ERGAVAL® Microscope

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3000x

8/1980

Instruction Manual

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Publication no. **30–G047c–2**

Printed in GDR

V-14-6 3 6902 M(p) G-7/284/79

Supplementary instructions for the unpacking and operation of precision instruments in countries with moist and warm climate see page 11.

ERGAVAL® Microscope

Instruction Manual

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1. Introduction

The present instruction manual presupposes fundamental knowledge in transmitted light microscopy. Thus, it is restricted to explanation of particulars of the ERGAVAL microscope and its operation.

2. Description

Decisive functional properties of the microscope:

1 The integrated lighting fixture can be centered and detached.

2 The coarse and fine drive mechanisms have been dimensioned to warrant that no objective can touch or destroy the specimen in case of observation with object slides of normal thickness (0.8 to 1.1 mm). Elimination of this protection allows maximum object thickness of 25 mm.

3 The setting range of the fine drive mechanism covers the entire range of the coarse drive mechanism.

4 The revolving nosepiece is carried in ball bearings.

5 The condenser setting mechanism has setting knobs on either end. Its smoothness of action can be varied.

6 The deflecting mirror of the microscope illuminant is adjusted invariably so that the condenser has to be centered.

7 The coarse and fine drive mechanisms have very deep position and move the microscope arm while the object stage is invariable in its position.

3. Unpacking and assembling (Figs. 2–6)

The microscope is supplied in two foam plastic containers which contain the stand, its detachable parts and the accessories.

Arrange the foam plastic container that the side with corresponding description is upward directed, take off the adhesive tape, and remove the upper part.

The bottom part of the larger packing case (Fig. 2) contains the following components: microscope stand (23), aplanatic condenser 1.4 (25) with condenser support mo 2 (26), object stage, type K 5 E (21), revolving nosepiece (19), angular tube 30° (20), straight binocular tube, factor 1 (22), objectives of the basic outfit in capsules (5), immersion oil flask (17), pipette with screwable cap (18), anti-dust hood of synthetic foil (24), and container for accessories (16) which accommodates the eyepieces, light filters, socket and centering wrenches and which has a bearing point for the immersion oil flask.

The smaller case (Fig. 3) contains the baseplate E (31), lampholder with supply line (27), low voltage transformer 220/6 with supply line for the halogen lamp 6 V 25 W (28), box with five projection lamps (15), socket wrench B (30), centering wrench (29), and bearing points for supplementary eyepieces (1).

It is advisable to take the single parts out of their packing cases in the following order and to assemble them as shown in Fig. 4: Take the stand (23) out of the large foam container and baseplate E (31) out of the small one and connect both parts by four screw connections from the baeplate bottom by using socket wrench B. Arrange the stand with the microscope arm head (32) toward the user and fasten condenser support (26) with condenser (25) by clampscrew (34) to condenser drive box (45). The condenser support must reliably be seated on stop pin (41).

The following condenser support combinations are possible:

— Condenser 1.2 and aplanatic condenser 1.4 are screwed into supports mo 2, mfl 2 or ms. Take care that the screw threads disappear entirely.

— The aplanatic-achromatic condenser 1.4, cardioid condenser or dissecting change-over condenser are pushed up to stop into the sliding sleeve of support mz and fastened by the clampscrew.

— The phase contrast condenser with annular diaphragm turret and the support are one assembly and fastened in the same way as a condenser support.

Use condenser setting knob (36) to set the condenser to its upper stop. Then attach object stage (21) to stage carrier (46) and fasten by clampscrew (42).

Clamp angular tube (20) on microscope arm head (32) and the straight binocular tube (22) on the angular tube. Push quintuple nosepiece (19) up to stop into the dovetail guide on the lower end of microscope arm head (32). The nosepiece recess and the tongue on the microscope arm head must be in correct engagement. The nosepiece has to be attached with utmost care because a faulty position means that the objectives are not in the optical axis of the microscope.

The halogen lamp 6 V 25 W fastened to a carrier plate (15) is fixed by two knurled screws (47) to lampholder (27) that one end of the holder section is in mesh with the notch of plate (48). Push the lampholder into the rear end of the microscope base that the positioning pin (49) on the holder (upward directed) fits into the corresponding groove in the microscope base. Then tighten the holder.

Screw objective (5) to the nosepiece. It is advisable to maintain the same order in all cases. This means increasing magnification if the nosepiece is turned clockwise. Replace the antidust caps in the eyepiece sockets of the binocular tube by eyepieces from accessories container (16). Take the immersion oil flask out of the case, remove the screwable cap and hollow plug, and attach the pipette with screw cap. The flask is now ready for use and can be deposited in the accessories container (16).

4. Using the microscope

4.1. Illumination (Figs. 4, 5, 7)

— Check mains and transformer voltages for identity.

— Connect the lamp through the supplied transformer to the mains.

— Set actuating lever (52) to horizontal position to move the integrated groundglass out of the path of rays.

— Close the luminous field stop by setting wheel (39) halfway, aperture stop (7) completely, bring widefield lenses (8, 9) out of the path of rays, and switch on the lighting.

— Loosen knurled knob (51) and shift lampholder (27) to image the lamp filament to the closed aperture stop (visible from below by hand mirror), and tighten the knurled knob after this.

