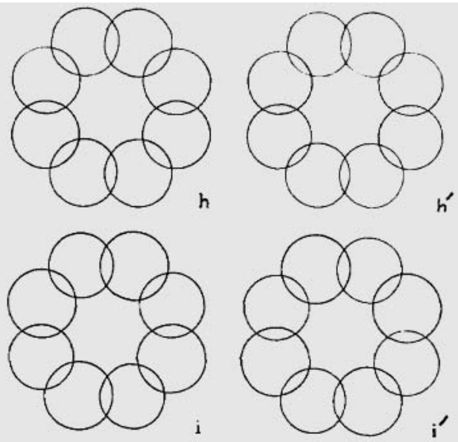

FIG. 3. h: circles 5.3% smaller than in h′, centered on equal size circles; (i, i′): same as (h, h′) but counter rotated 4.5°.

different sizes of the small circles appear to distort the implied (but not drawn) line of centers which is the same for both. In (i) and (i′) the same circles have been rearranged about the same lines of centers so that the two patterns are alike except that one is rotated 45° with respect to the other. The result is complex but the different sets of circles do indeed appear to show relief. In this case a change of orientation of two identical drawings is enough to produce a three-dimensional effect.

In conclusion it would appear that if two drawings differ only in size the identity of vertical and horizontal accommodation destroys any sense of differential distance wheieas if different parts of two pictures are different in size the vertical disagreement will be overlooked and the horizontal differences will present predictable differences in the perceived distances from the observer.

INDEX HEADING: Vision.

[1] Instrument by H. A. Cata, Geneva. Sci. Am. 212, No. 5, 134 (1965). Curves rules by C. L. Stong.

Spacers for Fabry–Perot Interferometers

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A RECENT paper[1] describes a method for making spacers for Fabry–Perot interferometers. The success of the method is reported to depend upon the use of a lathe with a highly accurate spindle. Also 'large diameter' solid rods of free machining Invar are required. We have, on the other hand, been able to make very satisfactory spacers using Invar rods of only 3-mm diameter and imbedding three of them in three equivalent positions in a perspex ring as illustrated in Fig. 1. Presently we are making spacers to be used with Fabry–Perot plates of 40-mm diameter. The same procedure can be used for plates of larger size.

The following is a brief description of how we have been making the spacers. Three pieces approximately equal to the desired length of the spacer are cut from an invar rod[2] of 3-mm diameter. These pieces are tightly fitted symmetrically in a perspex ring (o.d. 49 mm and i.d. 26 mm) and serve as bosses. The thickness of the perspex ring taken is about 2 mm less than the desired length of the spacer.

The spacer thus made is ground on a mild-steel flat using fine-grade emeries. While grinding, pressure of three fingers is put on the three bosses. Both sides are ground till the thicknesses of the bosses are equal to one another to within about 1/100th of a mm. The spacer is then polished on a pitch lap with rouge. The progress of the lapping is followed in a manner similar to that described by Phelps.[1] In all it takes about a day's work to obtain a spacer with

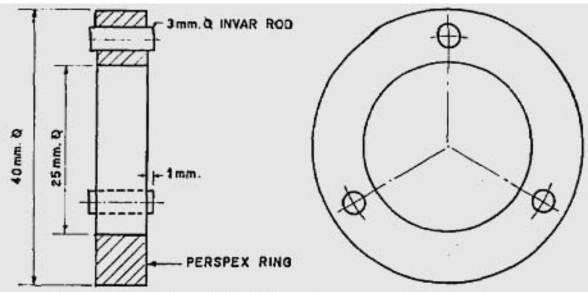

FIG. 1. Drawing of the Fabry–Perot interferometer spacer.

separations of opposite pairs of bosses differing by less than ½ wavelength of green light of mercury.

Employing this method, we have made six spacers of thicknesses ranging between 4 mm and 10 mm. The Fabry–Perot interferometer assembled with these spacers is found to remain in adjustment for several weeks in a vacuum chamber.

The author is grateful to Professor R. K. Asundi and Dr. N. A. Narasimham for their interest and for providing facilities for this precision work. He wishes also to acknowledge the help given by Shri S. A. Ahmad and Kum. K. Meenakshi in making the spacers.

