Leitz Universal Condenser UK

Introduction

Figure 1: The Universal Condenser UK.

The condenser in the image has been neglected and mistreated. It is very dirty and one of the centering keys and the aperture diaphragm have rust patches.

Figure 2: The Universal Condenser UK.

Leitz Universal Condenser UK (UK from German **U**niversal**k**ondensor) was introduced in the late 1970s for Leitz' new series of microscopes (Dialux 20 and Dialux 20 EB) with 160 mm mechanical tube length. It was the successor of the similar condenser model 402a for the preceding 170 mm tube length microscopes, and the predecessor for the later condensers with designations UKL (UK for Universalkondensor and L indicating that it was designed for the various Laborlux models) and UK0 (UK for Universalkondensor and 0 indicating that it was designed for the newest 160 mm tube length models, like Diaplan and Aristoplan, where the aperture diaphragm was built into the microscope foot.)

The table below summarizes the above mentioned Leitz condensers:

Model	Tube length	Leitz catalog number	Microscopes
402a	170 mm	513 140 (incl. top element Achr, 0.90 and revolving turret)	Most 1960s and 1970s models with 170 mm tube length
UK	160 mm	513 467 (condenser base only)	Dialux 20, 20 EB, 22 and 22 EB, Labovert
UKL	160 mm	513 558 (condenser base only)	Laborlux models, Biomed
(?)	160 mm	513 738 (condenser base only)	Laborlux models
UK0	160 mm	513 594 (condenser base only)	Diaplan, Aristoplan

Note that although several parts appear similar and mechanically interchangeable between these condenser generations, there may be critical differences and incompatibilities that make such combinations dubious (see, for example, A tour round a Leitz Diaplan microscope.)

The UK condenser can be used for brightfield microscopy, and, if equipped with the light ring turret (Figure 1 and Figure 2), also for darkfield and phase contrast microscopy. With Wollaston prisms in the turret the condenser can be used for interference contrast microscopy. The condenser also has a dovetail sliding mount, an aperture diaphragm, an exchangeable top element, a supplementary lens, and permanently attached centering keys for alignment of the light rings in the turret. The top element is mechanically linked to the supplementary lens; if the top element is moved into the optical path, then the supplementary lens is automatically moved out of the optical path, and vice versa. Turning the grip (Figure 1) on the underside of the condenser switches between these two settings. A couple of different top elements were available to cover particular applications (use with immersion oil, longer working distances, darkfield use, for specifics refer to Leitz Dialux 20 - Instructions.) The most common top element is achromatic with an n.a. of 0.90 which is intended for dry use (i.e., no immersion fluid) with an intercept distance ("working distance") of 1.1 mm. This top element should be switched into the optical path when objectives with n.a. > 0.25 are used.

Figure 3: The most common top element

The UK condenser doesn't have any screws or mechanisms for condenser centering, these functions have instead been built into the microscope's condenser holder.

Scope

After near 50 years of use a UK condenser may typically be dirty and suffer from a sluggish or frozen aperture diaphragm or lens switching mechanism. Another common problem is accidental contamination of the top element with immersion oil.

These maintenance notes describe the disassembly and some cleaning and greasing procedures for the Leitz UK condenser.

General user instructions for the UK condenser are available in Leitz Dialux 20 - Instructions.

I only have shallow knowledge about microscope lubrication but have chosen to use the easily available Super Lube Multi-Purpose Synthetic Grease with Syncolon (NLGI grade 2) for the UK condenser. For alternative microscope greases one can find many recommendations on the Internet.

About Iris Diaphragms

Refer to the Internet for general descriptions, drawings, and animations of how iris diaphragms work.

Iris diaphragm blades are cut out from thin steel sheets. They are sensitive to corrosion (rust) and mechanical abuse. A common problem with iris diaphragms is that they can become sluggish or stuck due to old, hardened oil. It seems however that Leitz didn't lubricate the aperture diaphragm in the UK condenser. The diaphragm blades may become bent and dented if the diaphragm is forced to close beyond its designated limit. The condenser has however bult-in mechanical stops to prevent such damage. Bent or damaged diaphragm blades are potentially serious problems and can be difficult or impossible to repair.

Rusty iris diaphragm blades are not uncommon in older microscope condensers. Light rust doesn't impair the functions of the iris diaphragm but be aware that rust dust/particles may fall down on any lens that is below the diaphragm.

To take apart an iris diaphragm is easy but putting it together again with all the blades in good order can be challenging. If the diaphragm blades are bruised or not completely flat and even, then your patience will face the ultimate test. But it certainly *can* be done, as examples of successful attempts see this article and this video clip.

Work Notes

Before you go ahead with fixing your UK condenser there are two things to consider:

i. Check that the condenser's top element is in good shape. Unscrew the top element from the top element holder (Figure 1) and inspect its lens surfaces, both the external and the internal. This is best done with a stereo microscope. Lens delamination, haze, particles, or fungus on the inside of the top element are difficult to remedy, although with some effort and luck the top element can be disassembled. Further servicing of the condenser is probably not very meaningful unless you can fix any top element problems or find a good top element replacement.
ii. Plan ahead. Get an idea of which parts of the condenser you need to fix. Then you can focus on these parts only and perhaps save time and effort by avoiding disassembling the entire condenser.

1. The top element.

Remove the top element from the top element holder (Figure 1 and Figure 2.) Inspect its lens surfaces, both the external and the internal, preferably with a stereo microscope. Look for signs of lens delamination, haze, particles, dust, or fungus. Clean the top element's lens surfaces, if required. Carefully clean the thread with cotton swabs wetted with white spirit. Temporarily put away and store the top element in a safe and dust-free place.

2. Remove the light ring turret.

Unscrew the large locking screw in the center of the bottom side of the condenser (Figure 4.) The screw can't be removed, but just unscrew it far as it goes. Pull out the light ring turret (Figure 1 and Figure 2) from the side of the condenser casing.

Clean the turret surfaces, if required. Check that all five light rings (Figure 5) are present, and that they appear intact and clean. Note that one of the light ring spaces in the turret should be empty – this the position that is used for brightfield microscopy.

Instructions for replacing, centering and use of the light rings are available in Leitz Dialux 20 - Instructions.

Figure 4: The UK condenser viewed from the underside. The red circle indicates the locking screw for the light ring turret.

