

Dmitry N. Frolov/ Olga A. Vinogradova/ Alexey D. Frolov

Modern microscope with telecentric course of beams

5. ENGINEERING DESIGN

Recently all greater application is found by systems with telecentric course of the main beams. It is considered, that it has the important practical value in optical devices which are used for the measuring purposes. Also telecentric course of beams is especially necessary in devices for a reproduction.

Telecentric course of the main beams allows avoiding distortions of peripheral sites in the image of object at not so exact focusing. At achievement of a high degree of scale in systems with not telecentric course of beams appears appreciable non sharpness or a parallax.

Wide use of a principle telecentric course is known in two kinds of optical systems. The first is a microscope with final optical length of a tube. On fig. 1 the circuit of a course of beams in such microscope is submitted.

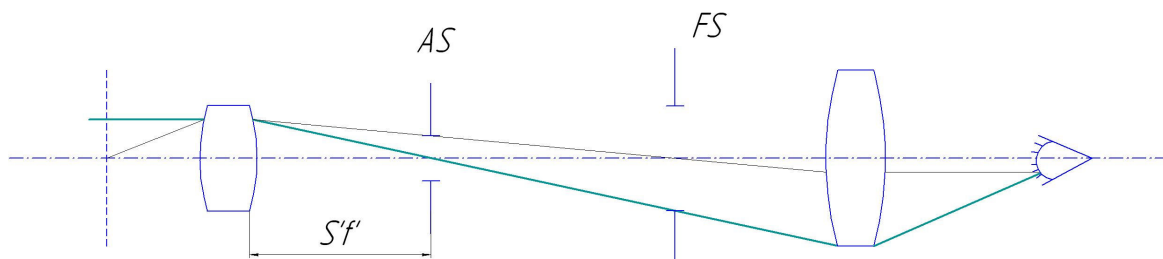


Fig. 1

The microscope is focused on object (subject plane). The real Aperture (first) diaphragm (AS) is located in back a focal plane of this objective, the Field (second) diaphragm (FS) is located before an eyepiece. Thus the main beams in space of subjects are parallel to an optical axis. Bunches of beams from any points of subject plane symmetries concerning an optical axis. The condition telecentric course satisfies a course of beams in space of subjects.

On fig. 2 the circuit of a course of beams in telescopic system is submitted.

The system works «from infinity». The aperture diaphragm (AS) settles down before an objective in its forward focal plane. The second diaphragm settles down before an eyepiece.

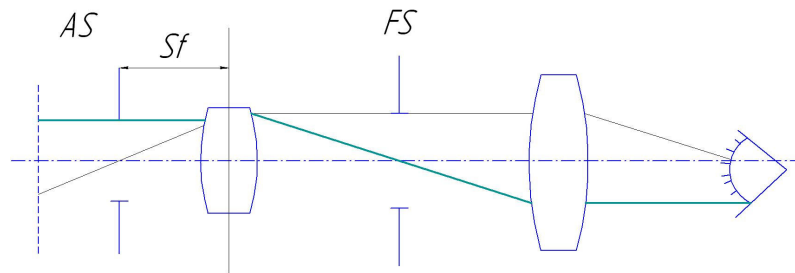


Fig. 2

So, observance of a principle telecentric course of the main beams is a necessary condition at designing the optical systems intended for the measuring purposes. It is known. But modern optical systems should satisfy to the full to the highest criteria of quality. It is actual also at use of optical systems together with digital receivers of images. Modern microscopes which are optical systems of reception increased images of objects should satisfy to conditions of telecentric course. On fig.3 the circuit of a course of beams with «Infinity» optical system is submitted. On the design it is a combination traditional telecentric course optical system of a microscope and a telescope. It will consist of a microobjective, an objective «tube lenses» and an eyepiece. The system is focused on object which settles down in forward focus of a microobjective. The aperture diaphragm (AS), settles down in back focus of a microobjective which is combined with forward focus of an objective «tube lenses». Thus back focus of an objective «tube lenses» and forward focus of an eyepiece also are combined. The second diaphragm which is field (FS) a diaphragm of a microscope here settles down. For full observance of a principle telecentric course of the main beams of eyes of the observer settles down in back focus of an eyepiece.

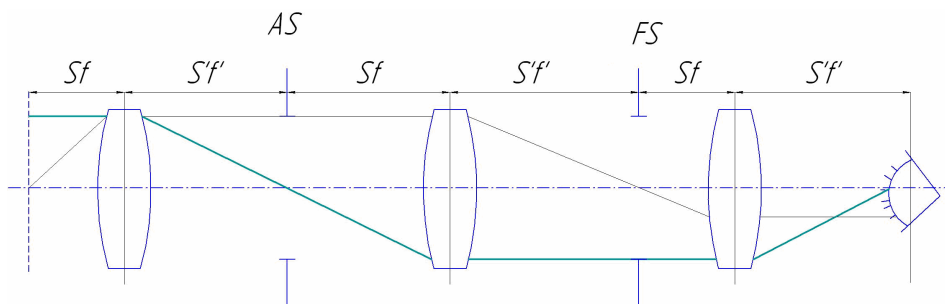


Fig.3

References:

[1] Patent of Russia № 2117970.

Authors:

Ph.D. Dmitry N. Frolov

Ph.D. Olga A. Vinogradova

Alexey D. Frolov

Scientific-Production Enterprise FOCUS INC, Research Department

51, Zapovednaya st., St.-Petersburg, 194356, Russia

Phone/ Fax: +7 (812) 933 25 78

E-mail: fronda@list.ru, vinog@list.ru