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LABOVAL 4

Microscope

Operating instructions

The illustrations shown herein do not correspond in any detail to the latest design of the instrument.

The instruction manual describes the operation of the instrument and the supplementary units. It is not binding in regard of the scope of equipment.

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Table of Contents

1. Introduction

This instruction manual is confined to the explanation of the characteristic features of LABOVAL 4 as well as its operation and care. It presupposes the microscopist's knowledge of the elementary laws of transmitted-light microscopy. A microscopist not sufficiently acquainted with the fundamentals of microscopy should therefore read corresponding literature in order to be in a position to fully utilize the performance of his microscope.

2. Description

(Figs. 1, 3, 4)

The LABOVAL 4 Microscope ist the refinement of our approved LABOVAL 3 designed for routine examinations in transmitted light.

It is characterized by the following features:

2.1. The stand (4) consists of the base and the microscope arm containing the quick-changing device for the tubes and the revolving nosepiece firmly screwed to it. The stand is available either with the simple-type object stage and object traverser or with a mechanical stage. Both stages are rigidly mounted to the stand in our works.

2.2. The microscope is designed for direct connection to the mains. All electrical components required for illumination are installed on the base plate (52) of the microscope base (7). Operation is effected from the front.

2.3. The illumination optics is factory-adjusted in the upper portion of the microscope base. The whole stand can be hinged down from the base plate. The illuminating equipment comprises the aspherical collector (12), the first frosted screen (11) arranged directly behind it, the deflecting mirror (10) and the second frosted screen located at the light exit with filter holder (15). The 6 V 20 W halogen lamp is mounted on a hinged panel (70 Fig. 6).

2.4. The condenser (19) is provided with a swing-in-type wide-field lens (16) and the aperture diaphragm (18).

2.5. Included in the LABOVAL 4 standard outfit are achromatic objectives (20) designed for 160 mm tube length and parfocalized to 45 mm. The pertaining paired eyepieces (23) are of the "P" type (plane-field eyepieces for achromatically corrected objectives without compensating effect for the chromatic difference of magnification). It is also possible to use "A" type eyepieces (analogous correction, former design for smaller fields of view).

2.6. Observation is feasible binocularly in a relaxed posture at a viewing angle of 30°.

2.7. The bilaterally arranged coaxial coarse- (6) and finefocus (5) controls act on the stage carrier (3) firmly screwed to the object stage. On Figs. 1, 4, 8, 9 and 10 the mechanical stage (1) is illustrated. Concerning the simplified stage with object traverser (Fig. 3) please cf. paras. 2.9. and 3.2.
The range of coarse adjustment is more than 20 mm. One of the fine-focus controls is provided with a scale for depth measurements. One revolution corresponds to a range of adjustment of 0.1 mm, one scale division is 2 µm. The smoothness of the coaxial motion mechanism is factory-adjusted and need not be readjusted.

Note: The two coarse-focus controls must by no means be counterrotated. Danger of destruction.

2.8. The condenser motion mechanism with pinion head (40) arranged on one side acts on the condenser support (2). The bright-field condenser included in the standard outfit has a mount for the diaphragm slides of the additionally deliverable phase-contrast/dark-field equipment for LABOVAL-4 (Fig. 3). It may be exchanged for other condensers (e. g. the cardioid dark-field condenser with objective HI 100/1.25), using a sliding sleeve, and fixed by means of clamp-screw (55).

2.9. The displacement of the specimen in the X-Y plane, vertical to the optical axis of the microscope, is effected with the mechanical stage (1) or the model C object traverser (35). With the aid of low-positioned coaxial pinion heads (53, 54) the mechanical stage can be moved over a range of 76 mm (3") in X-direction and of 51 mm (2") in Y-direction, and the model C object traverser over a range of 76 mm (3") × 26 mm (1").

2.10. The ball-bearing revolving nosepiece (43) has been designed for taking up 4 objectives and is provided with ball detent facilities.

2.11. At the standardized attachment faces the use of a number of supplementary units is possible for applying further methods of illumination and image reproduction, microscopic measuring and drawing etc. Please cf. par. 4.

3. Unpacking and installation

The LABOVAL 4 is delivered in a foamed plastic container. After removing the adhesive tape, combining the two parts of the container, same is placed on the table in such a way that its cover marked as such by an inscription is on top. Then the cover is taken off.

The container (Fig. 2) accommodates:

stand (4), condenser (19), straight binocular tube (22), 30° angular tube (21), objectives (20) in boxes (31, 32), halogen lamps (14), immersion oil (34) and dust hood (30). Also accommodated at place (30) is the accessories box containing eyepieces (23), eye cups, filters and spare fuses. The components are assembled in the order described below (Figs. 3 and 4):

3.1. Attaching the eyepiece tube

Screw out clamp-screw (56) up to the stop, remove black dust cap from 30° angular tube (21). Place the angular tube with its dovetailed ring in an inclined position against the two jaws of the dovetailed ring mount (44) of the microscope arm, opposite clamp-screw (56), tilt it in position, and tighten the screw. Attach straight binocular tube (22) to light exit of angular tube, and clamp it in position.

Slightly loosening clamp-screw (56) enables the inclined binocular tube, assembled in the way just described, to be rotated through 360 °, this being most advantageous for demonstrations and discussions during work with the microscope. Each of the systems has the factor 1, so that no tube factor has to be taken into consideration for computing the microscope magnification.

The left-hand eyepiece socket is adjustable to compensate different ametropia of the observer's eyes. To this end, viewing with the right eye through the right-hand eyepiece the user brings the object into focus by actuating fine-focus control (5), and then, viewing with the left eye through the left-hand eyepiece, adjusts the left-hand eyepiece socket accordingly by turning knurled ring (45) (after the complete assembly of the microscope acc. to paras. 3.2. to 3.6. and after adjustment acc. to par. 4.).
This done, a sharply depicted image is to be seen by both eyes. The interpupillary distance is adjustable in the range between 55 mm and 75 mm by symmetrically moving the two eyepiece sockets on the tube's central axis. The individual values for the compensation of ametropia and for the interpupillary distance (46) can be read off corresponding scales. If after longer use the interpupillary distance set should alter spontaneously, this defect can be eliminated by readjusting the built-in brakes. To this end, the tube is set to the smallest interpupillary distance, and the 4 screws marked by an X in Fig. 7 are carefully tightened, using an appropriate screwdriver. These screws must not be screwed tight but actuated only gradually while repeatedly checking the smoothness of the tube setting.

The microscope's total magnification is computed as follows:
objective magnification x low-power magnification of eyepiece

3.2. Attaching the object traverser

The instructions given below refer only to the standard outfit with simplified stage.
Attach object traverser (35) to the left side (when observing from the open side of the stand) of the stage which is provided with threaded sleeves at its bottom side, into which the traverser's fixing screws are screwed.