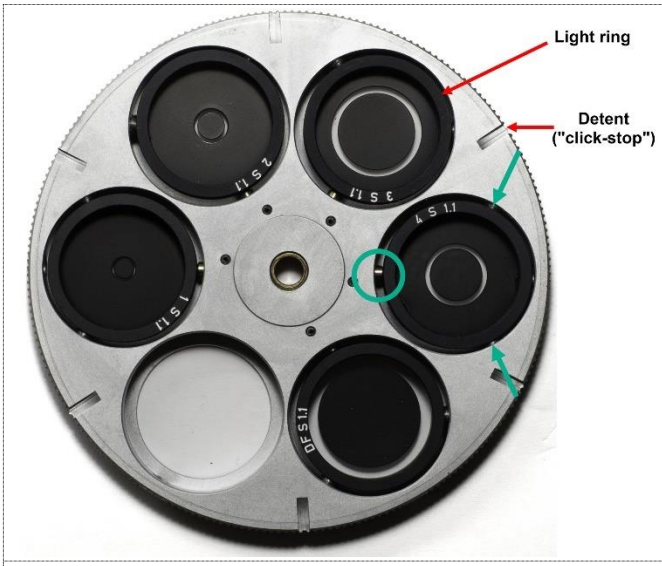

Figure 5: View of the upper side of the light ring turret.

The green circle indicates one of the spring-loaded pins that hold the light rings.
The green arrows indicate the direction of the centering screws for one light ring.

Figure 6: View of the underside of the light ring turret.

3. Disassemble and clean the top element holder, slide, and base.

Remove the two slide rails that cover the top element slide – each of them is attached by two black M2.5x5 screws (with red circles in Figure 7.)

Turn the grip (Figure 1) to move the top element slide to its middle position (Figure 8) with the catch (Figure 7) next to the notch in the side of the top element base (Figure 8.) Lift off the top element slide from the condenser. The plastic catch is attached to the slide with two M2x4 screws but doesn't need to be removed unless it is broken or in the way for cleaning.

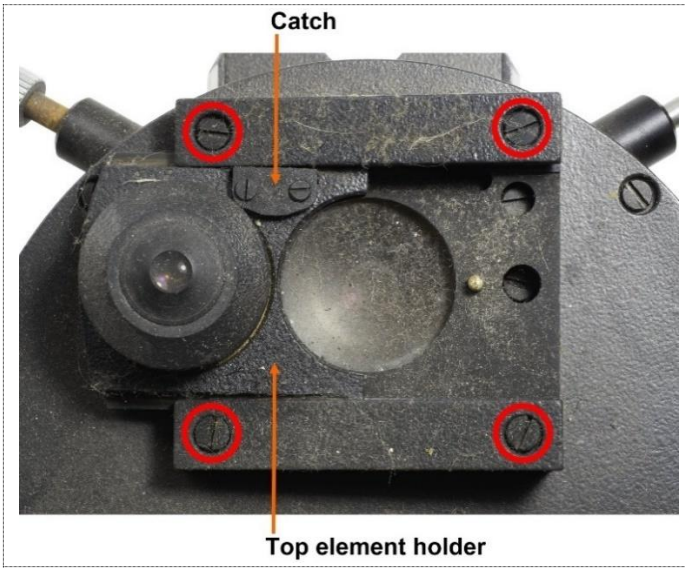

Figure 7: View of the top element and the top element slide.

The red circles indicate the screws that hold the slide rails.

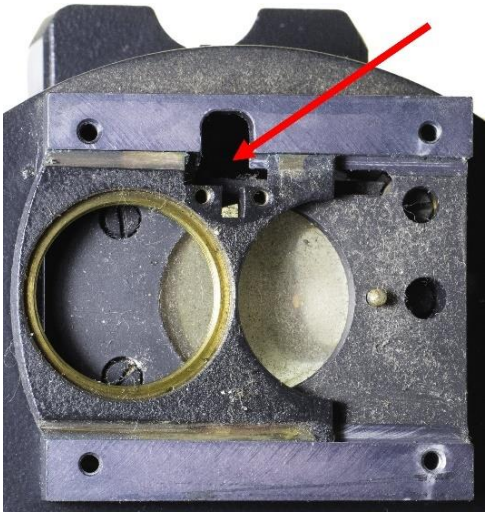

Figure 8: The top element holder on the top element base after the top element and both slide rails have been removed.

The red arrow indicates where the top element catch must be positioned before the top element holder can be removed.

Figure 9: The top element holder. The catch has been removed from the holder.

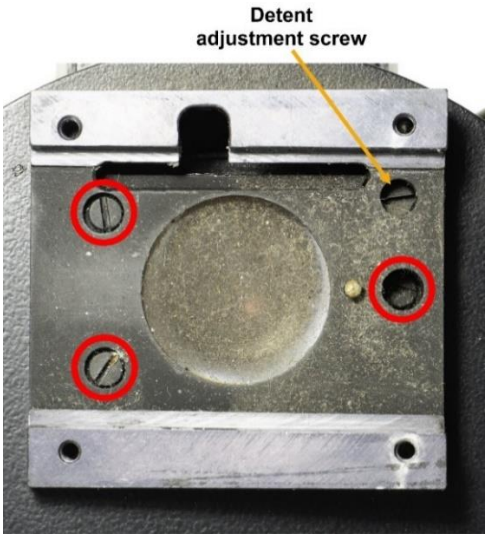

Figure 10: The top element base after the holder has been removed.

The red circles indicate the screws that attach the base to the condenser casing.

Remove the top element base from the condenser cover – it is attached by three black M2.5x5 screws (with red circles in Figure 10.) Don't touch the detent adjustment screw – it covers a spring-loaded steel ball and is used to adjust the tension applied on the light ring turret detents to ensure that the turret properly and without any play snaps into any of its six positions.

The collector lens (with its bulging side facing down) is attached from the underside of the top element base (Figure 11.) If the lens is very dirty (as in Figure 10) it is best to remove it from the base before cleaning it: From the underside of the top element base use a camera lens spanner equipped with suitable flat tips to unscrew the lens retaining ring. Be careful not to slip with the spanner! Clean the collector lens by immersing it in a beaker with lukewarm water with some dish detergent. Use nitrile gloves when handling the lens. While submerged, gently brush the lens with a very soft optical brush (preferably one with sabre, squirrel, or marten hair). Be careful not to scratch the lens. Rinse the lens with tap water and then isopropanol and leave it to dry in the air. Touch up, if required. Reattach the lens to the holder (with its bulging side facing down toward the condenser casing) and lightly tighten the retaining ring.