— Center the filament image relative to the aperture stop by means of three socket wrenches put on the centering squares (50) on the rear end of the mount.

— Open the aperture stop and move in the groundglass.

— Use a low to medium power overall magnification – such as 20-power objective and 10-power eyepiece –, adjust an object with good definition, and focus the condenser to image the luminous field with sharp definition into the object.

— Use centering screws (43) to center the condenser that the image of the luminous field stop is concentric in the field of vision.

— Open the luminous field stop until the field of vision is well illuminated. Recenter if needed.

— Full illumination of the large fields of low power objectives requires the upper widefield lens (8) for the objective 3.2 and the lower one (9) for the objective 10 to be moved into the path of rays until the spring clicks in.

— Set the aperture stop to best possible image contrast. The aperture stop image becomes visible as a luminous spot in the rear focal plane of the objective after one eyepiece has been taken out of the tube. It is advisable to close the aperture stop not further than until this spot has about two thirds of its maximum size. Reduction to the half is for exceptional cases only.

This is the way to adjust the illumination according to KOEHLER's principle.

On condenser immersion: Dry use of condensers is normally sufficient. Condensers with aperture of at least 1.0 will then attain an efficient aperture of no more than 0.9. Full aperture cannot be utilized unless the space between the condenser front lens and specimen bottom side is bridged by oil.

Advantages: better field brightness, higher resolution by objectives with apertures of at least 1, better colour purity in case of coloured specimens.

Disadvantage: loss in contrast.

The completely opened aperture diaphragm is a prerequisite for condenser immersion.

Condenser immersion should be as follows:

— Slightly lower the condenser.

— Give a small drop of immersion oil to the condenser front face.

— Give a large drop of immersion oil to the specimen bottom.

— Adjust the specimen by the stage setting mechanism that both drops are opposing each other.

— Slowly lift the condenser until the oil drops are touching (light flash in the oil).

— Set KOEHLER illumination as described above (the aperture stop must remain fully open).

It should be stressed in this context that the optimum performance of a microscope can be utilized only in case that the overall magnification is within the limits of useful magnification, i. e. the 500 . . . 1,000-fold of the aperture of the objective used and if objectives and eyepieces are appropriately mated. Achromats have to be mated with eyepieces A or P, apochromats and plano-objectives with eyepieces PK. Objectives of new production are additionally engraved with A or C. Objectives with A are mated with eyepieces A or P, objectives with C with eyepieces PK.

4.2. Adjusting the straight binocular tube (Fig. 9)

The straight binocular tube and the angular tube together have unit magnification.

The right-hand eyepiece socket is invariable while the left-hand one can be focussed to compensate for different focal lengths of the user's eyes.

Adjust as follows:

Set an object to sharp definition by the focussing unit while observing with your right-hand eye through the right-hand (fixed) eyepiece socket. Then focus for the same object by the diopter setting ring (57) of the eyepiece socket while observing through this (adjustable) socket with your left eye. Do not change the position of the focussing unit. The setting ring has a simple finder graduation so that an individual setting can quickly be repeated whenever required. The eyepiece distance can be set to the individual interpupillary distance by symmetric movement of the two tube halves relative to each other. The found distance can be set and read on graduation (59).

It is possible after longer use that the adjusted eyepiece distance has changed without influence from outside. This can be eliminated by resetting of the brakes: Set the tube to shortest interpupillary distance. A group of two small and one bigger screws becomes visible on every tube half. Carefully turn the small screws (58) clockwise for brake locking, counterclockwise for brake releasing. The bigger slotted screws hold the brake in the housing and must not be moved.

4.3. Adjusting smoothness of setting knob motions

The microscope is supplied with the drive brake released. This measure is to protect the moving elements from transport damages.

To set smoothness of the coarse drive mechanism move the knob through about half a revolution to the middle of the focussing range so that no stop is noticeable. Now take both coarse driving knobs and turn them against each other until smoothness is as required.

The condenser setting unit which can be used from either side has a brake, too, which can be set in the same way as that for the coarse driving mechanism.

4.4. Installing the adjustable illumination mirror (Fig. 8)

The object can be illuminated by a mirror screwed in instead of filter holder E (40 Fig. 4) if more light is necessary e. g. in photomicrography and fluorescence microscopy. This is possible by use of the two small control elements (55) on baseplate (54) of mirror (56). The mirror can be adjusted. Loosening of clampscrew (53) releases rotating and tilting motions of the mirror. The light source has to be imaged to the middle of the closed aperture stop and the adjustment thus found to be locked by tightening of the clampscrew.

N o t e : The built-in deflecting mirror (11 Fig. 1) is accessible after the filter holder has been removed. This mirror must not be touched by hand or cleaned by a cloth. The mirror should be cleaned by a hair brush after it had been degreased in an alcohol-ether mixture and well dried.

Observation with the ERGAVAL microscope is normally from the open side. Use from the other end is necessary if stronger single lamps are employed or the microscope combined with the micromanipulator.

The ERGAVAL is particularly suitable for micrurgic work because the object stage is stationary while the drive knobs act on the microscope arm.

