A Fast Venetian-Blind Shutter

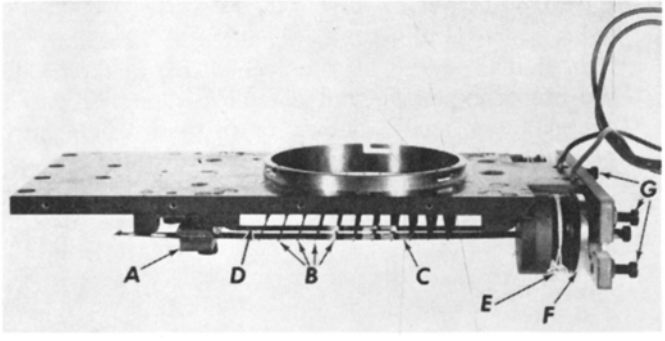
PAPER E—8

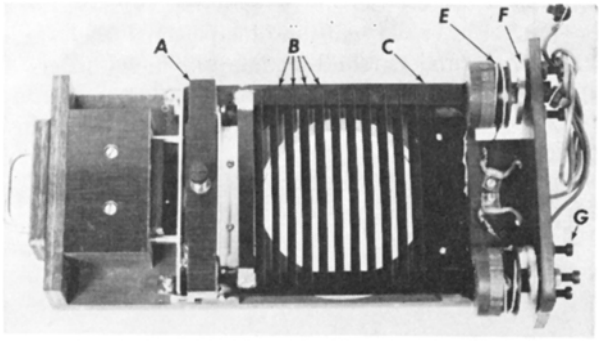
By J. KÜHNE

For some external ballistics photography a fast controllable shutter of large aperture is required. It is difficult to obtain a conventional mechanical shutter 10 cm in diameter that will operate faster than 1/100 sec. A venetian-blind shutter designed for operation at 1/1000 sec has been constructed by the author. It is shown in Figs. 1 and 2. The two pulling strips are of razor-blade steel 0.1 mm thick. There are 11 cross-strips made of high-strength aluminum alloy (Type SM 6315) 0.2 mm thick. These are bent about their long axes into a wide V to give added stiffness.

coil units are fitted to each shutter and provide the force to move the actuating strips. If the discharge energy is increased much beyond 35 or 40 joules the forces are so great that it is quite possible to rupture the actuating strips.

Specifications for this shutter are: aperture, 10 cm diameter; exposure time, minimum 0.5 msec, maximum 5 msec; shape of the light-time trace, triangular, Λ; delay from triggering to maximum opening, minimum 1 msec, maximum 5 msec; reproducibility of the delay, about 50 μsec.





Figs. 1 and 2. (A) Brake for damping the vigorous movement of the pulling strip; (B) Cross strips; (C) Pulling strips; (D) Fixed or resting strip (not seen in Fig. 2); (E) One of the two driving coils; (F) Aluminum induction plate; (G) Stop screws for adjusting the amplitude.

Driving Mechanism

The novel driving mechanism is shown in Fig. 3. The 40-μf condenser, charged to about 1.3 kv, is discharged through a three-electrode spark gap and a coil of 100 turns of 0.8-mm wire. A large current is induced in the aluminum induction plate. The interaction of the magnetic fields of this current and of the current in the coil tends to move the plate away from the coil.

The force depends on the circuit parameters and can be adjusted within convenient limits by control of the voltage to which the condenser is charged. Two such

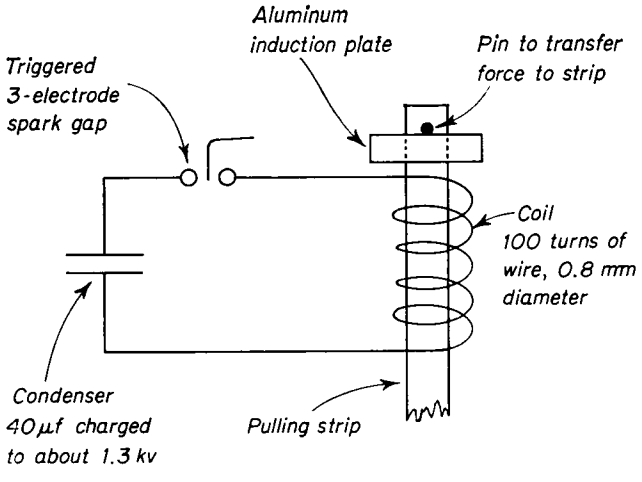


Fig. 3. The driving mechanism.

A contribution submitted to the *Proceedings* of the Fifth International Congress on High-Speed Photography on August 21, 1960, by J. Kühne, Aktiebolaget Bofors, Sweden.