Figure 11: The underside of the removed top element base.

Figure 12: The top of the condenser cover after the top element base has been removed.

Clean the slide rails, the top element holder (including the top element thread), and the top element base using pieces of cloth and/or cotton swabs wetted with white spirit. Make sure to remove all old grease and any dirt that has accumulated.

4. Remove the grip from the underside of the condenser.

The plastic grip (Figure 1 and Figure 2) has two functions: As a switch to toggle between the top element and the supplementary lens, and as a handle when the condenser needs to be pulled out from the microscope's condenser holder.

Remove the small black E clip that is attached to the end of the grip's steel axle (Figure 4.) Also remove the washer (o.d. 7.9 mm, i.d. 5.1 mm, thickness 0.10 mm) below the E clip. Pull off the grip from the axle. Retrieve the wave washer (o.d. 11.8 mm, i.d. 8.0 mm, thickness 0.10 mm) and the regular washer (o.d. 11.4 mm, i.d. 8.2 mm, thickness 0.20 mm) below. Two openings can now be seen in the condenser casing (Figure 13); one for the grip's connection to the top element lever, and

the other for a spring-covered rod which makes the grip to snap into one of its two outer positions ensuring that the top element or the supplemental lens, respectively, are appropriately aligned in the optical path.

The grip axle is attached to the base plate by a thread. It can be left attached.

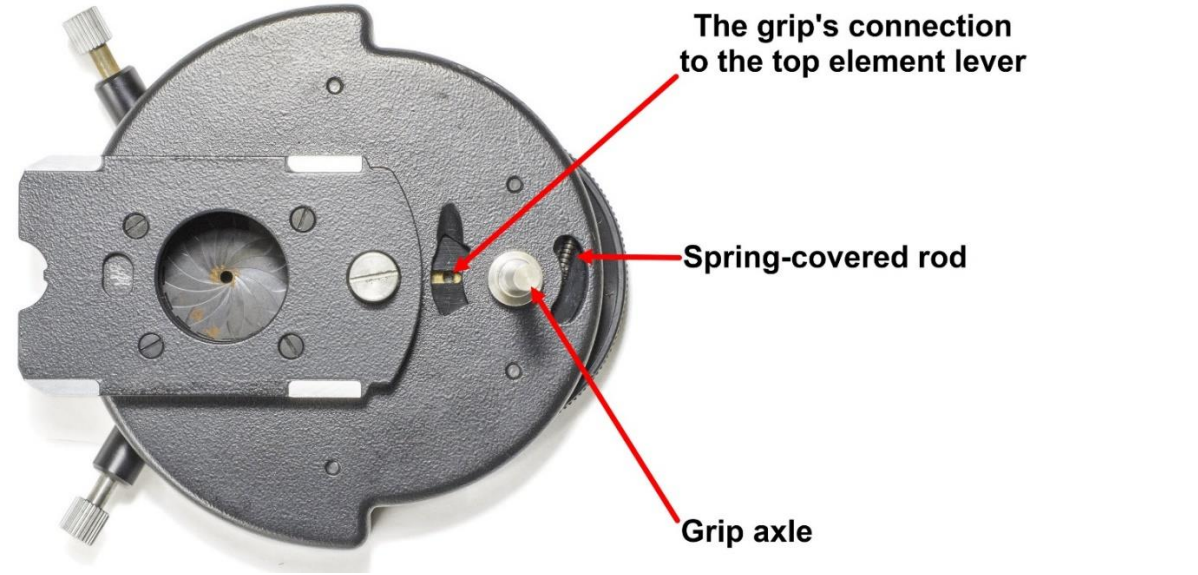

Figure 13: The underside of the UK condenser after the grip has been removed.

5. Remove the condenser cover.

From the top of the condenser remove the four M2.5x5 screws that attach the condenser cover (Figure 14 and Figure 16.) Remove the condenser cover to reveal the turret base (Figure 15) below.

Figure 14: The UK condenser viewed from the top. The red circles indicate the screws that hold the condenser cover attached to the condenser casing.

(The image is somewhat misleading because the top element assembly should have been removed at this stage.)

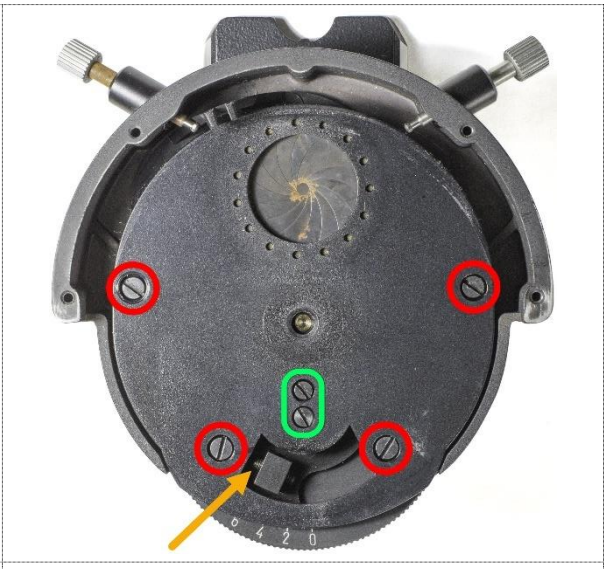

Figure 15: The turret base after the condenser cover has been removed. The yellow arrow points to the adjustment screw that protects the aperture diaphragm from being closed beyond safe limits. The red circles indicate the screws that attach the turret base to the condenser base. The green oval indicates the screws that attach the aperture diaphragm dial bushing to the turret base.

