Oct. 1, 1929. R. A. SLOAN 1,729,690

REVOLVING NOSE PIECE FOR MICROSCOPES AND THE LIKE

Filed Feb. 4, 1925

FIG. 1.

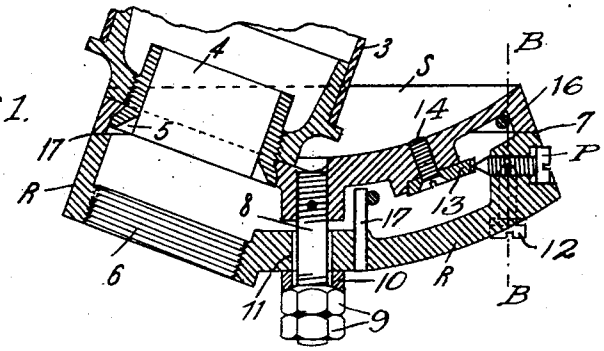


FIG. 4.

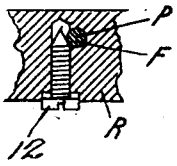


FIG. 2.

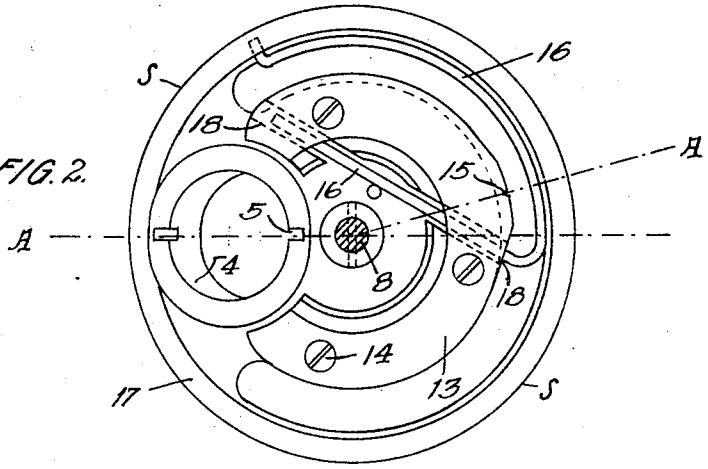
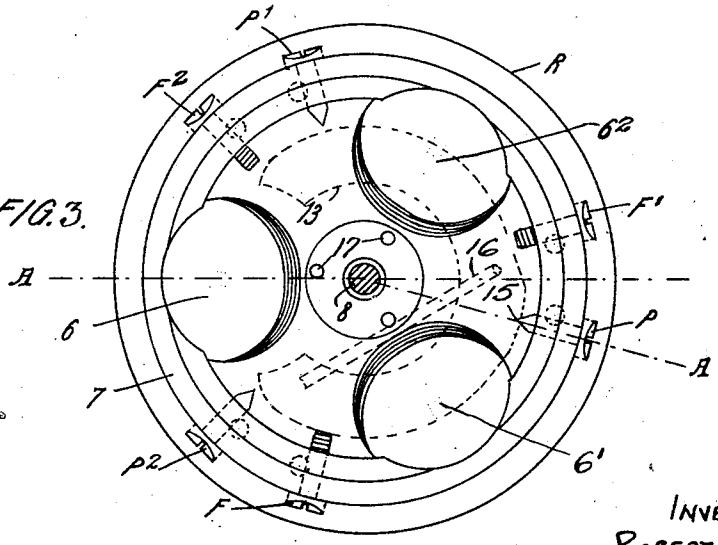


FIG. 3.



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Patented Oct. 1, 1929 1,729,690

UNITED STATES PATENT OFFICE

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REVOLVING NOSE PIECE FOR MICROSCOPES AND THE LIKE

Application filed February 4, 1925, Serial No. 6,734, and in Great Britain February 6, 1924.

This invention has reference to revolving nose-pieces for microscopes and the like, used for changing objectives, the usual form consisting of a fixed part, (which may be termed the stator,) rigidly attached to the tube nose, and a rotating part, (which may be termed the rotor,) centrally pivoted to the stator and carrying the various objectives which are attached to the rotor by being screwed into nozzles formed thereon.

Although this device is in very general use, owing to its convenience in rapidly changing the objectives, it has hitherto been unsatisfactory, on account, chiefly, of want of accuracy in centering the various objectives; this is a serious defect, being a source of much inconvenience and waste of time. This defect is due in part to the indirect connection and the rotating joint between the objectives and the microscope tube, which render it difficult, and perhaps impracticable under commercial conditions, to produce the device with such precision as to ensure that the various nozzles into which the objectives are screwed shall register exactly with the tube nose, when clicked in position; and even if this be accomplished, the further outstanding defect remains that the objectives themselves have centration errors, the effect of which can only be eliminated by individual adjustments specific to the respective objectives.

