where

A = the peak amplitude of the driving voltage (6 volts)

C = the effective capacitance of the 12 shunted diodes and their bypass capacitances (500 pf)

T_a = the rise and decay time of the driving voltage (0.1 μsec)

R = the effective resistance of the 12 shunted diodes (0.25 Ω)

R_G = source resistance (65 Ω)

$\tau = (R+R_G)C \approx 0.3\ T_a$

T = period of the square wave (2×10^{-6} sec).

Since the peak current for $t=T_a$ is given by

$$i_{\max} = \frac{AC}{T_a},$$

(12) becomes

$$\frac{W}{T} = 2\,\frac{i_{\max}^2}{T}\,R(T_a - \tau). \tag{13}$$

The power loss of the modulator ensemble computed from (13) is 1.5×10^{-5} watts. The power loss in the modulator circuits themselves can now be derived from (12) when C is made the effective capacitance of the 12 shunted diodes alone. When C is assumed to be 12 pf, the power loss in the 12 modulator circuits alone, derived from (12), becomes 10^{-8} watts. (In a later model of the semiconductor modulator, a complete redesign of the bypass capacitance will bring the capacitance of the modulator ensemble close to the capacitance assumed for the modulator circuits alone.)

The power loss of 12 modulators operated in shunt when calculated from (11), is 2.4×10^{-8} watts, assuming that the fundamental frequency in the modulating square wave is 0.5×10^6 sec^{-1} and the highest harmonic is 0.8×10^7 sec^{-1} ($n=8$). [The fundamental frequency is half the value which was assumed to derive (10) and (11).] There is very good correlation between the power loss which was derived from the measured current and the power loss which was calculated from (11).

In conclusion, by utilizing the resonant operation of a reversed biased varactor diode in a shunt configuration, the experimental modulator achieves the performance objectives of good modulation performance with extremely low modulation power consumption. At the design frequency, the semiconductor modulator has an insertion loss of less than 1 db in the transmission mode and more than 24 db in the rejection mode. The insertion loss in the transmission mode is comparatively insensitive to changes in the operating frequency; the bandwidth in the rejection mode ranges from 2 to 4 per cent.

The consumption of modulation power is extremely low; the modulation power for 100 diodes when operated in shunt will not exceed 1 μw. The modulator has the desired simplicity, compactness, and light weight.

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Correction

W. H. Eggimann, author of "Higher-Order Evaluation of Electromagnetic Diffraction by Circular Disks," which appeared on pages 408–418 of the September, 1961, issue, of these TRANSACTIONS, has brought the following misprints to the attention of the *Editor*. The following expressions should read

$$a_2 = \frac{\mu_0}{30}\left\{30H_z + a^2\left(-13\frac{\partial^2 H_y}{\partial y\partial z} + 11\frac{\partial^2 H_x}{\partial x\partial z} - 8\frac{\partial^2 H_z}{\partial x^2}\right)\right.$$
$$\left. - 9(ka)^2H_z\right\} + j\frac{4a^2}{9\pi}\mu_0(ka)^3H_z \tag{33}$$

$$b_2 = \frac{\mu_0}{30}\left\{-30H_z + a^2\left(13\frac{\partial^2 H_x}{\partial x\partial z} - 11\frac{\partial^2 H_y}{\partial y\partial z} + 8\frac{\partial^2 H_z}{\partial y^2}\right)\right.$$
$$\left. + 9(ka)^2H_z\right\} - j\frac{4a^2}{9\pi}\mu_0(ka)^3H_z \tag{34}$$

$$\boldsymbol{P} = \frac{16}{3}\epsilon_0 a^3\left\{\boldsymbol{E}_{\tan} + \frac{(ka)^2}{30}\left(13\boldsymbol{E}_{\tan} - \frac{3}{k^2}\frac{\partial^2\boldsymbol{E}_{\tan}}{\partial z^2}\right)\right.$$
$$\left. - j\frac{8}{9\pi}(ka)^3\boldsymbol{E}_{\tan} + j\frac{1}{15\omega\epsilon_0}(ka)^3\nabla\times\boldsymbol{H}_z\right\} \tag{38}$$

$$I(n, m, \mu; \rho, \phi)$$
$$= \sum_v A_v(n, m, \mu)\, \overset{2m}{\underset{2v}{P}}\left\{(a^2-\rho^2)^{1/2}\right\}\cos(2m\phi). \tag{56}$$

Eq. (38) here is equivalent to (38) in the paper.