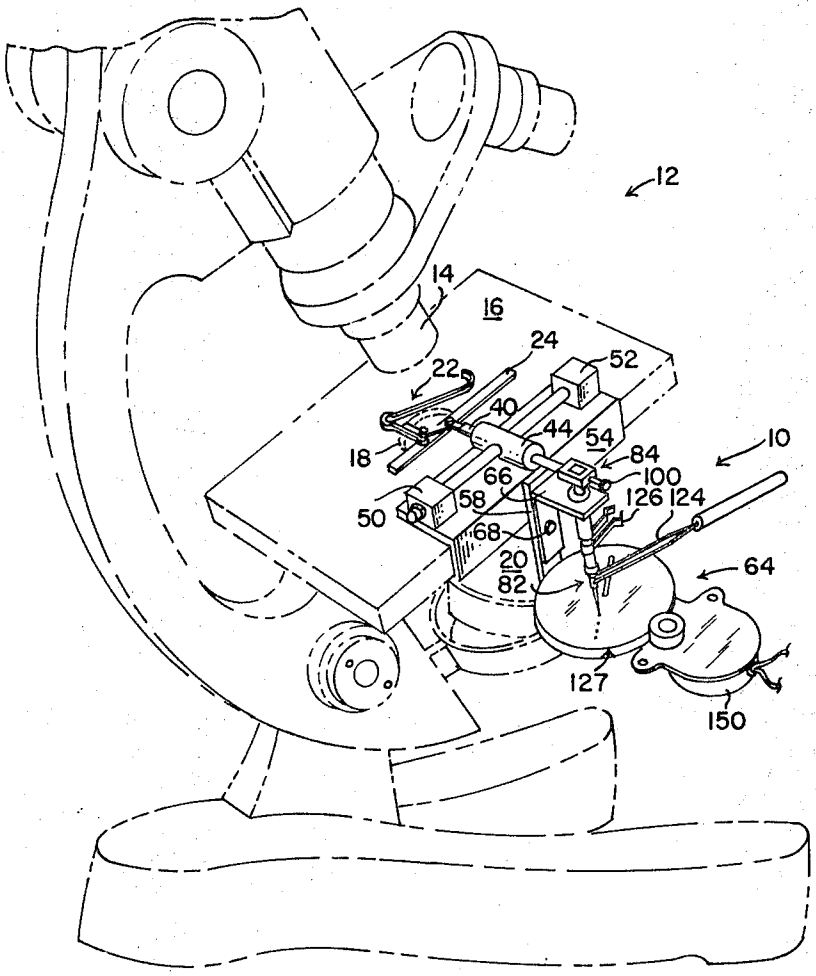


FIG. 1

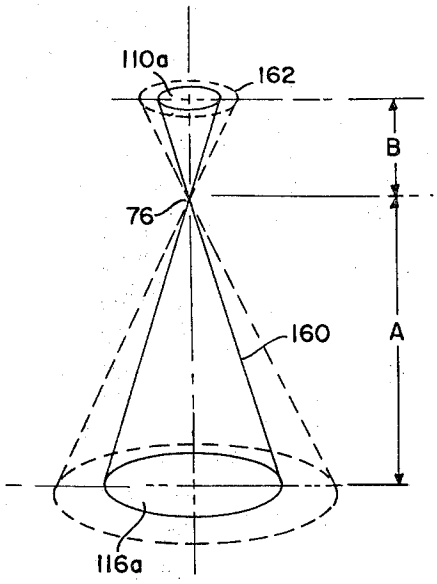


FIG. 9

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United States Patent

[11] **3,575,486**

[72] Inventors **Victor M. de Posada, deceased, late of San Salvador by Mary G. de Posada, Executrix, Calle Roma 192, Colonia Roma, San Salvador, El Salvador**

[21] Appl. No. **852,996**
[22] Filed **Aug. 25, 1969**
[45] Patented **Apr. 20, 1971**

[54] **SPECIMEN MOVING ATTACHMENT FOR A MICROSCOPE OR THE LIKE**
14 Claims, 9 Drawing Figs.

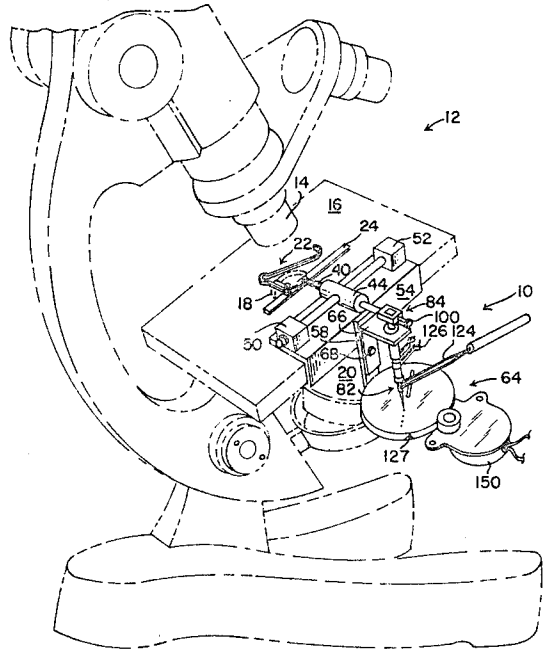
[52] **U.S. Cl.** **350/90,** 74/102, 350/245
[51] **Int. Cl.** **G02b 7/02**
[50] **Field of Search** 350/86, 90; 74/102, 103

