REICHERT

AUSTRIA

Zetopan

INSTRUCTION MANUAL

for the

"ZETOPAN" Large Research Microscope

"ZETOPAN" 21,10
5.GA E 12/76

LIST OF CONTENTS

We are constantly endeavouring to still further improve our instruments and to adapt them to the requirements of modern test and research methods. This involves, in certain cases, modifications in the mechanical and optical structure of our instruments. All descriptions and illustrations in catalogues and instruction manuals as well as specifications relating to the mechanical features and optical data **must not be regarded as binding.**

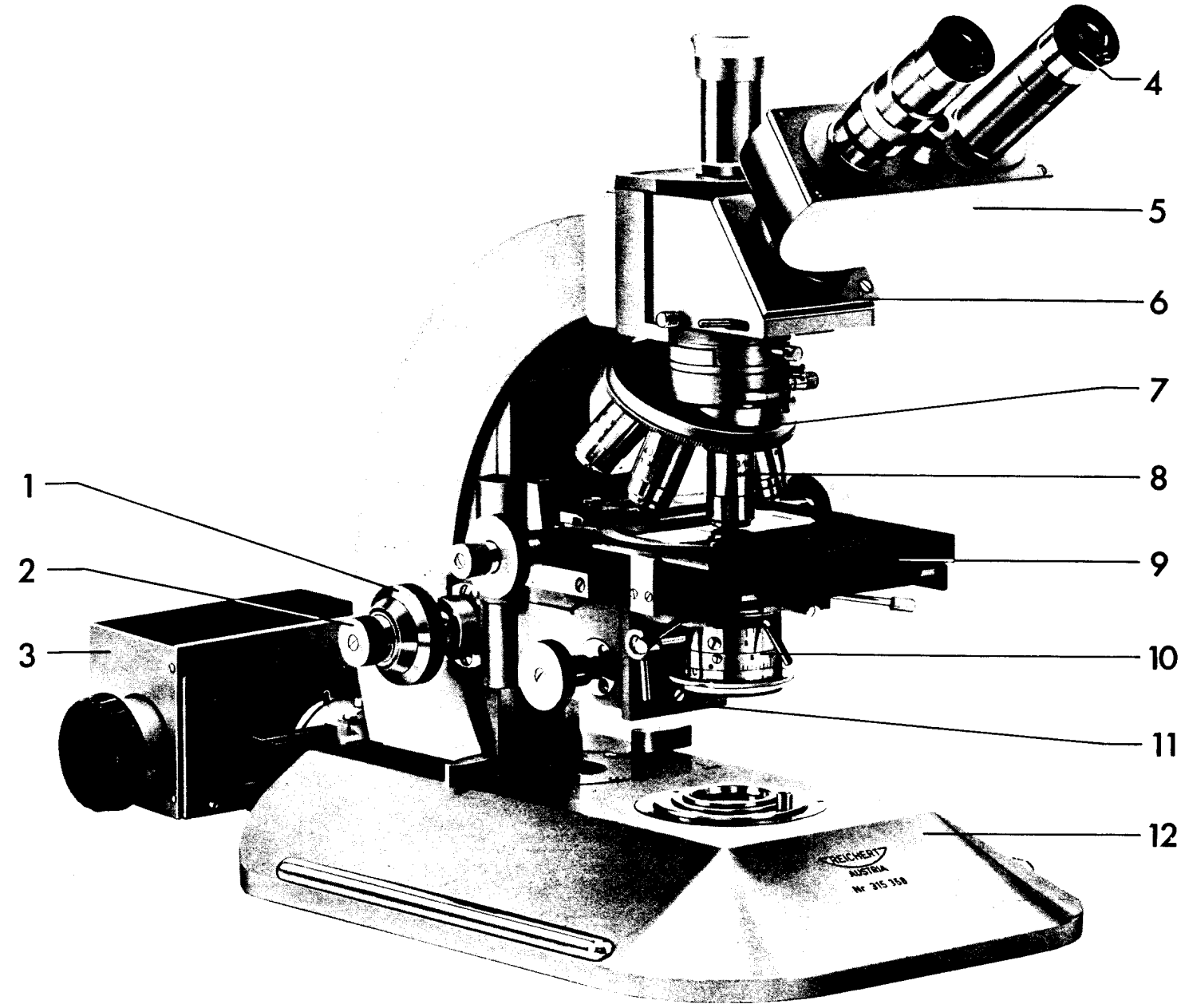


Fig. 1

"ZETOPAN" with transmitted-light illumination equipment

1 Coarse motion control
2 Fine motion control
3 "Lux US" lamp housing
4 Eyepiece
5 Binocular body
6 Swivelling head
7 Revolving nosepiece
8 Transmitted-light objective
9 Stage
10 Condenser
11 Substage
12 Base

SETTING UP THE BASIC INSTRUMENT

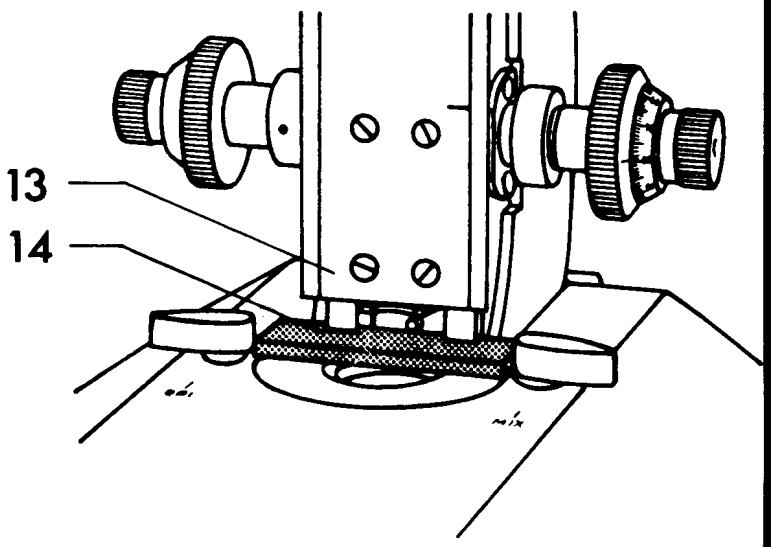
Unpacking

Put the transport carton in such a position that the inscription on the sides is legible. After opening take out the small carton with the binocular viewing tube and the condenser carrier. Remove the carton inserts and take out the microscope stand.

The object stage on its stage carrier is packed in a small wooden box.

The "Lux US" lamp housing as well as the mains supply are in their respective cartons. For microscope accessories (objectifes, eyepieces, condensers etc.) a separate carton respectively an accessories box are provided.

Fig. 3



Transport block

The transport block (14) between the dovetail guide (13) and the baseplate protects the fine motion against damage during transport. It is removed after raising the dovetail guide.