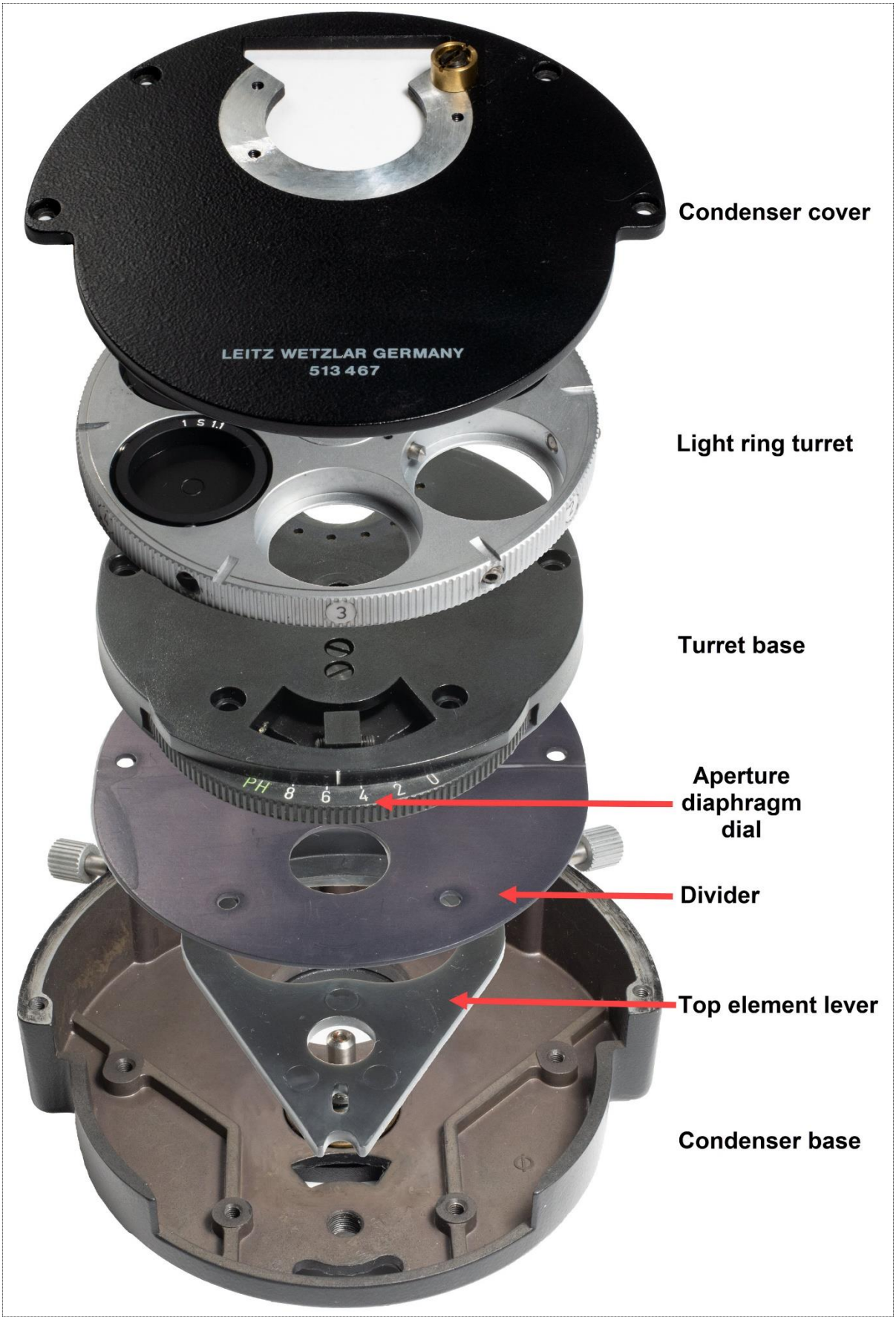

Figure 16: Exploded view of the main parts of the UK condenser (the top element slide and the grip have been removed.)

The light ring turret (Figure 5) that we removed earlier rests on the turret base, but the turret base also provides the stationary anchoring points for the aperture diaphragm that can be seen on the top of Figure 15. The 15 small holes around the aperture diaphragm opening in Figure 15 are the stationary anchoring points for the diaphragm blades' pivot pins.

6. Consider the options if the aperture diaphragm is sluggish, stuck, or needs cleaning.

At this stage we need to decide whether the aperture diaphragm needs cleaning, and if so, how to proceed with the cleaning.

At manufacturing no oil was applied to the aperture diaphragm, but after many years of use it could have happened that accidentally some oil contamination (for example, immersion oil) accidentally had reached all the way down to the aperture diaphragm. If the aperture diaphragm indeed is unacceptably sluggish or stuck due to old, hardened grease, you now need to decide between two options how to deal the problem:

1. The "shortcut option" is technically simpler but may leave a small residue of the old grease on the aperture diaphragm blades.

2. The "thorough option" is more challenging as it requires that the aperture diaphragm is taken apart and every blade cleaned separately. The challenge is to reassemble the aperture diaphragm after cleaning. It can be done, but it is somewhat tedious. The procedure for the "thorough option" will be described later in subsection 8 Clean the aperture diaphragm by the "thorough option".

Procedure for the "shortcut option":

The idea with the shortcut option is to clean the aperture diaphragm while it still is safely enclosed between the turret base and the condenser base.

Unless it is completely stuck close the aperture diaphragm. Carefully apply white spirit to the aperture diaphragm blades with the help of cotton swabs. Make the blades as wet as possible, but without allowing the solvent to seep off from the blades. Let the solvent work for at least ½ hour and then gently try to repeatedly open and close the diaphragm with the aperture diaphragm dial. Carefully blot or wipe off excess solvent. Repeat the treatment at least two more times with fresh white spirit to further dissolve and remove as much as possible of the old, hardened grease. Close the aperture diaphragm fully and lightly wipe off as much as possible of the solvent from the diaphragm blades. Finish by repeating the treatment one last time, but this time with iso-propanol – this will shorten the drying time. Now you need to decide whether you wish to apply oil to the aperture diaphragm or not. By applying oil, you will be forgiven if there are any minor residues left of the old grease, but years later the cost may be that the oil will again harden or become sluggish due to accumulated dust and dirt. If the aperture diaphragm is rusty, it may make sense to apply oil to bind any rust particles so they don't fall down on and contaminate any lens below.

If you decide to apply oil, then wet a cotton swab with a high quality, non-drying oil and dab it carefully and sparsely on the aperture diaphragm blades. Spread the oil evenly over the blades by opening and closing the aperture diaphragm repeatedly. Don't overdo the oiling!