[56] **References Cited**
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Primary Examiner—David Schonberg
Assistant Examiner—T. H. Kusmer
Attorney—Strauch, Nolan, Neale, Nies & Kurz

ABSTRACT: An attachment readily mountable on the stage of conventional microscopes and having a specimen holder or press and an actuator assembly connected to the holder for moving the holder manually in any desired direction on the flat support surface of the stage or automatically by a drive assembly, including a motor and a cam assembly having a cam surface which guides movement of the specimen holder in a predetermined path on the surface of the stage.



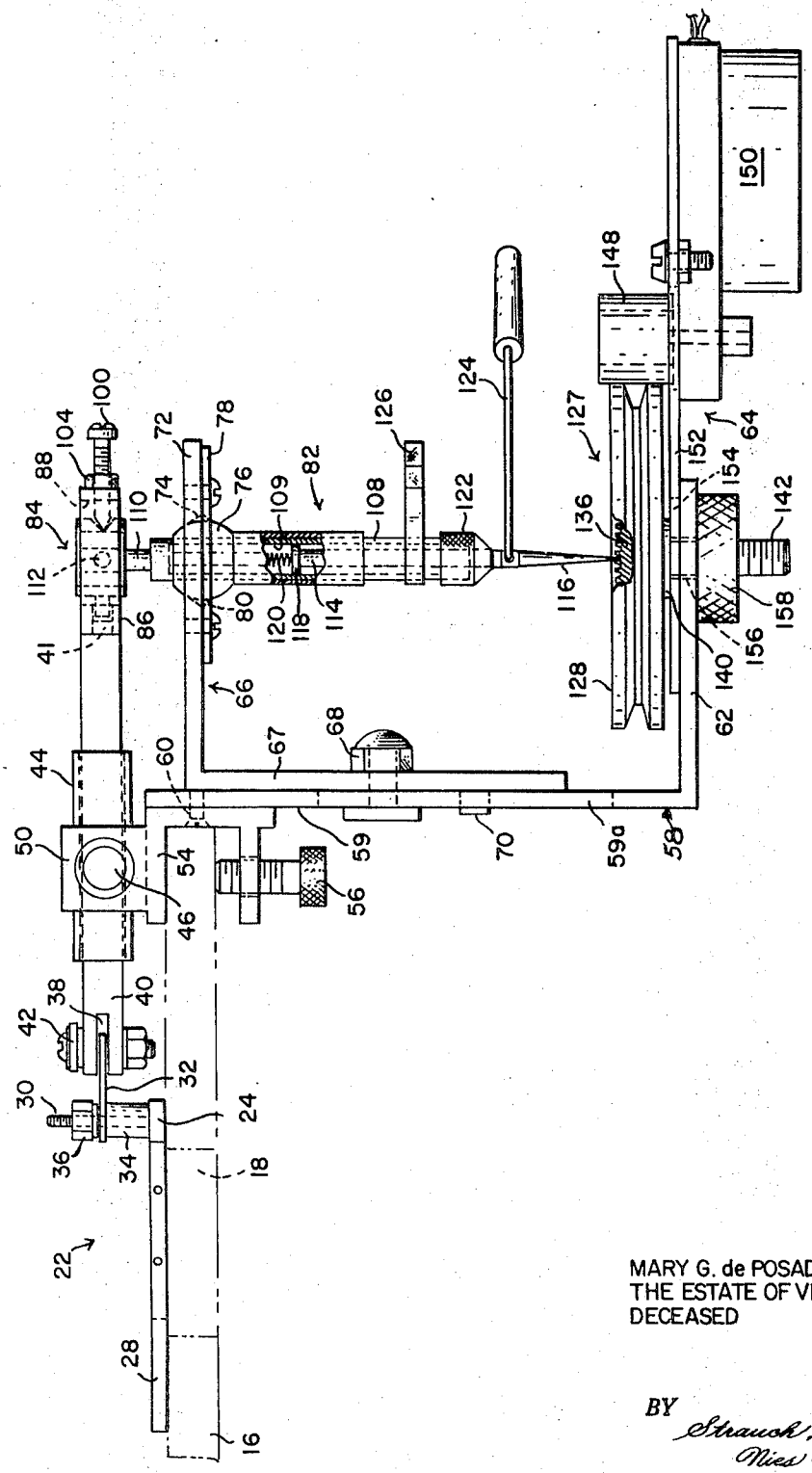


FIG. 2

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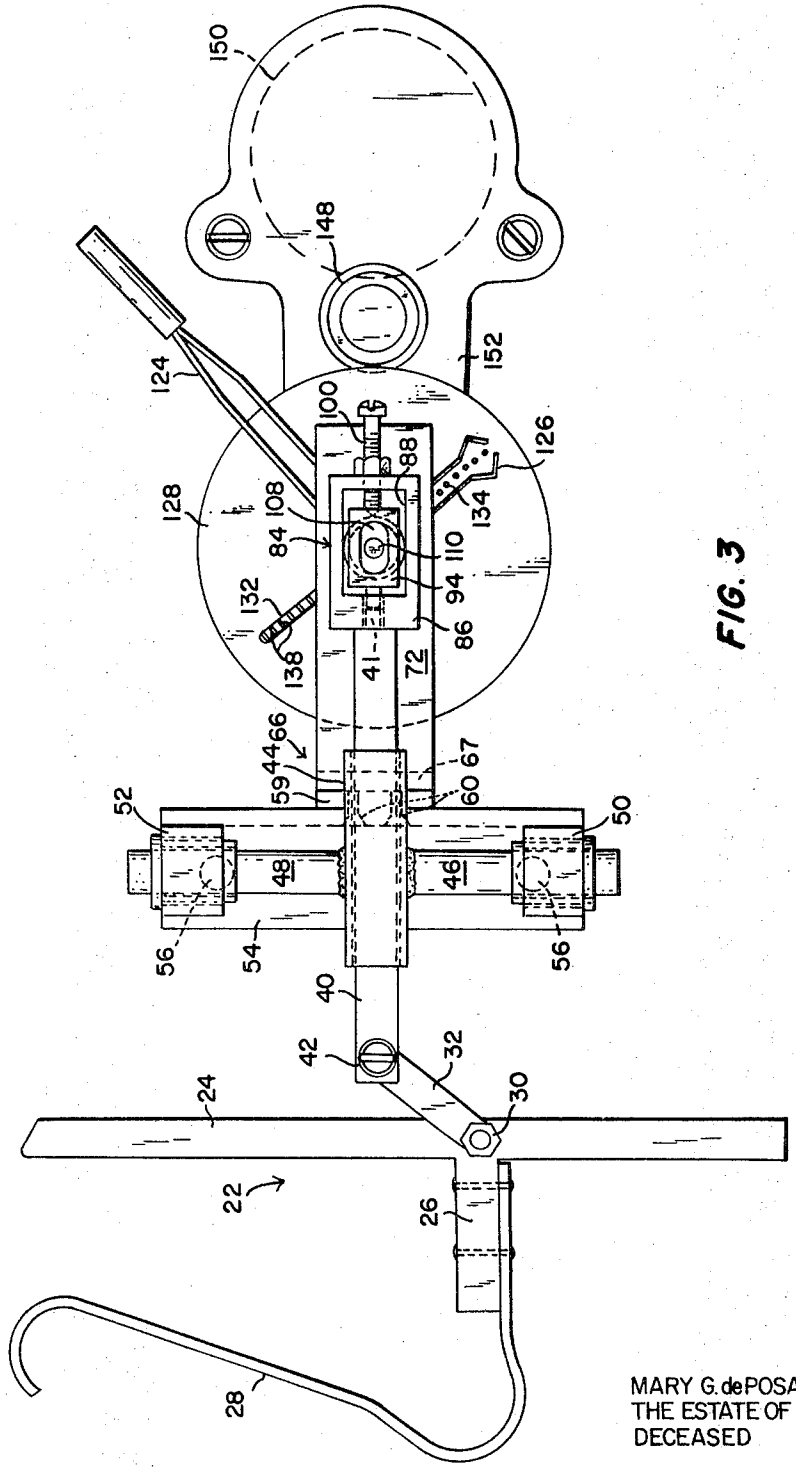


FIG. 3

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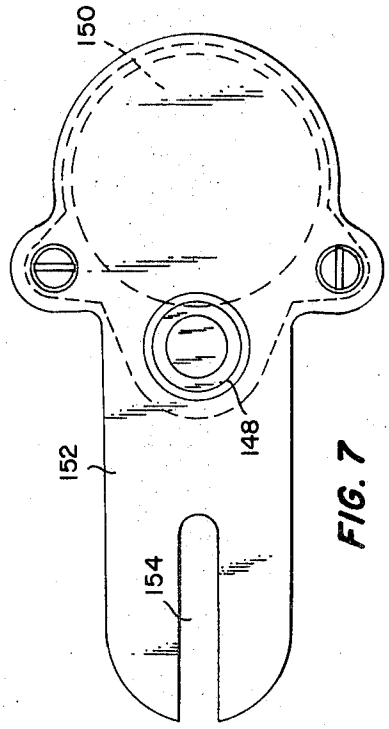


