APPARATUS FOR MAGNETIC RECORDING OF LOW-FREQUENCY PROCESSES

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A multivibrator with emitter capacitance incorporating three transistors was used for FM recording of signals with frequencies of 0-150 Hz. For an input signal of ±10 μA the coefficient of depth of modulation is ±80%.

Most methods previously described for FM recording on an ordinary tape recorder of signals containing low-frequency and steady components (EEG, EKG, blood pressure, respiration, and so on) are complex and cumbersome and require special power sources [2-4].

In the circuit proposed (Fig. 1), a multivibrator with collector-base connection was used as frequency modulator [5]. Any low-power low-frequency transistors of the P13, P15, and P16 type can be used in the circuit. The frequency of generation of the multivibrator is determined by the rate of recharging of the capacitor C. Rapid charging of the capacitor is effected through the triode T_1 as soon as it is triggered. The capacitor discharges through the triode T_3, conductance of which depends on the magnitude of the input signal. During tuning the initial generator frequency is set at 3-4 kHz, corresponding to the mean frequency of the transmission band of the tape recorder. With an input signal of ±10 μA, the change in frequency reaches ±80%, which is higher than that for the circuits used previously [1]. The output signal of the modulator is of the sawtooth variety. Its amplitude is 3 V. The signal is fed into the input of the recorder and is recorded as an ordinary acoustic signal.

A diode storage element with RC-filter was used as demodulator. With the parameters indicated on the diagram for capacitance and resistance of the filter, the demodulator reproduces signals with frequencies of between 0 and 150 Hz (Fig. 2). The input of the demodulator is connected to the output of the tape

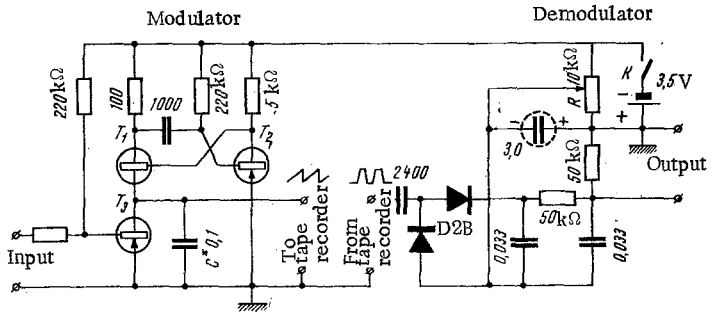

Fig. 1. Theoretical circuit of apparatus for FM recording of low-frequency signals on magnetic tape. The capacitor C is selected during tuning (explanation in text).

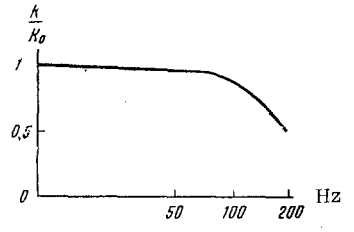

Fig. 2. Frequency characteristic curve of apparatus for FM recording of signals. Abscissa, frequency (in Hz); logarithmic scale; ordinate, relative coefficient of "input–output" transmission of instrument.

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recorder ("accessory speaker"). To increase the sensitivity of the demodulator, the signal from the tape recorder must be square in shape, and this is done by clipping when maximal amplification is obtained during reproduction. The greatest output signal of the demodulator is about 100 mV. Zero output control during changes in the initial frequency of the modulator is carried out by the potentiometer R (10 kΩ). The instrument is powered by a flashlamp battery. The current consumed is 3 mA.

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