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AMPLIVAL® Microscope

CARL ZEISS JENA

Instruction Manual

Caution

Supplementary instructions for the unpacking and operation of precision instruments in countries with moist and warm climate, see page 3.

AMPLIVAL® Microscope

Instruction Manual

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1. Introduction

This instruction manual presupposes fundamental knowledge of transmitted-light microscopy. Therefore, it is restricted to the explanation of the distinguishing features of the AMPLIVAL microscope and its manipulation.

2. Construction and function (Figs. 1 and 2)

Features directly influencing the function of the microscope:

1. The built-in illuminant is centrable and focusable and may be removed to adapt special lamps.
2. The deflecting mirror of the built-in illuminant is firmly adjusted so that centring of the field diaphragm is generally done by centring of the condenser.
3. Coarse and fine focus mechanisms are designed in such a way that in observation of specimens on slides of usual thickness (0.8 mm – 1.1 mm) no objective will touch the specimen or damage it. By dispensing with this protection, a maximum specimen thickness of 25 mm is attained.
4. Adjustment of the fine drive ranges over the entire range of coarse adjustment.
5. The condenser drive mechanism is equipped with control knobs on each side and its smoothness can be changed.

3. Unpacking and assembling (Figs. 2, 3, 4, 5, 6, 8)

The microscope is supplied in two plastic foam containers, containing the basic stand, its detachable parts and the accessories. Place foam containers in such a way that the side marked as upper part is in upward position, remove adhesive tape and take off upper part. The lower part of the bigger container (Fig. 3) accommodates:

Basic stand (17), stage carrier (18), tube carrier (19), 1.4 aplanatic condenser (26) with mo 2 support (27), specimen stage (23), revolving nosepiece (22), angular tube (21), straight binocular tube (20), the objectives of the basic equipment in protective capsules (5, Fig. 1), (objectives of larger external diameter are partly arranged below the basic stand as well as the dust hood), immersion oil bottle (33), pipette with screw cap (32) and accessory container (31) which has places for storing eyepieces, daylight and attenuation filters, B box spanner (34), centring and pin-type wrenches for lamps, condensers and specimen holders and a place for storing the immersion oil bottle as well.

The smaller container (Fig. 4) accommodates base plate A (30), lamp holder with cable (16), low-voltage transformer (35) for 6 V 25 W halogen lamp, box with five spare lamps (15), B box spanner (34), centring wrench (36) for lamp and has places for the storage of additional eyepieces (1, Fig. 1).

Take components out of containers in the order described below and assemble them according to Figure 2 and Figure 5, resp.:

Take basic stand (17) out of big plastic foam container and base plate (30) out of smaller container. Use B box spanner (34) to firmly connect both parts by screws from the bottom side of the base plate. Set up parts in such a way that open side faces the user.

During transport the coarse motion brake is released. By turning both coarse motion controls (47) against each other the smoothness of pinion motion is sufficiently adjusted, for the time being (see para. 4.1.).

Push stage carrier (18) from above onto dovetail guideway (46) to be found at the front side of basic stand. Use B box spanner to clamp it in position in the clamping device (43) of stage carrier.

Fasten condenser (26) with support (27) to rack-and-pinion housing of condenser (45) by means of clamping screw (41) so that it properly rests on stop pin (25) of condenser guideway.

The following condenser support combinations are possible:

— 1.2 condenser and 1.4 aplanatic condenser are screwed into mo 2, mfl 2, or ms support. Make sure that threads are fully screwed in.

— 1.4 aplanatic-achromatic condenser, cardioid condenser or dissecting changeover condenser are pushed into sliding sleeve of mz support up to stop and fastened by means of clamping screw.

— Phase-contrast condenser with revolving annular stop disk forms one assembly together with the support. They are fastened in the same way as a condenser support.

— Pancratic condenser as bright-field/dark-field and phase-contrast condenser is fastened in the same way as the normal condenser support.

Set condenser up to the upper stop of condenser pinion head (44). Insert dovetail mount at the bottom side of specimen stage (23) into carrier and clamp it in position by means of stage clamping screw (24), rotating the stage in such a way, if possible, that the deep-drawn control knobs (40) may be operated with your right hand.

Attach tube carrier (19) from the side to the dovetail of basic stand (17), tilt it into its position and slightly move the carrier forward and backward to shift it against the projection at the front side of the dovetail. Tighten clamping device (42) by means of B box spanner. Attach 30° angular tube (21) to tube carrier head and the straight binocular tube (20 to the angular tube and clamp them in position. Push revolving nosepiece (22) into dovetail guideway at the bottom side of tube carrier head up to stop. Make sure there is correct coordination of the stop at the nosepiece to the projection at the tube carrier head.

Carefully insert revolving nosepiece, as, in case of bad fit, the objectives do not lie within the optical axis of the microscope.

Fasten 6 V 25 W halogen lamp (15), which is attached to a backing plate, with two knurled screws (55) to lamp holder (16) in such a way that one tip of holder part engages with centring groove of backing plate (56). Push lamp holder into rear of stand base (29) so that orientation pin of mount (57) (pointing upward) engages with corresponding groove in the microscope base. This done, fasten mount firmly. Screw objectives into revolving nosepiece. It is recommendable to always keep the same order and to screw in the objectives in the order of increasing scale numbers, turning the nosepiece clockwise will thus place the next higher-power objective into the optical path. Replace dust caps of eyepiece sockets of binocular tube by eyepieces from the accessories container (31). Take out immersion oil bottle (33), remove screw cap and plastic stopper pressed in, and attach screw cap with pipette (32). Place immersion oil bottle, now ready for use, into accessories container.

4. Operation

4.1. Adjusting the smoothness of pinion motion

The instrument is supplied with the coarse motion brake released to protect the drive mechanism. To adjust coarse motion turn drive knob by 1/2 a revolution, appr., towards the centre of the focussing range. This done, use both your hands to turn coarse control knobs against each other until required smoothness is attained. Clockwise rotation will cause a stiffer motion, counterclockwise rotation a smoother motion of the control knob.

The smoothness of condenser motion may be adapted to the weight of the condenser used. Adjustment is effected the same as in case of the coarse motion mechanism.

4.2. Adjusting the illumination (Figs. 5, 6, 7)

— Check for correspondence between mains voltage and voltage of transformer.

— Connect lamp to mains via transformer (35 Fig. 4) supplied.

— Actuate control lever (54) to remove built-in ground glass plate from optical path (lever in horizontal position).

— Close field diaphragm by half its aperture by means of setting ring (49), close aperture diaphragm by means of control lever (50), swing widefield lenses (8 and 9, Fig. 1) out of optical path and switch on illumination.

— Loosen knurled knob (53). Move lamp holder (16 Fig. 2) to longitudinally depict lamp filament on the closed aperture diaphragm (observation via a hand mirror from below). This done, tighten knurled knob.

— Put three socket wrenches (36 Fig. 4) on centring square end (52) at the rear of mount to centre filament image with respect to the aperture diaphragm.

— Open aperture diaphragm and swing in ground glass plate.

— In case of low up to mean overall magnification – e. g. objective of scale number 20 and 10x eyepiece – focus onto the specimen and sharply image the field diaphragm into specimen by focussing of condenser.

— Actuate centring screws (51) to centre condenser in such a way that field diaphragm image lies centrically in the visual field.

— Open field diaphragm until visual field is illuminated, recentre, if necessary.

— In order to illuminate the large fields of low-power objectives, the upper widefield lens (8) must be introduced into the optical path until spring clicks in, if the 3.2x objective is used and the lower widefield lens (9) in case of the 10x objective.