FIG. 7

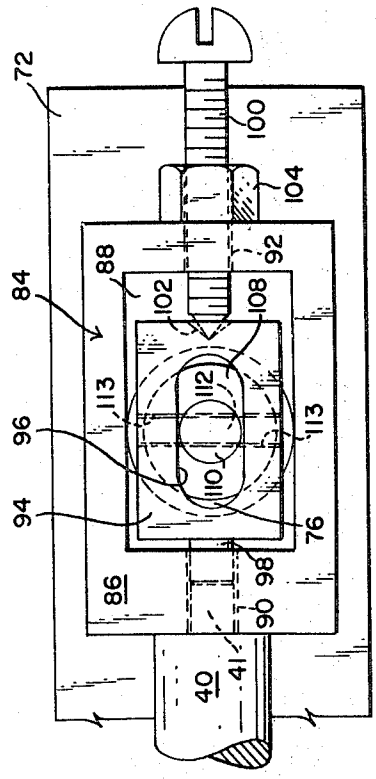


FIG. 8

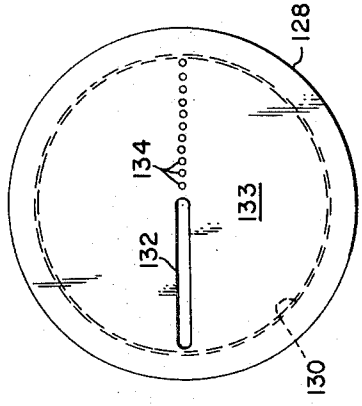


FIG. 5

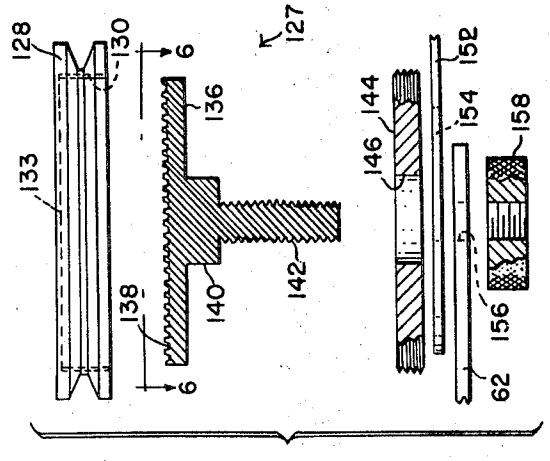


FIG. 4

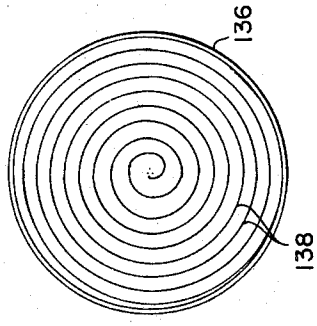


FIG. 6

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SPECIMEN MOVING ATTACHMENT FOR A MICROSCOPE OR THE LIKE

BACKGROUND OF THE INVENTION

This invention relates generally to mechanical stage apparatus for use with microscopes or the like, and more particularly to an attachment readily mountable on the stage of a microscope and capable of moving a specimen along the surface of the stage in a predetermined path at a given speed by employing a novel actuator and drive assembly which requires a minimum of attention by an operator.

When analyzing specimens under a microscope, it is necessary that the specimen be moved to various positions on the stage of the microscope to enable the observer to systematically and completely examine the specimen. Known mechanical stage systems employing a plurality of hand-operated gear and rack systems have generally been unsatisfactory in operation since they require the operator's attention in operation, are quite slow and time consuming in use and also cause the operator to divert attention from his examining function and to become fatigued, especially when a large number of specimens are to be examined, thereby producing undependable and inaccurate results. In addition, known systems generally have been incapable of providing a predetermined path of movement of the specimens during examination and of enabling an operator to repeat examination of a specimen while it travels in an identical path to that of a previous examination.

SUMMARY OF THE INVENTION

Accordingly, a primary object of the invention resides in the provision of a novel attachment apparatus for the stage of a microscope or the like for moving a specimen in any direction across the support surface of the stage when desired, while including a novel actuating and drive assembly which is operated either automatically or manually to move the specimen, when desired, in predetermined paths of movement.

Another object of the invention resides in the provision of a novel attachment for the stage of a microscope or the like including a holder for a specimen to be positioned on the support surface of the stage and a novel drive and actuator assembly which automatically positions the specimen for movement in a predetermined manner, thereby enabling an operator to concentrate on the microscopic analyses without being concerned with manipulating the specimen.

Still another object resides in the provision of a novel attachment for the stage of a microscope or the like in which a specimen holder is selectively movable in any direction on the support surface of the stage through the use of a novel drive and actuator assembly capable also selectively of moving the specimen in a predetermined path. The actuator assembly includes an axially adjustable actuator shaft universally pivoted intermediate its ends, one of which is connected to the specimen holder through a novel coupling and the other of which constitutes a follower that is moved by a drive assembly in a predetermined manner. The drive assembly includes a motor and cam mechanism for moving the follower end of the actuator shaft, and thereby moving the specimen holder in a predetermined manner on the stage. The movement of the follower end of the shaft is transmitted in a reduced proportional amount to the specimen holder due to the difference in the respective length of the shaft above and below its universal pivotal support. Consequently, the specimen may be moved very slowly through minute distances to permit complete observation and analysis thereof.

Another related object resides in the provision of the above-described novel attachment in which the drive assembly cam mechanism imparts helical movement to the follower end of the actuator shaft to impart helical movement to the holder and specimen at a given speed as necessitated by the degree of amplification and observation required for the specimen.

A further related object resides in the provision of the above-described attachment in which the one shaft end is connected to the holder by a novel coupling assembly which is capable of transmitting the universal planar movement of the one shaft end to the holder and specimen on the stage.

