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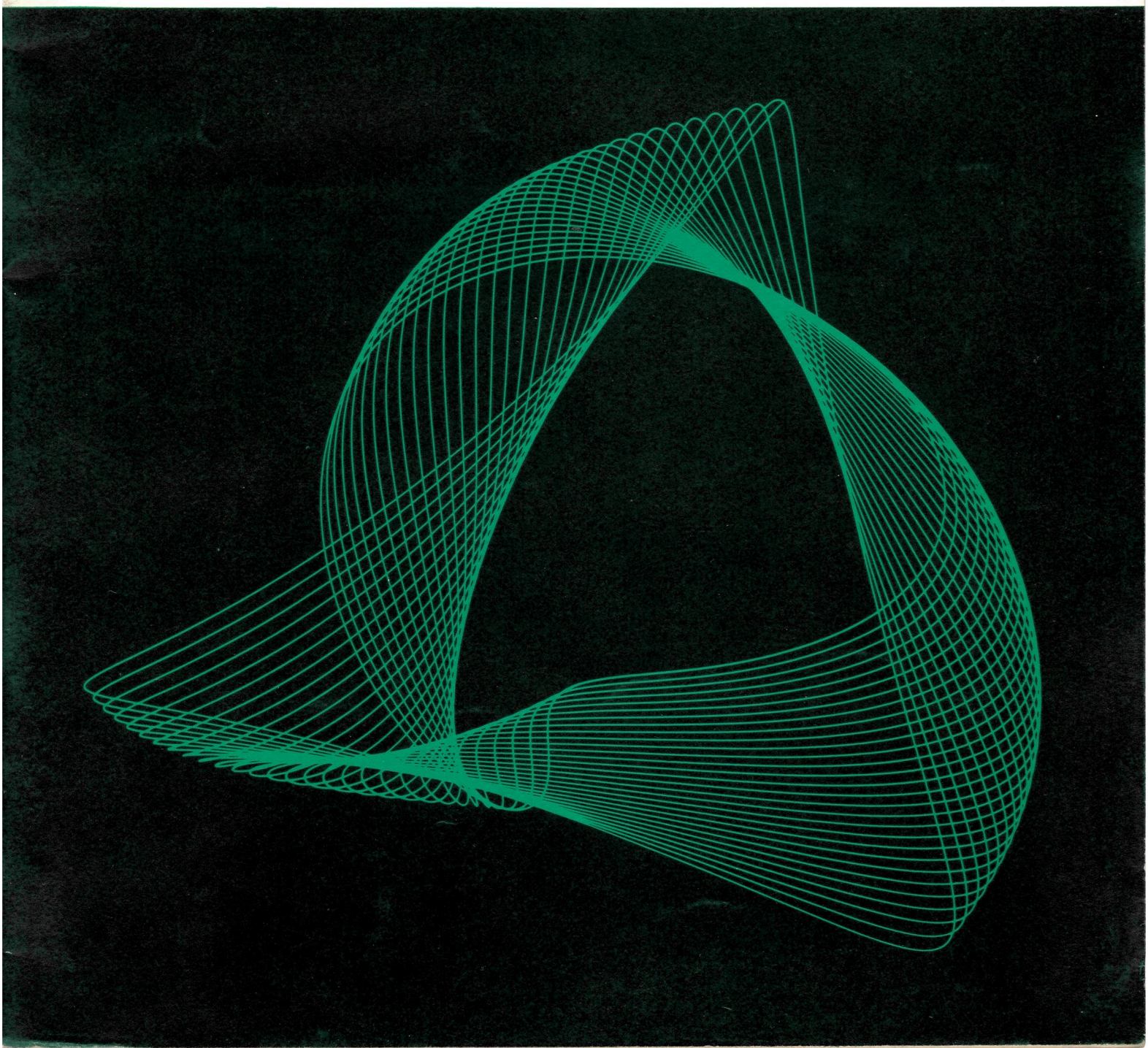

The Sound Level Photoprogrammer

Fernando von Reichenbach

This experimental device substantially improves stereophonic sound reproduction in an auditorium. Its main features are a very wide dynamic range and displacement of the sound configuration around the audience with no restrictions on the number of channels or speakers used. The device is automatically triggered by signals recorded on the same magnetic tape that reproduces the sound.

Music, voices, or sound effects commonly used in theaters require high and low volumes alternately. The adjustment of volume controls for the loud passages causes tape hiss to become audible when sound level decreases. Different ways to remedy the problem have been suggested. Use of tapes of the low-noise type and recording on a wider track are the obvious solutions, although the latter sometimes involves sacrificing the number of tracks to be recorded. Use of volume compressor and expander units, variations of bandwidth according to the volume reproduced, or improvement of special recorder equalizations are more costly approaches.

Another solution is to record the whole program at almost the same level and, on reproducing, to fade down to the proper levels the passages which so require. But a very skilled operator is needed for this, and it becomes impossible when the volumes of many speakers must be controlled in varying proportions for the achievement of changing sound patterns. By means of the sound level photoprogrammer, this complicated manipulation becomes programmed for automatic operation.