— Adjust aperture diaphragm to the highest contrast of the image possible. Remove one eyepiece from the tube, thus making the image of the aperture diaphragm visible as a luminous spot in the objective rear focal plane. Close aperture diaphragm until this spot is not smaller than 2/3 of its maximum size. It should be reduced to half its size only exceptionally.

This done, illumination is adjusted according to the KÖHLER principle.

Condenser immersion: Generally, it is sufficient to use the condensers in dry state. In this case, condensers with aperture $\geqq$ 1.0 attain an effective aperture of $\leqq$ 0.9. The aperture can be fully utilized only, if oil is provided between the condenser front lens and the underside of the specimen.

Advantages: better brightness of the field, higher resolution performance of objectives with apertures $\geqq$ 1, improved colour purity in stained specimens.

Disadvantage: Loss in contrast.

Condenser immersion presupposes fully opened aperture diaphragm.

If condenser immersion is applied proceed as follows:

— Lower condenser slightly

— Drip a small drop of immersion oil on condenser front surface

— Drip one bigger drop of immersion oil on underside of specimen

— Adjust specimen by means of stage drive in such a way that both drops face each other

— Slowly lift condenser until drops of oil contact each other (light flash within the oil)

— Adjust Köhler illumination as outlined above (keep aperture diaphragm open!)

In this connection we refer to the fact that optical performance of a microscope can be only attained, if overall magnification is kept within the limits of the useful magnification, i. e. ranging from 500 times up to 1000 times of the aperture of the objective used and correct combination of objectives and eyepieces is guaranteed. Achromats shall be used with A and P eyepieces, resp., only, and apochromats and plano-objectives with PK eyepieces only. Objectives of latest production may have either an A or a C as additional engraving. Objectives with A engraving are used with A or P eyepieces, objectives with C engraving with PK eyepieces.

4.3. Adjusting the straight binocular tube (Fig. 13)

The straight binocular tube together with the 30° angular tube forms the magnification factor 1.

Its right-hand eyepiece tube is fixed, whereas the left one is focusable to compensate individually different focal lengths of the user's eyes.

Adjustment is effected as follows:

Actuate focussing control to focus onto a specimen, while looking with the right eye through the right-hand (fixed) eyepiece tube. This done, actuate diopter setting ring (73) of left-hand eyepiece tube, to focus onto the same specimen, while looking with the left eye through the left-hand (adjustable) eyepiece tube (do not change position of focussing control!). The setting ring is provided with a simple reference scale so that the individual setting may be quickly found again, if necessary. Symmetrically move both tube halves against each other to adjust the eyepiece distance to the individual interpupillary distance. The distance value is set and read off the scale (75).

In case the eyepiece distance changes by itself, after the instrument has been in use for a longer period, this trouble may be eliminated by resetting of the brakes. Set tube to the narrowest interpupillary distance. A group of 2 small screws and one larger screw will be visible at each tube half (Fig. 13). Carefully turn small screws (74) clockwise to clamp the brake and counterclockwise for releasing it. The larger screws retain the brake in its housing. Do not change their position.

5. **The adjustable illuminating mirror** (Fig. 12)

If more intensive light sources are necessary – e. g. in photomicrography – the specimen can be illuminated via a mirror, which is screwed in instead of E filter holder (28 Fig. 2). To this end, use both handles (71) provided at the base plate (72) of the mirror. The mirror is adjustable. After loosening of clamping screw (70) the mirror may be rotated and tilted. After the image of the light source has been formed in the centre of the aperture diaphragm closed, tighten clamping screw to fix the setting found.

Note: After removal of the filter holder the built-in mirror (11 Fig. 1) is accessible. Do not touch it with your fingers or clean it with a cloth! Clean reflecting mirror with a hair brush. Before using the brush, degrease it in an alcohol-ether compound and dry it properly.

6. The pancratic condenser (Figs. 9, 10, 11)

6.1. Adjusting the bright-field illumination

If the pancratic condenser is employed instead of single condensers, replace E filter holder (28 Fig. 5) by p filter holder (66). Adjust pancratic illumination with 1.4 aplanatic condenser analogously to that of normal bright-field condensers:

— Switch on illumination, remove built-in ground glass plate from optical path.

— Turn aperture setting ring (61) clockwise up to stop (1.4 index).

— Open up aperture diaphragm (65), actuate setting wheel (49) to close field diaphragm until lamp filament is visible on ground glass plate, placed onto p filter holder.

— Loosen knurled knob (53 Fig. 7). Move lamp holder to longitudinally depict lamp filament on ground glass plate. Tighten knurled knob.

— Put three socket wrenches on centring square end (52) at the rear of mount to centre filament image.

— Remove ground glass plate, again introduce built-in ground glass plate into optical path.

— In case of low up to mean overall magnification – e. g. objective of scale number 20 and 10x eyepiece – focus onto specimen and sharply image field diaphragm into specimen by focussing the condenser.

— Centre condenser by means of centring screws (59) so that image of field diaphragm lies centrically to the edge of the visual field.

— Open field diaphragm until visual field is illuminated, recentre, if necessary.

— Switch in working objective, actuate aperture setting ring of pancratic system to set the aperture of this objective. Recentre field diaphragm, if necessary.

— Adjust aperture diaphragm as outlined in para. 4.2.

For obtaining luminous coverage of the large fields of objectives with apertures smaller than 0.16 the widefield condenser f = 15 mm (60) is employed.

It can only be introduced into the optical path, if the pancratic system has been lowered so far that the condenser turret can be freely rotated. Depiction of the field diaphragm with the widefield condenser is effected in the way adjustment is carried out with the 1.4 aplanatic condenser. The aperture setting ring at the pancratic system remains in 0.16 position for all objectives with aperture = 0.16.

6.2. Dark-field observation

For examinations with the aid of the cardioid condenser well cleaned specimen slides of 1.1 mm thickness, at maximum, can be used only. Specimen slides of a thickness less than 0.8 mm and more than 1.1 mm cannot be used.

The cardioid condenser is to be employed with objectives with apertures ranging from 0.65 up to 1.0. If immersion objectives with higher aperture are required,

use has to be made of such with iris diaphragms in order to stop down the objective aperture to an optimum value.

— Switch on lamp, remove ground glass plate from optical path.

— Lower pancratic system until condenser turret can be freely rotated. Swing in cardioid dark-field condensers (67).

— Set aperture setting ring to 1.4.

— Open field diaphragm half and fully open aperture diaphragm.

— Effect condenser immersion (how to effect condenser immersion, see para. 4.2.).

— Focus a medium-power objective and low-power eyepiece (not exceeding 10x) onto the specimen, noticing a light phenomenon showing characteristics of the dark field. Inhomogeneities or unsharp boundary lines are eliminated by focussing with the aid of the condenser motion knob. If dark zones should not disappear, the required specimen slide thickness has not been considered. In focussed state the limitation of the light phenomenon turns out to be the image of the field diaphragm.

— Put centring wrench (59) onto centring squares of cardioid condenser and centre image of field diaphragm.

— Insert working objective and corresponding eyepieces, open field diaphragm until field is illuminated, recentre, if necessary.

If dark-field examinations with the aid of objectives with apertures smaller than 0.65 are required, use should be made of the dissecting changeover condenser in dark-field position. To this end, the pancratic condenser has to be replaced by the dissecting changeover condenser in mz condenser support and p filter holder by E filter holder. This condenser does not need condenser immersion and may also be used with specimen slides thicker than 1.1 mm.