Further objects and advantages will become apparent from reading the following detailed description of a preferred embodiment and appended claims in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a generally perspective view of the novel attachment apparatus of the invention as it is mounted on the stage of a conventional microscope shown in dot-dash lines;

FIG. 2 is a partially sectioned elevational view of the attachment of FIG. 1 as viewed from the lower end of the microscope platform or stage of FIG. 1;

FIG. 3 is a top plan view of FIG. 2;

FIG. 4 is an exploded, partially sectioned view illustrating the cam mechanism by which a specimen is caused to move in a predetermined path across the microscope stage;

FIG. 5 is a top plan view of the upper cam wheel of the assembly of FIG. 4 and illustrates a radial slot and various openings in which the follower end of the actuator shaft may ride during operation of the attachment;

FIG. 6 is a top plan view of the inner cam plate of FIG. 4 and illustrates the helical guide surface in which the follower end of the shaft may ride;

FIG. 7 is a top plan view of the motor and drive assembly and the mounting plate for mounting it immediately adjacent and in driving contact with the cam mechanism shown in FIG. 4;

FIG. 8 is a fragmented top plan view of the coupling device which connects the upper end of the actuator shaft to the movable specimen holder assembly; and

FIG. 9 is a schematic illustration of the relative size of the cones formed by opposite ends of the actuator shaft as it is pivoted about its intermediate universal pivotal support by the drive assembly.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawings, FIG. 1 illustrates the attachment apparatus 10 of the invention used with a conventional microscope 12 having an objective lens 14, an operatively fixed stage or platform 16 having an opening 18 directly below which the usual mirror 20 is provided, with attachment 10 being fixedly mounted to stage 16.

As best seen in FIGS. 2 and 3, attachment 10 comprises a specimen holder or press 22 having a narrow side plate 24 providing a right angle projection 26 to which is connected a flexible, curved, gripper strip 28, the slide specimen (not shown) normally being held between plates 24 and 26 and flexible strip 28 as it rests on the top support surface of stage 16 overlying opening 18.

Plate 24 has an upright bolt 30 connected thereto at the point of intersection of the centerlines of plate 24 and projection 26 mounting on its upper end a connecting link 32 with a plastic spacer 34 disposed between it and plate 24 and a fastening nut and washer assembly. Spacer 34 and assembly 36 are dimensioned so that the lower surfaces of plate 26 and strip 28 lie flat on the support surface of stage 16 for easy sliding movement thereon.

The other apertured end of link 32 fits within slot 38 of one end of a slide rod 40 and is pivotally fastened therein by a bolt and nut assembly 42. Rod 40 has a reduced diameter opposite end 41 and extends longitudinally slidably through a circuit sleeve support 44 having a pair of transverse arms 46, 48 fixedly welded externally thereto and extending in a transverse direction perpendicular to the longitudinal axis of rod 40. Arms 46 and 48 are slidably journaled in respective end bearings 50 and 52 fixedly carried in upstanding bearing blocks formed on the upper plate of a U-shaped mounting

bracket 54 that fits over the edge of stage 16 and is secured thereto by clamp screws 56 (FIG. 2).

From the mechanism thus far described, it is apparent that the specimen holder 22 is movable perpendicularly and transversely across the surface of stage 16 due to the sliding movement of rod 40 within sleeve 44 and sliding movement by arms 46 and 48 within bearings 50 and 52.

A first L-shaped mounting bracket 58 has its vertical leg 59 screw connected at 60 to the web of bracket 54 and its right angular leg 62 disposed to support a drive assembly 64 provided to move rod 40 and holder 22 in one or more predetermined paths as will presently be described. A second L-shaped bracket 66 has its vertical leg 67 adjustably mounted in flush engagement with leg 59, leg 67 having a bolt aperture therein to receive a bolt and nut assembly 68, the bolt shank of which extends through vertically elongated slot 59*a* of leg 59 of bracket 58 to fixedly position bracket 66 at various selected positions along slot 59*a*. Leg 67 also has a guide lug 70 which rides in slot 59*a* and maintains proper vertical alignment between brackets 58 and 66.

The right-angled leg 72 of bracket 66 overhangs leg 62 of bracket 58 and is provided with an opening 74 in the form of an inverted truncated cone which receives a universal spherical fulcrum support 76 retained within opening 74 by a retainer plate 78 having a mating opening 80 of a similar but oppositely directed truncated cone shape. Fulcrum 76 is axially through apertured and forms the upper end of a support sleeve for an actuator shaft assembly 82, the upper end of which is connected to coupling assembly 84 and the lower end of which engages with and is moved in a predetermined selectable manner by drive assembly 64.

As illustrated in FIGS. 2, 3 and 8, coupling assembly 84 comprises a rectangular block 86 having a rectangular vertically directed through opening 88, an intersecting bored opening 90 at its forward end, and a threaded opening 92 at its rearward end in coaxially opposed relation to opening 90. A block member 94 is freely received within opening 88 and provides a vertically opening elongated slot 96. Block 94 at its forward end is provided with a forwardly directed stub shaft 98 journaled in the rearward end of opening 90 and is maintained in spaced relation within opening 88 for pivoting movement about its longitudinal axis by a conical tipped set screw 100 threaded through opening 92 of block 86 with its tip seated in an enlarged angle conical socket 102 formed in the back end of block 94 in coaxial relation to stub shaft 98. A lock nut 104 locks screw 100 in place once adjustment has been made to locate block 94 with the transverse center line of slot 96 disposed in vertical alignment with the center of spherical fulcrum support 76.

