope is further described in our co-pending Application No. 13262/56 (Serial No. 819,900) of even date and comprises a rigid vertical back member 11 comprising two vertical L-sectioned pillars interconnected by a web which is mounted on a horizontal base member 12. The base member 12 is of inverted box-shape, the front portion of the upper surface of that member being inclined downwardly to provide a panel 13 on which the various control members are mounted. In this example, each control member is provided as a circular knob having parallel serrations on its peripheral surface to facilitate rotation thereof.

In this example, the lens tube 14 is carried by a slide member 15 which passes rearwardly through an aperture in the web of the back support 11 and which is mounted on a linear ball slide for vertical movement relative to the back member towards and away from the stage 16 of the microscope. One end

of a vertically-extending connecting rod 17 abuts against the lower surface of the slide member 15 and the other end of that rod 17 abuts against one end 18 of a substantially horizontal lever 19 pivoted intermediate its ends. The other end 21 of the pivoted lever 19 carries a pin 22 which engages with a helical groove 23 in the surface of a generally cylindrical driving member 24. This member 24 extends through a lining bush 25 passing through the panel 13 and is provided with an axial counter-core 26 which receives an annular flange 27 on the control member 28 for effecting coarse adjustments of the lens tube 14. By rotating this control member 28 the driving member 24 will be rotated and will cause relative movement between the helical groove 23 and the lever 19, resulting in the lever 19 being tilted about its pivot. Such movement of the lever 19 will cause the vertical connecting rod 17 to be moved with consequent movement of the lens tube 14. If the end of the lever engaged by the rod 17 is moved downwardly, the weight of the slide member 15 will cause the rod 17 to remain in contact with the lever 19 and consequently the lens tube 14 will move downwardly and if that end of the lever 19 is moved upwardly the slide member 19 will be pushed upwardly by the rod 17 with consequential movement of the lens tube 14.

A second control member or knob 31, for effecting fine-focusing movements of the lens tube 14 is mounted coaxially above the coarse focus control member 28 and is separated therefrom by a circular ball bearing 32. The second knob 31 is carried by a shaft 33 which extends coaxially through the driving member 24 and engages with an internal thread on a cylindrical member 34 which projects into an axially-extending bore of the driving member 24 and is carried by a plate 35 secured to the base member 12. A compression spring 36 extends between and abuts against the end of the cylindrical member 34 and an internal flange 37 on the driving member 24.

On rotating the second knob 31 the shaft 33 will be rotated and due to its threaded engagement with the cylindrical member 34 will be moved axially. If the second knob 31 is rotated so that the shaft 33 moves upwardly, the compression spring 36 will urge the driving member 24 upwardly and will consequently cause the lever 19 to be tilted about its pivot and the lens tube 14 will be moved as aforesaid. If the second knob 31 is rotated so that the shaft 33 moves downwardly, the second knob 31 will press against the first knob 28 and force the driving member 24 downwardly against the bias of the spring 36 and will cause the lever 19 to be tilted about its pivot in the reverse direction.

The sub-stage condenser assembly generally indicated at 37 is similarly carried by a slide member which is mounted in a linear ball slide for movement towards and away from the stage of the microscope. One end of a second vertically-extending connecting rod abuts against the lower surface of the slide member and the other end of that rod abuts against one end 38 of a bow-shaped, substantially horizontal lever 39 pivoted intermediate its end. The other end of this lever 39 carries a pin which engages with a helical groove 41 in the surface of a second generally cylindrical driving member 42. This member extends through a lining bush passing through the panel 13 and receives the control member 43 for effecting focusing movements of the sub-stage condenser assembly 37. The sub-stage condenser assembly is moved in the same manner as the lens tube.

In this example, the stage top is supported by a linear ball slide for backward and forward horizontal movement relative to the microscope. A portion of the stage top extends rearwardly and is provided with an elongated flange which engages with one end 44 of the longer arm 45 of a pivoted bell-crank lever 46, that arm 45 extending substantially vertically. The end of the shorter horizontal arm 47 of the bell-crank lever 46 is engaged by an upwardly-directed lug 48 on one end of a horizontal lever 49 pivoted intermediate its ends. The other end of the pivoted lever 49 carries a pin which engages with a helical groove 51 in the peripheral surface of a substantially cylindrical driving member 52. This member 52 extends through a lining bush 53 in the panel 13 and is provided with an annular counter-bore 54 which receives an annular flange 55 on the undersurface of the control member 56 for effecting horizontal movement of the stage top.

By rotating this knob 56 the lever 49 will be caused to tilt, due to the engagement of the pin and helical groove 51 and will consequently cause the bell-crank lever 46 to rotate about its pivot. The rotational movement of the longer arm 45 of the bell-crank lever 46 will cause the stage top to be moved horizontally.