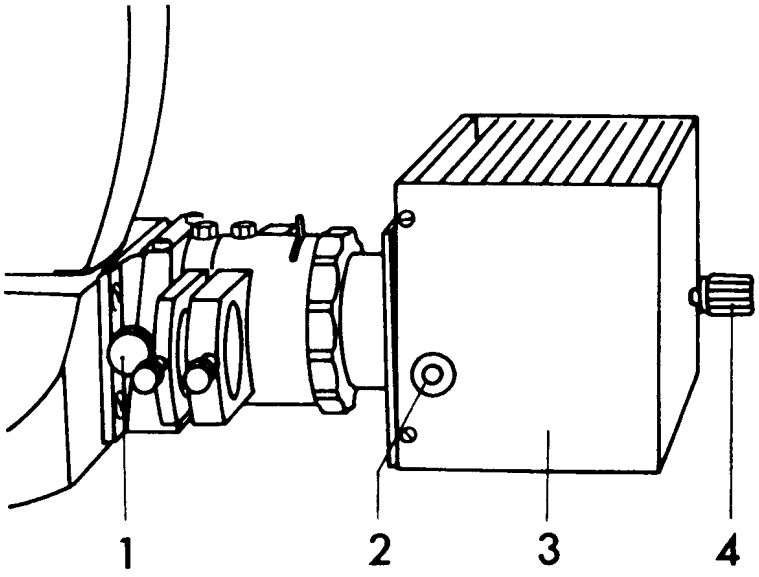


Fig. 4

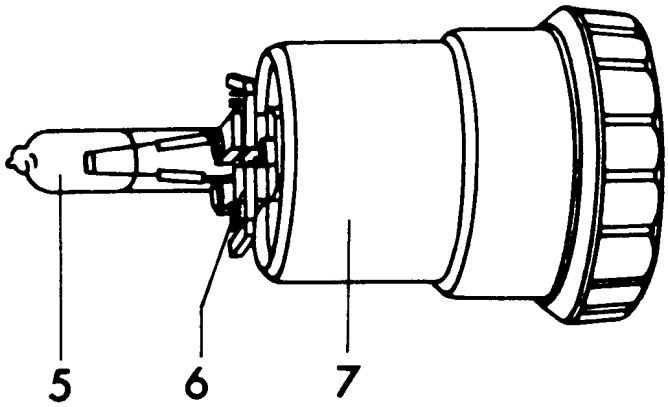
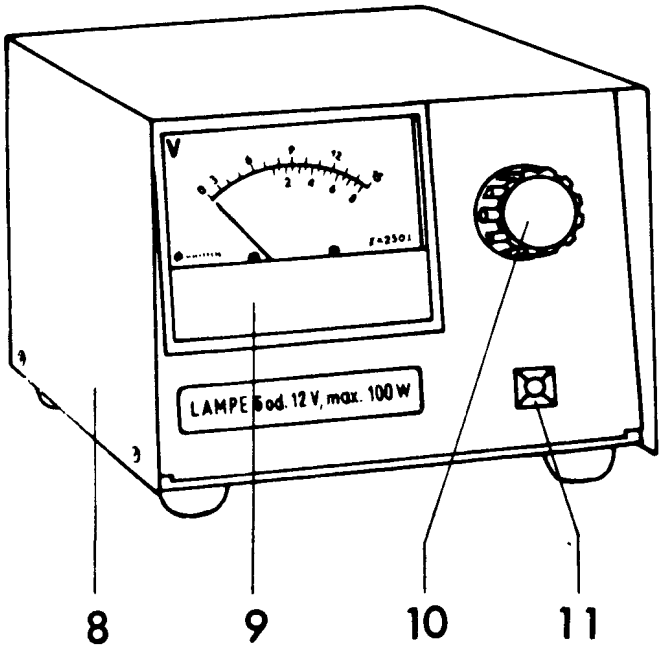


Fig. 5

Fig. 6



"LUX US" LAMP HOUSING

The lamp housing "Lux US" is intended for use with the low-voltage quartz halogen bulb 12 V, 100 W. The Reichert Microflash Equipment can also be fitted into the housing.

Fitting the lamp housing

The lamp housing (3) is inserted into the dove tail guide on the back of the base and secured with the clamping screw (1).

Inserting the low-voltage quartz halogen bulb

Pull the lamp insert (7) out of the lamp housing after releasing the clamping screw (4). Remove the bulb (5) together with its protective cover from its wrapper and carefully insert its base into the holder (6) of the lamp insert up to the stop. Before this can be done, the two clips on the lamp insert must be pressed together. After the clips are released the bulb is locked in position.

Remove the cover and clean off any dirt on the bulb. Then fit the lamp insert into the lamp housing so that the axis of the bulb filament is perpendicular to the axis of the collector, and the connecting cable points towards the rear of the lamp housing.

Regulating transformer

The regulating transformer (8) is used to operate 6 V and 12 V low-voltage lamps.

For a.c. only ! Voltage range 110 – 125 V and 200 – 250 V. If the mains voltage does not agree with the voltage marked on the back of the transformer, unscrew the four screws at the side, remove the cover and reconnect the transformer in accordance with the circuit diagram. Secure the cover back into position with the screws. The fuse on the back of the transformer must also be changed (1,25 A fuse for 100 – 125 V, 0,8 A fuse for 200 – 250 V).

The front of the transformer carries the voltmeter (9), the knob (10) with switch, and the pilot light (11). The upper voltmeter graduation is used for the 12 V range, the lower one for the 6 V range. The voltmeter pointer must not move beyond the red marks at 12 V or 6 V, respectively !

The back of the transformer carries two sockets for the special non-interchangeable plugs of the 6 V and 12 V low-voltage lamps. Next to them is the socket for the mains supply cable to the power supply and the fuse.

The lamp is switched on by turning the control knob clockwise. The red pilot light lights up. The desired brightness can be adjusted continuously with the control. The voltmeter pointer indicates the voltage.

The low-voltage quartz halogen lamp should only be operated at 12 V when actually required since the life of the bulb decreases rapidly as the voltage increases.

Filter set

The filter set consists of two filter slides (14) and (15) which carry the following filters :

Frosted daylight-filter (color light blue)
for reducing the light intensity and adjusting the color of the illuminator to that of daylight. For color-correct rendition on panchromatic black-and-white photographic material.

Green filter
usually used for black-and-white photomicrography provided correct tone reproduction is not necessary A powerful contrast filter for red specimens. Also used occasionally in microscopy of unstained specimens (phase contrast) to increase contrast.

Neutral filters, light and medium
for reducing excessively intensive illumination.

Frosted screen in "Lux US" lamp housing

Use of the built-in frosted screen on slide ensures uniform illumination of the field, especially at low magnifications.