3.3. Screwing the objectives into the revolving nosepiece

Take objectives (20) out of their boxes (31, 32), and screw them into the revolving nosepiece (43) in the order of increasing magnification factors, turning the nosepiece in clockwise direction. Pay attention to take the objectives by their knurled rings only.

3.4. Inserting the condenser

Insert condenser (19) from below into the sliding sleeve of condenser support (2), and fix it slightly by means of clamp-screw (55).
The condenser should be positioned in such a way that setting lever (51) of the aperture diaphragm is still well accessible on the right, with the diaphragm being closed, and wide-field lens (16) can be freely swung to the left without affecting the optical path.

3.5. Inserting the eyepieces

Unpack eyepieces (23) and insert them into the sockets of the straight binocular tube (22), where they should be left to prevent any dust from getting into the tube.

3.6. Illuminating equipment

The primary voltage of transformer (9) installed on base plate (52) of microscope base (7) may be set by the manufacturer to

220/240 V or 110/127 V.

Therefore, the line voltage required by the customer should be specified in the order placed.
Fuse links of the following load capacity should be used:

for 220 V to 240 V : T 250 mA, slow-blow
for 110 V to 127 V : T 500 mA, slow-blow

In general, the microscope is designed for a mains frequency of 50 Hz, ex works, unless a mains frequency of 60 Hz has been expressly required by the customer.

A subsequent change to 60 Hz is possible by a service technician (of our agency or service workshop) as follows:
Open microscope base as described on page 14 for exchanging the fuse links. Cut through the high-situated wire jumper on p. c. b. 301025:045.25, marked with 50 Hz, thus compensating the higher lamp voltage ($\approx$ 0.7 V) occurring at a 60 Hz operation.
Prior to connecting the microscope to the mains by means of the cable with safety plug (8) check, if the mains voltage is identical with the transformer's primary voltage given at the rear of the microscope base (7). Moreover, take care to use the correct fuse link.

Switch on the instrument by actuating mains switch (41). The lamp voltage can be regulated between 2 V and 6 V by turning knurled ring (42) provided with a scale. Prior to switching off the microscope by means of mains switch (41) the lamp voltage should be set to the lowest value by means of knurled ring (42). The potentiometer for brightness setting is provided with a detent position at 4.8 V. The intensity achieved there will be sufficient for the majority of examinations carried out, enables colour photomicrography to be employed, and ensures a long lamp life. If higher light intensities should be required, the range above the detent position (red scale mark) can be used. In the case of longer use, however, this will result in an increased warming-up of the base and, consequently, in a shortened lamp life.

4. Operation of the microscope

4.1. Bright-field illumination

In the interest of a more convenient operation of this microscope the conventional Koehler principle of illumination with centring-type field diaphragm is no longer applied, thus facilitating the adjustment of the illuminating equipment prior to starting the instrument and after a lamp change. Simplified Koehler illumination, nevertheless, fully, ensures a uniform luminous coverage of the field and adequate luminous coverage of objective apertures.

Connect microscope with cable (8) to the mains via safety socket. Actuate mains switch (41), push-button is depressed in the ON-state. Place specimen onto stage, move it into position by sight, actuating the pinion heads (53, 54) to move the stage in x- and y-directions. Switch in 3.2/0.10 or 10/0.25 objective. Swing in wide-field lens (16) of condenser (19) and raise the latter to its upper stop by actuating pinion head (40). Critically focus onto specimen by means of coarse- (6) and fine-focus (5) controls. Remove wide-field lens (16) from optical path. Switch in 40/0.65 objective. Pull an eyepiece (23) out of the tube and observe rear objective lens (corresponding to objective's exit pupil). Completely open aperture diaphragm (18) of condenser (19) by means of setting lever (51), and lower condenser by actuating pinion head (40) until objective's exit pupil is optimally covered with light. Adjust aperture diaphragm for controlling contrast, depth of focus, and resolution in accordance with the object used. For usually stained sections and smears not less than half the diameter of the exit pupil and not more than two thirds of it should be covered with light.

Note: Too high a light intensity must not be reduced by closing the aperture diaphragm but only by decreasing the lamp voltage by means of knurled ring (42) or by inserting attentuation filters (grey glasses) or other filters into filter holder (15). For the luminous coverage of the visual field, when using low-power objectives and eyepieces, swing wide-field lens (16) into optical path.

4.2. Further methods of illumination and image reproduction

In conjunction with further supplementary units the LABOVAL 4 microscope can be used for applying further conventional methods. Reference may be made to the application of the phase-contrast/dark-field equipment for LABOVAL 4, and graticules for microscopic measuring and counting.

Image reproduction methods comprise microscopic drawing with the drawing eyepiece (Fig. 8) or the binocular drawing attachment, demonstration of the microscopic image to several viewers with the aid of the demonstration tube (Fig. 9), and photomicrography with an equipment of the model mf-AKS system (Fig. 10).

Detailed information on these and further supplementary units is contained in the respective catalogues and instruction manuals.

5. Maintenance

A microscope's lifetime comprises several decades, proper treatment provided. Its care and maintenance are easy, being confined to careful handling, to the observance to the operating instructions, protection from dust and chemically aggressive substances and vapours, and to timely repairs of minor defects that may occur. An occasional general overhaul by technical staff is recommended. The following cleaning operations may be carried out by the user himself, if so required:

Removal of dust with a dry brush: for the treatment of glass surfaces, eyepieces, mirrors etc use should be made of a natural hair brush degreased in an alcohol-ether mixture and dried afterwards. The brush should be kept free from dust in a closed test tube. Finger prints on glass surfaces should be avoided. If, nevertheless, there should be any, they are to be removed immediately by means of a piece of chamois leather or a soft linen cloth.

Cleaning the objectives is confined to keeping the front and the rear lens clean.

Any attempt to take apart an objective will undoubtedly result in its complete maladjustment. The rear lens is dusted with a brush, the front lens is placed on a linen cloth or gauze drawn over the fingertip, and moved to and fro under light pressure. For removing immersion oil the cloth may be moistened with xylene or benzene but never with alcohol.

When changing objectives it is recommended not to touch the annular contacting surfaces of both the revolving nosepiece and the objective as well as the

screw threads with the fingers. Objectives not in use should be stored in their capsules.
When not in use the microscope should be kept under a transparent plastic cover.
In the case of a failure of the electric system check, if the halogen lamp (14) is burnt out or the fuse is blown.

Lamp change:
Switch off instrument by actuating mains switch (41).

Pull mains plug.

Tilt instrument to the rear or sideways, and hinge down panel with lamp (70 Fig. 6). Pull burnt-out lamp (14) out of its holder (13), and replace it by a new one.
Take care not to cant it. Push in pins up to stop.