7. Supplementary equipment

The AMPLIVAL microscope can be supplemented by the following items:

	Publication No.
— separable optics (objectives, eyepieces, condensers)	30– 048–2
— cardioid condenser	30–G306–2
— dissecting changeover condenser	30–G502–2
— phase-contrast equipment	30–G304–2
— interference-contrast equipment after NOMARSKI	30–G312–2
— polarizing equipment for transmitted-light microscopes	30–G331–2

— mf photomicrographic equipment	30– 605–2
— equipment for measuring and counting	30–G492–2
— instruments for drawing with the microscope	30–G205–2
— 10x demonstration attachment	30– 048–2
— pancratic tube	30– 420–2
— heating and cooling stage — 20 °C up to + 80 °C	30–G516–2
— u illumination unit	30–G372–2
— microscope photometer AMPLIVAL photometrie	30–G626–2
— incident-light equipments for AMPLIVAL (VERTIVAL) microscopes	30– 685–2

8. Maintenance

A good-quality microscope has a long life, proper treatment provided. Its maintenance and care are quite easy. Treat the instrument carefully, observe the instruction manual, protect it from dust, direkt insolation, temperatures above + 50 °C, frost, moisture, chemically aggressive substances and fumes and take care that minor damages be repaired in time. For such repairs as well as for overhauls recommendable to be carried out at longer intervals, the workshops of our Agencies, our Technical Consulting Offices, and our Jena Works are at the customer's disposal.

The following cleaning and maintenance jobs may be done by the user himself, if necessary:

— Never remove dust from optical parts with a cloth or a leather rag, but with the aid of a natural hair brush degreased in an alcohol-ether compound and dried well.

— Finger prints on glass surfaces cannot always be avoided. Remove any finger prints with a dust-free piece of chamois or a cloth. Benzene or xylene may be used as solvents. However, **do never use alcohol,** as it will attack the cement of the lenses.

— Confine cleaning of objectives to keeping clean front and rear lenses as well as connecting thread and contact surface.

— Use xylene or benzene to remove immersion oil. Do never use alcohol.

— Keep objectives not in use in their protective capsules.

— The plastic capsules for the objectives and the material of the accessories container must not come in contact with xylene or xylene-containing substances!

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

This first-class precision instrument is designed for operation in tropical rain climate, too, but in order to keep it ready for service continuous maintenance is necessary.

The optical elements are specially coated. Because of their high precision particular functional parts are metallicly bright. These parts are to be protected against the effects of the tropical rain climate.

For these reasons, attention should be paid to the following directions to maintain faultless readiness of operation for many years.

Unpacking of the instrument

1. For transport and storage purposes the instrument is provided with an anticorrosive and dehumidifying agent. The protection holds for a period of 200 days from the date of packing.

2. On arriving the instruments should be unpacked about 200 days at the latest after the date of packing. Instruments which are to be installed by authorized specialists may be unpacked by those specialists only.

3. The instruments being fully unpacked are to be stored in dry rooms (relative air humidity below 65 %, if possible). To maintain the original value avoid air humidities above 70 % lasting over a longer period.

Storage and operation of the instruments

4. Regular use of the instruments reduces the risk of becoming covered with mould fungus. In case of unavoidable down times or longer storage time we recommend the following:

   — Store the instruments in bright and dry rooms. Rooms of air humidities below 65 % are most favourable which can be obtained by using air dehumidifying plants. The instruments are to be aired periodically by installing ventilators near the instruments, if applicable.

   — Components, small instruments and accessories as eyepieces and objectives that are especially susceptible to mould fungus should be stored in drying cabinets. For example, confined and glazed cabinets of non-combustible material, in which heating sources (as incandescent lamps or infra-red radiators) produce an overtemperature of abt. 5 degrees, are suitable as depository. If no other directions are expressly given in the instruction manual components, small instruments and accessories can also be stored in exsiccators.

5. The attack on instruments in storage container by fungus can largely be avoided by impregnating absorbent materials (e. g. cardboard disks) with fungicide (e. g. a solution of p-chlorine-m-cresol in spirit) and putting them into the storage container. Repeat the impregnation when no more smell is noticed. It is also possible to put paraformaldehyde in the form of tablets or powder (prepacked in paper bags) as fungicide into the container.

6. To protect instruments against dust, covers penetrable by air and the addition of fungicides below the covers suggest themselves.

7. The built-in drying agent inserts are to be regularly regenerated and renewed according to the directions in the instruction manual.

   The silica gel, mostly used as drying agent, can be regenerated at + 120° to + 150 °C more than once and then it shows again the original blue colour.

8. Maintenance directions for optical surfaces

   — Remove dust from optical surfaces by means of a soft, clean, and grease-free brush only.

   — Stronger contamination, e. g. finger marks on optical surfaces, are best to be removed by using clean commercial cleaning cloths for optics and spectacles that can be **slightly** moistened with spirit, too, if no other cleaning agents are expressly prescribed in the instruction manual.

9. Maintenance directions for steel parts

   Steel parts that are bright, burnished or phosphatized due to functional reasons are to be protected by using acidless greases (vaseline) and oils.

   When doing this, pay attention to the directions given in the instruction manual.

   It is advisable to renew the protection against corrosion at accessible places using greases and oils after a period of three months.

The directions 4 to 9 analogously refer to the instruments which are in continuous use. Their consideration certainly contributes to the prolongation of the lifetime of the instruments.

All optical-precise instruments are exposed to be covered by mould fungus under the following conditions:

— relative air humidity above 75 % for more than 3 days on end

— darkness, no air motion

— dust, finger marks on optical surfaces

— longer storage time in wooden or leather container

(The growth of mould fungus is accelerated at temperatures between + 15° and + 35 °C).