5. Completing units

The ERGAVAL can be extended by the following completing units:

	Publication no.
— Detachable optical components (objectives, eyepieces, condensers)	30–G047–2
— Cardioid condenser	30–G306–2
— Dissecting change over condenser	30–G502–2
— Phase contrast equipment	30–G304–2

— Equipments for interference contrast according to NOMARSKI	30–G312–2
— Polarizing equipment for transmitted light microscopes	30–G331–2
— Fluorescence equipment for ERGAVAL	30–G543–2
— Photomicrographic equipments mf	30–605–2
— Equipments for measuring and counting	30–G492–2
— Devices for drawing with microscope	30–G205–2
— 10-power demonstration attachment	30–047–2
— Pancratic tube	30–420–2
— Heating and cooling stage – 20 ... + 50 °C	30–G516–2
— Micrurgic equipments	30–500–2

6. Maintenance and upkeep of the microscope

Appropriate treatment is the basis of long service life of the microscope. Maintenance and upkeep are easy.

The microscope has to be treated carefully in consideration of the instruction manual, protected from dust, direct solar irradiation, temperatures exceeding + 50 °C, frost, moisture, aggressive chemicals and vapours, and smaller damages should be repaired immediately. This and overhauls which are advisable at longer intervals can be done by the workshops of our agencies, branches, and the Jena factory.

The following cleaning and maintenance operations can be executed by the user:

— Dust on optical elements must not be removed by a cloth or leather but by natural hair brushes degreased in a mixture of alcohol and ether.

— Fingerprints on glass faces are sometimes unavoidable. They can be removed by an optical leather or cloth which must be protected from dust. Benzene or xylene may be used as solvents but not alcohol which attacks the lens cement.

— Cleaning of objectives must be restricted to front and rear faces, connecting threads, and contact areas.

— Remaining immersion oil has to be removed by xylene or benzene, never by alcohol.

— Preserve objectives in their protective encapsulations if they are out of use.

— The synthetic encapsulations for objectives and the accessories container must never be treated with xylene or with substances containing xylene.

Additional instructions concerning unpacking and operation of precision instruments in countries with damp climate

This first class precision instrument has been designed for use in damp tropical climate, too. This, however, means permanent upkeep to maintain its use value.

Optical elements are specially coated, certain functional elements are metallically bright due to precision. Such elements must be protected from the influence of damp tropical climate.

That is the reason why the following instructions have to be followed to maintain the service life for many years.

Unpacking the device

1 For transport and storage the device is protected by an anti-corrosive and dehumidifying agent. The period of protection amounts to 200 days from the day of packing.

2 The device has to be unpacked after receipt, i. e. not later than after approx. 200 days from packing date. Devices which are installed by specialists must not be unpacked by other people.

3 The completely unpacked devices have to be stored in dry rooms (relative air humidity less than 65 per cent if possible). Humidities of more than 70 per cent must not act for longer periods if the new value of devices is to be maintained.

Storing and using devices

4 Permanent use of the device reduces the risk of attack by mould fungus.

The following recommendations, however, should be considered if longer downtimes or storing times are unavoidable.

— Preservation in bright and dry rooms. The most suitable rooms are those with humidities of less then 65 per cent which can be materialized by air dehumidifiers, for instance. It is advisable to ventilate the devices at certain intervals by fans arranged close to them.

— Subassemblies which are easily attacked by mould fungi, small devices, and accessories – such as eyepieces and objectives – should be stored in cabinet driers. Suitable places are e. g. glass-enclosed cabinets of incombustible material in which heat sources (filament lamps or infrared radiators) generate an overtemperature of about 5 degrees. Subassemblies, small devices, and accessories can also be stored in exsiccators unless otherwise specified in the instruction manual.

5 The attack by mould fungi to devices in storing containers can largely be avoided if absorbent materials (cardboard, for instance) are impregnated with the fungicide (e. g. a solution of p-chloro-m-cresol in spirit) and put into the storing containers. Impregnation has to be renewed if the smell has disappeared. It is also possible to use paraformaldehyde in tablets or powder (packed in paper bags) as fungicide for the containers.

6 The devices should be protected from dust by air-penetrable coverings with fungicides put under them.

7 Inserts with drying agents in the devices must be regenerated or renewed at intervals specified in the instruction manuals. The most frequently applied drying agent, silicagel, can be regenerated several times at + 120 ... + 150 °C after which it has again its blue colour as in the beginning.

8 Instructions for maintenance of optical surfaces

— Remove dust from optical faces by means of soft, clean, and degreased brushes only.

— Heavier soiling such as fingerprints on optical faces should be removed with clean conventional optics/spectacle cleaning cloths. They can s l i g h t l y be wetted with spirit unless the instruction manual prescribes other agents.

9 Instructions for maintenance of steel parts

Steel parts which are bright, burnished or phosphatized for functional causes must be protected by acid-free grease (vaseline) and oil. Relevant notes in the instruction manual have to be considered. It is advisable to renew the film of anti-corrosive oil and grease in accessible regions every three months approximately.

Instructions Nos. 4 to 9 are analogously applicable to devices, too, which are in the state of use. The measures help to give the devices longer service life.