Caution: Do not touch the quartz bulb of the new lamp with your fingers. Do not remove its protective envelope until the lamp has been properly inserted in its holder (13).
Hinge back panel (70). Put instrument again into operation. An adjustment of the lamp is not necessary.

Exchange the fuse links as described below:
Switch off instrument by actuating mains switch (41).

Pull mains plug.

Screw out fixing screw (61 Fig. 5) between base plate (52) and upper portion of microscope base with the aid of a screwdriver, and hinge stand to the rear. Exchange defective fuse link (60), hinge back stand, screw it tight, connect mains plug to the mains, and put microscope into operation. Other electrical failures cannot be eliminated by the user himself but by our service experts.

5.1. Additional instructions for unpacking and operating precicion instruments in countries with damp and warm climate

This first-class precision instrument has been designed for operation in tropical rain climate, too, but in order to keep it ready for use 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.

5.1.1. Unpacking of the instrument

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

Therefore, the instruments should be unpacked within 200 days, at the latest, from the date of packing.

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

5.1.2. Storage and operation of the instrument

Regular use of the instrument 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 instrument in bright and dry rooms. Rooms of air humidities below 65 % are most favourable which can be obtained by using air dehumidifying plants.
  The instrument should be aired periodically by installing ventilators near the instrument, if possible.
- 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 infrared radiators) produce an overtemperature of abt. 5 K, are suitable as depository.

The attack on instruments in storage containers by moulds 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 (packed in paper bags) as a fungicide into the container.

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

5.1.3. 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 optics cleaning cloths that may be slightly moistened with benzene.

5.1.4. Maintenance directions for steel parts

Steel parts that are bright, burnished or phosphatized due to functional reasons are to be protected by acidless greases (vaseline) and oils.
It is advisable to renew the protection against corrosion, using greases for this purpose.

The directions given in par. 5.1.2. and par. 5.1.4. analogously refer to the instruments which are in continous use. Their consideration certainly contributes to the prolongation of the lifetime of the instruments.

All precision mechanical-optical 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 times in wooden or leather container. (The growth of mould fungus is accelerated at temperatures between + 15 °C and + 35 °C).

6. Legends to illustrations

Fig. 1.

Sectional view

1 Mechanical stage
2 condenser support
3 Stage carrier
4 Stand
5 Fine-focus control
6 Coarse-focus control
7 Microscope base
8 Cable with safety plug
9 Built-in transformer
10 Deflecting mirror
11 Frosted screen
12 Aspherical collector
13 Lamp holder
14 Halogen lamp
15 Frosted glass with filter holder
16 Wide-field lens
17 Filter holder
18 Aperture diaphragm
19 Condenser
20 Objective
21 Angular tube 30 °
22 Straight binocular tube
23 Eyepiece

Fig. 2.

LABOVAL 4 Microscope in foamed plastic container

30 Accessories box
31 Objectives in capsules
32 HI 100/1.25 objective, in container
33 Recess for spare lamps
34 Bottle of immersion oil
35 Object traverser

Fig. 3.

LABOVAL 4 Microscope

40 Condenser pinion head
41 Mains switch
42 Knurl for potentiometer
43 Revolving nosepiece
44 Dovetailed ring
45 Knurled ring
46 Interpupillary distance setting scale

Fig. 4.

Front sectional view

50 Lever for object holder
51 Aperture diaphragm setting lever
52 Base plate of microscope base (7)
53 Pinion head for mechanical stage, X-direction
54 Pinion head for mechanical stage, Y-direction
55 Condenser clamping screw
56 Clamping screw for dovetailed ring

Fig. 5.

Partial view with stand hinged to the rear

60 Fuse links
61 Fixing screw

Fig. 6.

Exchange of halogen lamp (Partial view from below)

70 Hinged Panel with 6 V 20 W halogen lamp

Fig. 7.

Adjusting the smoothness of action of the binocular tube

Fig. 8.

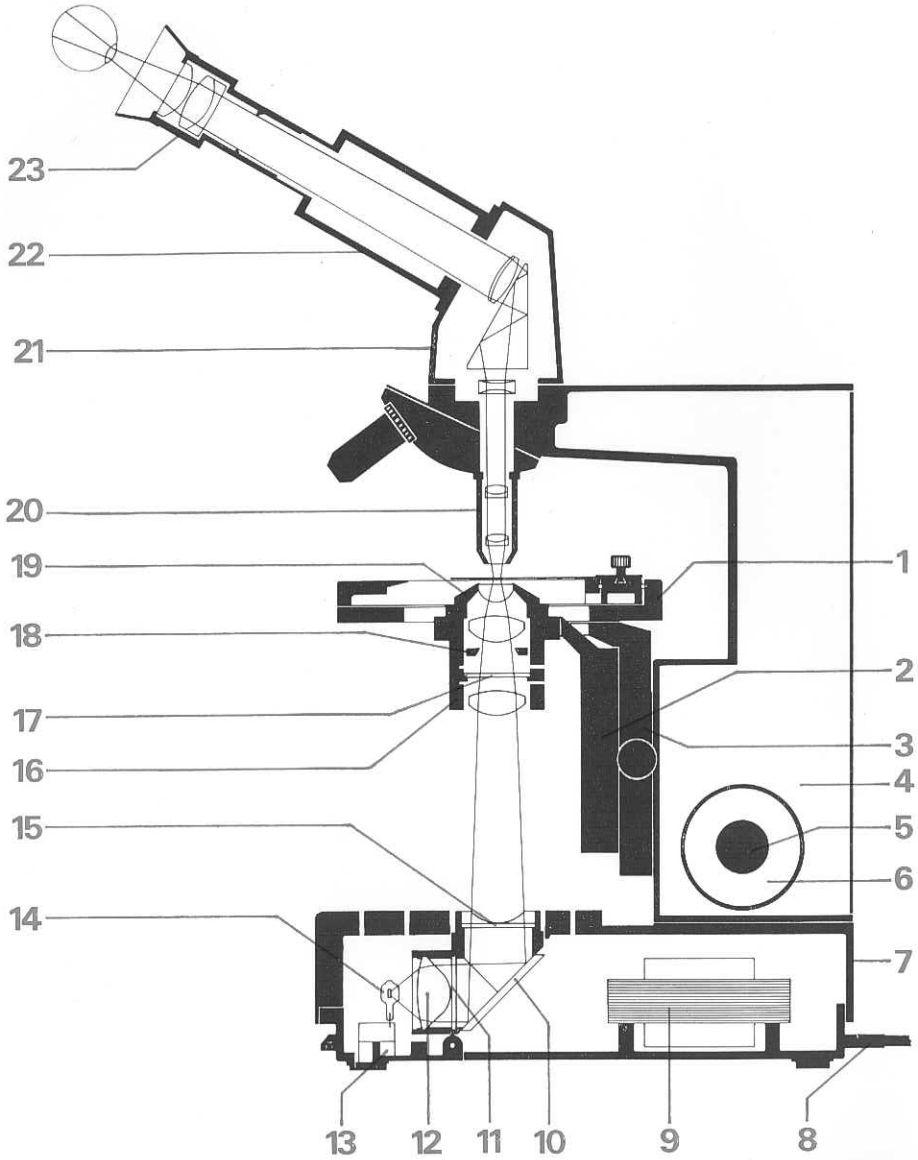
LABOVAL 4 with 8 × drawing eyepiece

Fig. 9.