To insert the frosted screen :
move lever (2) in up to the stop.

To withdraw the frosted screen :
pull lever (2) out up to the stop.

Adjusting the low-voltage quartz halogen bulb

Switch on the lamp with the regulating transformer. Remove all light filters (move both filter slides to center position).

Also remove the frosted screen on slide (pull the lever out of the lamp housing up to the stop).

Set the "ZETOPAN" for transmitted light illumination; move the levers (1) and (4) (Fig. 12) outwards to the left and right respectively.
Set the swing-in illumination lens to position "EX" with the pin (3) (Fig. 12).

Place a sheet of paper on the light exit aperture (2/Fig. 12).

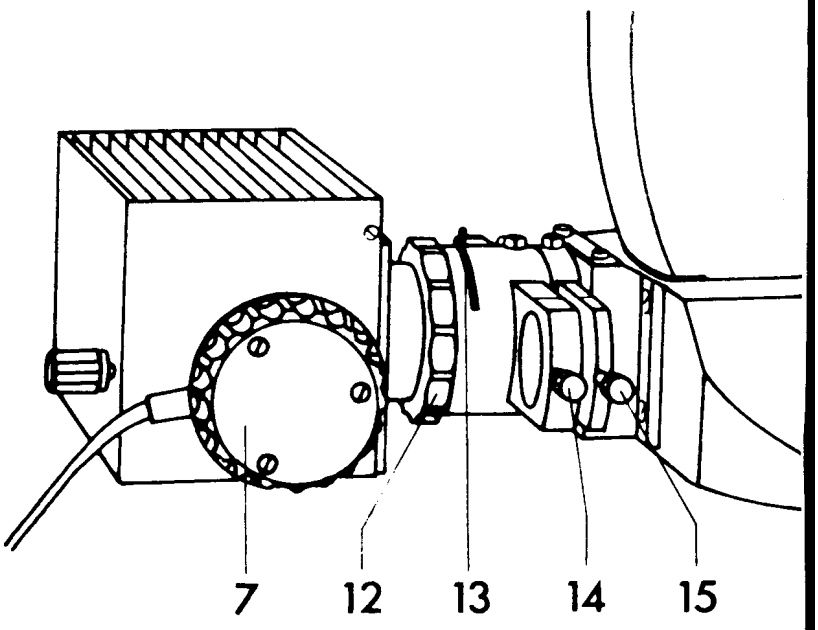


Fig. 7

Adjust the lamp condenser with the knurled ring (12) and close the lamp field diaphragm with the lever (13) to produce an image of the filament on the paper. This image is first adjusted roughly for coincidence with its mirror image in the centre of the light exit aperture by rotating the lamp insert or moving it sideways, after loosening the clamping screw (4).

The exact adjustment is carried out after the microscope has been assembled for transmitted light microscopy. A transmitted light specimen is placed on the stage and the microscope adjusted for exact transmitted-light bright-ground illumination as described on pages 15 or 16, using a low-power objective, such as 10/0,25. During this operation the field diaphragm is focused by adjusting the height of the condenser and centred in the middle of the field by displacing the condenser.

Next the lamp condenser is rotated anti-clockwise up to the stop and the pivot lens set to "EX" with the control (3/Fig. 12). The specimen is moved until an empty area is in the field. The condenser is then lowered with its control until the lamp filament appears sharply focused in the field. The lamp holder can now be moved sideways and rotated so that the lamp filament coincides exactly with its mirror image. Any dark gaps between the windings are filled with bright parts of the mirror image.

Finally the lamp holder is secured in position with the clamping screw (4).

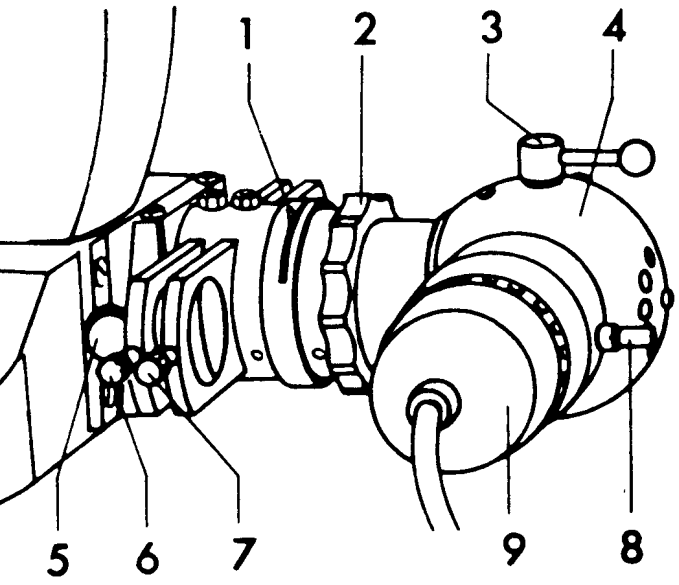


Fig. 8

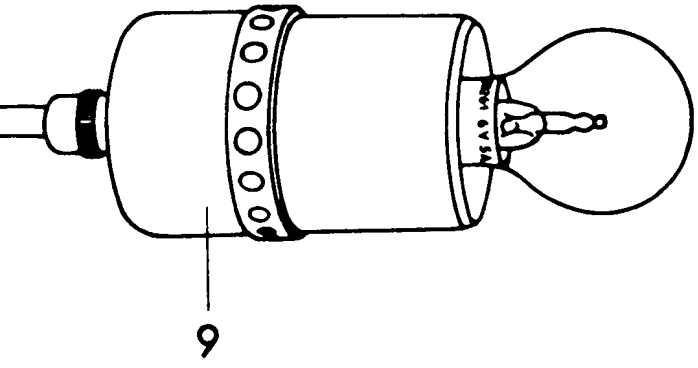
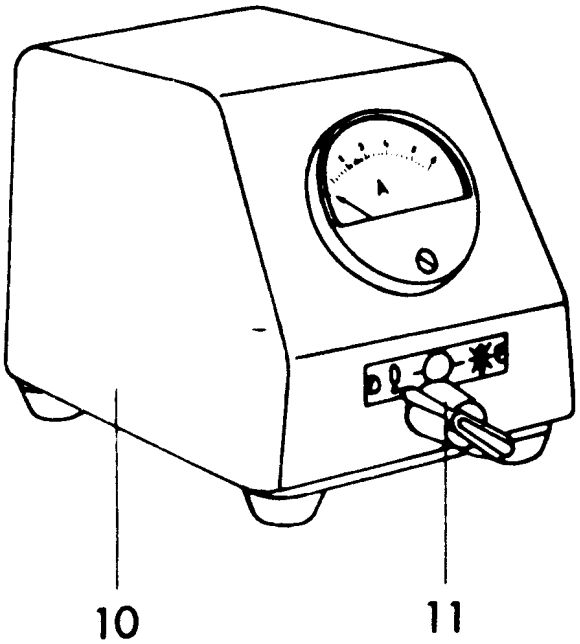


Fig. 9

Fig. 10



"LUX FNI" LOW-VOLTAGE LAMP

The low-voltage lamp is intended for use with the 6 V, 30 W low-voltage bulb. The Reichert Microflash Equipment can also be inserted into this lamp housing.