The conditions specified hereafter are the basis that all opto-mechanical elements could be attacked by mould fungi:

— Relative air humidity of more than 75 per cent for more than three days without interruption

— Darkness, no air circulation

— Dust, fingerprints on optical faces

— Longer storage in wooden or leather containers
(growth of mould fungi is accelerated by temperatures of + 15 ... + 35 °C)

7. Reference numbers

1	eyepiece	1 3 4
2	tube length correction lens	1
3	deflecting prism	1
4	tube length correction lens	1
5	objectives	1 2 4
6	condenser	1
7	aperture stop	1 5
8	widefield lens for objective 3.2	1 4 5
9	widefield lens for objective 10	1 4 5
10	dust protection glass with filter holder E	1
11	deflecting mirror	1
12	luminous field stop	1
13	collector	1
14	groundglass	1
15	halogen lamp 6 V 25 W	1 3 6
16	accessories container	2
17	immersion oil flask	2
18	pipette with screwable cap for (17)	2
19	revolving nosepiece	2 4
20	angular tube 30°	2 4
21	object stage type K 5 E	2 4 5
22	straight binocular tube, body magnification 1	2 4
23	microscope stand ERGAVAL	2 4
24	anti-dust hood	2
25	aplanatic condenser 1.4	2 5
26	condenser support mo 2	2 4 5
27	lampholder with supply line	3 4 6
28	low voltage transformer 220/6 with supply line for halogen lamp 6 V 25 W	3 3
29	centering wrench for lamp	3
30	socket wrench B	3
31	baseplate E	3 4
32	microscope arm head	4
33	microscope arm of (23)	4
34	clampscrew for condenser support	4 5
35	pinion head of mechanical stage	4
36	knob of condenser drive mechanism	4 5
37	knob of coarse drive mechanism	4
38	knob of fine drive mechanism	4
39	setting wheel of luminous field stop (12)	4
40	filter holder E	4
41	stop pin	4
42	clampscrew for object stage	4 5
43	condenser centering screws	5
44	setting lever for aperture stop (7)	5
45	condenser drive box	5

46	stage carrier	5
47	knurled screws for lamp fastening	6
48	centering notch on carrier plate	6
49	pin for positional orientation of lampholder	6
50	centering squares	7
51	knurled knob for focussing	7
52	actuating lever for groundglass (14)	7
53	clampscrew for (56)	8
54	baseplate	8
55	small control element	8
56	mirror	8
57	diopter setting ring	9
58	four setscrews for brake	9
59	graduation for IPD setting	9

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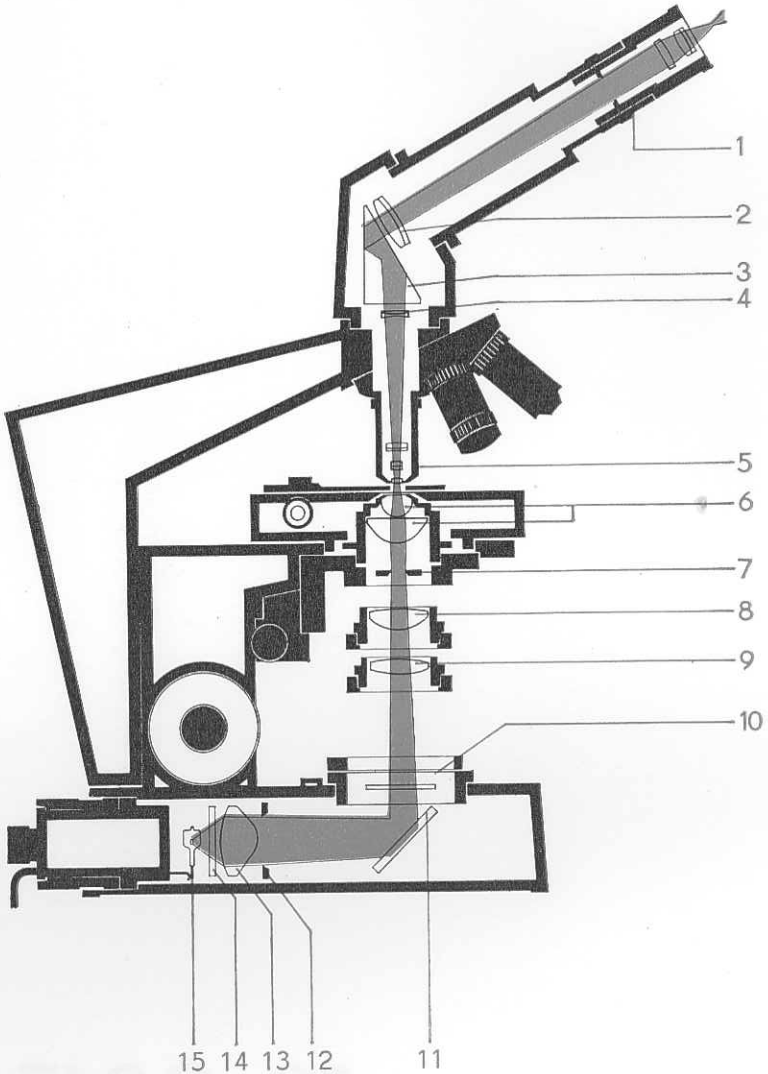