LABOVAL 4 with 10 × demonstration tube

Fig. 10.

LABOVAL 4 with model mf-AKS attachment camera 24 × 36 expomet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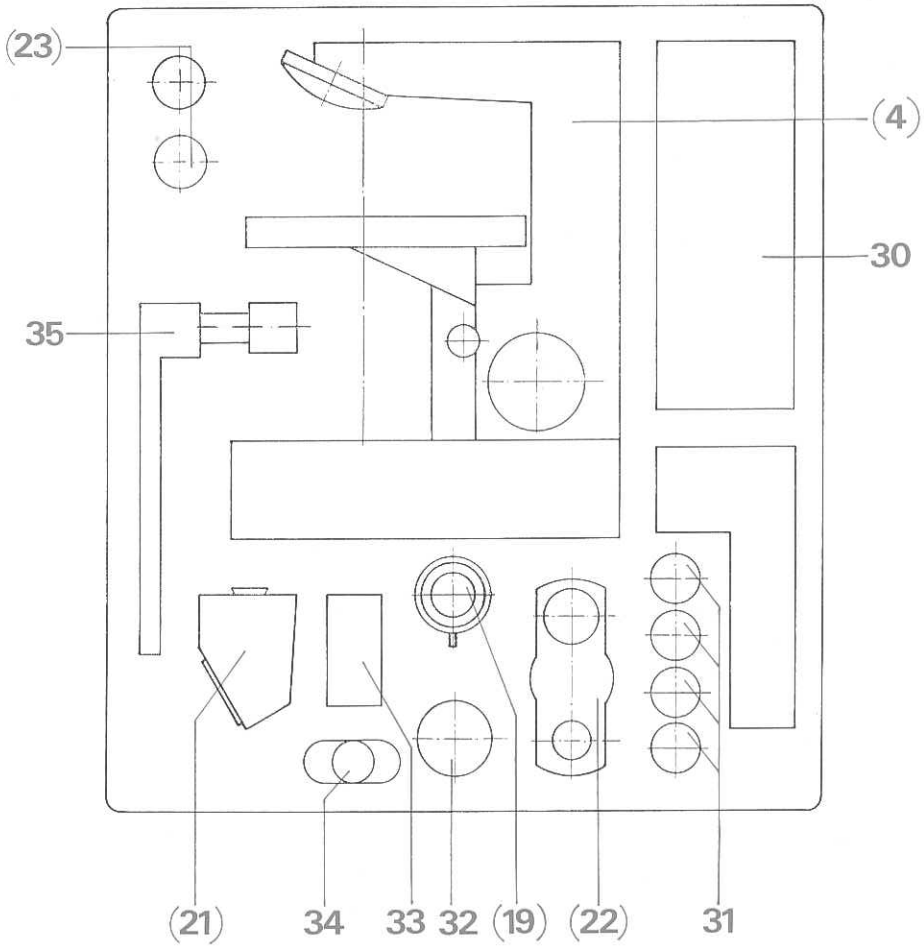
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