Fitting the low-voltage lamp

The low-voltage lamp (4) is fitted into the dovetail guide at the back of the base and secured with the clamping screw (5).

Inserting the bulb

Move the lamp condenser as far as possible away from the lamp housing by rotating ring (2) anticlockwise up to the stop.

Swing-out the frosted screen : swing lever (3) backwards.

Withdraw the bulb holder (9) from the lamp housing after loosening the clamping screw (8). Screw the bulb with its precentered collar firmly into the holder. Slide the bulb holder back into the lamp housing and rotate it so that the axis of the bulb filament is perpendicular to the optical axis of the collector. Clamp the holder provisionally with the screw (8).

Regulating transformer

For a.c. only ! If the mains voltage does not correspond to the voltage marked on the transformer (10), pull the cover apart slightly at the bottom on the right and left and lift it off; reconnect the transformer in accordance with the circuit diagram and snap cover back in place. The 3-pin plug of the cable from the low-voltage lamp is connected to the transformer. With the transformer switched off, i.e. knob (11) pointing to the left, connect it to the mains supply; then turn the knob clockwise and set to the desired current. The pointer of the ammeter must not move beyond the red mark at "5 Amp" !

Filter set

The filter set consists of two filter slides (6) and (7) which carry the following filters :

Frosted daylight filter (color light blue)
for reducing the light intensity and adjusting the color of the illuminator to that of daylight. For color-correct rendition on panchromatic black-and-white photographic material.

Green filter
usually used for black-and-white photomicrography provided correct tone reproduction is not necessary. A powerful contrast filter for red specimens. Also used occasionally in microscopy of unstained specimens (phase contrast) to increase contrast.

Neutral filters, light and medium
for reducing excessively intensive illumination.

Swing-in frosted screen

The swing-in frosted screen permits uniform illumination of the field without adjustment for accurate Köhler illumination. When the full light output is required and uniform illumination of the field is achieved with Köhler illumination, the frosted screen is swung out.

To swing in the frosted screen :
move lever (3) to the left.

To swing out the frosted screen :
move lever (3) to the back.

Adjusting the bulb

Switch on the lamp with the regulating transformer. Remove all light filters (move both filter slides to the center position).

Also swing out the frosted screen (move the lever to the back).

Set the "ZETOPAN" for transmitted light illumination; move the levers (1) and (4) (Fig. 12) outwards to the left and right respectively.

Move the swing-in illumination lens to position "EX" with pin (3) (Fig. 12). Adjust the lamp collector with the knurled ring (2) and slightly close the lamp field diaphragm with the lever (1) to produce an image of the glowing filament on the paper.

Release the clamping screw (8) again and pull lamp holder (9) slightly out of the lamp housing. Two images of the filament can now be seen; one is the filament image produced directly by the collector while the second is the mirror image produced by the reflector in the lamp housing (Fig. 11a). Rotate the bulb holder so that both filament images can be seen in their full length (Fig. 11b). Then slide in the bulb holder up to its shoulder so that the two images are superimposed. This ensures that the bulb filament is now exactly in the optical axis from reflector to collector.

Should any dark gaps be visible between the individual coils of the filament (Fig. 11c), a slight rotation of the holder is sufficient to fill these gaps with bright parts of the mirror image (Fig. 11d); if necessary the holder can be rotated through 180°. Secure the clamping screw (8) permanently.

This adjustment should be checked occasionally.

