Antoni Sojecki *

Stereoscopic Eyepiece Cap for Microscopes

The commonly known stereoscopic microscopes enable us to see amplitude objects in incident and reflected light but with relatively low magnification (ca 200) and not great objective apertures. Their applicability is, thus, restricted to observation of relatively big microobjects and coarse structures.

The idea suggested by M. Pluta to build a phase-contrast stereoscopic microscope, symbolized as MB30S and produced for several years in the Polish Optical Manufactures, has broadened the possibilities of stereoscopic observation of microobjects.

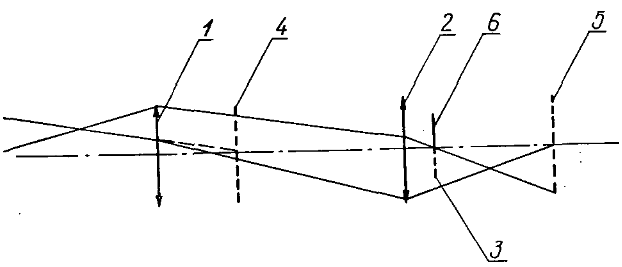

Fig. 1. Optical system diagram of the stereoscopic eyepiece cap

This microscope gives the stereoscopic effect independently of magnification with passing-through light in bright field and phase contrast. It also allows us to change over from stereoscopic observation to pseudo-stereoscopic.

Still there were no devices which would allow for a stereoscopic observation of objects in dark field in incident light at great magnifications.

At attempt to fill up this gap was the construction of the stereoscopic eyepiece cap, SEC, as an auxiliary equipment that enables us to change the flat image of ordinary microscopes into a three-dimentional image.

The optical system diagram of the SEC is shown in Fig. 1. Collector 1 and objective 2 form a reversing system of multiplicity 1^x which displaces image 4 developed by the objective system of the microscope onto object plane 5 of the eyepiece system.

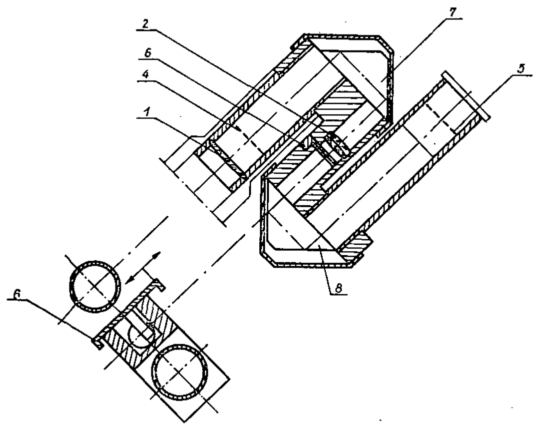

Fig. 2. Cross-section of the stereoscopic eyepiece cap

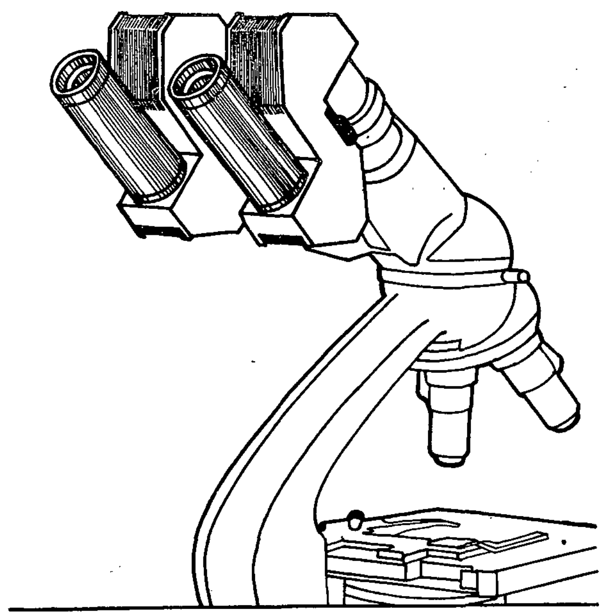

Fig. 3. The stereoscopic eyepiece caps inserted into the barrels of a double-eyepiece microscope caps

Simultaneously collector 1 forms image 3 of the aperture diaphragm in the vicinity of objective 2. In the plane of this image is placed moveable diaphragm that can obstruct the left or right half of the pupil image.

Fig. 2 shows real construction of the cap in which elements 1 and 6 play the role of collector and objective, whereas prisms 7 and 8 change the direction of

*) Polskie Zakłady Optyczne, Warszawa, ul. Grochowska 316, 318, 320, Poland.

light beam in order to diminish the overall dimensions of the cap without changing the position of eyepiece thrust face.

A pair of the caps SEC may cooperate with any microscope of biological or metalographical type equipped with double eyepiece. The cap SEC is to be inserted into every lens barrel together with any pair of eyepieces from the microscope set (Fig. 3). Depending on the diaphragm position the stereoscopic or pseudostereoscopic effect can be obtained, independently of the microscope magnification and the applied technique of observation (bright field, dark field, epi, dia, phase contrast etc.) without change in magnification, field of vision or hight of the microscope pupil. Moreover, the SEC turns the image from the upside-down position in ordinary microscopes to the right one.

Jolanta Wilk, Antoni Sojecki *

A New Optical System Realizes Wide Range of Continuously Variable Magnifications

A new triplet system that realizes a continuously variable magnifications with a 11.5 : 1 zoom ratio has been developed. Simultanously the total conjugate remains constant within 0.14 mm.

A symmetrical triplet system that realizes a continuosly variable magnification by shifting the exterior elements fixed together has been developed recently by CLO in Warsaw. This system has a zoom-ratio 4 : 1. T. Wagnerowski [1] proved that the system mentioned above keeps the total conjugate within a small depth, while shifting the exterior elements. It is possible for two cases of magnification +1 (Fig. 1) and −1 (Fig. 2).

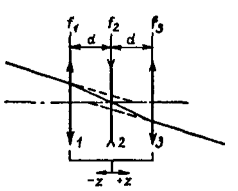

Fig. 1. Rays passing through a triplet form an image with magnification +1

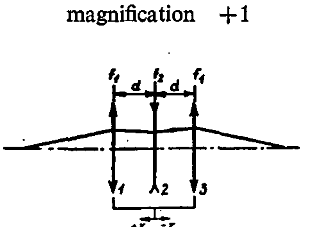

Fig. 2. Rays passing through a triplet form an image with magnification −1

This idea was utilized in PZO to develop a new optical system with a wide range of continuously variable magnification. The invention was to use the same system twice for changing the power as shown in Fig. 3. Rays comming from the left through

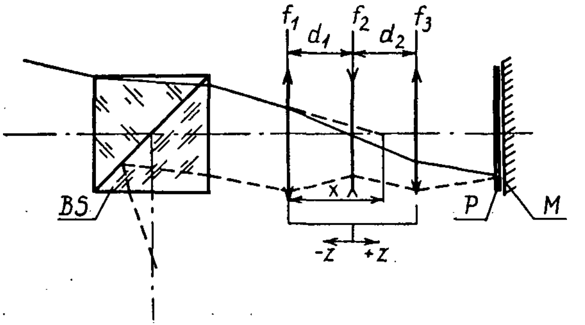

Fig. 3. Rays passing a triplet for- and backwards form an image with magnification −1

a polarizing dielectric multilayer beamsplitter BS pass the triplet as shown in Fig. 1. After reflection from the mirror M rays pass the system backwards

*) Polskie Zakłady Optyczne, Wacszawa, ul. Grochowska 319, 318, 320, Poland.