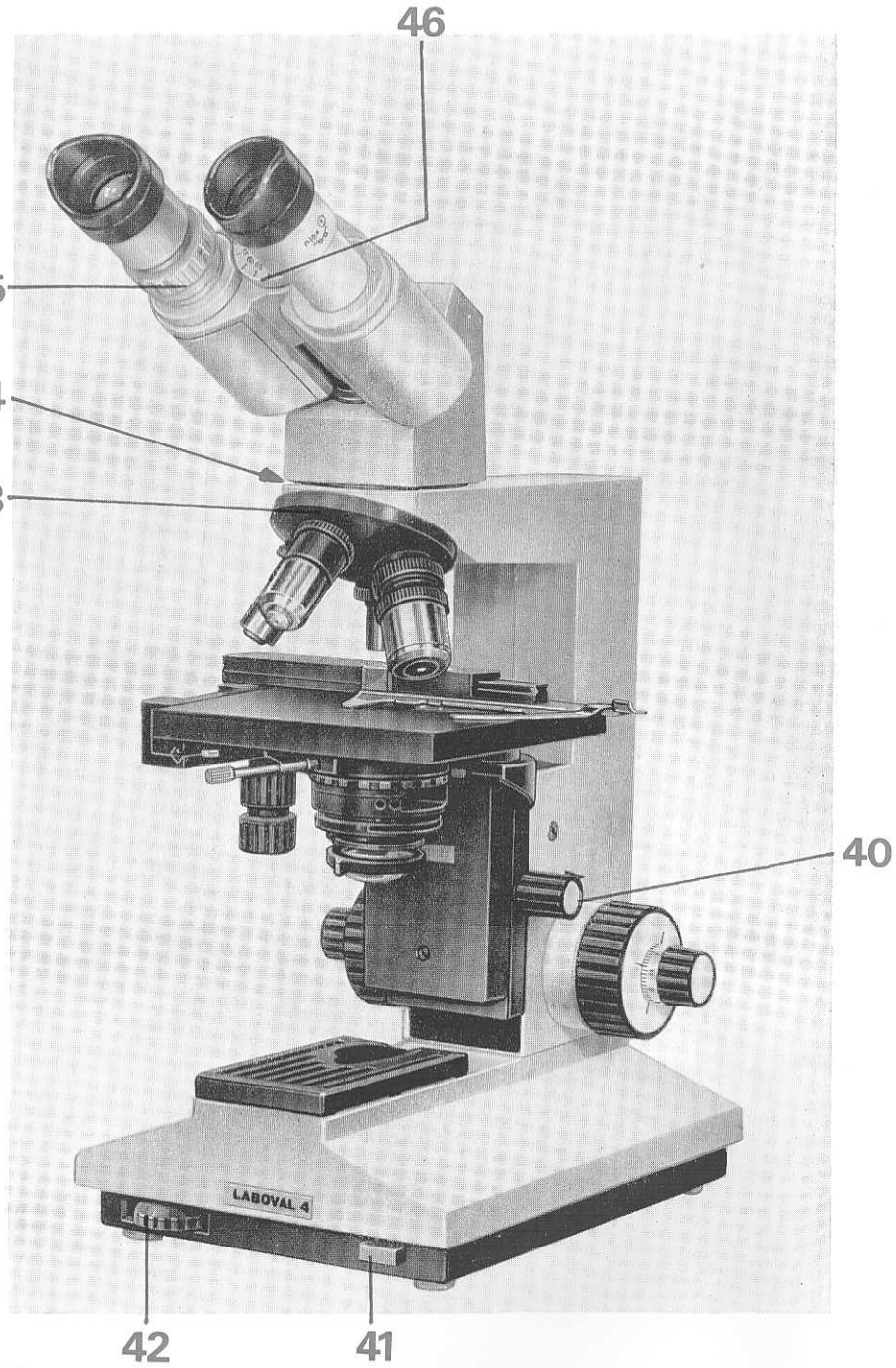
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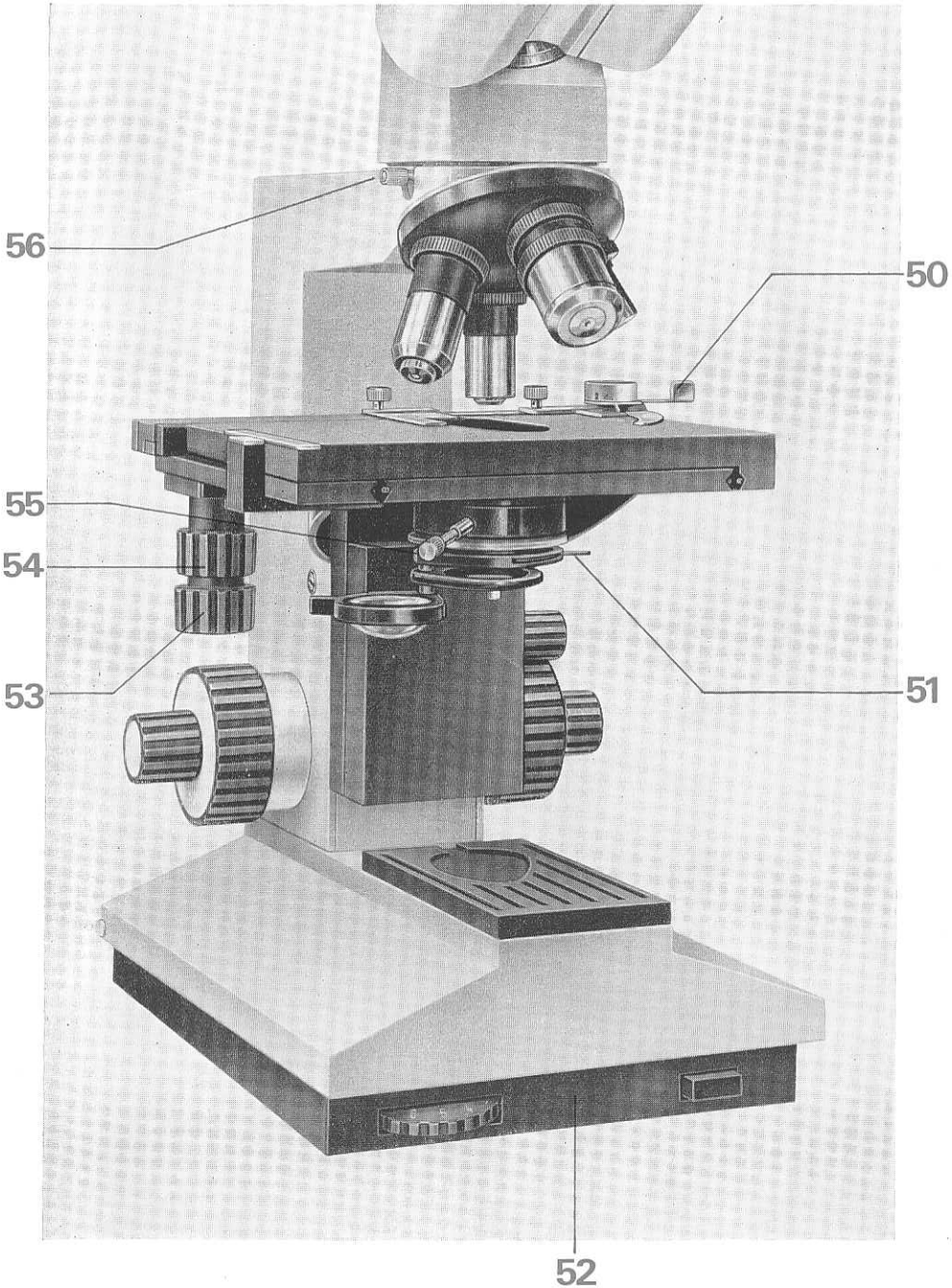
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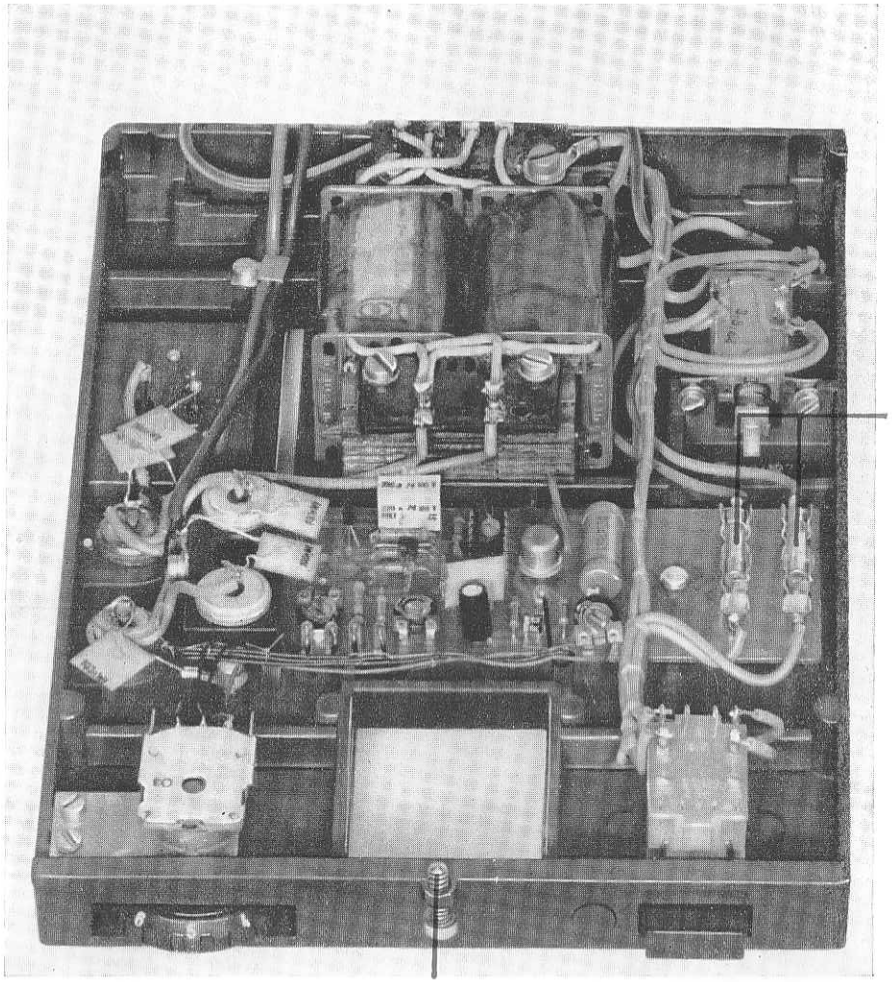