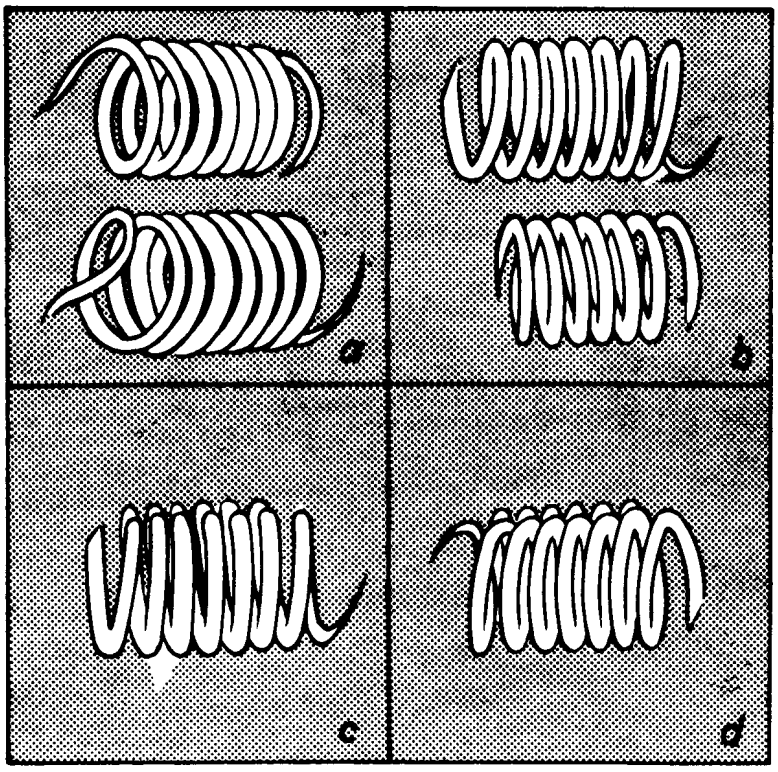


Fig. 11

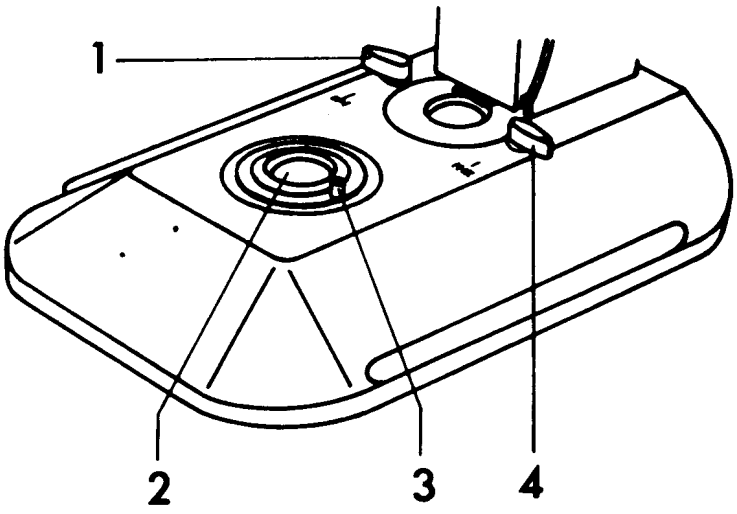


Fig. 12

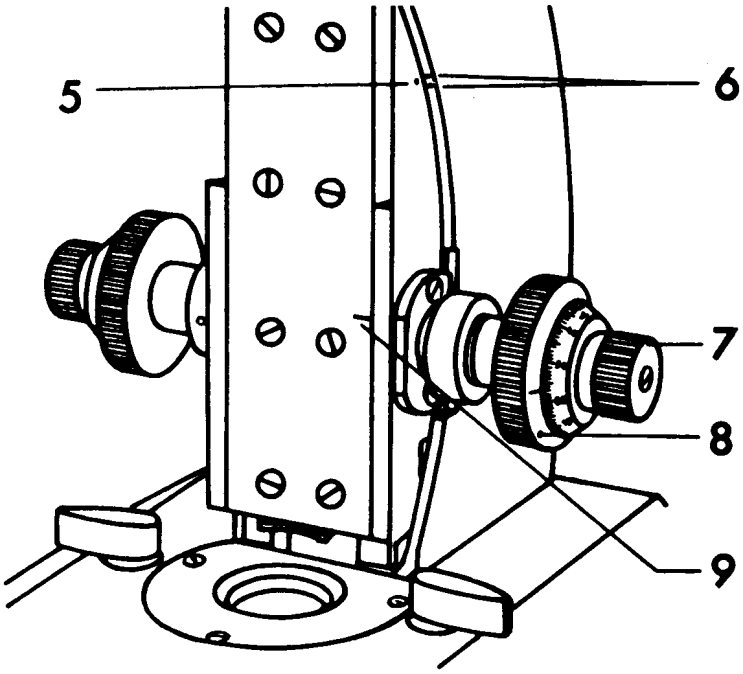
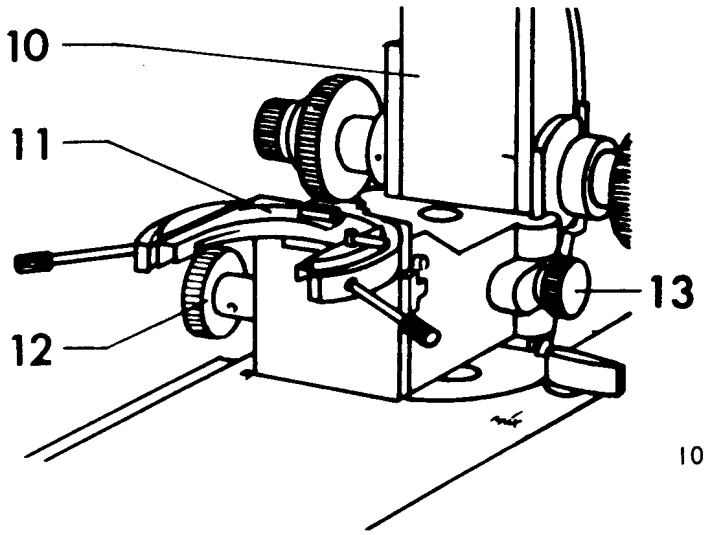


Fig. 13

Fig. 14



THE MICROSCOPE STAND

Illumination optics in the base

The base contains one deviating mirror each for transmitted light, incident light and mixed illumination. The mirror for transmitted light is permanently fixed in position while the other two can be inserted into the light beam with the swivelling levers (1) and (4); the markings "EPI" (incident light) or "MIX" (mixed illumination) show the positions selected. For transmitted light illumination the levers (1) and (4) are swung outwards to the left and right, respectively, so that the mirrors are out of action.

The base also contains an illumination lens for transmitted light illumination which is operated by means of pin (3). Its purpose is described on page 14.

Coarse and fine motion

The coarse motion is operated with the controls (8), the fine motion with the controls (7).

The right-hand fine motion control carries a graduation for depth measurement; each division represents one µm.

The range of the fine motion is approximately 2 mm and is limited by the two marks (6). Before starting to work the fine motion should be set so that the mark (5) is approximately midway between these two limits.

Substage

The dovetail guide (10) to which the substage-and stage carriers are attached is raised slightly with the coarse motion. Unscrew clamping screw (13) on the substage carrier (11) by about 6 – 8 mm. Fit the substage carrier first from the left on to the dovetail guide (10), then swing it into position to the right, move it downwards up to the stop and secure it with clamping screw (13).

The height of the substage can be adjusted with the knob (12).

For incident-light microscopy the substage can only be left on the stand if the specimen height does not exceed 2,5 mm; as a rule it is therefore removed for this type of work or not fitted at all.

Mechanical stage and stage carrier

Unscrew the clamping screw (20) for the stage carrier (21) by about 6 – 8 mm, then fit the stage with the stage carrier first from the left on to the dovetail guide, then swing it into position to the right, move it downwards until it is in contact with the substage, and then secure it by tightening clamping screw (20).

For incident-light microscopy the stage is clamped to the dovetail guide in such a way that the top edge of the stage carrier is against the index line (9) (Fig. 13).

The specimen is clamped between the fixed jaw (17) and the springloaded jaw (16) of the specimen holder (14).

The coordinate movements 50 X 75 mm are operated by the coaxial controls (18) and (19). The coordinate settings can be read to the nearest 0,1 mm on millimeter scales with verniers and set again at any time if a particular specimen point has to be located.
The specimen holder (14) can be detached after releasing the two screws (15) and be replaced by the cover plate Ref.No. 19 48 02.

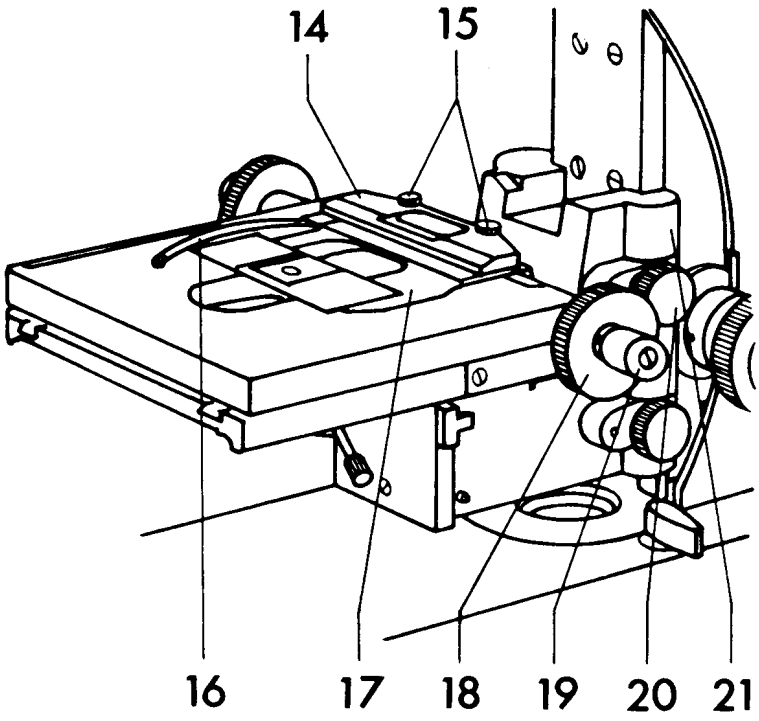


Fig. 15

Swivelling head

The swivelling head (22) is inserted into the dove tail guide on the microscope stand and clamped with screw (27).

