New Siemens 16mm ProjectorAmplifiers

By NORBERT ENGELS

THE PRINCIPAL construction characteristic of the Siemens Projector 2000 is a component block system, with components such as the sound-head assemblies, amplifiers and 16mm tape decks. These are manufactured separately from the basic projector and assembled to basic standard models depending on market requirements. It is feasible in most cases to expand a projector which is already in use by equiping it with additional components to work with new projection methods or requirements. The many uses of 16mm sound film require the availability of a variety of amplifiers with different characteristics and power outputs. Three transistorized amplifiers were recently designed and put into production (Fig. 1).

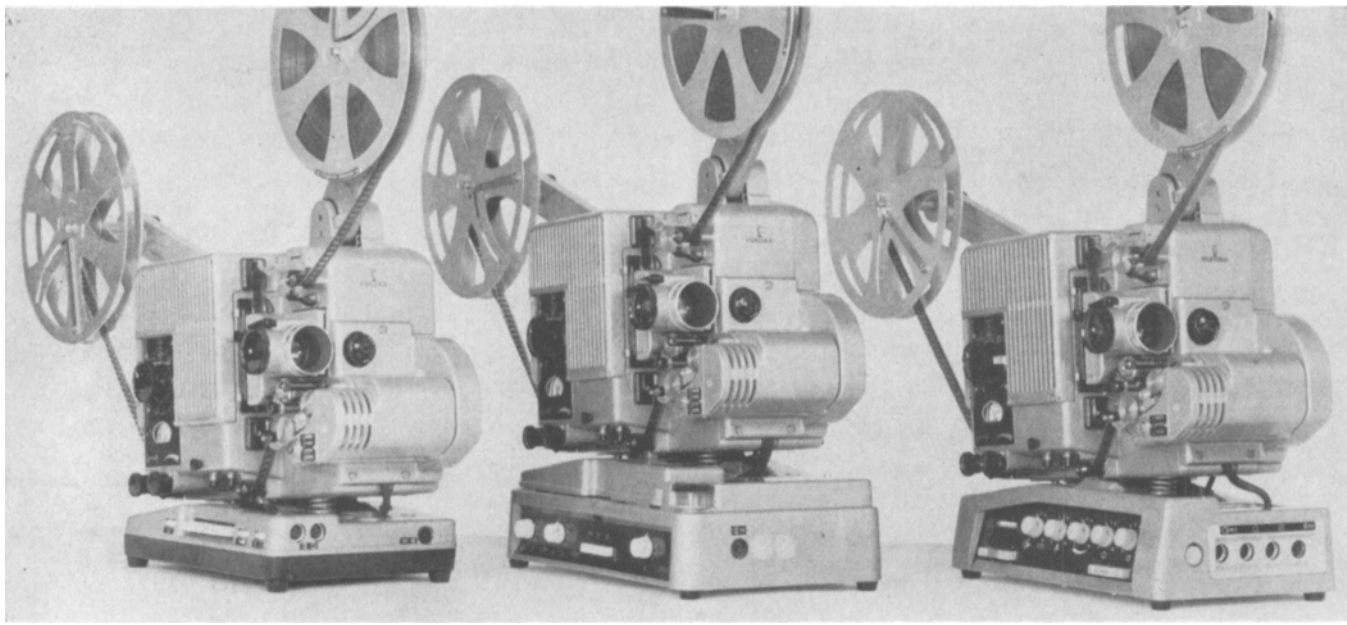

Fig. 1. Three new amplifiers mounted with the projectors.

The experience gained from the introduction of the first 2-W transistor socket amplifier in 1963 led to the basic construction principle of making all amplifiers with complete printed circuit boards mounted in lightweight aluminium alloy housings (Fig. 2). This type of metal enclosure helps reduce the basic weight and is useful for additional cooling required to keep power transistors within maximum tolerable temperatures. All amplifier inputs for optical and magnetic sound are identical. This permits complete interchangeability of soundhead assemblies without needing electrical matching, and consequently simplifying production.

The input sensitivity for the optical sound is 0.5 mV, on 1.8-kΩ impedance, whereas the input for the magnetic sound is 1.2 mV, on 3 kΩ. Due to high input sensitivities, some remarkable gain reserves are available to assure proper sound reproduction if a poorly recorded soundtrack is reproduced. A 3-W Exciterlamp, type BRK, is used in all optical soundhead assemblies, contrary to previous models. A dc bias supply powers the Exciterlamp which is voltage controlled over a transistor circuit. This system is used on all amplifiers (Fig. 3). A small photo transistor, operating without a dc bias supply, is installed in the input circuit of the optical sound, doing away with a transformer matching to the first transistor preamplifier.

A similar voltage-stabilizing circuit powers the amplifier transistors. This circuit is extremely stable and produces

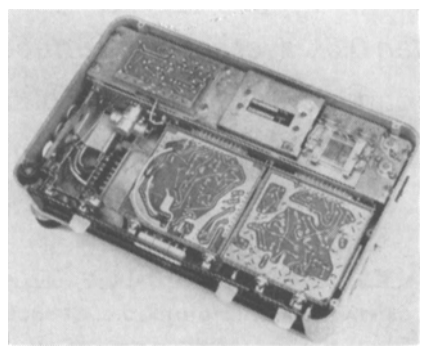

Fig. 2. Chassis and printed socket board layout of 12-W amplifier.