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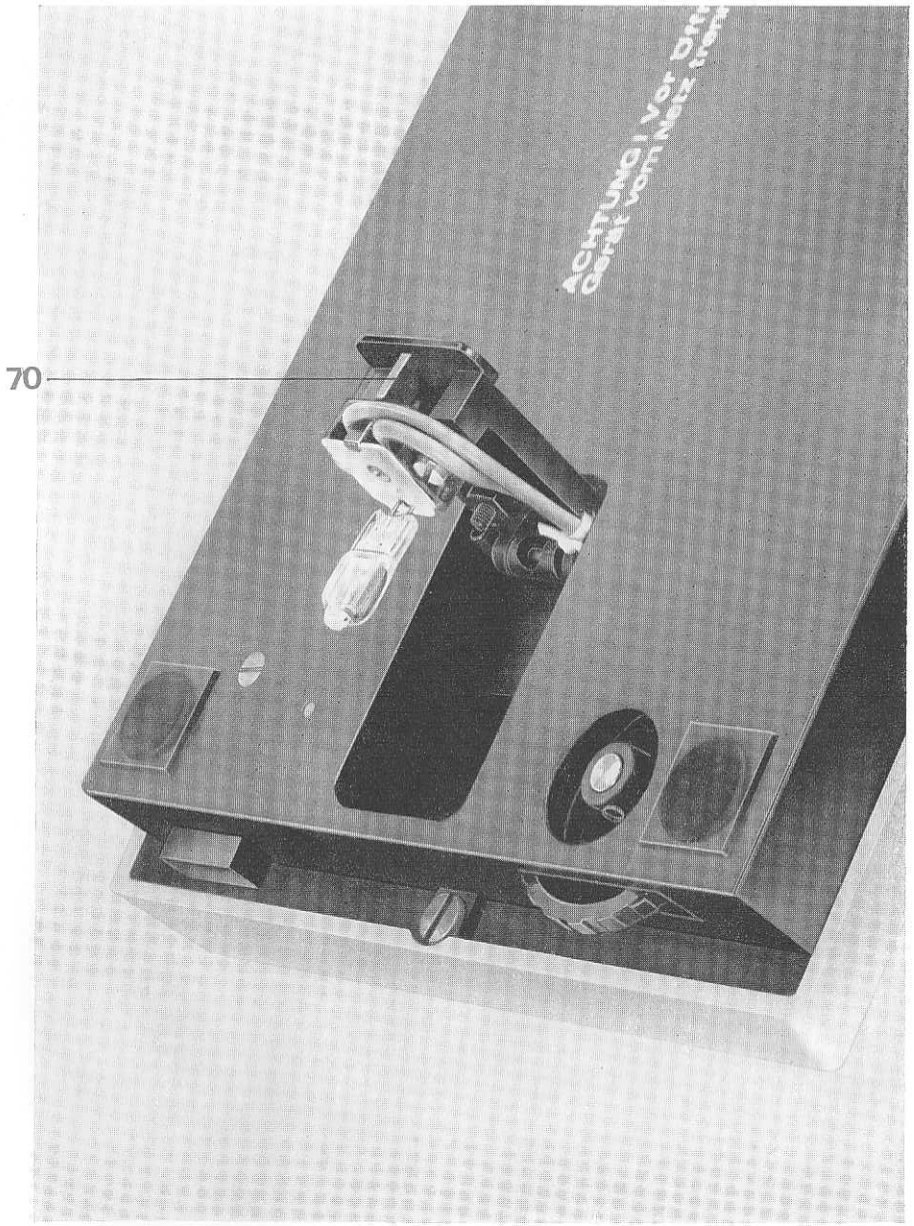

