United States Patent

[11] **3,566,101**

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[33] **Germany**
[31] **1,623,224**

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[54] **CENTERING DEVICE**
3 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **240/44.1,** 352/203, 353/87
[51] **Int. Cl.** **F21v 7/00,** F21v 19/02
[50] **Field of Search** 240/44.1, 44.2, 44; 353/87; 352/198, 203

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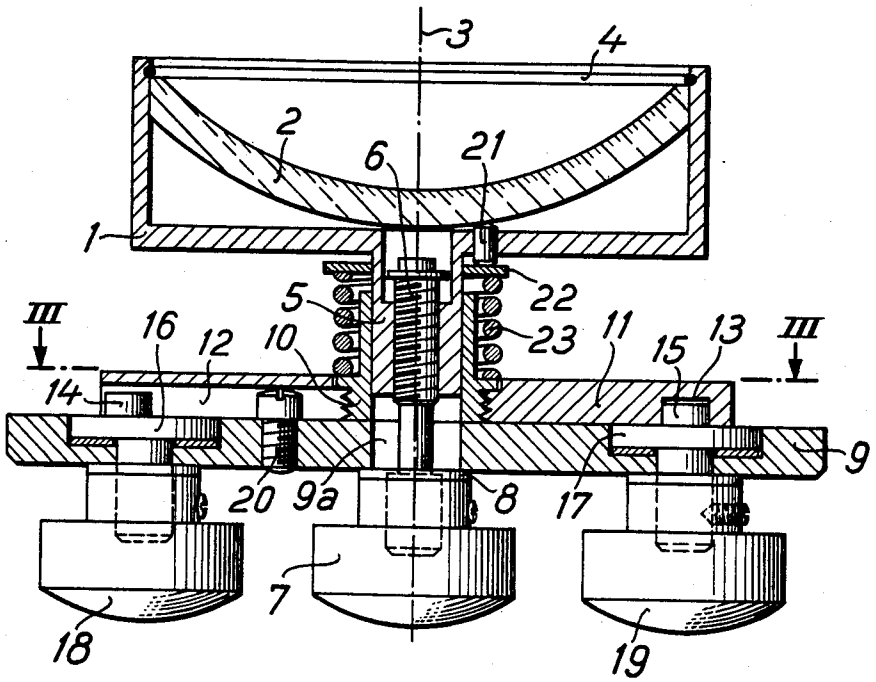
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ABSTRACT: A device for centering optical elements which is adjustable in three directions normal to each other having a carrier, a shaft, one guide bar, one base plate and one compression spring. The device is adjustable in all three directions by a spindle and two eccentric studs. The base plate has a central bore and a first and second bore on either side of the central bore. The guide bar has a sleeve perpendicular to the central bore and also has first and second grooves perpendicular to each other. The carrier for an optical element is provided with a hollow internally threaded shaft which has an outer surface extending into the sleeve. The spindle has a threaded end which is threaded into the internally threaded shaft of the carrier and extends through the central bore. A first knob is secured to the other end of the spindle and abuts the base plate. The spring is positioned between the carrier and the guide bar to apply force to the base plate, the guide bar and carrier to hold them together in an adjustable relationship. When the first knob is turned it adjusts the carrier in an axial direction. The eccentric studs extend through the first and second bores and engage the first and second grooves, respectively, of the guide bar. When the eccentric studs are turned the position of the guide bar and carrier are adjusted.

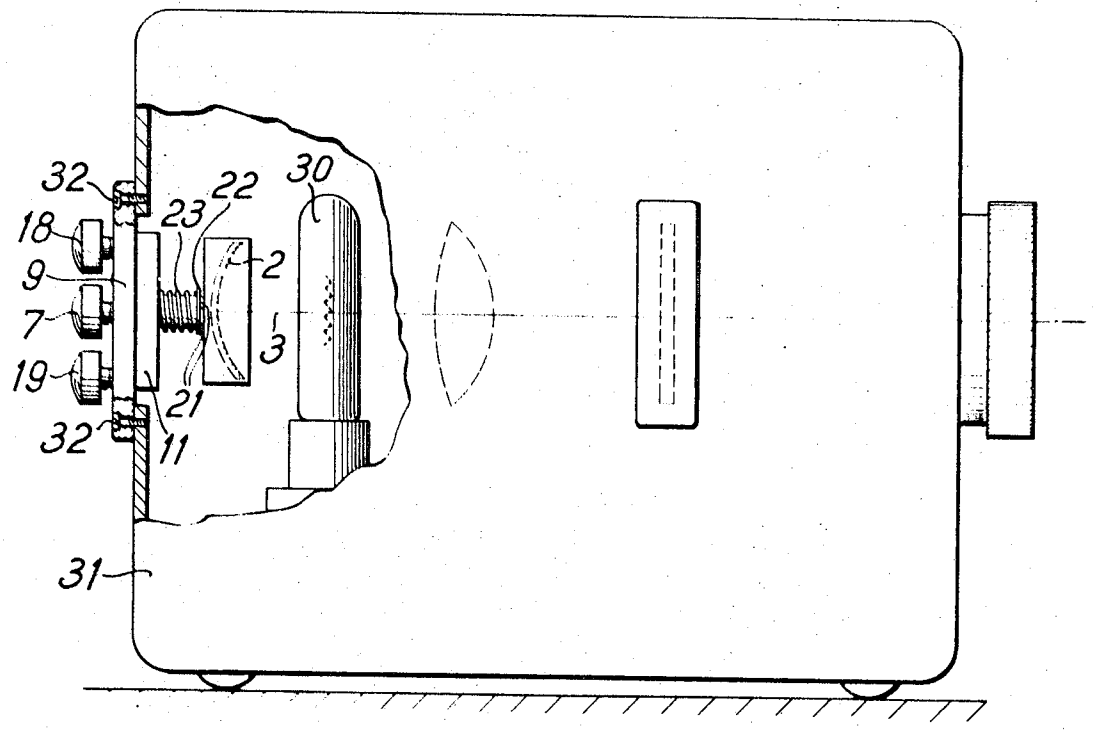


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SHEET 1 OF 2

Fig. 1



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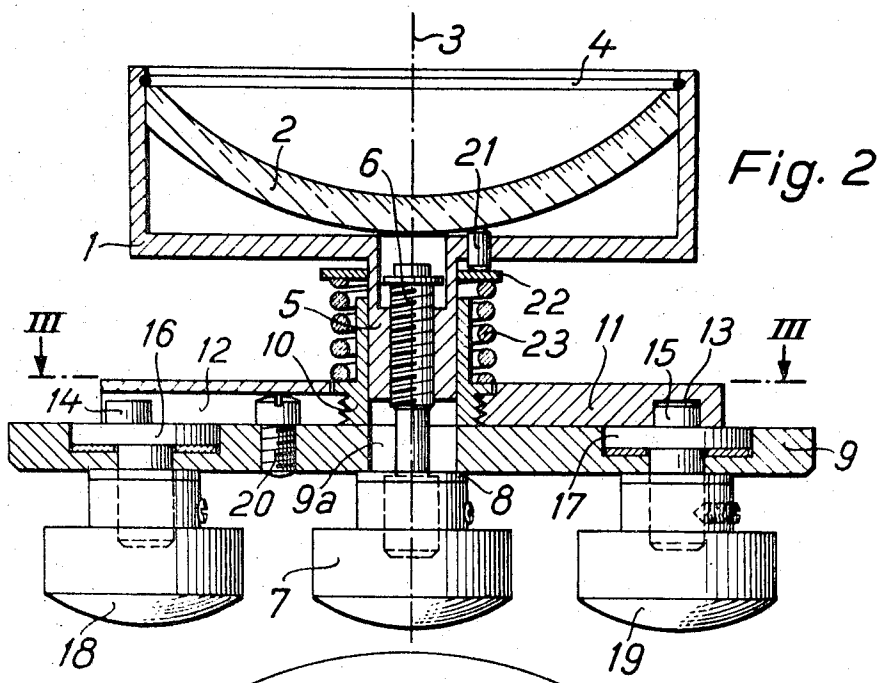


Fig. 2

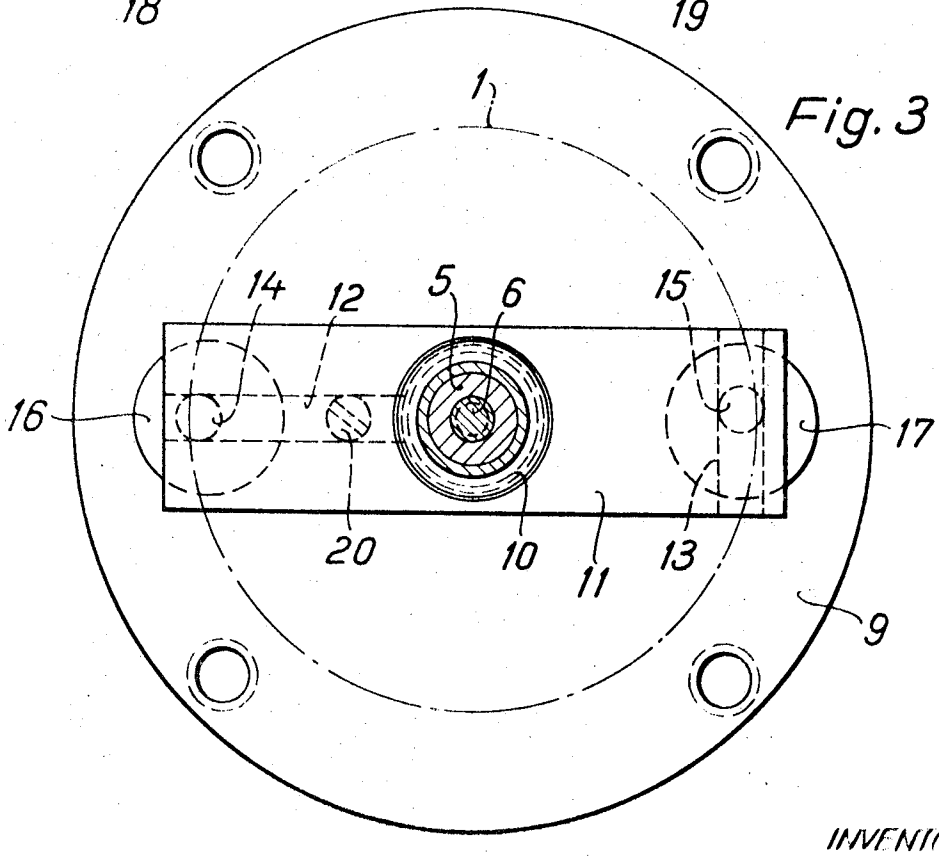


Fig. 3

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CENTERING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a device for centering optical elements in optical apparatuses, such as mirrors, lenses, light sources etc.

2. Description of the Prior Art

Centering devices by means of which an optical element may be adjusted in all three directions normal to each other are already known.

Particularly with illumination devices in microscopes, projectors etc. it proves necessary to center the lamp and/or the concave mirror behind the lamp relative to the optical axis of the apparatus and, further, relative to a field diaphragm or a projector aperture.

To this end, the prior art devices usually make use of separate setting means for each of the three directions, consequently requiring a large number of component parts. Assembly time of these parts is, as a rule, rather long which renders the centering devices as a whole rather expensive.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide a centering device comprising only few component parts. It is a further object to provide a centering device which is easily to assemble and which may be incorporated as a subassembly group into various optical apparatuses.

These objects are attained by a device which consists of a carrier for the element to be adjusted, which carrier is provided with a centrically arranged hollow shaft. The latter is axially displaceable in a matching sleeve that is part of a guide bar. A base plate is arranged on which the guide bar is mounted displaceably in the two directions normal to the optical axis by means of two pivotable eccentric studs that can be operated from the back of the base plate. A setscrew is threaded into the hollow shaft from the back of the base plate, which setscrew serves to perform the axial displacement of the carrier.

DESCRIPTION OF THE DRAWINGS

The invention will be more readily comprehended from the following description when taken in conjunction with the appending drawings, wherein

FIG. 1 shows by way of example a projector into which the inventive centering device is incorporated,

FIG. 2 is a sectional view of the centering device, and

FIG. 3 is a plan view of the centering device cut along the line III–III of FIG. 2.

In the drawings is shown a concave mirror 2 which is to be adjusted relative to the optical axis 3 and relative to the lamp 30. The mirror 2 is mounted in a carrier 1 wherein it is secured by means of a spring ring 4. On its back the carrier 1 is provided with a hollow shaft 5 that is threaded internally. A spindle 6 is threaded into shaft 5, which spindle is to be operated by means of a knob 7. With a shoulder 8 the knob 7 rests against a base plate 9 which is provided with a larger central bore 9*a* through which spindle 6 extends.

Shaft 5 of carrier 1 is axially displaceable in a sleeve 10 which is a solid portion of a guide bar 11. Two grooves 12, 13 are in bar 11. Groove 12 extends laterally and groove 13 extends in a direction normal thereto.

A first stud 14 is placed in groove 12 and a second stud 15 is placed in groove 13. Each stud is arranged eccentrically on a disc 16, 17 respectively, which discs are disposed in cavities in the base plate 9. Both discs are provided with a centrically arranged shaft end on the back, which shaft ends extend through bores in the base plate 9. Knobs 18, 19 are fastened to said shaft ends to that the discs can be rotated by means of said knobs.

On the base plate 9 is further provided a pin 20 which, for example, may be the head of a screw. The pin reaches into groove 12 and serves as the pivot for guide bar 11.

Three pins 21 are inserted in the rear plate of carrier 1, said pins being angularly spaced from each other by 120° and being adjustable in the direction of the optical axis. Against the pins 21 rests a washer 22 which serves as the abutting surface for a spring 23 which with its other end bears against the guide bar 11.

The above-described parts of the centering device are assembled in the following manner: The discs 16, 17 are placed into the cavities of base plate 9 and thereafter the knobs 18, 19 are rigidly connected to the shaft ends of the discs. Then pin 20 is screwed into the base plate 9. Now the guide bar 11 can be placed on the base plate 9 in such a way that stud 15 of disc 17 fits into groove 13 and pin 20 and stud 14 of disc 16 fit into groove 12.

From the front of carrier 1 spindle 6 is then screwed into shaft 5 and thereafter mirror 2 is mounted in the carrier where it is secured by spring ring 4. After spring 23 has been placed on bar 11 the shaft 5 of carrier 1 is introduced into sleeve 10 with the washer 22 at the same time being placed between spring 23 and the pins 21. Against the force exerted by spring 23 the carrier 1 with shaft 5 is inserted far enough into sleeve 10 so that knob 7 can be fixed to spindle 6. This ends the assembly of the device.

Adjustment of the mirror in axial direction is performed by rotating knob 7. Thereby shaft 5 with carrier 1 is pulled more or less in the direction of bar 11, against the force of spring 23. Adjustment of mirror 2 in the remaining two directions is performed by turning the knobs 18 or 19. In case knob 19 is operated pin 20 and stud 14 serve as a linear guide in cooperation with groove 12. If, on the other hand, knob 18 is turned pin 20 will be the pivot about which bar 11 swings.

In FIG. 1 there is illustrated in what way the centering device may be incorporated into an optical apparatus. In this embodiment the base plate 9 is mounted to the rear wall of the slide projector 31 to which it is secured by means of screws 32. In equal manner the device may be mounted to any other apparatus where the necessity of adjusting an optical element prevails.

I claim:

1. A device for centering an optical element in three directions perpendicular to each other having an axial direction, said device comprising in combination:

a. a base plate having a central bore and first and second bores at either side thereof;

b. a guide bar having a sleeve perpendicular to said central bore and first and second grooves perpendicular to each other and perpendicular to said axial direction, said first groove extending laterally to said guide bar;

c. a carrier for said optical element provided at its back with a hollow and internally threaded shaft, said shaft having an outer surface extending into said sleeve;

d. a spindle having a threaded end and an end without threads, threaded into said internally threaded shaft and extending through said central bore;

e. a first knob secured to said end without threads and abutting said base plate;

f. a spring inserted between said carrier and said guide bar for applying force to said base plate, said guide bar and said carrier and holding them in adjustable combination whereby the turning of said first knob adjusts said carrier in axial direction;

g. a first shaft extending through said first bore and having a second knob at one end and a first disc with a first stud mounted eccentrically thereon, said stud engaging said first groove whereby said guide bar and said carrier are adjusted in a first direction perpendicular to said axial direction by turning said second knob; and

h. a second shaft extending through said second bore and having a third knob at one end and a second disc with a second stud mounted eccentrically thereon, said second

stud engaging said second groove whereby said guide bar and said carrier are adjusted in a second direction perpendicular to said axial direction by turning said third knob.

2. The device for centering an optical element as defined in claim 1 and further comprising a pin rigidly connected to said base plate, said pin disposed in said first groove and adapted to serve as a pivot for said guide bar.

3. The device for centering an optical element as defined in claim 1 and further comprising three pins mounted in the back of said carrier at an angular space of 120° from each other, said pins being adjustable in axial direction, and a washer being disposed between said pins and said spring so as to provide an abutting surface for one end of said spring.