Rectangular block 86 is also connected to slide rod 40 through reduced diameter rod end 41 which is press fitted into the forward end of the bore 90 so that any movement of block 86 is transmitted to slide rod 40 and consequently to specimen holder 22.

Actuator shaft assembly 82 also includes an inner cylindrical sleeve 108 slidably received in the sleeve section of fulcrum 76 and having an upper reduced diameter rod end 110 dimensioned to be closely received between the longitudinal walls of opening 96 of member 94 and pivotally connected thereto by cross pin 112 fitted into opposing aligned through bores 113. A rod 114 freely slidably disposed within bore 109 of sleeve 108 has a conical lower end 116 and a guide head 118 at its upper end engaged by a compression spring 120 compressed between head 118 and the upper closed end of bore 109 to bias rod 114 in a downward direction. A retainer cap 122 threadedly fixed to the lower end of sleeve 108 has an axial opening through which rod 114 freely slidably passes serving in conjunction with head 118 to guide the rod for axial movement relative to sleeve 108.

A hand lever 124 is pivotally connected to rod 114 outwardly of retainer cap 122 so the entire shaft assembly 82 may be manipulated by hand when desired, a pair of spring holder members 126 fixedly attached to sleeve 108 being provided to slidingly receive therebetween and hold handle 124 in an inoperative position when automatic manipulation from drive assembly 64 is desired.

As best illustrated in FIGS. 2 and 4—6, drive assembly 64 comprises a driven cam mechanism 127 including an outer cylindrical wheel 128 having a bottom opening threaded, cylindrical recess 130 and a top wall 133 formed with an elongated radial slot 132 at one side of the center dimensioned to freely pass conical end 116 of rod 114 and a plurality of radially spaced openings 134 extending in the opposite direction of slot 132 on a common diameter. Each opening 134 is dimensioned to engage the conical periphery of rod end 116 inwardly from its lower extremity to assure that the tip clears the helical track on disc 136. Telescopically received within recess 130 is a cylindrical disc 136 having a continuous upper helical grooved surface 138, a dependent hub section 140 and a reduced diameter threaded stem 142. A peripherally threaded retainer plate 144 having a central opening 146 freely passes hub 140 and threads into recess 130 to retain disc 136 within recess 130 in free running relation to wheel 128.

Wheel 128 is driven through a friction drive connection with pinion 148 suitably drive-connected to motor 150 which is supported together with pinion 148 on a motor bracket plate 152 having an elongated slot 154 opening through one end to freely pass stem 142 which in turn extends through opening 156 of bracket leg 62 to receive a clamp nut 158. As shown in FIGS. 2 and 4, when driven assembly 64 is in assembled relation, stem 142 extends downwardly through slot 154 of motor bracket 152 and opening 156 in the lower leg 62 of mounting bracket 58 and nut 158 threaded on its lower end clampingly secures bracket plate 152 between disc hub 140 and bracket leg 62 and fixedly nonrotatably connects disc 136 to bracket leg 62. During operation of the drive assembly, wheel 128 and retainer ring 144 will rotate together relative to disc 136 and its hub 140. The slot 154 of bracket plate 152 provides both an angular and radial adjustment for the motor and pinion assembly so that the motor assembly may be conveniently located around the axis of stem 142 and radially adjusted to assure proper driving engagement between pinion 148 and wheel 128 or disengagement of the drive connection when desired.

A typical operation of the apparatus will now be described. Assuming conical end 116 of rod 114 extends through slot 132 of wheel 128 into groove 138 of disc 136, energization of motor 150 and pinion 148 will cause wheel 128 to rotate driving conical end 116 of rod 114 along helical groove 138 in a gradually enlarging horizontal circular plane 116*a* to define a gradually enlarging lower cone 160 (See FIG. 9) beneath the universal fulcrum 76. At the same time, upper end 110 of shaft 108 will move in gradually enlarging horizontal circular plane 110*a* and define an upper cone 162 of proportionally smaller cross-sectional dimensions due to the varying differences in axial heights A and B between the fulcrum 76 and the respective horizontal planes 116*a* and 110*a* of cones 160 and 162 permitted by the projection of rod 114 under influence of spring 120 from sleeve 108. Hence, it is apparent that for a large displacement of rod end 116, rod end 110, slide rod 40, and specimen holder 22 will be displaced a proportionally reduced amount along a helical path determined by disc face 138, thereby permitting an operator to completely analyze all microportions of the specimen as it is being very slowly moved through minute distances. Movement of the upper end 110 of shaft section 108 is transmitted through coupling assembly 84 to specimen holder 22 by reciprocation of slide rod 40 within sleeve 44 and reciprocation of arms 46 and 48 in respective bearings 50 and 52.

It should be noted at this point that the amount of movement transmitted to specimen holder 22 may be varied merely by adjusting the position of bracket leg 67 on bracket leg 59 and thereby varying the vertical position of fulcrum 76 and the axial height of lower cone 160 through relative axial sliding of sleeve 108 in fulcrum 76. Variation of the axial

height of cone 160, of course, varies the ratio between the height of cones 162 and 160 and thereby varies the respective amount of displacement of shaft end 110 in the horizontal plane of the base of cone 162.