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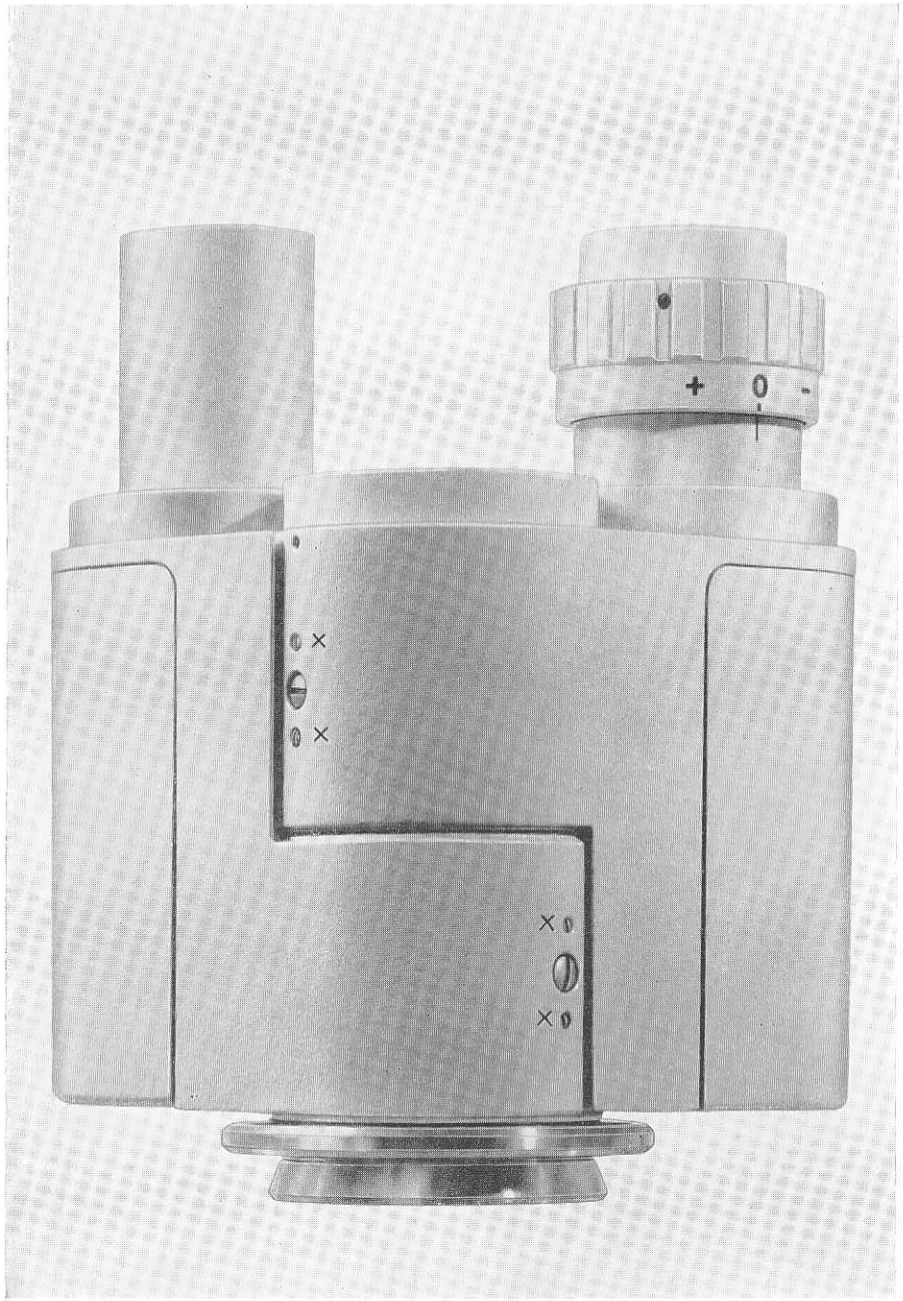
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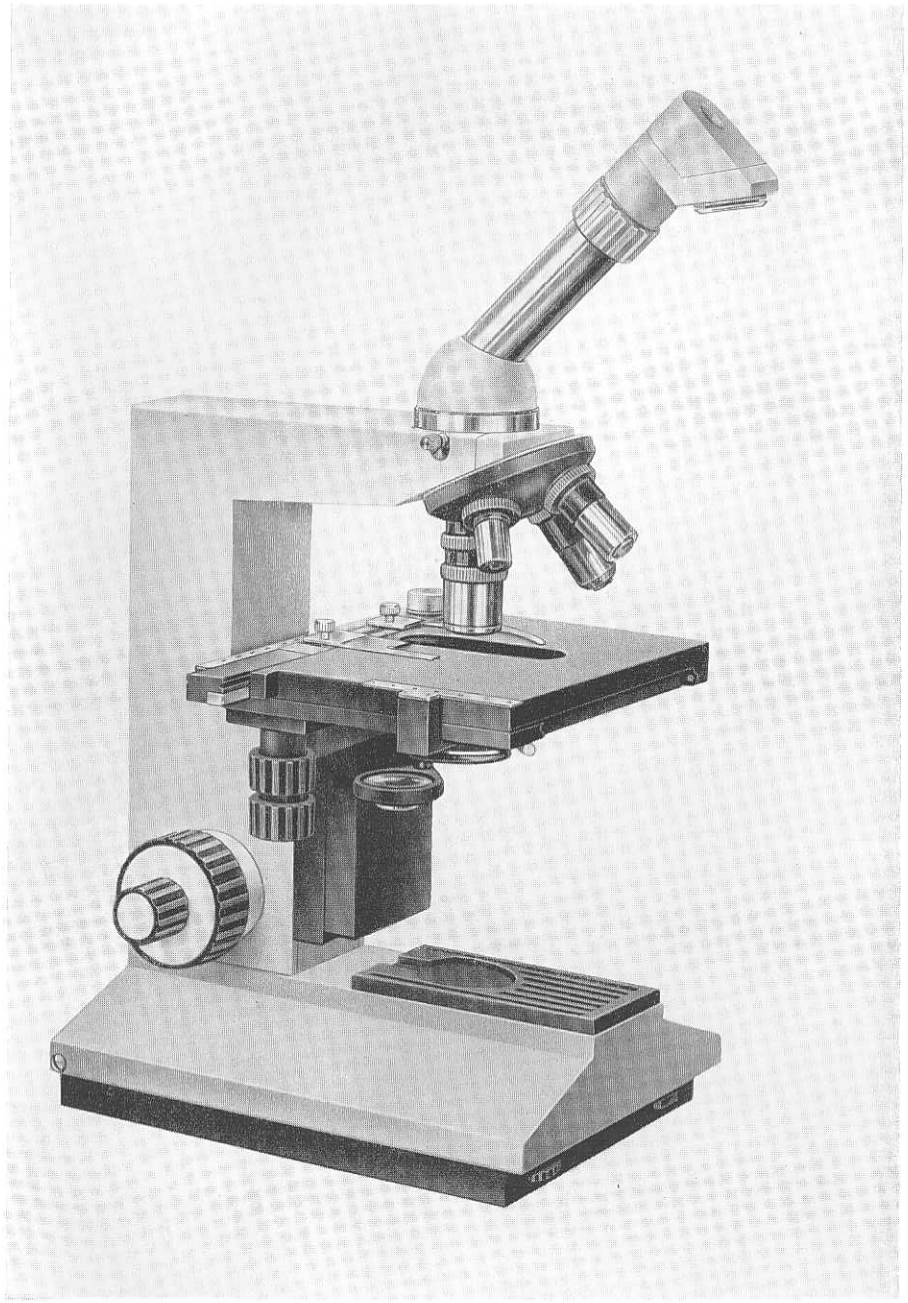