[1] F. M. Phelps, III, J. Opt. Soc. Am. 55, 293 (1965).
[2] Invar was obtained from *M/s* New Metals & Chemicals Ltd., Chancery Lane, London W.C.2, England.

Quoting of Unpublished Reports

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CONTRARY to your current policy, I believe the quoting of unpublished reports to be an unavoidable necessity. This arises as a logical consequence of the following causal chain:

1. Abundant contributions and rising costs have made scientific journals ever more exacting about quality and brevity in the articles they accept.

2. The resulting gap between usability and publishability cannot be crossed by many types of material (spectral collections, tables, computer programs, etc.) Also, much of the material that does appear has had to be condensed beyond the point of maximum usefulness.

3. This information is useful, costly to obtain (or to duplicate needlessly) and abundant. Its loss to the scientific community must therefore be avoided.

4. Short of reversing step 1, which nobody really wants, this can be done only by preparing this material as reports for private circulation.

5. As pointed out by Weale,[1] quoting of unpublished material frustrates the literature searcher. Obviously, this frustration can be avoided by keeping the searcher in ignorance of the existence of the report. But being frustrated seems preferable.

6. Abuses, bypassing of referees, and perpetuation of mistakes[1] could be prevented by asking prospective authors to submit for review any unpublished report they quote along with the article itself.

7. Extensive letter-writing to authors would of course make the quoting of unpublished reports less necessary. But elimination of the need for this is the very thing for which scientific journals were originally invented. The loss of time involved if readers had to write to every author who might possibly have some unpublished work in their field is prohibitive.

Editor's Note: As stated in the Editor's Page (470) for April 1965, the author of a paper published in the Journal may, in that paper, cite the report on which it is based, of which he was an author. However, the editor cannot ask the referees to examine the original report. The referees serve without compensation, other than the satisfaction of serving their Society, the Journal, its readers, and the cause of science. Those referees who have published papers may also feel that they are repaying some of the debt they owe to the anonymous referees who read their manuscripts and offered constructive criticisms. The burden of refereeing should not be increased by superimposing the examination of reports that are already issued, in which any errors stand so long as a copy survives, over which the referee can have no influence whatever.

Extensive tabular material, and other essential information, such as working drawings, derivations, and computer programs can be submitted with the manuscript pruned for publication. If asked to do so by the author, the Editor deposits that extra material with the American Documentation Institute at the Library of Congress, and includes in the published paper the number assigned to it by the Institute, by use of which any applicant is able to obtain easily and inexpensively a copy of the deposited material. Such material can be forwarded by the Editor to the Institute only if the notice of availability is published in the Journal and if the material is supplementary to or logically related to a paper, Letter, or Note published in this Journal. The material to be deposited must be: (1) typewritten with black ribbon; (2) notes must be in black pencil or ink; (3) charts and illustrative material must be glossy prints; (4) all material must be easily handled for photoreproduction, preferably about 8×11 in.

[1] R. A. Weale, J. Opt. Soc. Am. 55, 1188 (1965).

Moiré Pattern in the Diffracted Field Near an Edge of a Dielectric Slab

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(Received 31 March 1965)

Using apparatus described previously,[1] we have measured the diffracted field produced near an edge of a Plexiglas slab by 3.188-cm microwaves at normal incidence. The slab was 45 cm square and 1.27 cm thick. Relative dielectric constant was 2.6. Measured data are shown in Fig. 1 for a monopole probe positioned on a set of lines parallel to the slab and near one edge. The direction of the electric vector was parallel to this edge. Locations of transmittance extrema are connected by curves; these curves are iso-intensity contours to within $\pm\frac{1}{4}$ dB.

The scattered-field magnitude can be estimated from the transmittance minima of Fig. 1. For an incident field of unit magnitude, assume that the incident field E^I and the scattered field E^S are out of phase at a minimum. For example, near the deepest minimum of Fig. 1, the transmittance is -4.8 dB so that the diffracted field E has magnitude 0.58. Therefore, $E^S=E-E^I$ has magnitude 0.42. This estimate is low because E^I and E differed in phase by about 30° near the deepest minimum. When this phase difference is included, $|E^S|$ is 0.56; the phase difference between E^Z and E^S is $5\pi/4$, to within a few percent.