During continued rotation of wheel 128, rod 114 will be extended outwardly of cylinder 108 by force of spring 120 to maintain engagement of follower end 116 of rod 114 in groove 138, while at the same time the respective opposite ends of shaft assembly 82 will be universally pivoting in a conical plane about fulcrum 76 as described above.

If it is desirable to simply have the holder 22 and specimen retained therein rotate in a continuous substantially circular path on stage 16, the operator need only place the conical end 116 of rod 114 in an opening 134 of appropriate radius on wheel 128. This will prevent conical end 116 from entering into and following the helical groove 138 and will cause the shaft assembly 82 to impart purely circular movement to the holder 22.

It is also apparent that the speed of movement of the specimen may be readily adjusted merely by changing the diameter of drive pinion 148 and readjusting the bracket 152 along bracket leg 62.

If desired, the specimen may be manipulated manually through proper positioning of handle 124 and shifting of motor bracket plate 152 in a direction to disengage pinion 148 from its driving engagement with wheel 128.

Also, while the attachment according to the invention has been described in relation to usage with a microscope, it is readily adaptable for usage with any type of device in which it may be necessary or desirable to move and manipulate a specimen or workpiece during operation of the device.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by Letters Patent is:

I claim:

1. Specimen moving apparatus for attachment to the stage of a microscope or the like for positioning and moving a specimen for inspection and analysis, comprising mounting means readily attachable to the stage, specimen holding means, support means connecting said specimen holding means to said mounting means and permitting planar movement of said specimen holding means in predeterminable paths across the microscope stage, actuator means drivingly connected to said support means and supported from said mounting means, said actuator means including motion producing means and a shaft assembly universally supported between its ends and drive connected at its opposite ends to said support means and said motion producing means for moving said specimen holding means in a selected one of several paths of movement across the stage of the microscope to present said specimen for microscopic examination from varying positions as desired.

2. Apparatus as defined in claim 1, wherein said shaft assembly has one end universally connected to said support means and its opposite end drive connected to said motion producing means.

3. Apparatus as defined in claim 1, wherein said motion producing means comprising motor means and a motor driven wheel having respective shaft assembly connector means for selective connection to said shaft assembly to effect movement of said actuator means in a selected one of several predetermined paths of travel whereby said specimen holding means and said specimen may be moved in a predetermined path across the stage of the microscope.

4. Apparatus as defined in claim 2, wherein said shaft assembly one end and said shaft assembly other end are telescopically coupled together to cause said shaft one end to move in a predetermined path of travel around the axis of said universal support resulting in movement of the specimen holder and specimen in a predetermined planar path across the stage of the microscope.

5. Apparatus as defined in claim 4, wherein said motion producing means comprising a motor and cam means rotatably drive connected to said motor, and said cam means provides a cam surface coupled to said opposite end of said shaft to move said opposite end in a predetermined path in a plane angularly related to the longitudinal axis of said shaft assembly to produce movement of said specimen holder means in a correlated predetermined path across the stage of the microscope.

6. Apparatus as defined in claim 5, wherein said cam means comprises a wheel having a top wall and bottom-opening recess enclosing a stationary cam disc having a helically grooved upper face, said wheel top wall has an opening through which said opposite shaft end passes to engage in the helical groove of said upper face whereby, upon rotation of said cam wheel, said opposite shaft end will be forced to follow the helical groove thereby causing said one shaft end and said specimen holder to move in a predetermined helical path across the stage of the microscope.

7. Apparatus as defined in claim 6 wherein said opening in said wheel top wall comprises an elongated slot extending radially outwardly in one direction from the axis of rotation of said wheel.

8. Apparatus as defined in claim 5 wherein said cam means comprises a wheel having a top wall and a bottom-opening recess enclosing a stationary cam disc and said wheel top wall has a plurality of apertures spaced radially outwardly in one direction from the axis of rotation of said wheel, said apertures being selectively fitted to said opposite shaft end whereby, when said opposite shaft end is positioned in a selected one of said apertures, said opposite shaft end will be forced to move in a substantially circular path thereby causing said one shaft end and said specimen holder to move in a predetermined circular path across the microscope stage.

9. Apparatus as defined in claim 1, wherein said shaft assembly comprises a first hollow shaft having an upper generally spherical fulcrum mounting in said mounting means, a second shaft slidably received within said first hollow shaft and having a blind bore opening through one end and a shaft extension at its other end universally connected to said support means, a third shaft slidably received within said blind bore of said second shaft and with one end protruding from said blind bore and terminating in a conical end portion drive connected to said motion producing means, and spring means disposed between the other end of said third shaft and the bottom of said blind bore in said second shaft, said spring means biasing said third shaft in a direction to establish an extensible drive connection between said motion producing means and said support means whereby the ratio of movement between the opposite ends of said shaft may be varied.

10. Apparatus as defined in claim 1, wherein said support means comprises a slide rod having one end connected to said specimen holding means and a cross arm sleeve support axially slidably mounting said slide rod and having a pair of oppositely transversely extending arms slidably mounted in respective bearing supports formed on said mounting means, and said actuator means is connected to the other end of said slide rod.