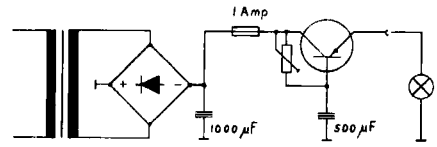

Fig. 3. The dc Exciterlamp circuit.

sufficient current so that bass tones by maximum gain can be reproduced in full fidelity thus minimizing the general overall distortion.

All amplifier inputs such as microphone, phono and tape have been dimensioned to have the same input impedance for each amplifier. The input sensitivity for a microphone is 0.8 mV and the impedance is 200Ω.

The signal-to-noise ratio on all amplifiers against full output, measured on the inputs of optical sound, microphone, and phono, is higher than 55 dB. On magnetic playback the signal-to-noise ratio is higher than 45 dB measured with standard German test film DIN 15638. Extensive mu-metal shieldings on the magnetic heads as well as a complete mu-metal enclosure of the motor help to eliminate outside interferences. A distortion of 5% is measured between the frequency range of 60 Hz and 10 kHz on full output, whereas the constant signal of 1 kHz produces less than 1% of distortion (Fig. 4). All amplifiers work without output transformer. The two power transistors are wired, to receive their dc supply, in series and to produce the audio signal in parallel phasing. The output impedance is 15Ω for all amplifiers.

The amplifiers have been designed with pushbuttons for selection and with

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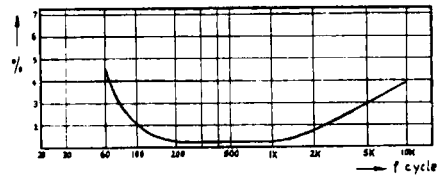
servicing expedited by accessible components. The printed circuit boards may be replaced individually. All amplifiers are equipped with a single tone control which in the case of the 12-W record and playback amplifier also effects the frequency response while in record position. The increase or decrease of frequency response may be seen from Fig. 5. A regulation of +5 dB and −12 dB is reached at 12 kHz.

The 7.5-W socket amplifier (at the left in Fig. 1) is designed for optical and magnetic playback and is simply built into the socket base of the projector. The projector and amplifier are mounted as an integral unit and it weighs only 29 lb. The amplifier cannot be equipped with magnetic recording facilities.

The 12-W plug-in amplifier (at center in Fig. 1) has been built into a detachable housing and functions basically as the 7.5-W amplifier described above.

The 12-W socket amplifier (at right in Fig. 1) may also be used for magnetic recordings. Three mixable inputs are featured. The recording oscillator is installed on a separate board and has an adjustable bias system. This permits superimposing of magnetic sound tracks or a gradual fade-in or fade-out of the bias to avoid switching noise.



Harmonic distortion by 1 Watt

Fig. 4. Harmonic distortion by 1 W.

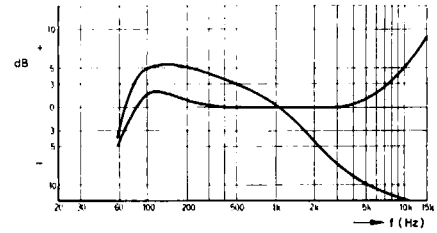


Fig. 5. Frequency curve of 12-W record and playback amplifier.

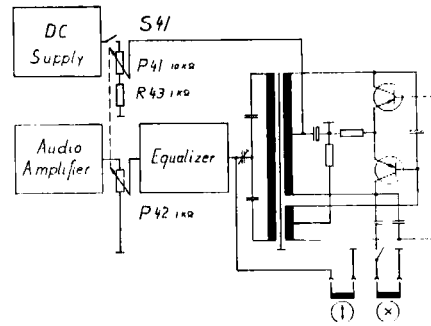


Fig. 6. Principal outlay of variable recording oscillator.

As shown in Fig. 6, this stage uses principally two power transistors wired in push-pull method by using a separate feedback winding. The amplitude, and, therefore, the high-frequency bias, for the erase and record and playback head may be altered by adjusting the dc supply of the two transistors which is fed over a variable voltage divider No. P-41 and R-43. The potentiometer P-41 is coupled mechanically to potentiometer P-42 which in turn regulates the audio level feeding the record and playback head. If P-41 is turned down to the minimum, enough dc supply remains to guarantee a positive start if the oscillator is switched on to record position with S-41. The coupling of the dc supply potentiometer P-41 with the audio potentiometer P-42 guarantees that the audio level decreases in the same ratio as the decrease of the oscillator bias. Thus, over-modulation is avoided. The recording level indicator is a magic-eyetube system that also shows the decrease of audio level to the magnetic recording head if P-42 is adjusted. The rugged construction, and mechanical and electronic reliability makes this equipment suitable in both the professional and amateur fields.

In conclusion, we thank H. Maschgan of Siemens & Halske, in Germany, for providing the technical information on which this paper is based.