In this example, a specimen under examination, e.g. a slide, is held in position on the stage top by means of two or more clips which extend forwardly over the stage top. These clips are mounted so that they are movable transversely across the stage top and the arrangement is such that this movement causes the specimen to be moved across the stage top.

The transverse movement of the clips is effected by means of a vertically-extending arm 57 provided with a lug 58 at its upper end which engages with the mounting of the clips. This arm 57 is carried by a horizontal,

forwardly-extending rod 58 provided with a second arm 59 which extends horizontally away from the rod. This second arm 59 carries a pin which engages with a helical groove 61 on the peripheral surface of a further substantially cylindrical driving member 62. This member is provided with a coaxial cylindrical extension 63 which passes coaxially through the driving member 52 and knob 56 for effecting horizontal movement of the stage top, and at its outer end engages with the control member or knob 64 for effecting horizontal movement of the clips.

By rotating this knob 64, the horizontal arm 59 will be rotated and will cause the rod 58 to rotate. Such rotation of the rod 58 will cause the vertically-extending arm 57 to rotate and will move the clips horizontally.

It will be appreciated that the manner in which the vertical arm 57 engages the mounting of the clips and the manner in which the longer arm 45 of the bell-crank lever 46 engages the stage top, are such as to permit the two respective adjustments to the microscope to be made independently.

A further control member or knob is mounted on the panel to control a variable resistor in order to adjust the intensity of the light used to illuminate the specimen.

In the second example the microscope is a so-called " Students Microscope ". In this type of microscope the only adjustments that can be made are coarse and fine-focusing movements of the lens tube.

As in the previous example the microscope comprises a rigid back member and an inverted box-like base member. The lens tube is carried by a slide member mounted in a linear ball slide bearing for vertical movement relative to the back member towards and away from the stage of the microscope. The focusing movements of the lens tube are effected from two coaxial control knobs mounted as a pair one above the other on a control panel as described in the previous example.

The invention is not limited to the constructional details of the foregoing two examples.

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819,899 COMPLETE SPECIFICATION
1 SHEET

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Fig. 3.