11. Apparatus as defined in claim 9, said actuator means including shaft means having an upper end and a lower end which is connected to said motion producing means, said shaft means being supported intermediate its upper and lower ends from said mounting means for universal pivotal movement, universal coupling means for connecting said upper end of said shaft means to said other end of said slide rod, said coupling means comprising an outer coupling member having a transverse opening therethrough and a pair of longitudinal openings extending through the front and back walls thereof,

an inner coupling member spaced within said transverse opening and supported therein for pivotal motion about the longitudinal axis of said outer coupling member, the upper end of said shaft means being pivotally connected to said inner coupling member for pivotal motion in a direction transverse to the longitudinal axis of said outer coupling member, and the other end of said slide rod being fixedly received within the opening in the front wall of said outer coupling member, whereby movement of the lower end of said shaft means is transmitted through said coupling means and said slidable support means to the specimen holding means to position a specimen on the stage of the microscope as desired.

12. Apparatus as defined in claim 1, said mounting means comprising first bracket means fixedly attached to the stage through a vertical leg and having a right angularly extending lower leg, a second bracket means having a vertical leg vertically adjustably connected to the vertical leg of said first bracket means and having a right angularly extending upper leg; said actuator means comprising shaft means including a first hollow shaft having an upper generally spherical fulcrum mounted for universal pivotal movement in said upper leg of said second bracket means, a second shaft slidably received within said first shaft and having an elongated, bottom end opening blind bore and an upper extension pivotally connected to said slidable support means, a third shaft slidably received within said blind bore and having a lower end engaging said motion producing means which is mounted on said lower leg of said first bracket means, spring means positioned between the upper end of said third shaft and the bottom of said blind bore, whereby the length of said shaft means extending from said fulcrum to the lower end of said third shaft may be varied by vertically adjusting said second bracket with respect to said first bracket.

13. In combination with a conventional specimen examination microscope having a specimen support stage, an attachment for receiving and moving a specimen holder across the specimen support stage in a desired path of movement for examination comprising an attachment clamp bracket formed to receive and be fixed to an edge of the support stage, and providing laterally spaced bearing supports; specimen holding means comprising a crossarm sleeve support the lateral arms of which are slidably mounted in said spaced bearing supports and the sleeve support of which is disposed with its axis normal to said lateral arms; specimen holder support rod means slidably mounted between its ends in said sleeve support and including clamp means at one end carrying a specimen holder; actuator means including a motor support bracket dependently fixedly secured to said clamp bracket and having a plate portion which extends at a right angle away from said specimen support stage beneath said specimen holder support rod means, the free end of said plate portion having an opening; a shaft support bracket vertically adjustably fixed to said motor support bracket and having a plate portion disposed in overhanging vertically spaced relation to the plate portion of said motor support bracket and provided adjacent its free end with an opening delimited by a downwardly facing spherical ring socket, said shaft support bracket opening being substantially coaxially related to said motor bracket opening; an actuator shaft assembly including a spherical ended support sleeve journaled in dependent relation from said spherical socket and slidably carrying an extensible shaft, said shaft assembly including an upper sleeve shaft extending upwardly and terminating in a closed upper end adjacent the other end of said specimen holder support rod means and a lower shaft slidably carried by and depending from the lower end of said upper sleeve shaft and terminating at its lower end in a conical downwardly tapering end portion, a compression spring interposed between the closed upper end of said upper sleeve shaft and the upper end of said lower shaft to yieldingly bias said upper sleeve shaft and said lower shaft toward their maximum extension; means universally connecting the upward extension of said upper sleeve shaft to the other end of said specimen holder support rod means; a cam and wheel assembly fixedly mounted on said plate portion of said motor support bracket through a cam disc having a dependent threaded shank extending through said motor support bracket opening and a clamp nut threaded on its dependent end, said cam disc having an upwardly facing helically grooved cam face and journaling a driven wheel the upper side face of which is provided with a radial slot dimensioned to freely pass said tapering end portion of said lower shaft and a series of oppositely radially spaced circular openings dimensioned to grippingly engage said tapering end portion of said lower shaft; and a motor and drive pinion assembly including a support plate slotted at one end to receive said threaded shank of said cam disc, said slotted plate end being selectively adjustably clamped between said cam disc and said plate portion of said motor support bracket upon tightening of said clamp nut in position to frictionally drivingly abut said drive pinion with the peripheral face of said driven wheel whereby said driving wheel may be selectively drive connected to said tapering end portion of said lower shaft through said radial slot to drive said actuator shaft assembly along said helical groove to impart helical movement to said specimen holder and to a selected one of said radially spaced circular openings to impart a predetermined circular movement to said specimen holder.

14. The combination of claim 13 wherein said lower shaft pivotally mounts a handle member for manually actuating said shaft assembly upon disengaging said drive pinion from said driven wheel to impart desired manual movement of said specimen holder when necessary to effect proper examination of the specimen.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,575,486 Dated April 20, 1971

Inventor(s) Victor M. de Posada, deceased, late of San Salvad
by Mary G. de Posada

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 29, change "driven" to -- drive --

Column 6, line 66, change "9" to -- 10 --

Signed and sealed this 31st day of August 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents