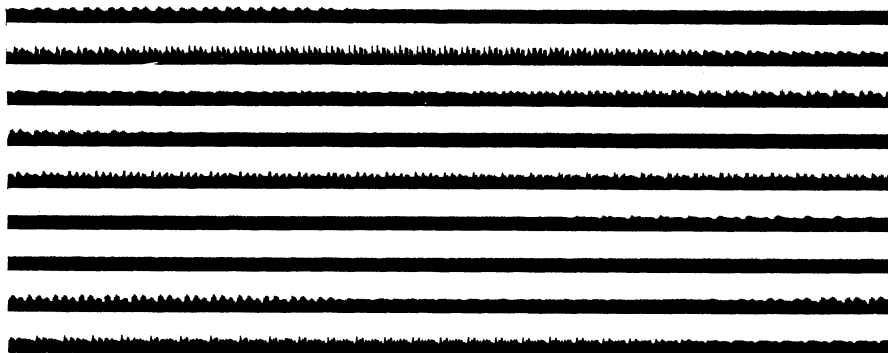


How sound is recorded in the film phonograph. The nine sound tracks reproduce the original sound waves, and when this film is run through the reproducer, a facsimile of the original sound results. The film is here shown about three times its actual size.



Film Phonograph Plays for 2 Hours

Engineering

Child of the Talkies Heralds Home Entertainer of Future

BORN of the talkies, a film phonograph capable of playing continuously for two hours from a 400-foot reel of motion picture sound film has been perfected by Dr. C. H. Hewlett, engineer of the General Electric Company. From a reel of film small enough to fit into a coat pocket a complete play or opera can be reproduced, which otherwise would require 15 to 20 ordinary 12-inch disc records.

Talking motion picture technique allowed Dr. Hewlett to achieve his result. In one of the principal methods of recording sound for the talkies, a jagged line photographed on the edge of the film is the representation of the sound. Light passes through a narrow slit, through the film onto a photoelectric tube. As the teeth of the jagged lines pass by the slit, they vary the amount of light reaching the tube, which in turn varies the intensity of an electric current. When this current is amplified and fed into a loud speaker, a reproduction of the original sound emerges.

Dr. Hewlett's film phonograph record has no sequence of photographs and contains only sound records. It lacks the perforations of ordinary motion picture film. At present there is space for nine separate sound tracks side by side, but he hopes soon to increase its capacity to fifteen. When the film has run through once it is necessary to shift to the next sound track. In the early models this was done by recording the second track backwards, and reversing and shifting when the end was reached. The third track ran forward again, and the operation was repeated until the film ended.

Now, however, a continuous loop

of film is used, unwinding from the inside as it winds up on the outside, after the fashion of automatic movie machines used for window displays. When a track ends, the machine shifts automatically to the next in a fraction of a second, with practically no interruption of sound. With this system and nine tracks, a program lasting an hour and twenty minutes can be played without attention. With fifteen tracks the machine will play for over two hours.

Recording is done through the same kind of microphone as used in radio or ordinary record studios. The light from a 50-watt incandescent lamp passes over a straight edge close to the lamp, and is focussed on a small mirror made to vibrate electrically in step with the sound waves. The edge is reflected upon a small slit, so that, as the mirror oscillates, the light shining through varies. A microscope lens focusses this slit on the film one tenth its actual size, and as the film moves along, the jagged line is photographed.

Positive film, slower and less "grainy" than the negative film for talking movies, is the material used in the film phonograph. The "grain" is made of the small clumps of silver molecules that form the black parts of a photograph, either negative or positive, and its size sets the limit to the length of the program that can be recorded on a given strip of film. If these clumps reach a size approaching that of the teeth on the sound record, they also affect the photoelectric tube and cause distorted reproduction.

If the grains can be reduced in size, then the sound wave can also be reduced; the film in turn can be run more slowly and a longer program can

be recorded on the same length of film. Dr. Hewlett runs his film through the recorder and the reproducer at a speed of 45 feet per minute, half the speed of talking motion picture film. Ordinary silent movies are projected at 60 feet per minute.

When it is necessary to make extra copies of the film record, prints can be made on other films in the same way that prints of motion picture films are made from the negatives exposed in the camera. However, for the purpose of reproduction, printing is not necessary. The original negative record, when run through the reproducer, will yield exactly the same sounds as a positive print. This is because the sound depends upon the *variations* of the light reaching the photoelectric tube. These are the same regardless of whether the record is a black line with a white background, or white line against a black background. The pitch of the sound is regulated by the distance between the peaks of the jagged line, while the volume depends on the height of the peaks.

The other means of recording sound on film is by the variable density method. A light, made to vary in accord with the voice or sounds to be recorded, shines on a narrow slit, in back of which runs the film. This results in a line of constant width, but varying density and can be reproduced in the same machine that is used for the variable width method, such as Dr. Hewlett has applied.

So far, no plans have been announced for the commercial exploitation of the film phonograph.

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