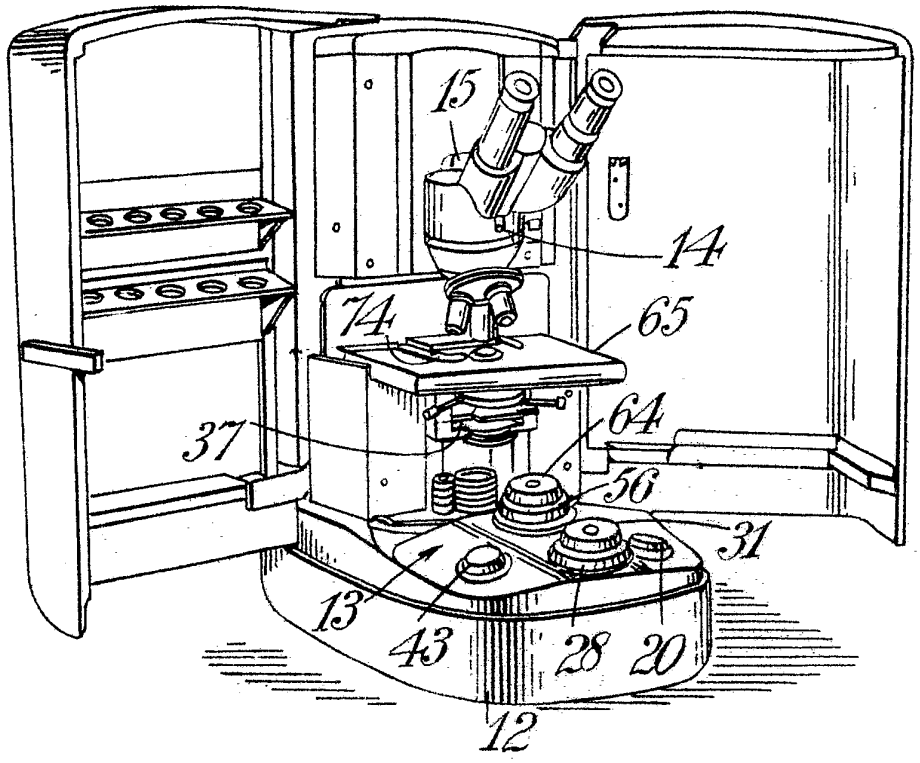
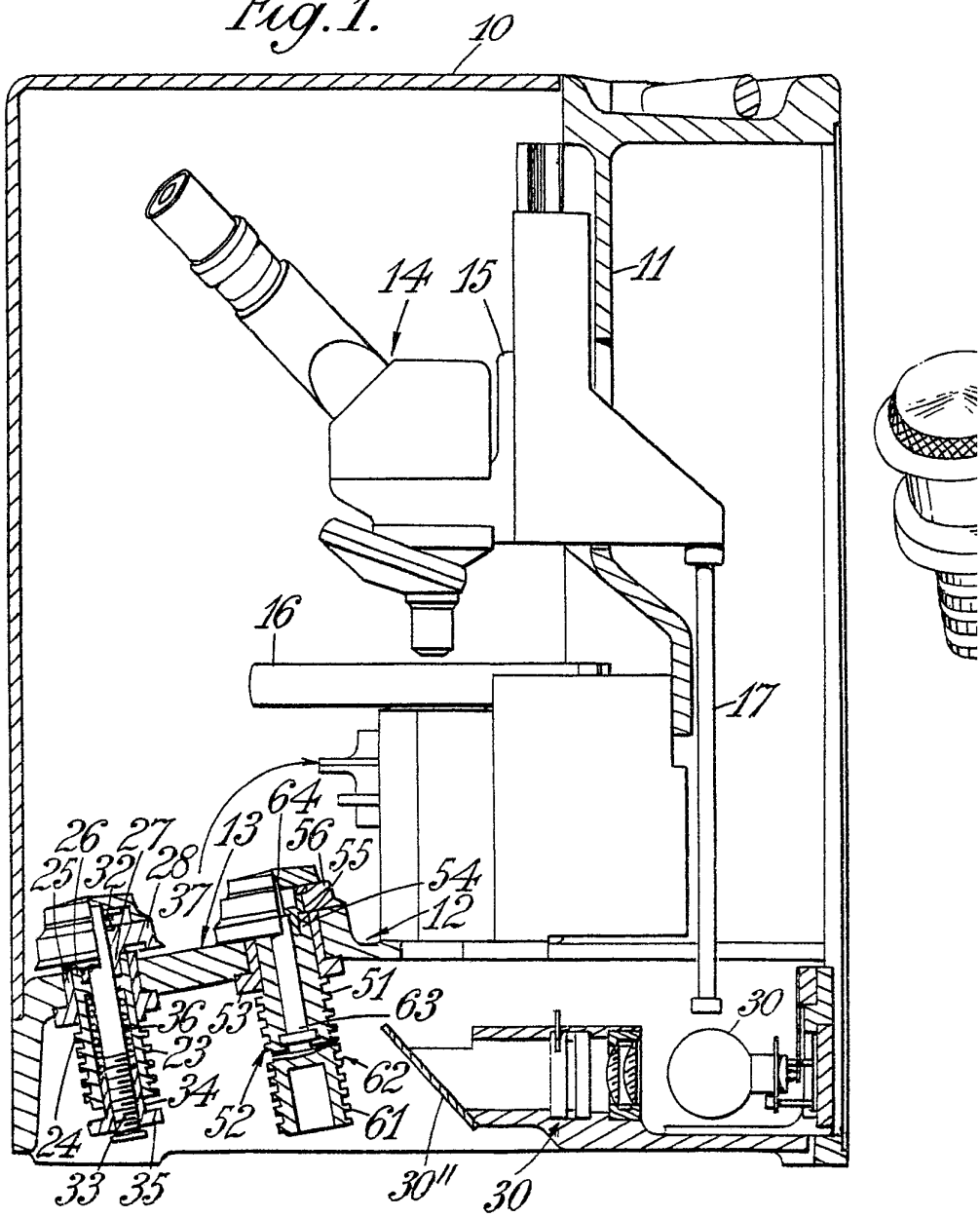