The deviating prism in the head diverts the beam into the inclined binocular observation body tube or allows the light to pass into the photographic tube; it is operated with lever (23).

Position for visual observation :
push lever (23) in all the way.

Position for photomicrography using a camera fitted to the vertical photographic tube, or for micro projection :
pull lever (23) out all the way.

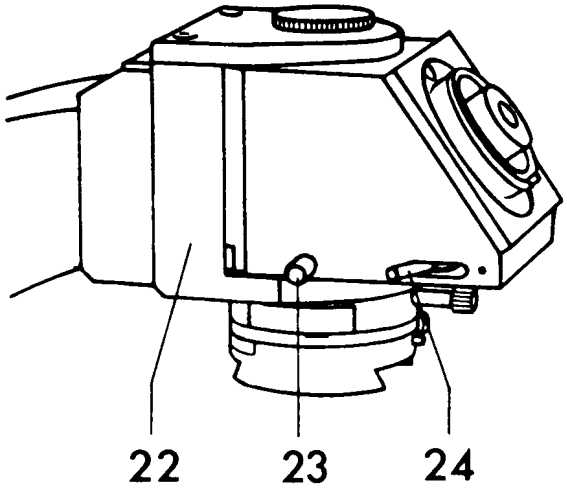


Fig. 16

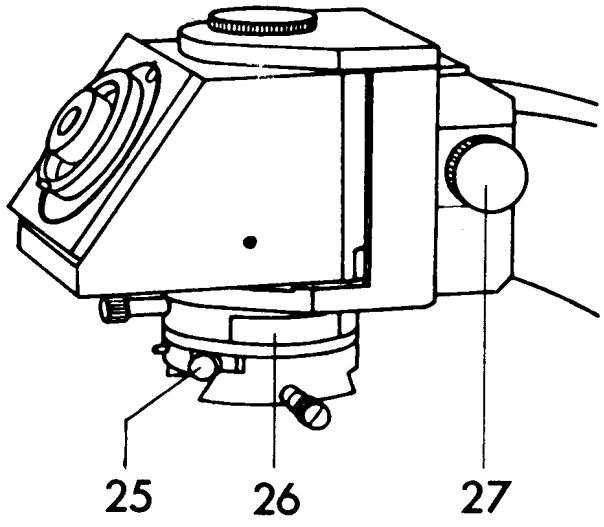
The Bertrand lens in the head allows accurate observation of the rear focal plane of the objective, for magnifications from 40 X upwards, both with the inclined body (monocular or binocular) and the photographic tube. This lens is used for polarization work (axial image observation) and for phase contrast observation (centering the annular diaphragm image to the phase ring).

To insert the Bertrand lens :
push lever (24) forward (towards red dot).

To swing out the Bertrand lens :
push lever (24) to the back.

The openings (25) and (26) are closed with blank slides; they can be fitted with a filter analyzer and a compensator, for example.

Fig. 17



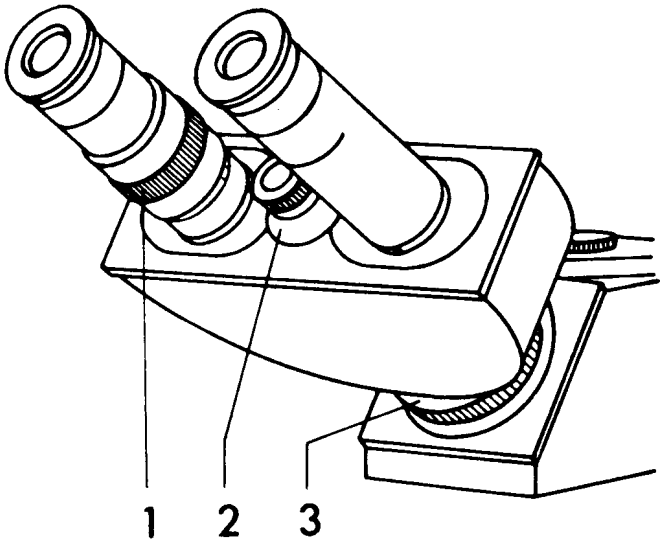


Fig. 18

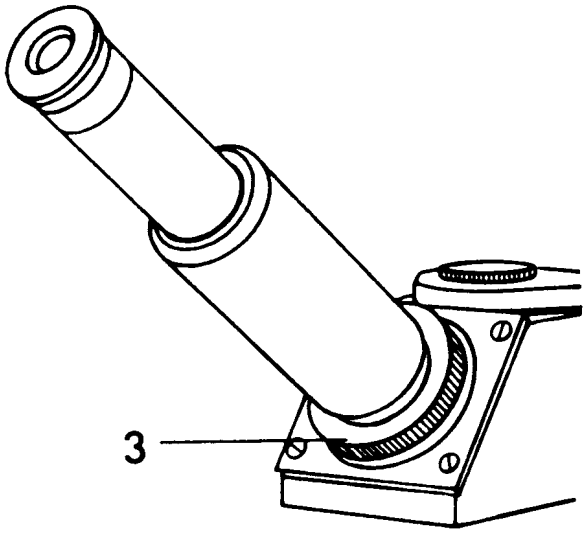
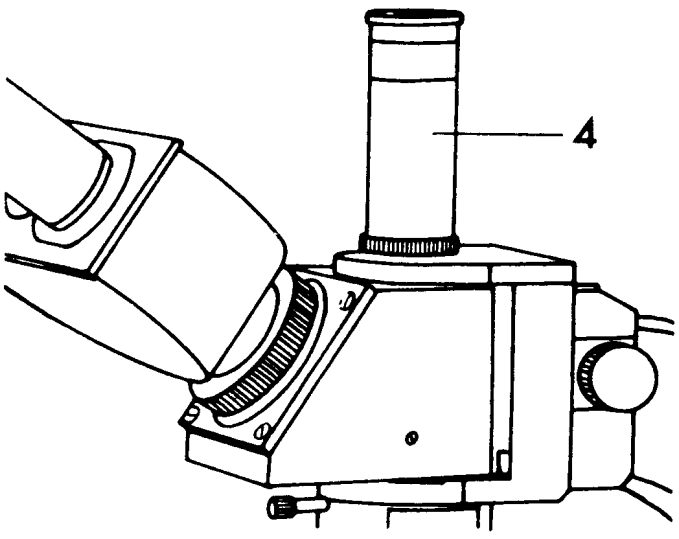


Fig. 19

Fig. 20



Microscope bodies

OBSERVATION BODIES

Remove dust cap from the swivelling head and carefully fit the binocular or monocular body on it. The locating pin on the head must engage with the groove in the body. The body is secured in position with ring (3). Insert eyepieces into the eyepiece tubes.