The object of my present invention is to obviate these defects by modifying the ordinary construction in such manner that adjusting means are provided whereby the various objectives can be individually so located that when swung into position, their respective centres of field will be in very close or substantially perfect agreement.

It has previously been proposed to effect this object by providing adjustable means for attaching the respective objectives to the rotor instead of screwing them directly into the latter, the rotor being, as usual, positively centred on the stator so as to rotate concentrically therewith, and being located in its respective working positions by a spring pawl or detent.

According to my present invention, I attach the various objectives directly to the rotor, in the ordinary manner, by screwing them into nozzles integral therewith, but unlike any device of this class, so far as I am aware, the rotor is not positively centred on the stator but is pivoted thereto with a small amount of radial freedom so that it can not only be rotated but can also be slid in any direction relatively to the stator.

The rotor is provided with a series of adjusting screws, one pair for each objective, arranged round its rim and engaging with the stator in such manner that the location of the rotor as a whole when swung into any of its working positions, can be adjusted for each objective independently in two co-ordinate directions so that the respective centres of field of the various objectives are brought into substantially perfect agreement with each other and with the optical axis of the microscope tube.

This improved construction enables me to eliminate the usual spring pawl or detent which hitherto has always been an unsatisfactory feature.

In the accompanying drawings which show a triple nose-piece in accordance with my invention, Fig. 1 is a section on the line A, A of Figs. 2 and 3.

Fig. 2 is an inverted plan of the stator.

Fig. 3 is a plan of the rotor, and

Fig. 4 a fragmentary section on the line B, B of Fig. 1.

S is the stator, of the usual spherical segmental form, rigidly attached to the nose 2 of the microscope tube 3. The attachment may be made by any of the usual methods, but I prefer to make the attachment after the manner set forth in the specification of my prior Letters Patent No. 1,428,990, that is to say, by the conically-headed screwed ferrule 4 with notches 5, adapted to be operated by a screw-driver. This method is simple, direct and rigid; the conical head ensures good register with the tube-nose, and the attachment occupies less depth than the usual forms.

R is the rotor with screwed nozzles 6, 6_1 and 6_2 to receive the various objectives; three are shown but the number may, of course, be greater or less.

The rotor and stator abut round their edges 7, and the abutting surfaces, which are flat, are kept in adjustable close, but not tight, working contact by the central stud 8, firmly fixed in the stator, and the lock-nuts 9 and the washer 10 abutting below the central flat facing of the rotor. In order that the location of the rotor, when turned into position, may be determined solely by the adjusting means it is necessary that the pivotal attachment of the rotor to the stator should permit of the requisite radial freedom, and I accordingly make the central hole 11 of the rotor a little larger than the stud 8.

The adjusting means consist of a pair of hardened steel adjusting screws, for each of the objective nozzles 6, 6_1 and 6_2; these pairs of adjusting screws are indicated by the reference letters P and F, P_1 and F_1 and P_2 and F_2, corresponding respectively with the nozzles 6, 6_1 and 6_2. The screws P, P_1 and P_2 have conical ends and are located nearly diametrically opposite to the respective corresponding nozzles. The screws F, F_1 and F_2 are flat-ended and are located about a quadrant from the corresponding pointed screws. Each adjusting screw has a locking screw 12, (see Fig. 4) the conical point of which abuts against the side of the adjusting screw.

The ends of the adjusting screws are arranged to abut against the edge of a ring 13 which may be integral with the stator but is preferably made of hardened steel and firmly attached to a turned seating on the stator by the screws 14. The ring has a V notch 15 adapted to engage in succession with the conical ends of the three screws P, P_1 and P_2. 16 is a wire spring carried by the stator and adapted to exert a radial inward pressure against the three pins 17 fixed to the rotor, or alternatively against the central boss of the rotor. The curved part of the spring is hooked at one end into the stator rim and a clip (not shown) is fitted to hold the curved part of the spring snugly in position. The free part of the spring passes above the ring 13 through grooves 18 in the ring seating and these grooves limit the play of the spring so that it only comes into action when the rotor is at and near its clicking position.

One of the pins 17 is conventionally turned into the plane of section in Fig. 1, but the correct location of these pins is shown in Fig. 3. The force exerted by the spring on the pins 17 may be resolved into two components at right-angles acting along the axes of the engaged pair of adjusting screws and pressing them into close engagement with the ring 13.

The action will be readily understood; one of the objectives 6 being in position, with its screw P engaged in the notch 15 and its screw F abutting against the ring as shown in Fig. 3, the objective can be adjusted into the exact position required by adjusting the screws; P is preferably adjusted first, bringing the objective into position radially, after which F is adjusted to bring it into position circumferentially. After adjustment, the screws are locked by firmly tightening up the locking screws 12.