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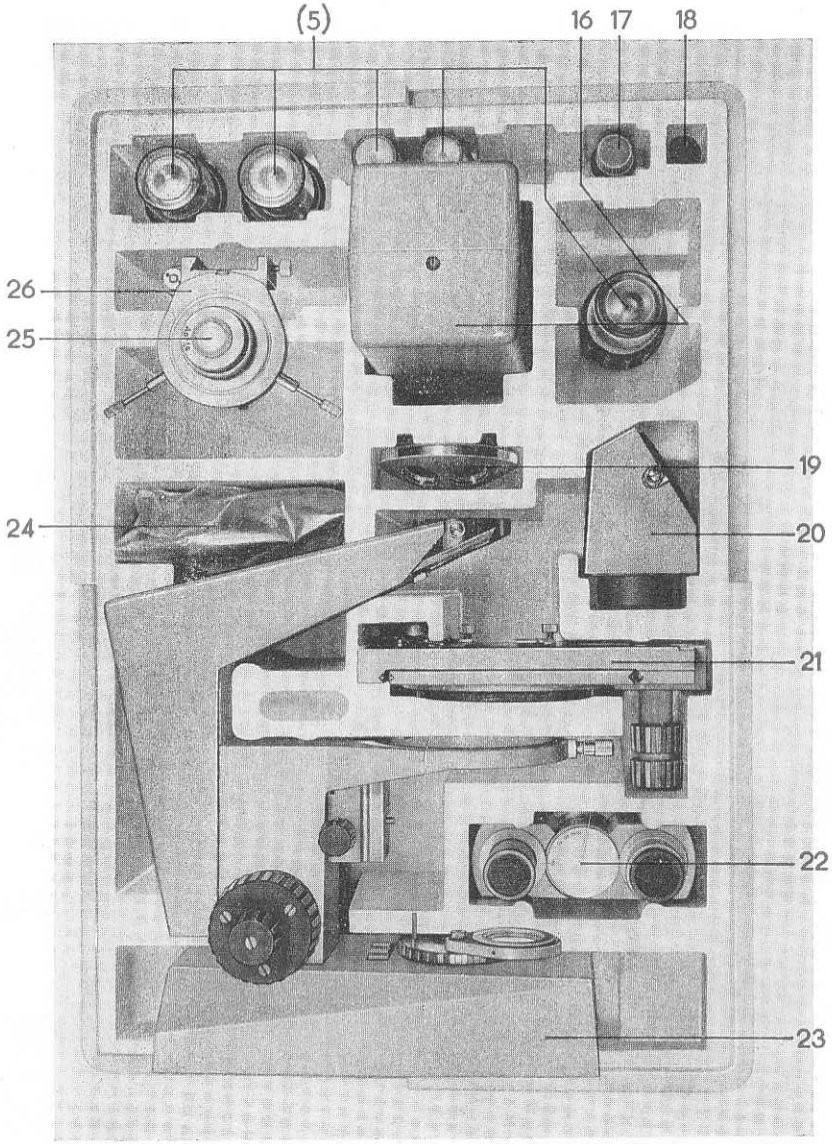