Six speakers are located around the auditorium. Each has its own power amplifier and the volume of each amplifier is controlled by means of two photoresistors per amplifier which connect to both outputs of a two-channel tape recorder. Flashlight bulbs with lenses illuminate the photoresistors through a transparent film, twelve inches wide, on which the program is prepared with segments of plastic tape. The different degrees of opacity accorded to the film determine the exact amplitude supplied to the speaker. A transport mechanism (synchronous motor with magnetic clutch) moves the film at approximately six mm. per second. Longitudinal tracks on the transparent film correspond to six different speakers: each track controls the sound level from either one or both of the recorder channels. Another lateral track takes care of synchronization and is controlled by its own photoresistor. The apparatus may be seen in Figs. 1 and 2.

Speech, music, or sound effects are recorded on two tracks of the magnetic tape. On a third track, a pilot tone is recorded which triggers each change of volume. The tone closes the relay, which sets the film in motion. As the film advances, a transparent section passes over the photoresistors; each new section of film contains the information for the volumes of the speakers for a corresponding section of tape. This motion continues until a black bar on the synchronization track appears and stops the film. Upon receiving another signal, the film advances again. The length of time during which the film advances is determined by the distance between black bars; the signal indicates only at what moment movement must begin. The volume of sound is-

suing from each speaker depends on the quantity of light going through the film over the programming unit. For black tape, the attenuation is better than 70 dB. Tapes of various colors in single and double layers allow adjustment of the volume in each passage. The sound is recorded near 0 dB. The reproduction levels are so adjusted that tolerable maximum volume coincides with direct passage of light.

This inexpensive gadget, built in April 1966 for a theatrical performance, still operates well. In some respects it can be compared to the experiences of Pierre Henry with coils. Once the initial temptation to use the photoprogrammer merely for the sake of effect is overcome, a new field of experience in sound perception will remain open to art production.

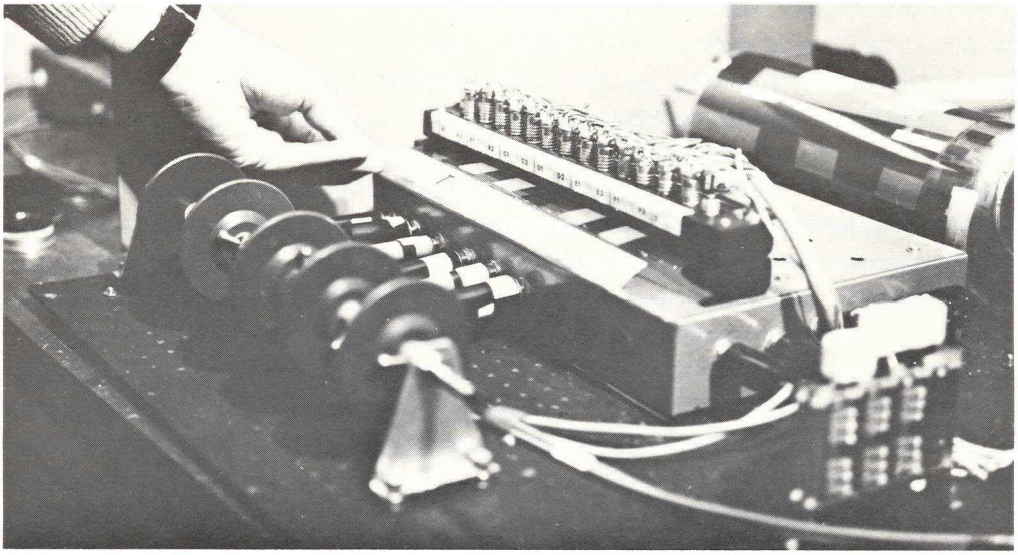

Fig. 1. A static stereophonic sound configuration is inserted on transparent film. It is equivalent to the volume adjustment by 12 independent potentiometers.

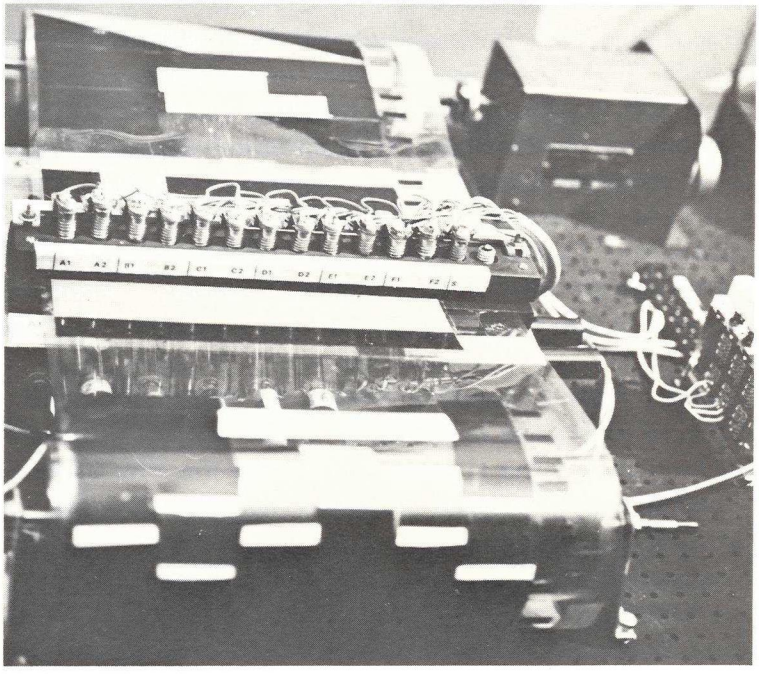

Fig. 2. A monaural program is fed to the photoprogrammer. Diagonal bar on the film (top of picture) allows sound to circle the room.