If you decide to go oil-free, just let the aperture diaphragm air dry.

7. Proceed by disassembling the condenser casing.

Next, we will remove the turret base together with the divider from the condenser base (Figure 16.) This must be done carefully and by ensuring that the divider never is allowed to separate from the turret base as this would risk that the aperture diaphragm and its blades fall apart. (It's onerous to reassemble an iris diaphragm where the blades have become disorganized. It can be done, though, refer to this video and this article.) Open the aperture diaphragm fully with the aperture diaphragm dial. Remove the four black M3x12 screws (Figure 15) from the turret base but don't allow the turret base to separate from the condenser base. With your hand hold the turret base firmly attached to the condenser base, turn the condenser upside down, and place it with the turret base facing downward and resting on a suitable support (for example, on a lid from a food jar) on the table.

If you look into the opening in the dovetail sliding mount on the bottom of the condenser (Figure 17) you will be able to see several of the internal parts (Figure 18, compare with Figure 16.)

Gently remove the condenser base from the divider and the turret base. Put a wooden toothpick through the opening in the dovetail sliding mount and hold down on the divider (Figure 18) so it stays safely resting on the support (together with the turret base below) while you carefully lift off and remove the condenser base.

Figure 17: The underside of the UK condenser - looking at the aperture diaphragm below the dovetail sliding mount.

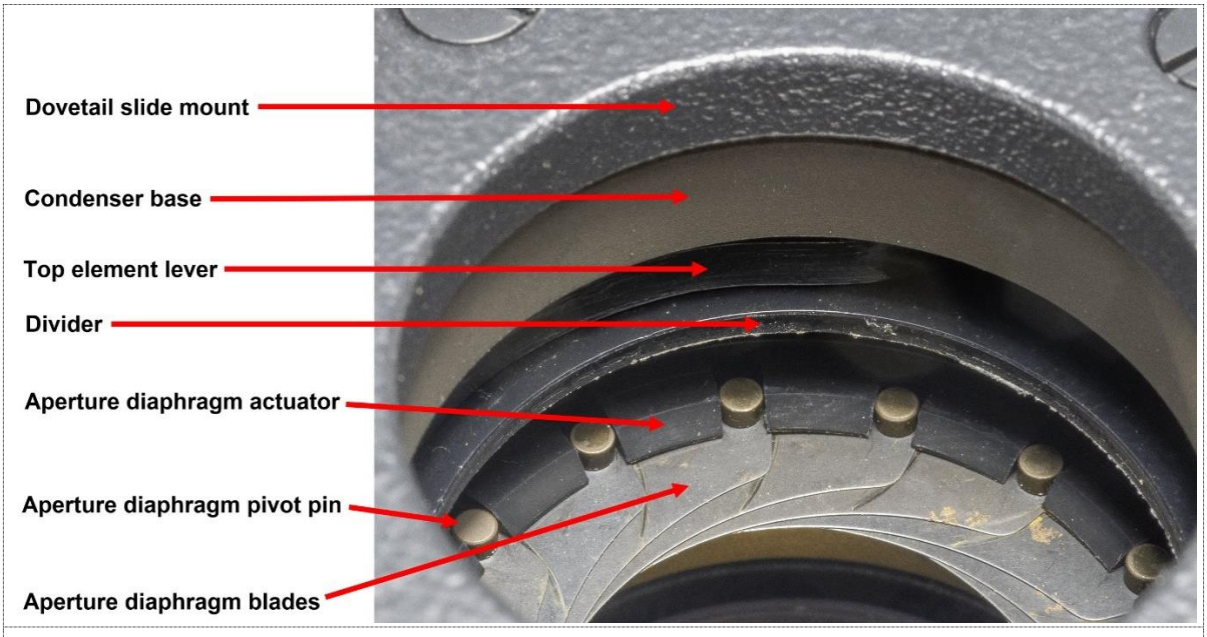

Figure 18: View of the aperture diaphragm through the dovetail sliding mount.

Typically the top element lever (Figure 16 and Figure 20) will remain attached with the condenser base (Figure 19), but it may also fall off from the condenser base (together with the spring-covered rod, Figure 13, that snaps the lever into any of its outer positions.)

Figure 19: The condenser base with the top element lever. (The spring-covered rod is not included in the image.)

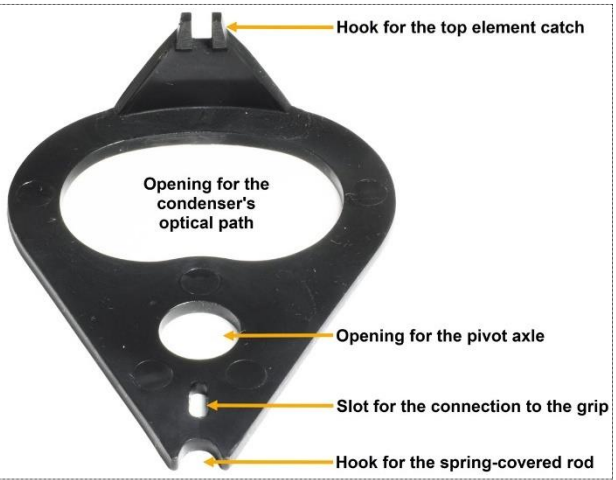

Figure 20: The top element lever.

With the condenser base out of the way the turret base covered with the divider will remain on the support on the table (Figure 21.) Remove the divider (Figure 22) – it just sits loose on top of the turret base (Figure 23.)

Figure 21: The divider on top of the turret base.

Figure 22: The divider.

Figure 23: The turret base after the divider has been removed.

Note that the aperture diaphragm actuator (Figure 18) at this stage sits only loosely attached over the aperture diaphragm blades. Removing the actuator will leave the diaphragm blades vulnerable to falling apart. Applying two or three narrow tape strips to lock the actuator to the turret base can help to keep the actuator temporarily in place and the aperture diaphragm safe from falling apart.

The aperture diaphragm dial pivots around a brass bushing (Figure 24.) The microscope user's dial settings are passed on to the aperture diaphragm's actuator by a simple rack and pinion mechanism. To ensure that the dial scale is properly aligned with the aperture diaphragm the teeth of the rack and the pinion must be joined in a particular way – refer to the proper teeth positions in Figure 24.