In order to change the objective, the rotor must first be withdrawn slightly in opposition to the spring so as to free the screw P from the notch; the rotor may then be turned in either direction until the next screw P_1, or P_2 as the case may be, snaps into the notch, but it is preferable to turn the rotor clockwise (regarded from above) as the turning effort then co-operates with the spring to locate the pair of adjusting screws into firm engagement with the ring 13. It will be noted from Fig. 3, in which the ring 13 is shown dotted, that its edge is so shaped as to stand well clear of all the adjusting screws except the particular pair which are for the time being engaged with it.

It will be noted that each objective is adjusted individually and independently of the others. The adjustments, having once been made, are intended to be permanent and should not subsequently be interfered with, unless to effect any readjustment that may be subsequently desirable. If an objective has to be removed, it should be replaced in its own nozzle, and for this reason the various nozzles should be distinctly marked.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. In a microscope, in combination, a stator rigidly fixed to a microscope tube, a rotor pivoted to said stator and having radial freedom of movement, means in said rotor for receiving various objectives, adjusting means specific to each objective, for locating the rotor relatively to the stator for each objective working position.

2. In a microscope, in combination, a stator rigidly fixed to a microscope tube, a rotor pivoted to said stator and having radial freedom of movement, means in said rotor for receiving various objectives, adjusting means specific to each objective, for locating the rotor relatively to the stator for each objective working position, said adjusting means comprising a pair of adjusting screws for each objective screwed into the rotor rim, one screw in each pair being pointed; and a ring on the stator for the screws to abut against, said ring having a notch to engage in succession with the ends of the pointed screws for the various objective working positions, and connecting means between rotor and stator urging the rotor radially, intermediate the pair of screws then abutting against the stator ring, so as to hold the said screws in close engagement with said ring.

3. In a microscope, in combination; a stator rigidly fixed to the microscope tube and hav-

ing a plane guide surface arranged transversely to the microscope tube; a rotor having a plane guide surface; means for holding the two said surfaces in slidable contact and adapted to limit the extent of relative radial sliding movement between them; means in the said rotor for receiving various objectives; spring means tending to produce relative movement between stator and rotor; adjusting means specific to each objective for locating the rotor relatively to the stator for each objective working position, said means comprising for each objective a pair of adjustment members, the line of adjustment movement of one of the members of each pair intersecting the objective with which it corresponds, and the line of adjustment movement of the other member of each pair being approximately at right angles to that of the first mentioned member; means by which under the action of the said spring means each of the first mentioned adjustment members of the respective pairs may in succession be held in pivotal connection with a point in the stator; and an abutment on the stator with which by the action of the said spring means each of the second mentioned adjustment members of the pairs is adapted to abut; substantially as described.

4. In a microscope, in combination, a stator rigidly fixed to a microscope tube, a rotor pivoted to said stator and having radial freedom of movement, means in said rotor for receiving various objectives, adjusting means specific to each objective for locating the rotor relatively to the stator for each objective working position, said adjusting means comprising a pair of adjusting screws for each objective screwed into the rotor rim, one screw in each pair being pointed; and a ring on the stator for the screws to abut against, said ring having a notch to engage in succession with the ends of the pointed screws for the various objective working positions, and connecting means between rotor and stator urging the rotor radially, intermediate the pair of screws then abutting against the stator ring, so as to hold the said screws in close engagement with said ring, the axes of respective pointed screws being located approximately diametrally opposite the corresponding objective, and the axes of the other screws being severally at right angles to the respective axes of the pointed screws; substantially as described.

5. In a microscope, in combination, a stator rigidly fixed to a microscope tube, a rotor pivoted to said stator and having radial freedom of movement, means in said rotor for receiving various objectives, adjusting means specific to each objective, for locating the rotor relatively to the stator for each objective working position, said adjusting means comprising a pair of adjusting screws for each objective screwed into the rotor rim, one screw in each pair being pointed; and a ring on the stator for the screws to abut against, said ring having a notch to engage in succession with the ends of the pointed screws for the various objective working positions, the axes of respective pointed screws being located approximately diametrally opposite the corresponding objective, and the axes of the other screws being severally at right angles to the respective axes of the pointed screws; spring connection means between the stator and rotor and urging the rotor radially consisting of a spring attached to the stator and having a transverse portion, pins fixed to the rotor portion, and adapted to engage with said transverse portion of the spring there being one pin for each pair of adjusting members, and said pin being located angularly intermediate the said pair of members; substantially as described.

6. In the combination as claimed in claim 2, said rotor being provided with a peripheral flanged portion having radially disposed screw-threaded holes to take the pairs of adjusting screws, and axially disposed intersecting screw-threaded holes to take screws adapted to lock the respective adjusting screws; substantially as described.

In witness whereof I set my hand.

ROBERT ALEXANDER SLOAN.