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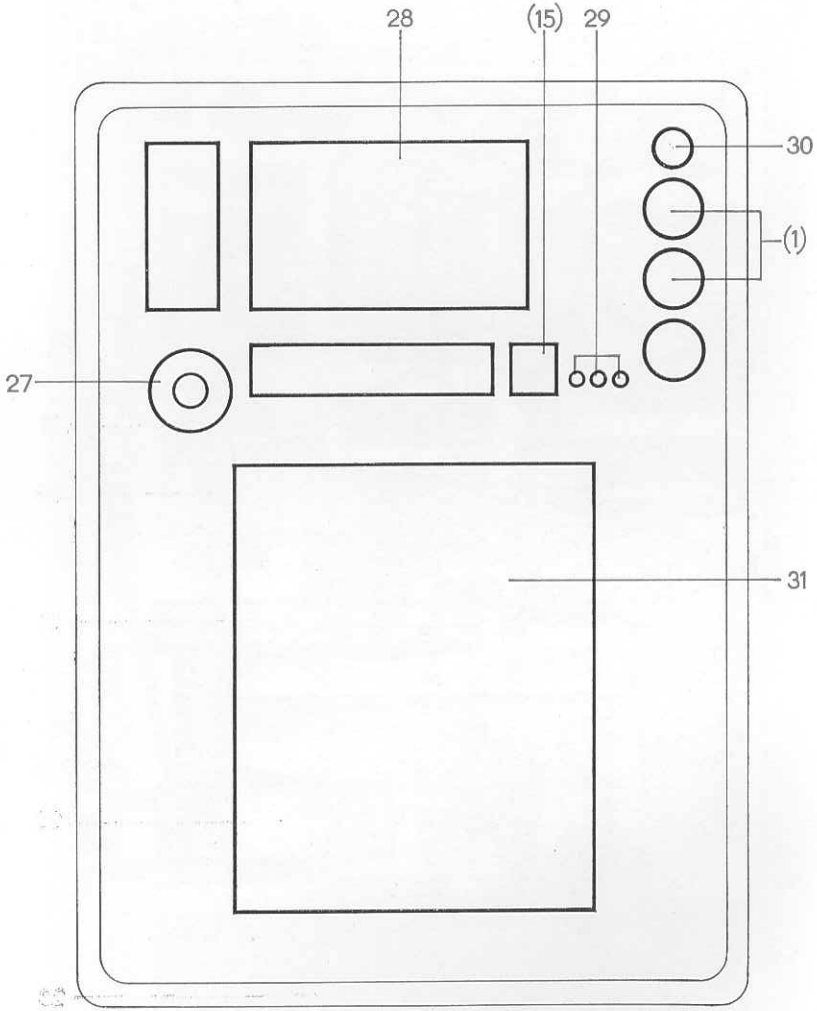
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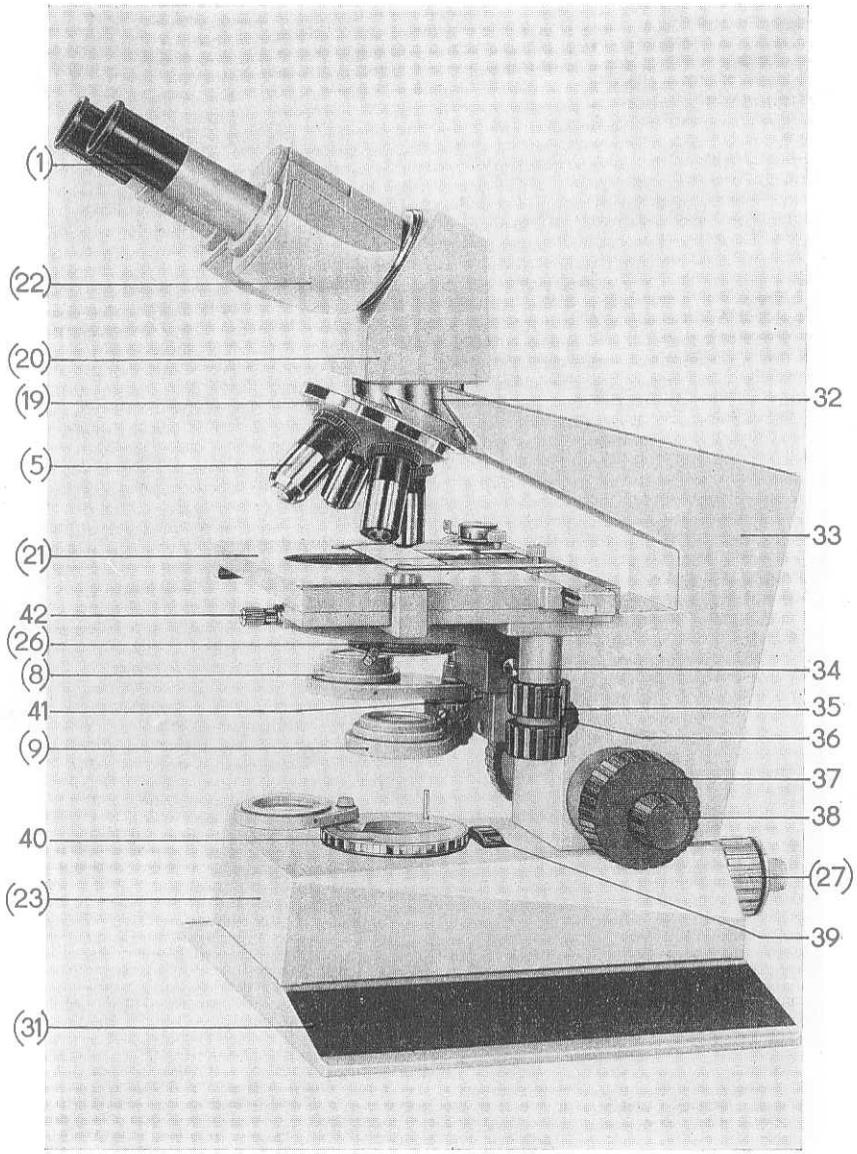
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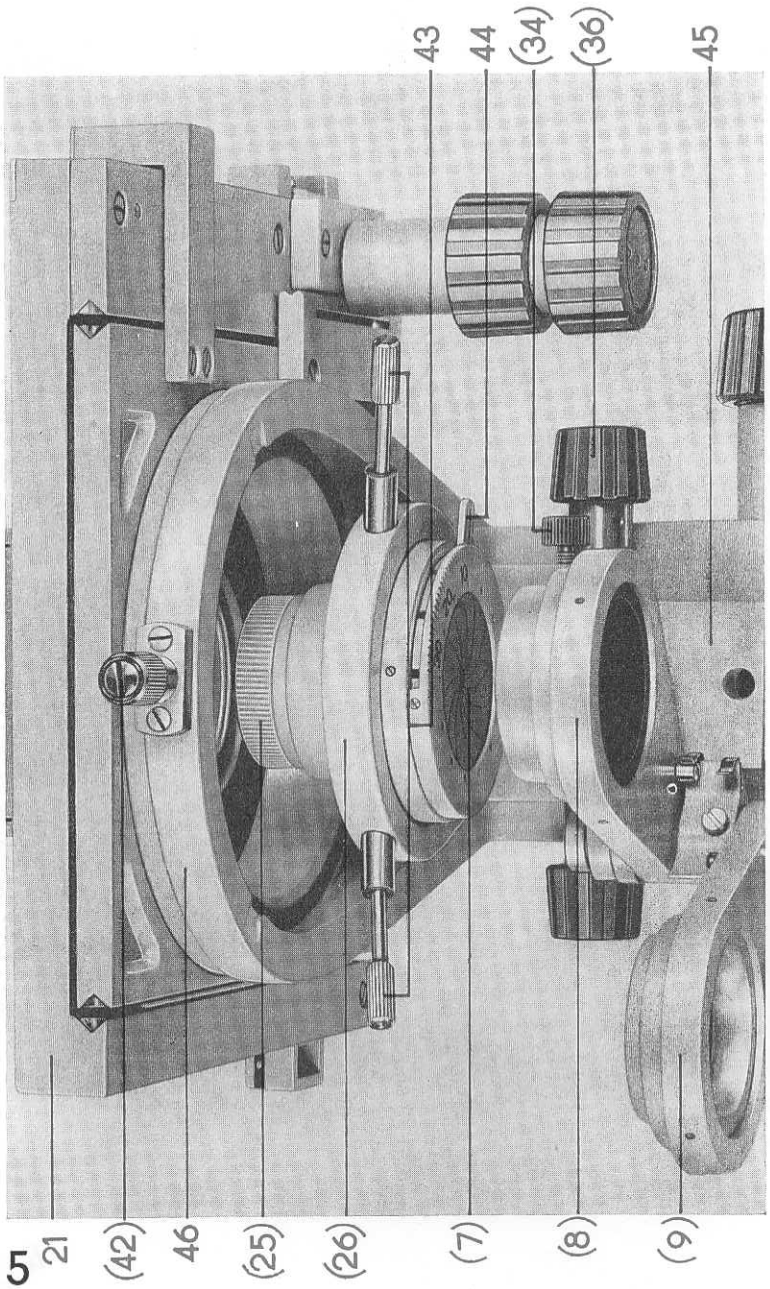
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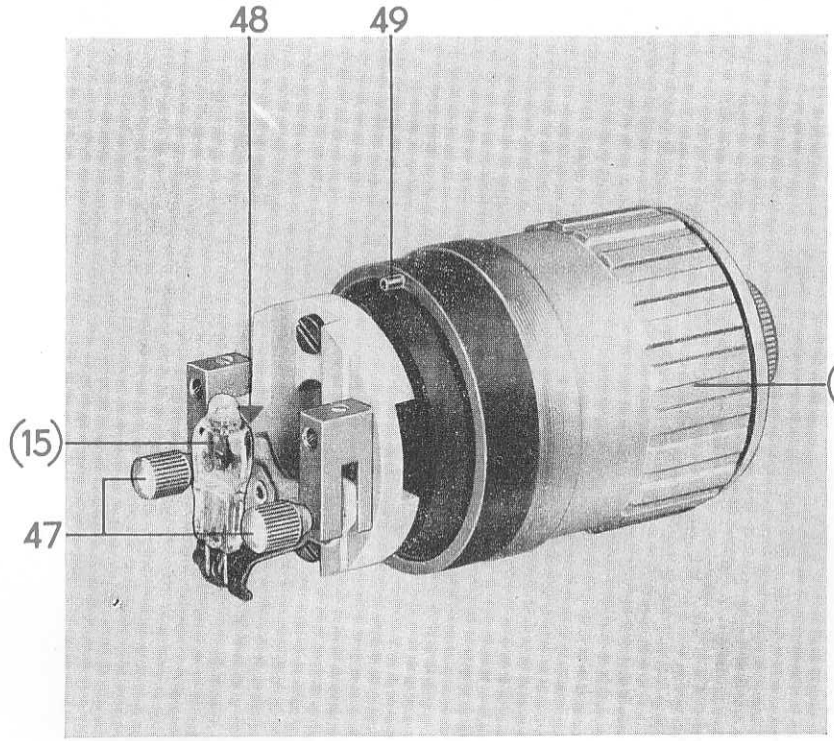
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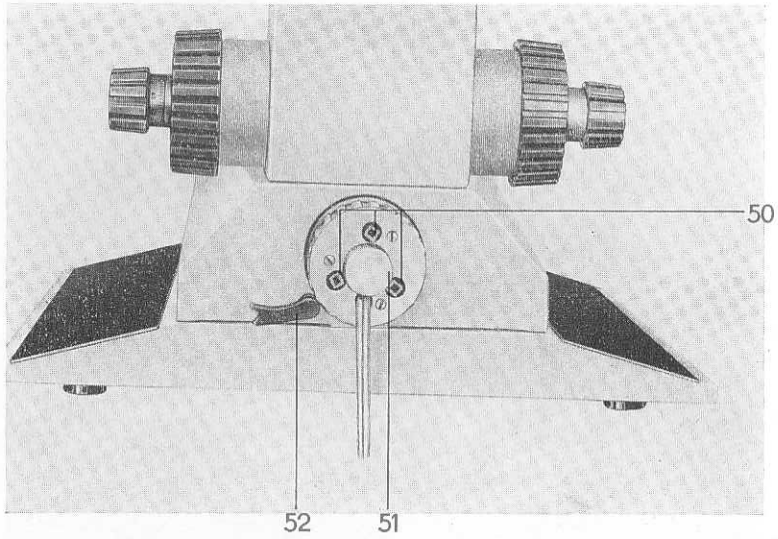