9. List of reference numbers

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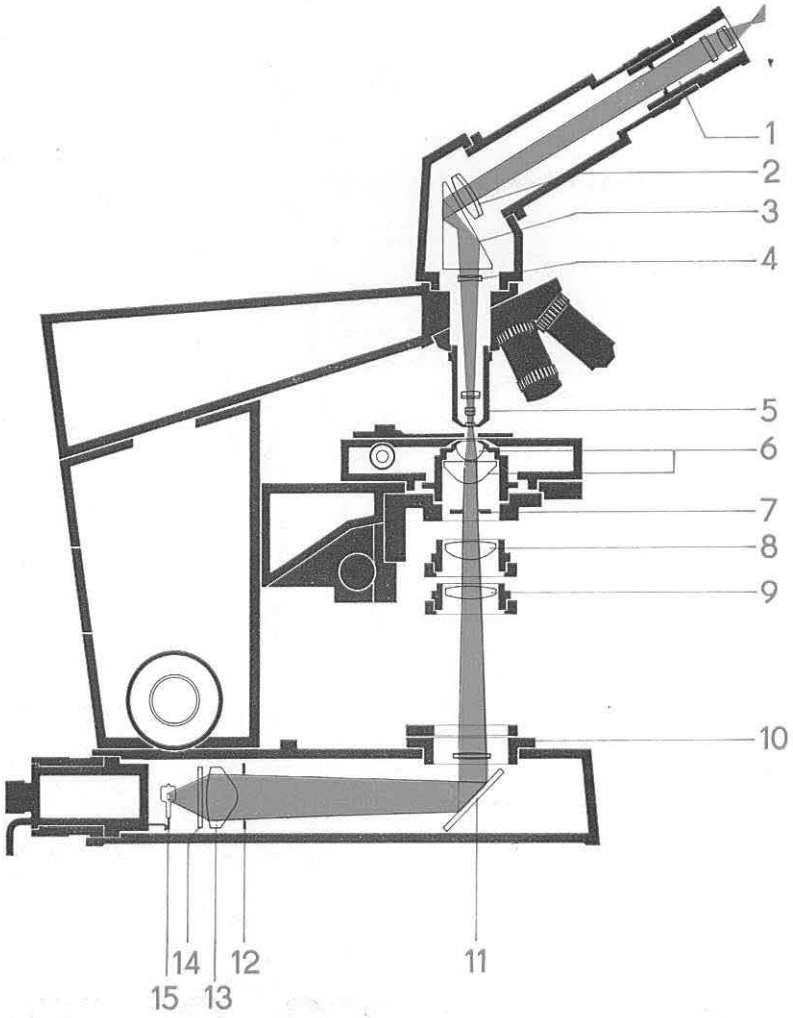
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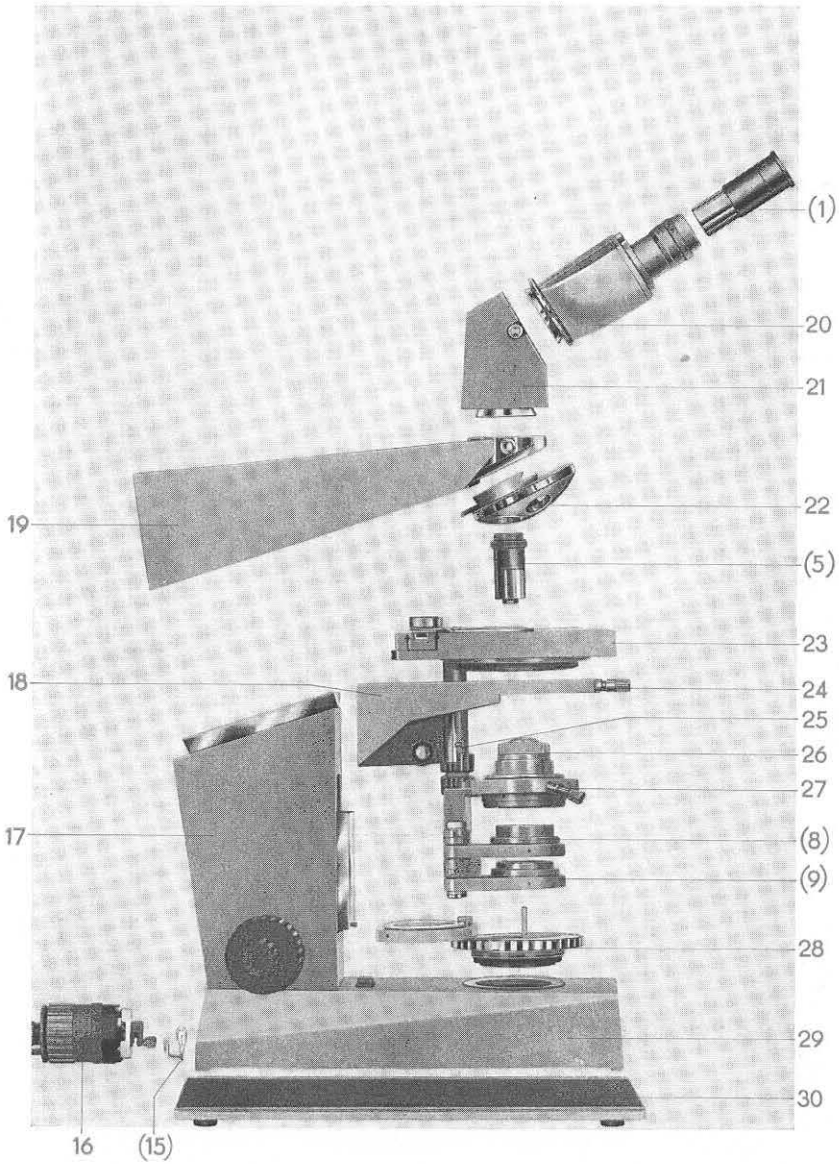
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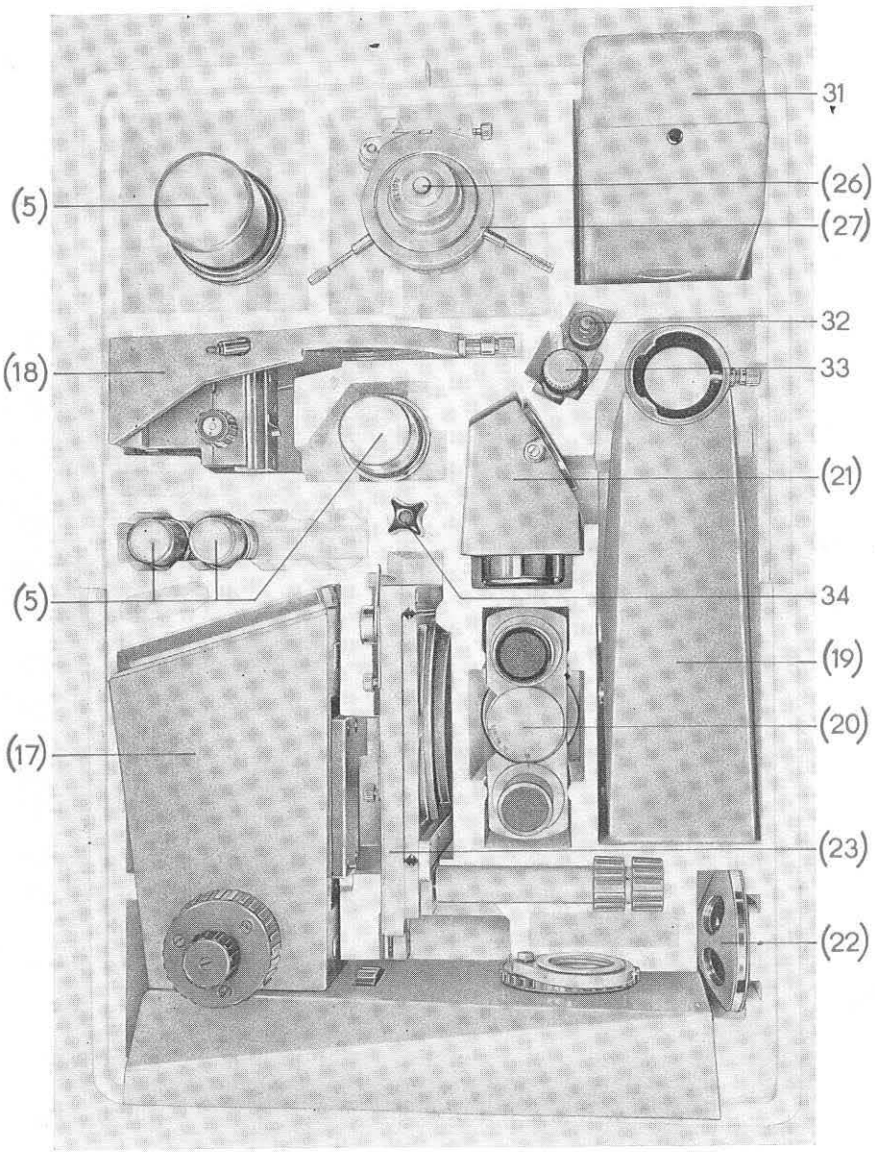
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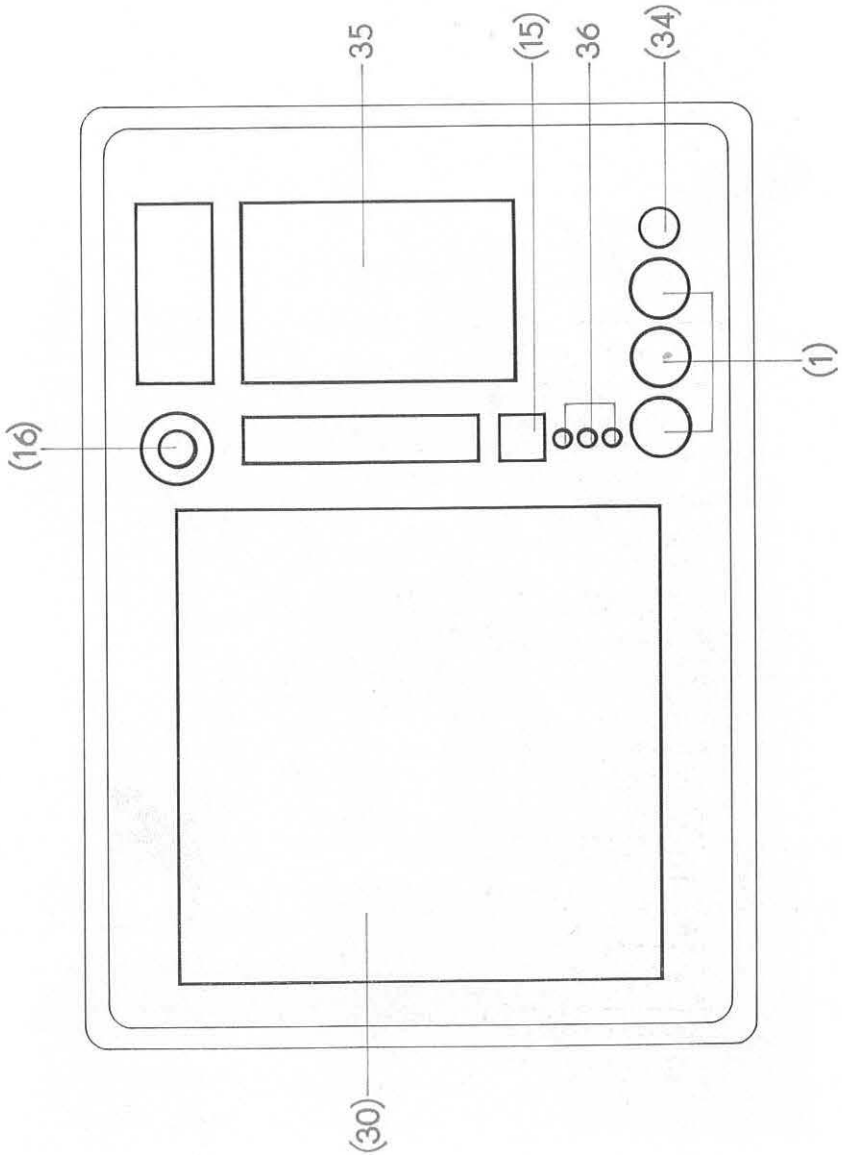
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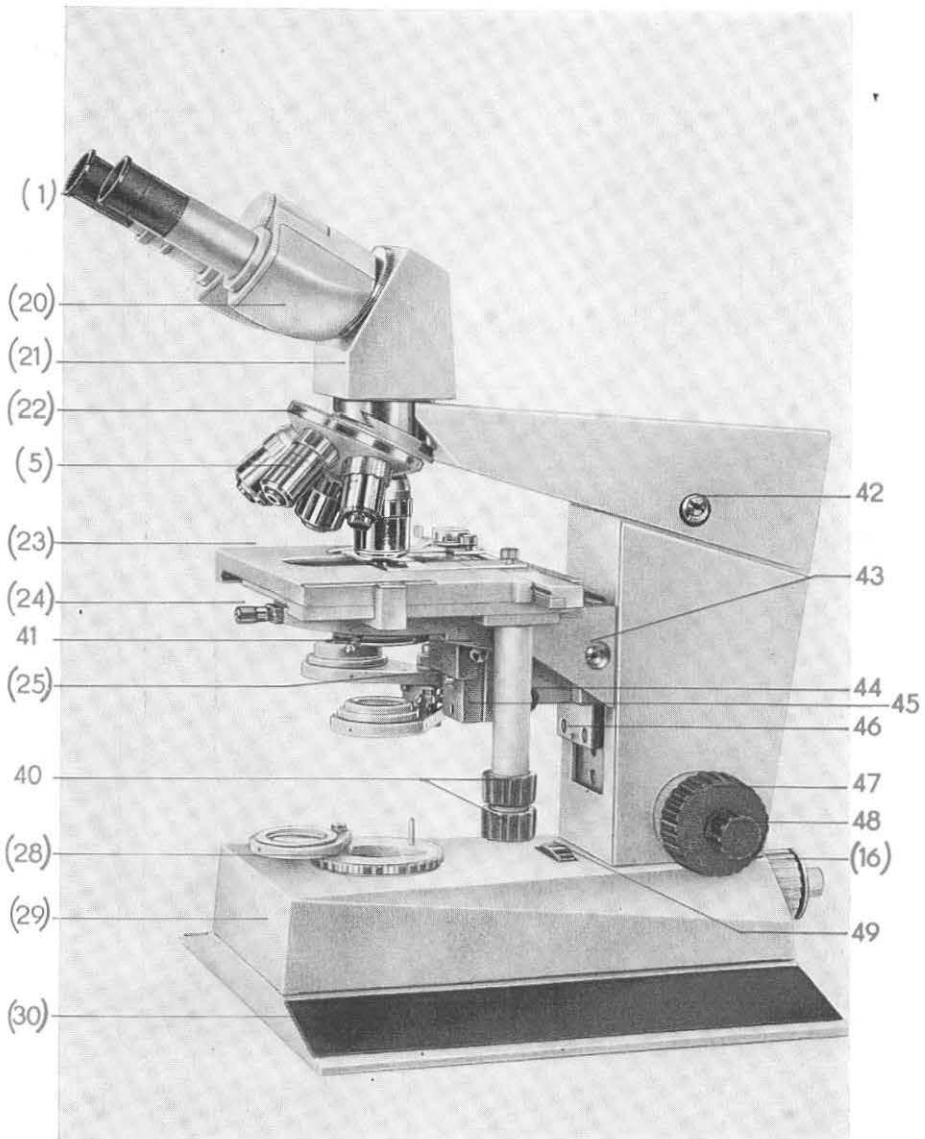
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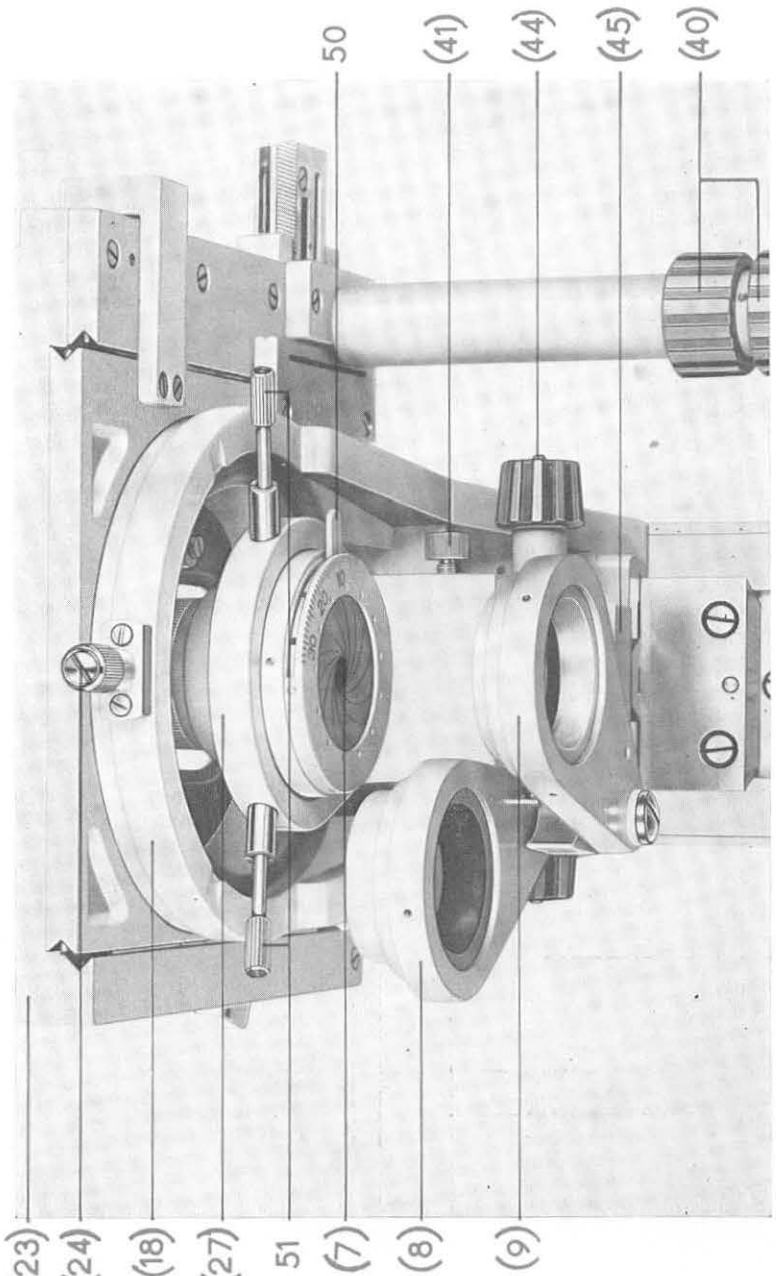
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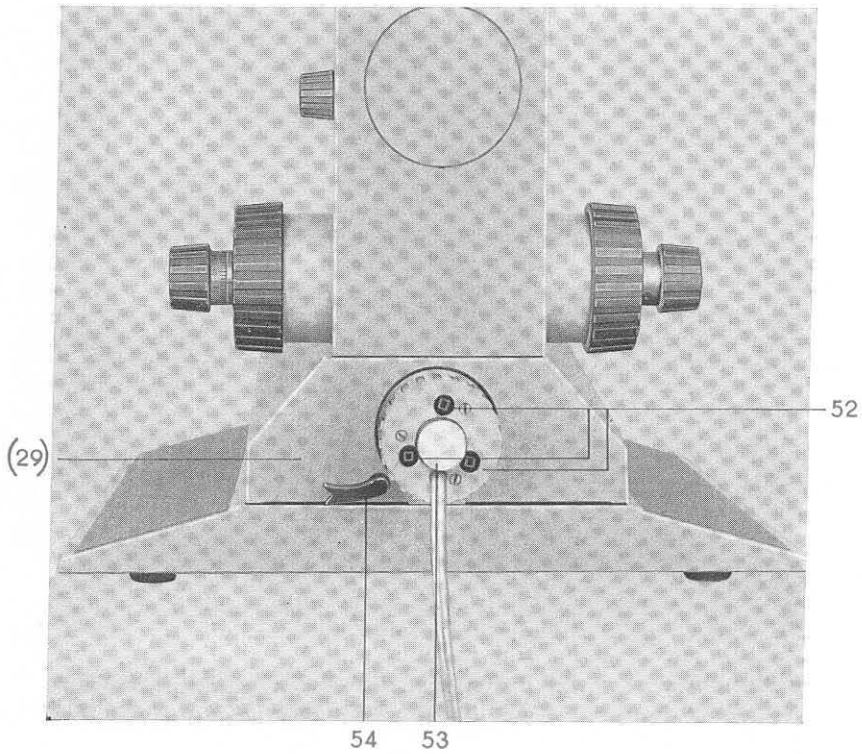
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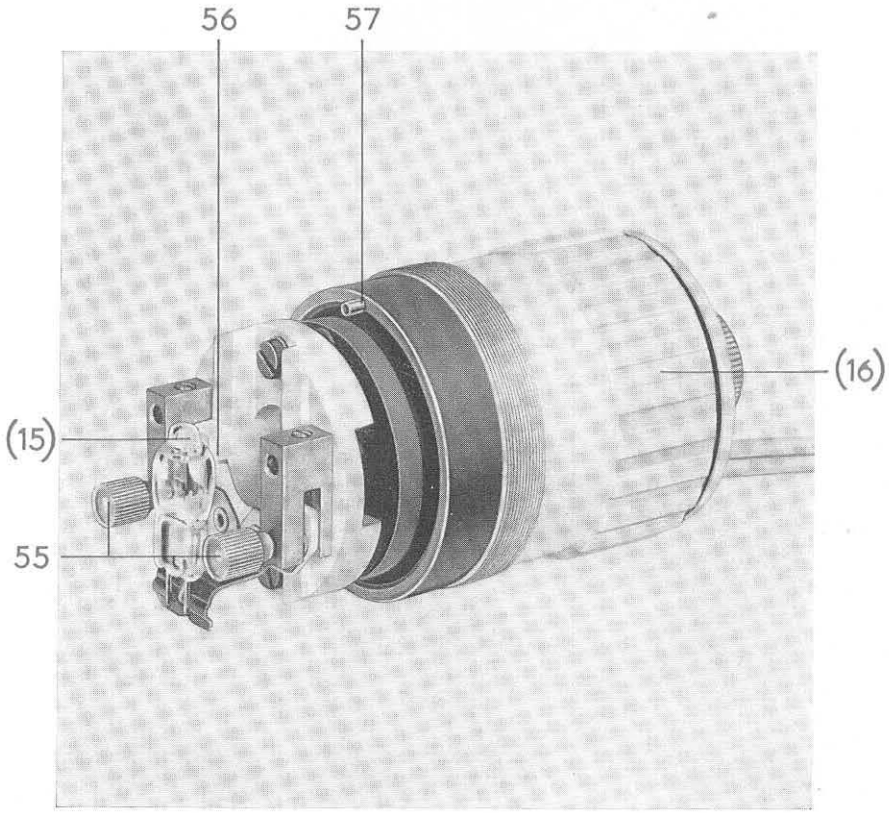
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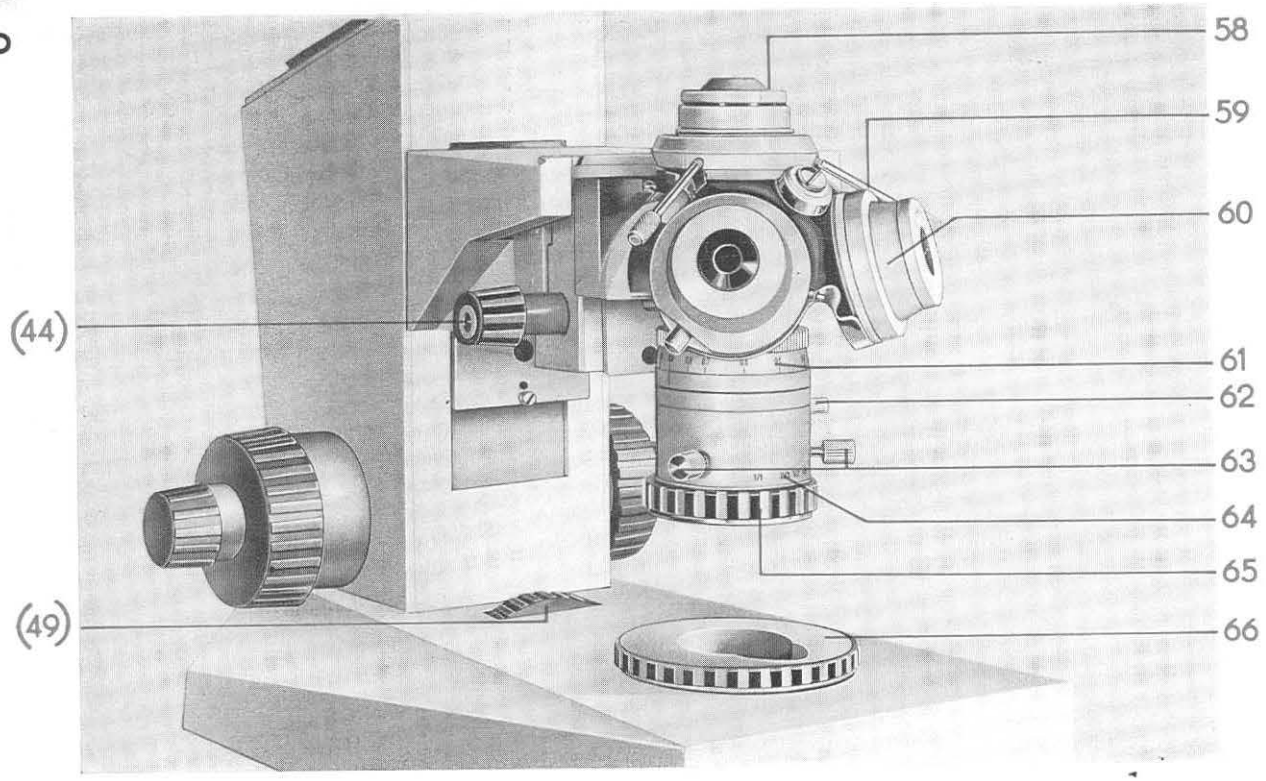
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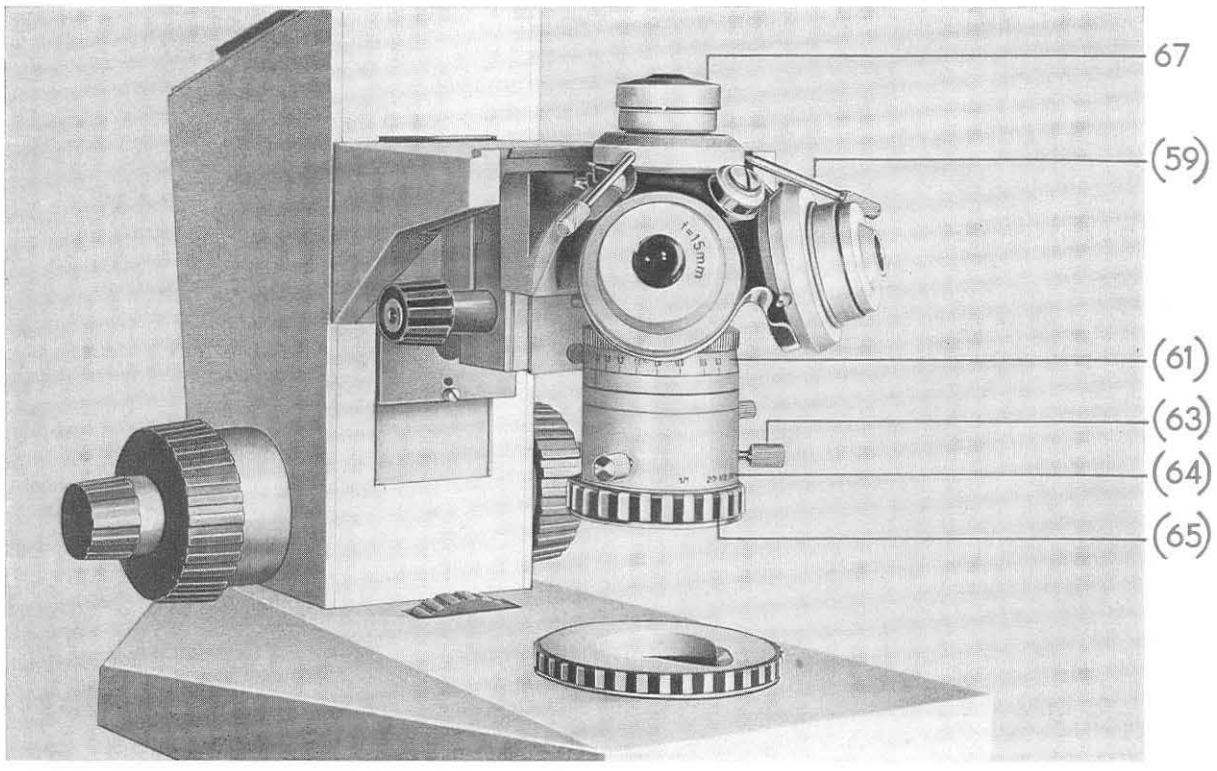
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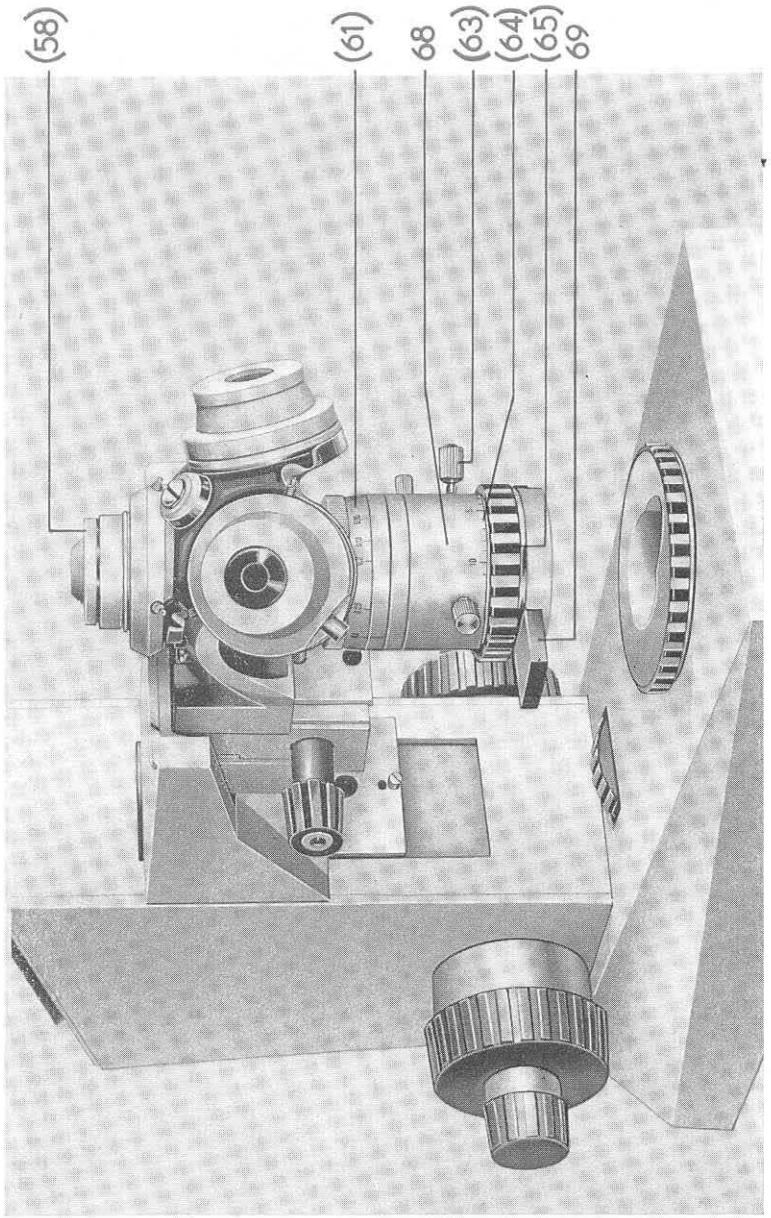

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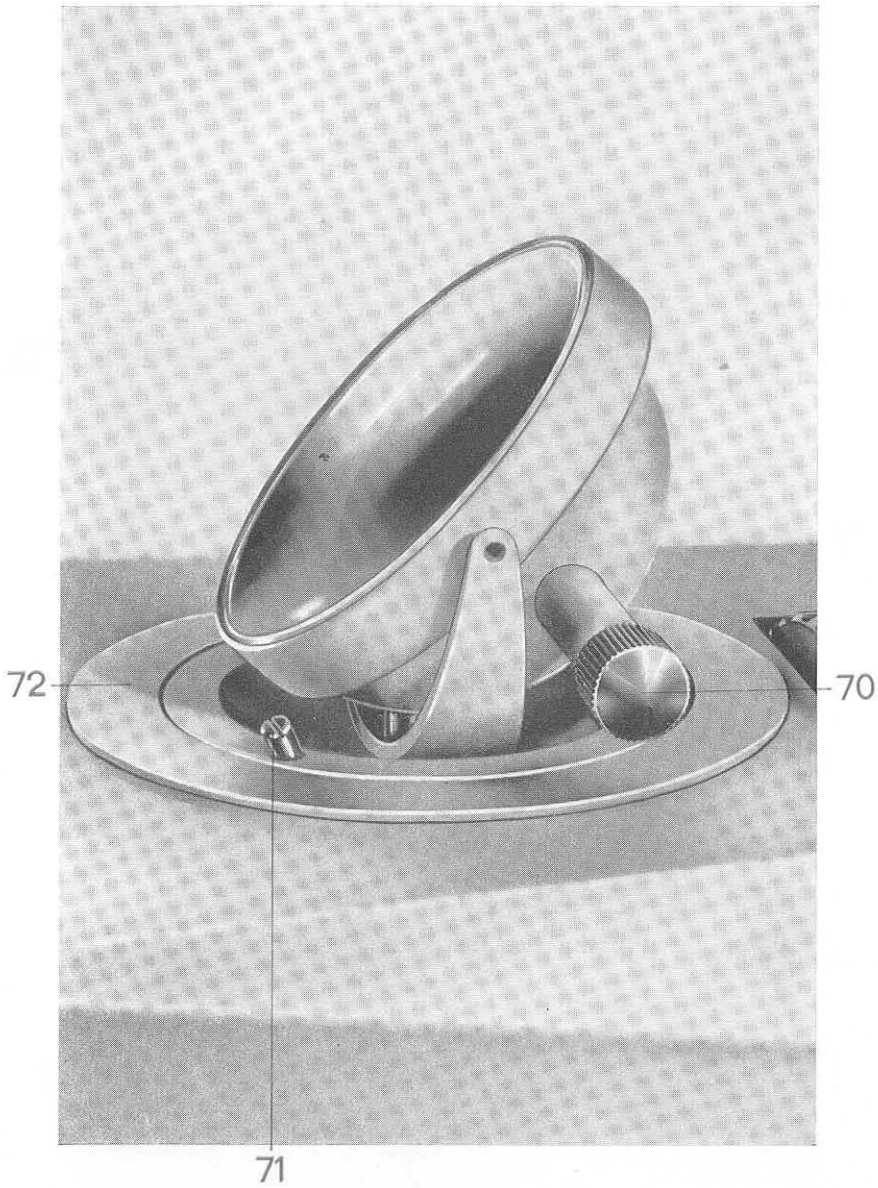

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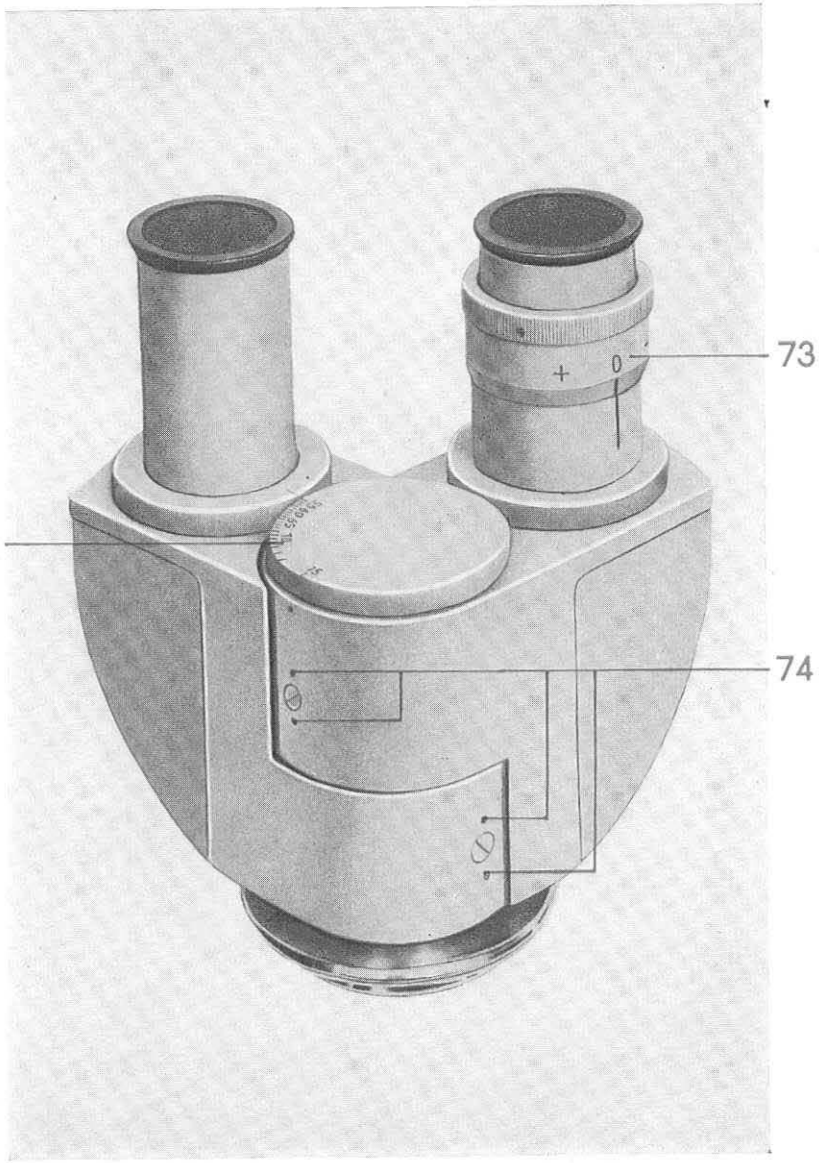
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