The set of iso-intensity contours in Fig. 1 has a simple interpretation as a moiré pattern produced by superimposed sets of curves.[2] These curves represent wavefronts which result from resolving the diffracted field into certain component fields. Before describing the component fields, we define three regions in Fig. 2. In each region the component fields differ from those in the other regions; therefore, the curves representing the wavefronts differ from region to region. All three regions have the common property that $Y\leq 0$. The regions are separated by the two diagonal lines through the origin. The *directly illuminated region* lies to the left of both diagonal lines for all points in this region $X<0$. The *shadowed region* lies to the right of both lines; for all points in this region $X>0$. Finally, the *transition region* lies between the two diagonal lines; this region is symmetric about the negative part of the Y axis. The boundaries of the transition region are arbitrary but are suggested by experiment in the following way. Consider a point (X,Y). For (X,Y) in the shadowed region, the phase delay for large X is approximately equal to and oscillates about the value for a plane wave incident on an infinitely broad dielectric slab. For decreasing X, with Y fixed, the transition-region boundary is the positive value of X at which the phase delay departs from the infinite-slab value in approaching zero. This boundary is approximated very accurately by one of the diagonal lines in Fig. 2. For $X_M<0$, the boundary is approximated by the second diagonal line; the phase delay differs from zero on this line by only a few degrees. The various component fields are described next.[3]

In the directly illuminated region and far from the edge of the slab, E should differ only slightly from E^I; therefore, we assume that one component of the diffracted field in this region is E^I. The loci which represent E^I are straight-line segments. See Fig. 2. These line segments are spaced $\lambda/4$ apart where λ is the wavelength in air. In the shadowed region, we assume that one component of the diffracted field is T_PE^I, where T_P is the complex-valued, amplitude transmittance for a plane wave incident normally on a dielectric slab of infinite breadth. T_P was defined in Ref. 1. The loci which represent T_PE^I also are line segments spaced $\lambda/4$ apart. This second set of line segments is displaced from the set for E^I by a distance equivalent to the phase of T_P, arg T_P. In the transition region, the phase delay varies rapidly from zero to arg T_P but is continuous. A smooth transition is approximated by connecting the two sets of line segments with the tilted line segments shown in Fig. 2.

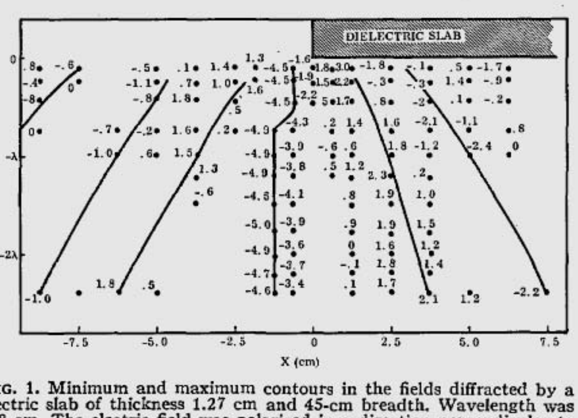

Fig. 1. Minimum and maximum contours in the fields diffracted by a dielectric slab of thickness 1.27 cm and 45-cm breadth. Wavelength was 3.188 cm. The electric field was polarized in a direction perpendicular to the figure. The power level in the incident field was taken as 0 dB.

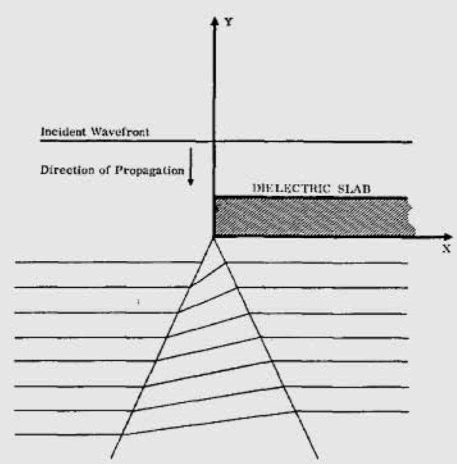

Fig. 2. This figure shows one of the two kinds of waves which are assumed to produce the observed extrema. For $X\ll 0$, the incident field predominates. For $X\gg 0$ the field is that behind an infinitely broad slab for a plane wave incident. Near the Y axis these two wavefronts are joined smoothly by straight lines. The lines are spaced by a half-wavelength.