Fully open aperture diaphragm

Fully closed aperture diaphragm

Figure 24: The aperture diaphragm viewed from the underside of the turret base. Close-up views below.

To remove the aperture diaphragm dial for cleaning and regreasing the brass bushing must be removed. It is attached from the upper side of the turret base by two black M2.5x5 screws (within the green oval in Figure 5.) Again a reminder: Be careful to keep the aperture diaphragm actuator safely attached over the aperture diaphragm blades. After cleaning and regreasing the bushing make sure to reattach the dial with the teeth combined exactly like shown in Figure 24. This is easiest to accomplish with the aperture diaphragm fully open.

Now back to the condenser base and the top element lever. The top element lever pivots around a brass bushing in the bottom of the condenser base (Figure 25.) It seems that the bushing was left without grease at manufacturing, but in case it is dirty it can easily be picked apart and cleaned (and perhaps lightly greased.) In the middle of the bushing a short axle protrudes. The axle is the tip of the locking screw for the light ring turret (Figure 4) and also functions as the pivot point for turning of the turret. The axle was left ungreased at manufacturing, so we should refrain from applying any grease on it. The thread of the locking screw was however greased. If the grease appears dirty or degraded, remove the E-clip from the axle,

Figure 25: The bushing and the axle in the condenser base.

unscrew the locking screw, clean all affected surfaces with solvent and cotton swabs, regrease, and reassemble the locking screw/axle parts again.

8. Clean the aperture diaphragm by the “thorough option”.

Disregard this subsection if the aperture diaphragm doesn’t need any cleaning or if you already have successfully cleaned it by the “shortcut option” described above in subsection 6.

This procedure entails taking apart the aperture diaphragm and all its 15 diaphragm blades, cleaning all parts, and reassembling everything again.

Figure 26: The aperture diaphragm half open. The actuator sits only loosely attached on top of the diaphragm blades.

Figure 27: The aperture diaphragm fully closed after the actuator has been removed.

Remove the aperture diaphragm actuator (Figure 26) from the turret base. Below you will see the aperture diaphragm blades that now sit loose in the base plate (Figure 27.) The blades are cut out from thin sheets of steel and are fragile, so be careful not to bend them – even slightly disfigured blades will make the aperture diaphragm reassembly much more difficult. The stationary end of each diaphragm blade rests with a pivot pin in a round hole in the turret base plate. The other (moving) end of the diaphragm blade has another pivot pin sticking out in the opposite direction; this pin sits in a slot in the actuator. Note that the diaphragm blades are not symmetric – the ends that are attached to the base plate have a more rounded appearance than the pointed ends that are attached to the actuator (Figure 28.)

Put the actuator and the 15 diaphragm blades in a jar with white spirit. If the blades stick together, don’t try to separate them, just put them into the solvent jar as they are. Leave the parts to soak over the night, or for several days, if necessary, to dissolve any old grease and have the blades effortlessly freed. Repeat the soaking at least two more times with fresh white spirit, and then to shorten the drying time finish with a final rinse in iso-propanol. Let the parts dry.

Figure 28: The aperture diaphragm blades after the actuator has been removed. The stationary sides of the blades are still sitting with their pivot pins in the holes in the turret base.

If the parts still stick together try to change to a stronger solvent, for example, toluene, but remember first to test that the plastic actuator doesn't dissolve or get damaged by the new solvent.

Review section About Iris Diaphragms including the provided references and then go ahead and reassemble the aperture diaphragm in the turret base. A few tips: I have found steel needles useful for gently separating two blades before pushing in the next blade between them. One or two strategically placed small tape strips (approx. 2 x 10 mm, preferably of the semi-transparent type that doesn't leave any glue residue) can help to prevent the blades from popping up and away from their holes in the turret base. When all diaphragm blades sit evenly spaced and properly anchored in the turret base carefully push the loose blade ends outward so they touch against the wall of the turret base (equivalent to a fully opened aperture diaphragm.) Attach the actuator over the blades making sure 1) that every upward facing pivot pin attaches into its own slot in the actuator, and 2) that the actuator is properly turned so the rack-and-pinion connection with the aperture diaphragm dial will work as expected (refer to the close-up views in Figure 24.) Once you have got the actuator properly attached, you have qualified for the Aperture Diaphragm Assembly Hall-of-Fame.

Now you need to decide whether you wish to lubricate the aperture diaphragm or leave it dry as it was at manufacturing.

If you decide to apply oil, then wet a cotton swab with a high quality, non-drying oil and dab it carefully and sparsely on the aperture diaphragm blades. Spread the oil evenly over the blades by opening and closing the aperture diaphragm repeatedly. Don't overdo the oiling!

9. Re-attach the grip to the underside of the condenser.

This is basically a repeat of subsection 4, but in reverse order. The grip axle and washers were not greased at manufacturing, so we will also leave them unlubricated.

Push first the 11.4 mm regular washer and then the wave washer all the way down over the grip axle (Figure 29.) Attach the plastic grip (Figure 31) over the axle. Lock the grip by attaching first the 7.9 mm regular washer and then the E-clip to the tip of the axle (Figure 30.)

Figure 29: The grip axle on the underside of the condenser base. The arrows show where the E-clip and washers will be attached.

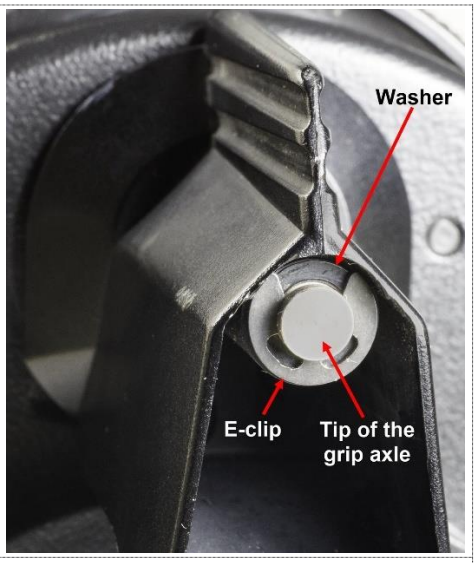

Figure 30: The tip of the grip axle sticking out through the grip.