Fig. 1.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819,899 PROVISIONAL SPECIFICATION
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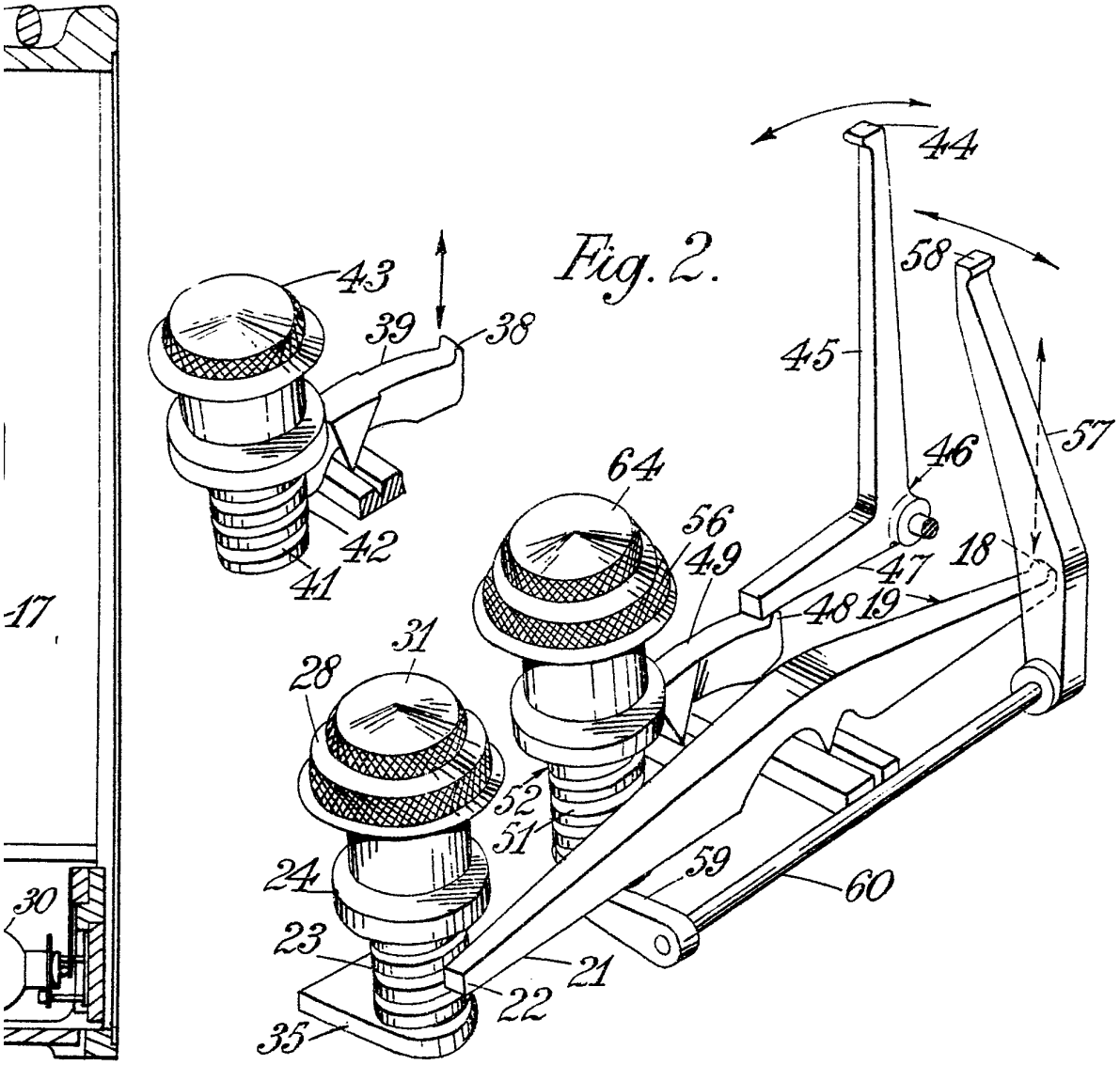

Fig. 2.

819,899 PROVISIONAL SPECIFICATION
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Fig. 1.

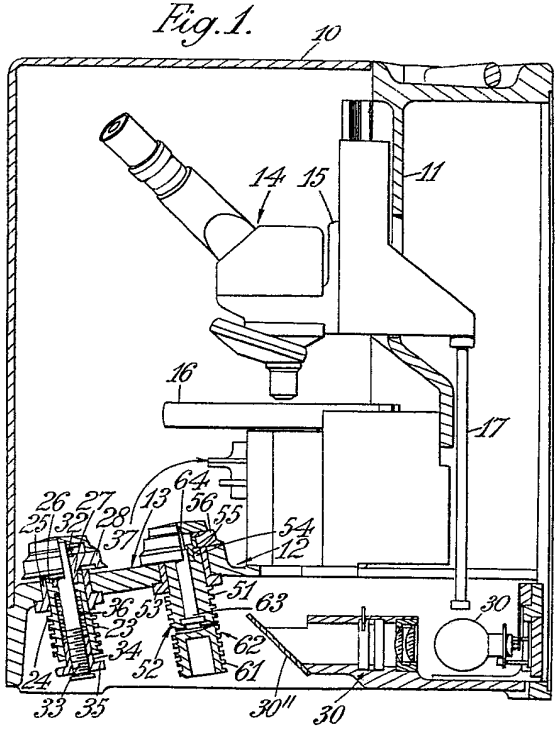

Fig. 2.