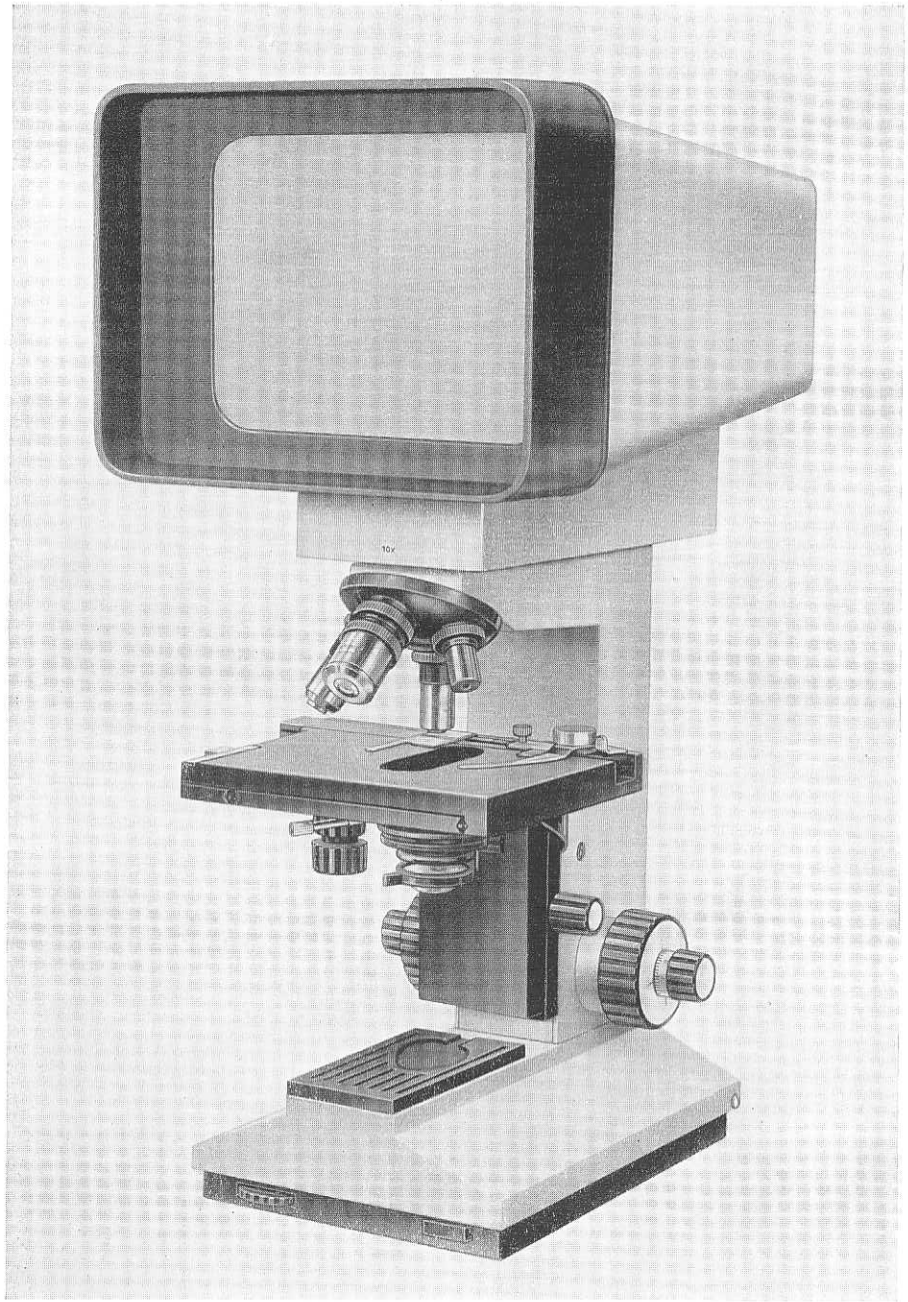

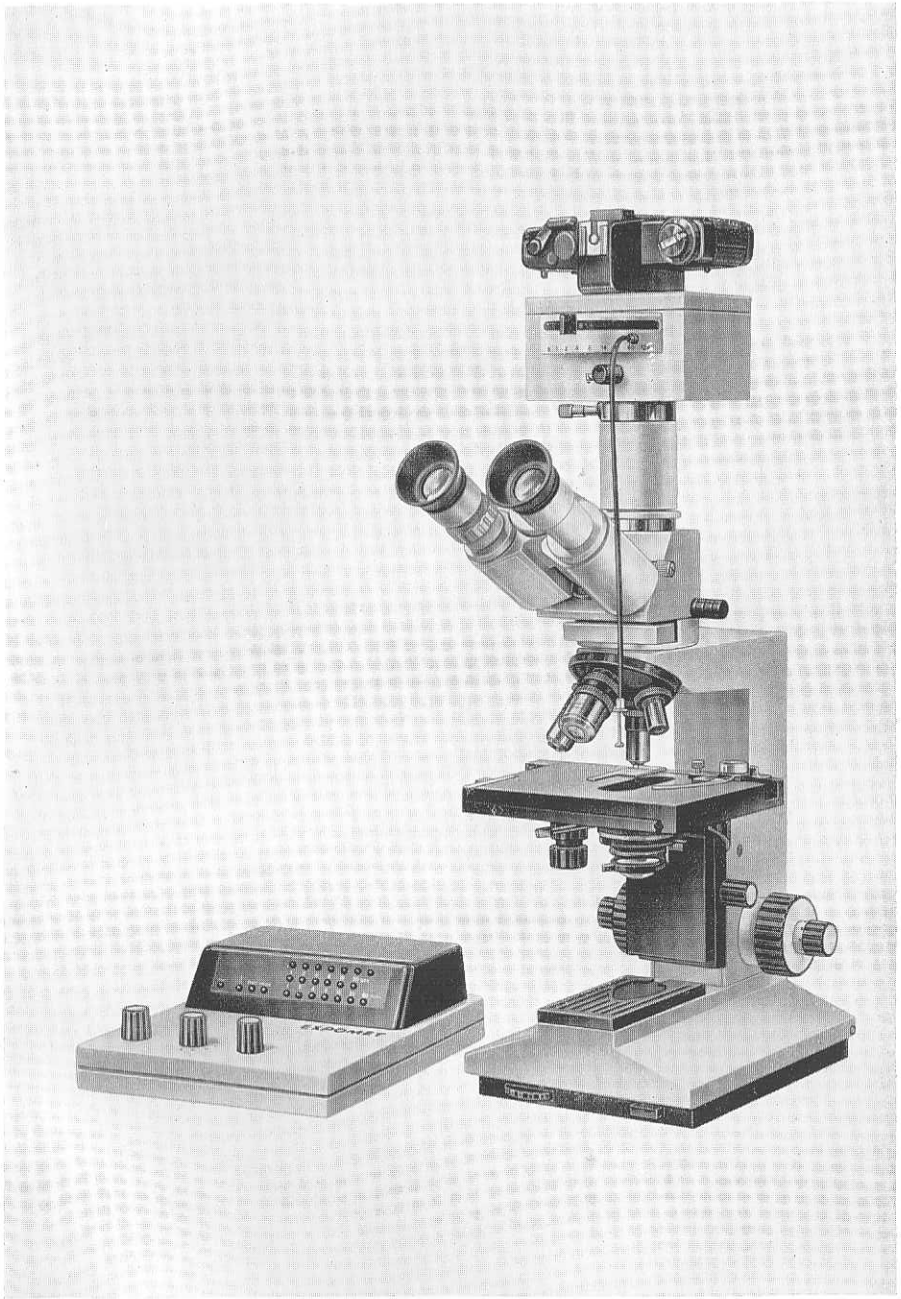
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