All bodies have a magnification factor of 1 X.

a) Inclined binocular body, Fig. 18.

The interpupillary distance is adjusted with the knob (2); the actual distance in mm can be read on the knob.

Differences in the acuity of the two eyes are compensated as follows : close the left eye, look into the right eyepiece with the right eye, focus the microscope on a specimen with the coarse and fine motions. Close the right eye and focus on the specimen with the left eye by rotating only ring (1) of the diopter adjustment.

b) Inclined monocular body, Fig. 19.

It is used for low-brightness specimens, e.g. for fluorescence work.

VERTICAL PHOTOGRAPHIC TUBE

The vertical photographic tube (4) can be screwed to the head in place of the dust cap. It accepts accessories for photomicrography or micro-projection.

To prevent dust finding its way into the body the eyepiece tubes should always carry eyepieces or dust caps !

TRANSMITTED–LIGHT ILLUMINATION EQUIPMENT

Fitting the condenser

Raise the stage slightly with the coarse motion, lower the substage with control (5). Open lever (6) on the substage by half a turn. Slide the condenser (7) on slide (e.g. 2-diaphragm condenser) into the guide of the substage up to the stop and clamp it with lever (6).

Raise the substage again with control (5).

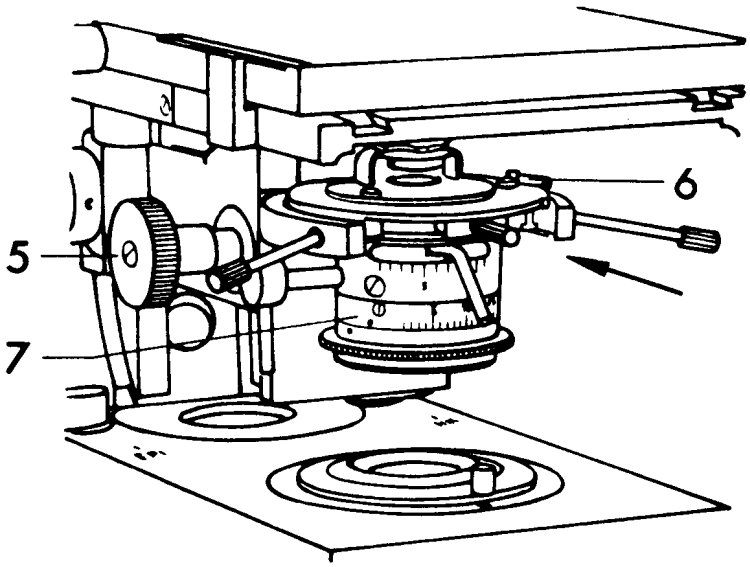
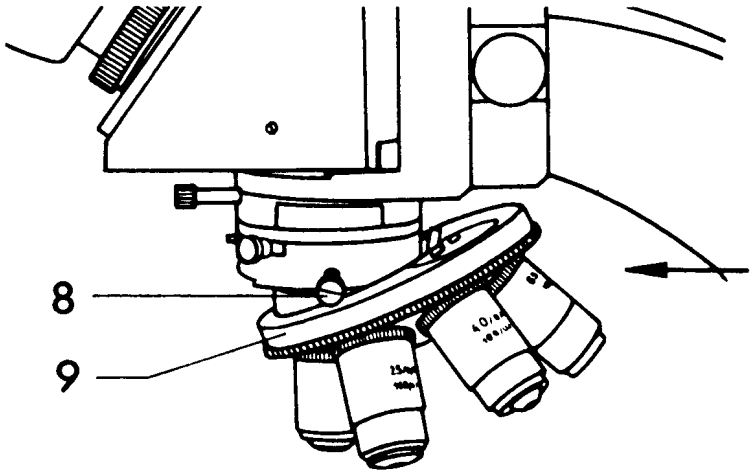


Fig. 21

Transmitted-light objectives and revolving nosepiece

The objectives are screwed into the holes marked with their magnification on the quadruple (10) or sextuple (9) revolving nosepiece. Lower the stage with the coarse motion, slightly loosen clamping knob (8) on the microscope head, remove the blank slide, slide the nosepiece from the rear into the head up to the stop and tighten knob (8).

Fig. 22

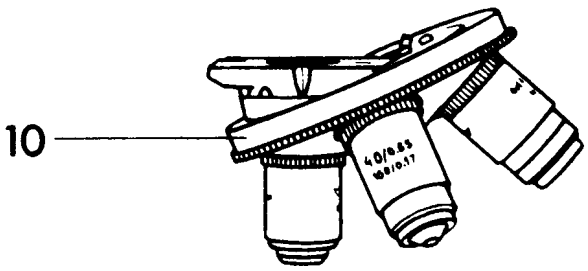


Rotate the nosepiece to swing in the desired objective; the nosepiece has click stops corresponding to each working position. Do not touch the objective front lenses; when swinging in higher power objectives be particularly careful to prevent the front lenses colliding with the specimen (lacquer ring, specimen edging) or the specimen holder.

All objectives are parfocalized to the nosepiece; after changing the objective the microscopic image remains visible in the eyepiece and can be accurately focused by a slight readjustment of the fine motion.

Some higher power objectives are equipped with aperture iris diaphragms for dark ground or fluorescence observation. For normal bright ground observation these aperture iris diaphragms must always be fully open.

Fig. 23



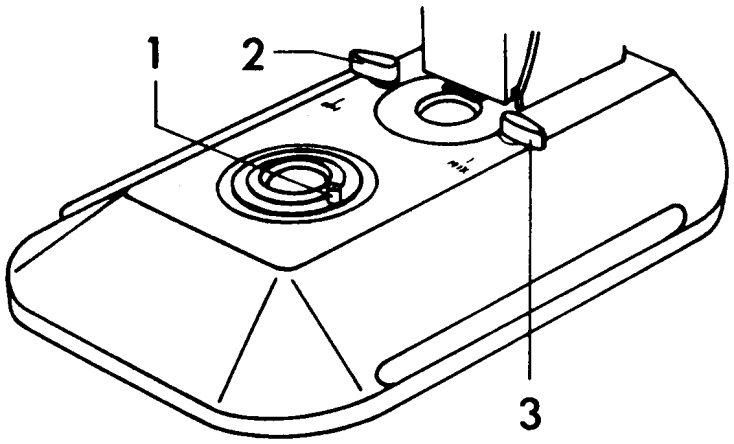


Fig. 24

Transmitted-light illumination optics

The two levers (2) and (3) are turned outwards for transmitted light illumination to the left and right respectively.