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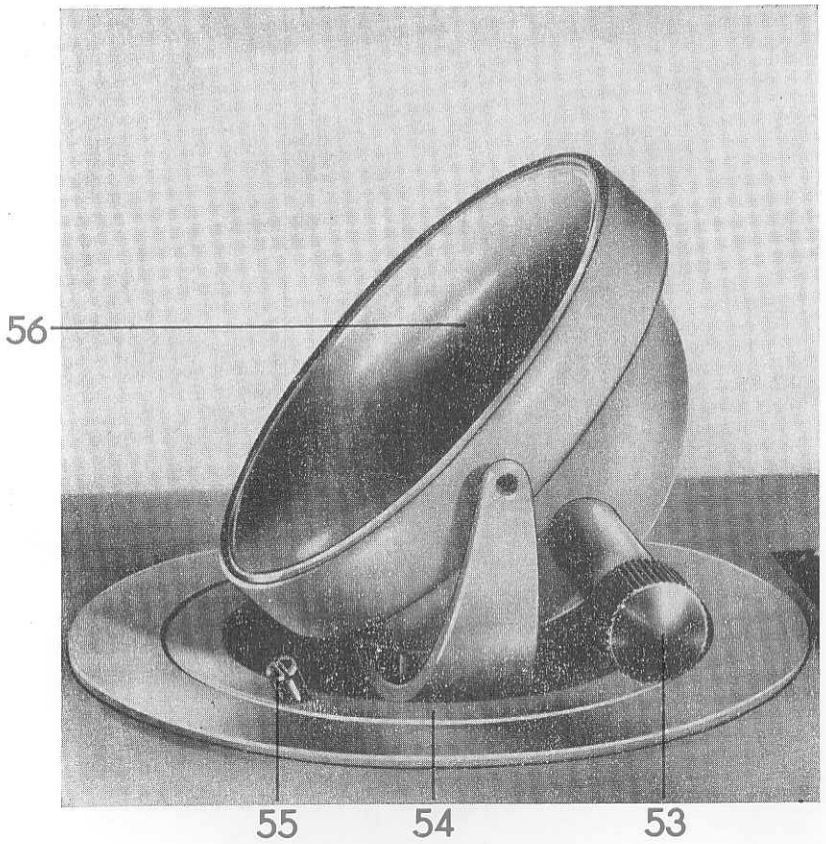
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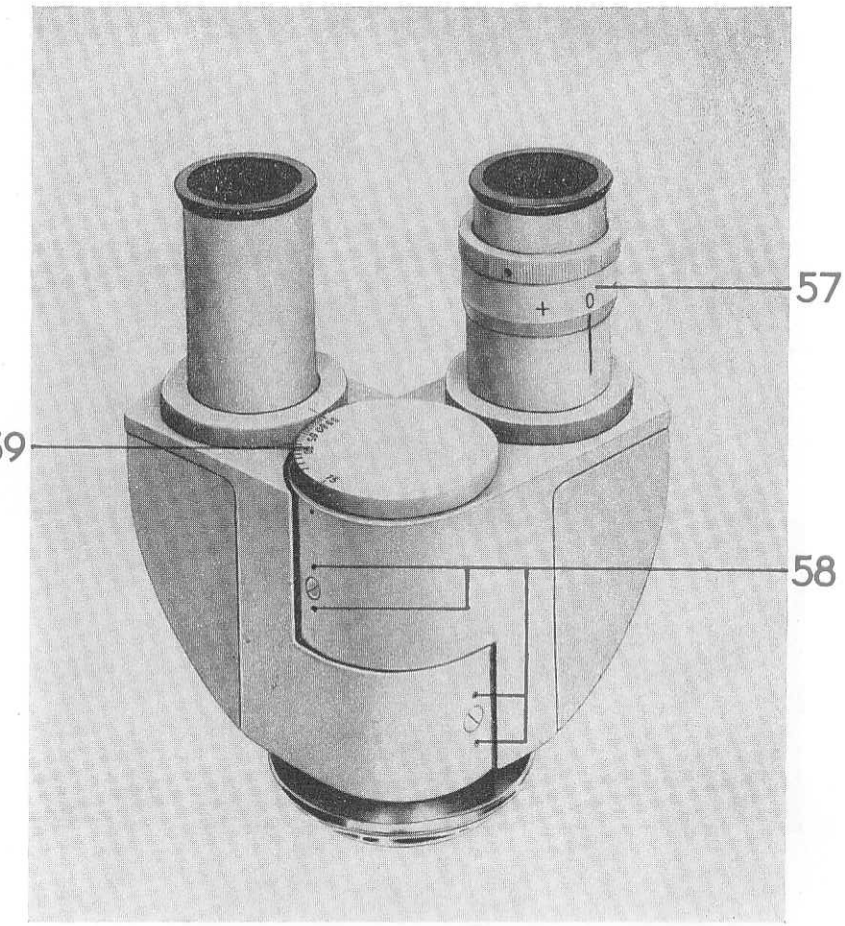
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