STAPLE EXAMINATION APPARATUS (COTTON GRADER) BASED ON APPLICATION OF POLARIZED LIGHT (TEXORISCOP, TYPE 2—09—2)

By

V. DISCHKA

Departmental Chief of the Textile Research Institute

It is generally known that light passing through a birefringent fibre placed diagonally (or octagonally) between a crossed polarizator and analizator, will cause interference colour effect. This colour effect is caused by difference in phase of the ray components oscillating upon the two rectangularly placed planes. The phase difference influences also the energy of the radiation emitted by the analizator. The various radiation energies are perceptible with the aid of photocells. This principle is utilized by the Textile Research Institute Cotton Grader based on polarized light, the working principles of which are given on the enclosed sketch. (P) glass plate (polarizator) is placed at the angle of full reflection, in the path of light rays emitting from a pin-point light source. (A) glass plate (analizator) is placed in a similar manner to the direction of the light ray. No light reaches the photocell with the analizator and the polarizator in a crossed position. If, however, an (L) specimen containing birefringent fibre material is placed between the polarizator and the analizator, the light rays emitting from the analizator reach the (C) photocell. The photocell then emits electric current proportionately to the intensity of the light received, the intensity of the current can be read on the (M) meter. A mirror (T_1) can be placed into the position of the (P) polarizator, by means of a knob, in which case ordinary light (not polarized) is passed through the specimen. In this latter position, the surface covered by the fibres contained in the specimen, is determined by reading the sensing instrument. The value thus-read off, forms the base of the photocell current intensification required.

The apparatus described in the foregoing is extensively used now for determining the maturity of various cotton qualities. For this purpose a specimen containing 800—900 cotton fibres is prepared. The specimen is made up of parallel fibres placed across the length of the object plate, as far as possible in uniform density. Ordinary light is first passed through the specimen and according to the light intensity thus obtained, correction is made to the photocell current amplification. After this correction is made, polarized light is applied and the light intensity value then readable, independent of fibre number (quantity) variations, gives directly the maturity index of the cotton, which for cottons of medium fineness closely agrees with the number of the mature fibres percentage ratio, as determined by other methods. A close connection exists between the maturity index values of specimens of various maturity taken from one and the same cotton quality, and their fineness and breakage force, and thus with the aid of tables or diagrams based on these connections, the fineness and breakage force of the cotton under examination can be estimated on the basis of the maturity index. This method of maturity determination gives a quick and safe means of controlling the effects of growing conditions and of assuring a better uniformity with regard to commercial and spinning cotton lots.

The instrument can be used in other fields also. Namely, the polarized light intensity is the joint measure of the molecular

orientation of the fibre structure and of the fibre fineness. If either of these two coefficients is known, the other can be determined.

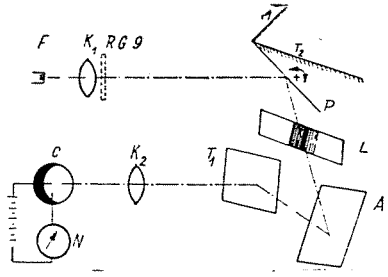

Abb. 1

Thus, for example, in the case of a fibre of known thickness, (denier or tex fineness), the light intensity varies according to the degree of specific birefringency, while the latter varies in accordance with the molecular orientation value. In this case, therefore, the apparatus can be used for *control of the fibre draft technology of artificial fibre*. If again, the specific birefringency of a natural fibre material is constant, the value shown by the apparatus varies proportionately to the fibre thickness only, i. e. cross-section.

A great advantage of the apparatus is that the specimens to be tested need not be conditioned, neither is it necessary to carry out the testing in conditioned premises since the birefringency values are independent from higroscopic moisture contents. A series of cotton maturity test results have demonstrated that specimens taken from a delivery of 20 bales gave average maturity indexes in the dispersion band of 64 to 81, the result of 20 tests per bale gave a maturity index of 71,8 average, representing a value dispersion of ± 7. The variation coefficient was 9,75%. Dividing this latter into its components, it was found that the variation coefficient for tests made on specimens taken from individual bales is 7,3%, while the inter bale results give a variation coefficient of 6,5%. If it is desired to produce uniform yarn meeting high standards from this delivery, it would be necessary to exclude the two bales of which the maturity index was below 68 (maturity indexes of 64,0 and 63,3), these being suitable only for a lot of lesser significance.

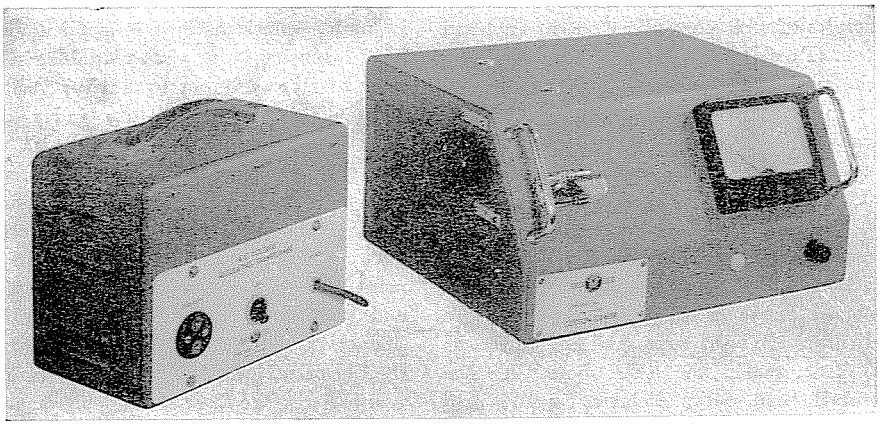

Abb. 2

Designed by: mechanical engineer T. Tihanyi and engineer L. Gyimóthy by Optical Research Institute in Budapest.

Manufactured by: Factory for Electronic Apparatuses.

Exported by: METRIMPEX, Budapest 62, P. O. Box 202.