The table below shows the position of the illumination lens for different condensers and objectives for optimum illumination of the field. The illumination lens is operated with pin (1).

	Position of the illumination lens	
2-diaphragm condenser 0,95 N.A.	IN	
Achromatic aplanatic condenser 1,35 N.A.	EX	
2-lens wide field condenser f = 55 mm	EX	
Contrast condenser	EX	
Long-focus contrast condenser	EX	
Immersion dark ground condenser 1,18/1,42 N.A.	EX	
	up to objective	from objective
2-lens condenser 0,90 N.A.	6,3/0,16 IN	10/0,25 EX
Contrast fluorescence condenser 0,92 N.A.	16/0,32 IN	25/0,45 EX
Interference contrast condenser	16/0,32 IN	25/0,45 EX
3-lens UV condenser	16/0,32 IN	25/0,45 EX

Fig. 25

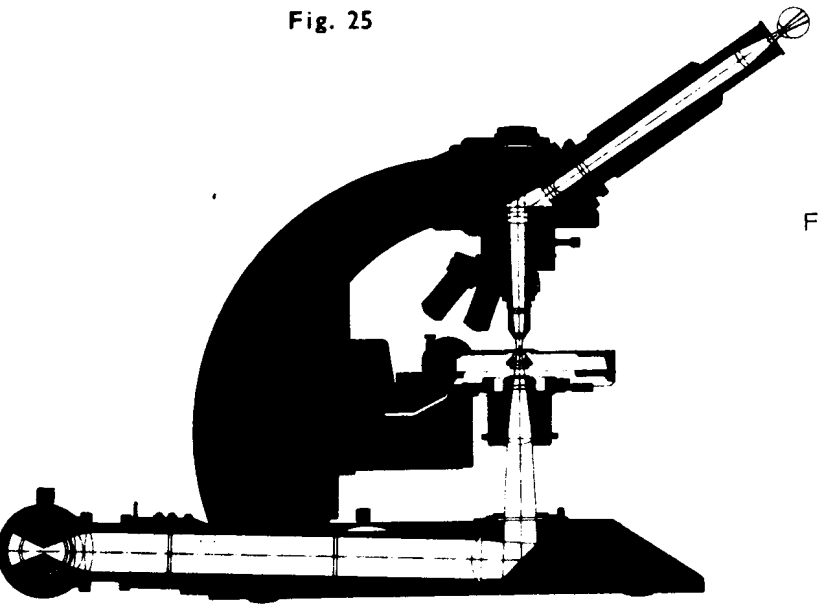


Fig. 25 shows the path of rays for transmitted light.

A) Transmitted-light bright ground

Working with the 2-diaphragm condenser, Fig. 26

a) Adjusting the illumination for work with the objective 10/0,25 or higher power objectives.

Place a specimen on the stage, swing in the 10/0,25 objective.

Switch on the lamp, insert a neutral filter and set the illumination lens to "IN" with pin (1).

Swing in the condenser front lens with lever (5).

Focus sharply on the specimen with coarse and fine motions.

Fully open the lamp field diaphragm with lever (11). Slightly close the field diaphragm of the condenser with ring (9) and focus on the image of the field diaphragm in the field of view by raising or lowering the condenser with knob (6); then center it in the field with the two centering screws (4). Open the field diaphragm to just beyond the edge of the field (further opening causes excessive illumination and loss of contrast).

Adjust for the brightest and most uniform illumination of the field with the lamp collector ring (10).

Adjust the aperture iris diaphragm with the lever (8) to obtain the clearest and most contrasting microscopic image; this is usually the case when the objective rear lens (viewed with the Bertrand lens) is brightly illuminated to about 2/3 of its diameter.

When changing over to higher magnifications, check the positions of the field and aperture iris diaphragm and correct them if necessary.

The standard condenser front lens 0,95 N.A. (7) with its knurled mount can be unscrewed from the 2-diaphragm condenser and replaced by a condenser front lens 1,30 N.A. to obtain a larger illumination aperture. This arrangement can be used with objectives from 25/0,45 upwards. To achieve the full illumination aperture a drop of immersion oil is placed on the condenser front lens before it is brought into contact with the slide.

b) Adjusting the illumination for work with the objective 6,3/0,16 or lower power objectives.

Swing out the condenser front lens with lever (5); fully open both condenser diaphragms.

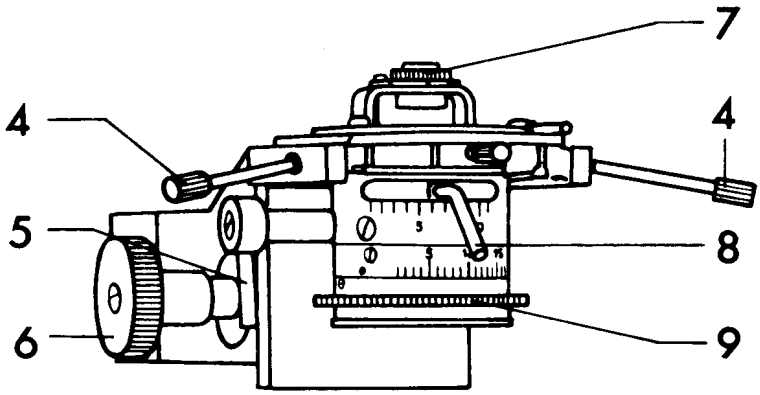


Fig. 26

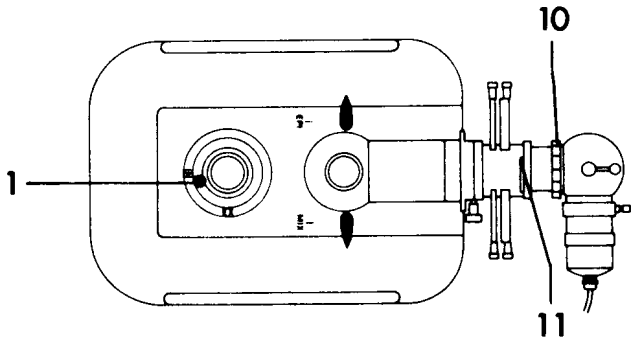


Fig. 27

Fig. 28