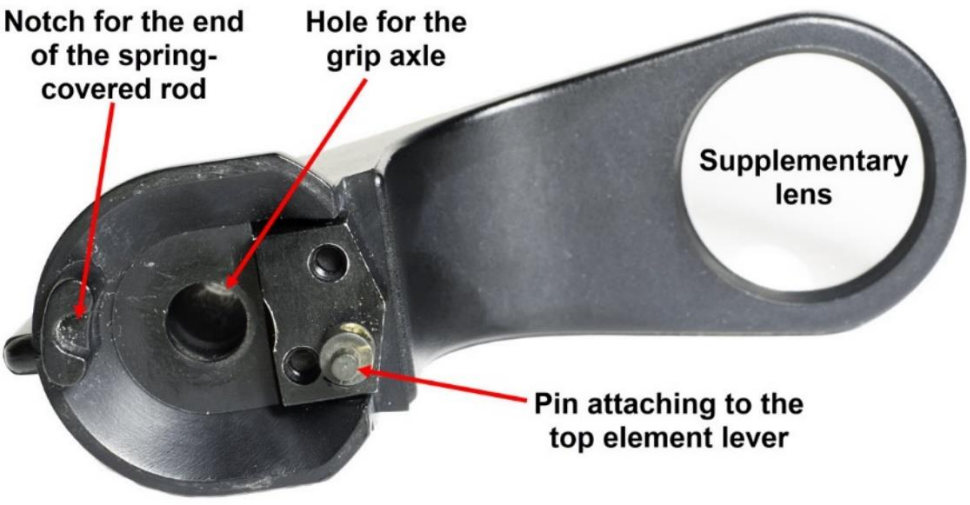

Figure 31: The grip viewed from the side that is facing the condenser base.

10. Re-assemble the condenser casing.

Attach the top element lever (Figure 20) over the brass bushing (Figure 25) in the condenser base (Figure 19.) The slot in the lever (Figure 20) must go over the pin on the underside of the grip (Figure 31 and Figure 32.) Insert the spring-covered rod between the hook at the narrow end of the top element and the notch in the grip (Figure 32.) The spring will help to keep the top element lever in its place when we now are going to attach the turret base with the aperture diaphragm.

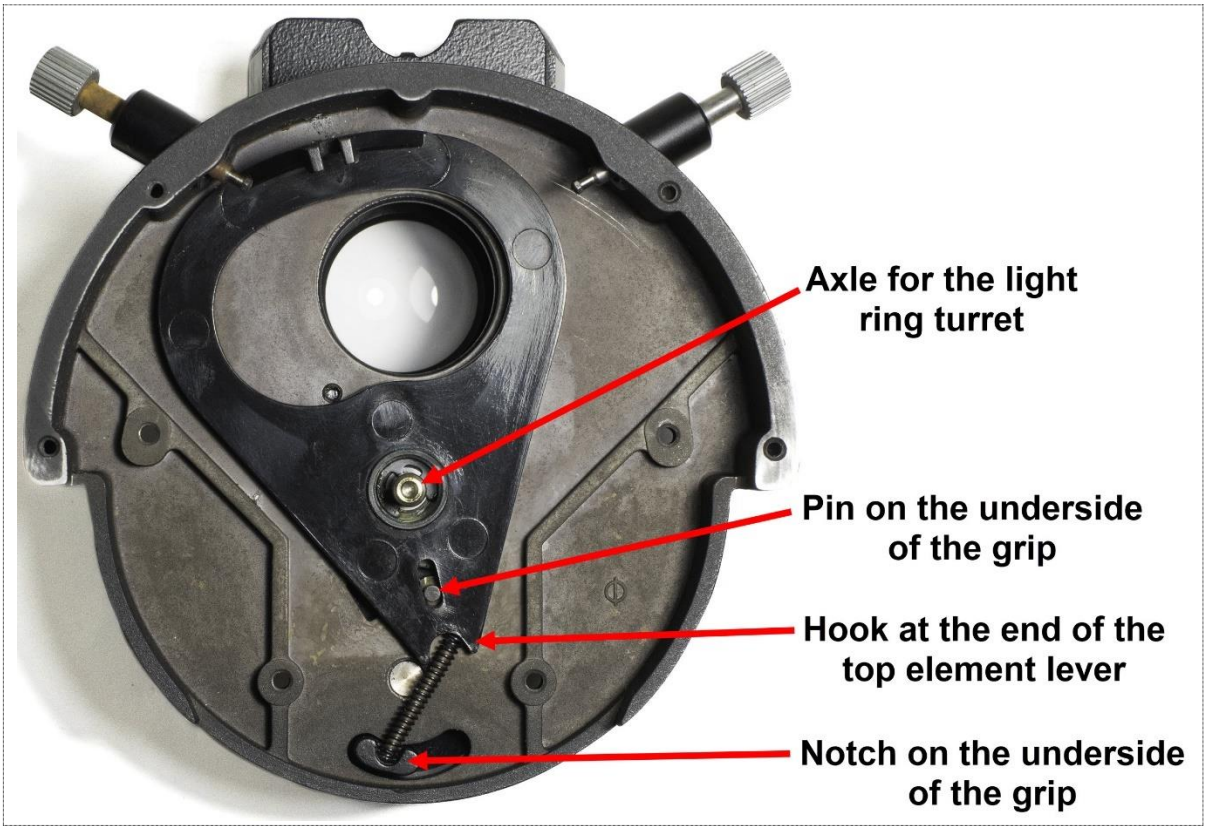

Figure 32: The condenser base with the spring-covered rod attached between the hook at the end of the top element lever and the notch in the grip.

Place the turret base (Figure 23) on the table and on the same support as was used in subsection 7. Put the divider (Figure 22) on top of the turret base (Figure 21.)

Unscrew the locking screw (Figure 4) on the underside of the condenser base as far as it goes. This is done to withdraw (shorten) the axle that sticks out on the inside of the condenser base. Attach the condenser base to the turret base. The short axle in the middle of the of the condenser base (Figure 32) should be pushed into the hole in the center of the turret base+divider. Be careful to avoid that any of the loose parts get displaced or fall off (i.e., the top element lever and the spring-covered rod from the condenser base, and the divider and aperture diaphragm from the turret base.) Hold together the combined condenser base and turret base with your hand and turn it all upside down so the upper side of the turret base faces you like in Figure 15. Attach and tighten the four M3x12 screws that are indicated with red circles in Figure 15. With this the aperture diaphragm is secured and can't fall apart anymore.

