tioned for the differences in the optical density ranging from 0.05 to 0.08. This phenomenon was observed for both the negative and positive branches of $W_{pol} = f(I_{ob}/I_{ref})$.

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White Light Reconstruction of Holograms Recorded on 10E70 Photographic Plates

As is well-known, during hologram recording, there are permitted deformations of holographic systems, which will not cause shifting of the interference fringe for more than 1/4 of the distance between adjacent fringes. For the systems with "opposed beams" (Denisyuk method [1]) the mechanical stability is order of a fraction of the used light wavelength. It is very difficult to obtain such stability during the time of an exposure. Hence it is desirable to shorten the exposure time, which can be obtained when high sensitivity materials are used. The present paper describes a study of 10E70 photographic plates employment for the opposed beam holography.

These plates were provided with an anti-halo coating, so it was necessary to prepare them initially by immersing the plates for about fifteen seconds into the Agfa-Gevaert developer G3p (the plates were dried after removing from the developer), or by gentle washing the anti-halo coating in such a manner that the emulsion remained dry. Later studies showed that both methods can be employed.

For preliminary studies, the holographic system shown in Fig. 1 was used. Light beam *WL* emitted by the He-Ne laser, expanded by means of a collimator

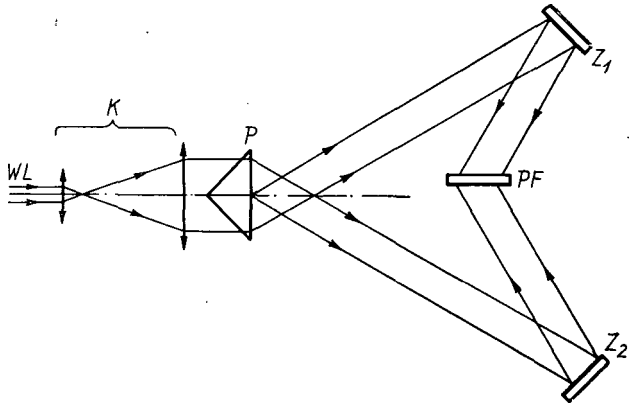

Fig. 1. "Opposed beams" holographic system. *WL* — laser beam, *K* — collimating lens, *P* — prism, Z_1 and Z_2 — auxiliary mirrors, and *PF* — photographic plate

K, was divided by means of a prism *P* into two beams. Both parallel light beams were directed by the two auxiliary mirrors Z_1 and Z_2 on to the photographic plate *PF*, the latter being processed according to producers' specification. For comparison, 8E70 photographic plates were also exposed in the same system.

Images of point light sources recorded in this way were then reconstructed by means of standard light sources, and observed in transmitted and reflected light. In transmitted light, the diffracted wave

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contained all colours, and intensity of diffracted light was much weaker than in the case of similiar holograms recorded in the system proposed by Leith and Upatnieks. When reconstructed image was observed in reflected light, it contained all colours as well, but now the green light was more intense than all the other colours. When one of the waves was attenuated, which corresponds to changes of intensity ratio of incident beams, then total intensity of diffracted light was lowered, and the domination of green light was more distinct. No essential difference in quality of holograms recorded on the 10E70 and 8E70 photographic plates could be seen. Existing green light supremacy in place of the red light anticipated (He-Ne laser emits radiation of wavelength $\lambda = 633$ μm) is undoubtedly caused by photographic emulsion shrinkage (after developing and fixing according to producers' specification). Photographic emulsion thickness changes, estimated on the basis of colour changes, comprise about 20%.

Diffracted light band halfwidth comprises over 20 nm, which gives evidence of not very high quality of obtained holograms. This is connected with insufficient thickness of photographic emulsion, which for both types of plates comprisses about 7 μm, when the thickness of 15 μm or more is recommended for such holograms.

For further studies, the mirror Z_2 was replaced by a wooden figure, and the other (reference) beam was attenuated, so that the beams combining on the hologram were of similar intensity (reference beam was slightly more intense). This system allowed for recording the figure hologram on the 10E70 plate (the exposure time was about 2 min). However, it was not possible to record the hologram of the wooden figure on the 8E70 plate (the exposure time should be about 8—10 minutes in this case). It is therefore concluded that in the developed holographic system long time stability was not obtained.

During image reconstruction from the recorded hologram unsatisfactory colour selectivity could be found (it is caused by insufficient emulsion thickness), which was revealed as a yellowish halo around the green image. As is known, the quality of the reconstructed image depends on the angular dimensions of the reconstructing light source. It was observed that when for reconstruction purposes sunlight, or light emitted by an electric bulb, placed not very far, were used, obtained images were strongly diffused, which frequently made their recognition impossible. Good results were obtained when a mercury arc, or even a microscope lamp with the diaphragm partly closed were used as a reconstructing light sources. The results were good when the distance from the lamp to the hologram comprised at least several meters.

It is suggested that, owing to their high sensitivity, 10E70 photographic plates can be used for hologram recording in opposed beam system, in cases when high resolution of the reconstructed image is not critical, hence above all, for demonstration purposes.

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