Check that turning the grip moves the hook of the top element lever that sticks up from the cover.

Aperture diaphragm blades are sensitive items and should be protected from damage. One hazard is to force the diaphragm to close beyond what is safe. Fortunately, the UK condenser has a simple mechanism to protect the aperture diaphragm from this mishap.

The safety mechanism is an adjustable limiter of the range of the aperture diaphragm dial (indicated with a yellow arrow in Figure 15.) The limiter consists of a plastic cube on the aperture diaphragm dial that moves in a restricting opening in the turret base (Figure 33.) When the plastic cube hits the wall of the opening, the dial can't move further.

Fine tune the mechanism with a 1.5 mm hex ("Allen") key in the small screw that goes through the plastic cube. The key can't be used perpendicularly to the screw because of the constrained space; therefore, the key tip must be of the ball-end type (Figure 34.) Use your best judgement to decide how far you wish to allow the aperture diaphragm to close.

Check that the aperture diaphragm works as expected.

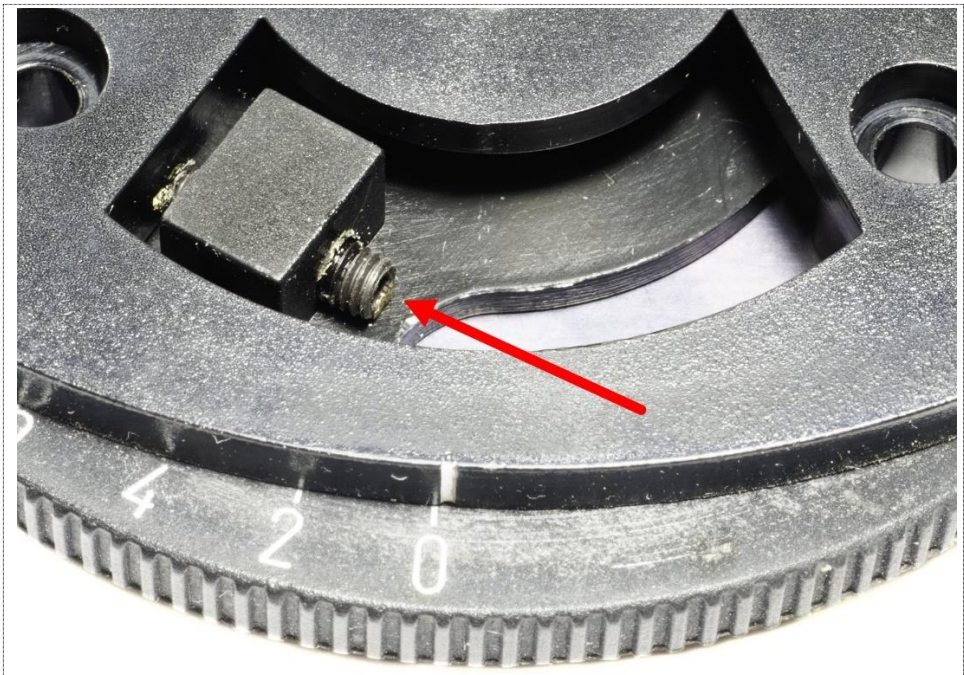

Figure 33: Close-up of the aperture diaphragm range limiting mechanism.

The arrow indicates the head of the adjustment screw.

Figure 34: Ball-end tip of a hex key.

Attach the condenser cover (Figure 16) to the condenser with four of the M2.5x5 screws (with red circles in Figure 14.)

Insert the light ring turret into its slot in the condenser (Figure 1 and Figure 2.) Check the numbers on the turret's periphery to ensure that it isn't inserted upside-down. Lock the turret by screwing down the locking screw on the underside of the condenser (Figure 4.) The screw head should reach down below the surface of the condenser casing; rock the turret back-and-forth to ensure that the locking screw doesn't get stuck before that. The screw should then be left only very lightly tightened.

Turn the turret into all of its six positions to check that the turret's detents work distinctly and without any play. Freedom from play is important to avoid that the light discs need to be re-centered all the time. The turret is typically somewhat hard to turn, which may obscure if there is any play. Therefore, you will need some finger strength for the checking. If required, adjust with the detent adjustment screw (Figure 10) on the condenser cover. When satisfied, leave the turret with the regular brightfield opening (i.e., with no light ring) in the optical path.

11. Reassemble the top element base, slide, and holder.

Check that the collector lens in the top element base (Figure 11) is clean; if required, clean the lens as described in subsection 3.

Attach the top element base to the condenser cover with three of the M2.5x5 screws (Figure 10.)

Lightly grease the slides of the top element base – both the horizontal slides and the vertical slides. Avoid getting grease on the collector lens.

Attach the black plastic catch (Figure 7) to the top element holder (Figure 9) using the two M2x4 screws.

Turn the grip (Figure 1) until the hook at the end of the top element lever (Figure 20) is positioned in the middle of the opening for the catch in the top element base (red arrow in Figure 8.) Attach the top element holder to the slide making sure that the catch locks with the hook of the top element level.

Lightly grease the upper slide surfaces of the top element holder – both the horizontal slides and the vertical slides. Attach the two slide rails over the top element holder with the M2.5x5 screws (Figure 7), but don't yet tighten the screws. Release by ¼ turn the two M2x4 screws on the catch (don't remove them.) Very lightly press the slide rails against the top element holder (too much pressure will prevent the slide from moving freely) and tighten the rails' four M2.5x5 screws. Now lightly retighten the two M2x4 screws on the catch. Test that the slide moves freely when the grip is turned. Readjust the slide rails, if required.

Attach the top element to the top element holder.

References

Instruction for the Leitz Dialux 20 microscope including some information about the UK condenser:
Leitz Dialux 20 - Instructions

A user's comments on the Leitz Diaplan microscope including some information about condenser component compatibility between different generations of Universal Condensers:
A tour round a Leitz Diaplan microscope

An article describing the function and repair of aperture/field diaphragms:
https://www.microscopy-uk.org.uk/mag/artfeb07/pj-iris.html

YouTube movie that illustrates the dexterity and patience needed to reassemble an aperture diaphragm:
https://www.youtube.com/watch?v=oH6GfyxpK9o