Magnetic Tape Recording Electrocardiograph

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A method of recording the electrocardiogram on magnetic tape is described and possible applications are mentioned.

RECORDING the electrocardiogram for prolonged intervals presents difficulties from the standpoint of economy and convenience. One 200 foot roll of paper for a direct writing instrument is used in 40 minutes of continuous recording at 25 mm. per second, and reviewing this long electrocardiographic record is a cumbersome procedure. A convenient method of recording electrocardiograms and filtered electrocardiographic impulses. Figure 1 shows a block diagram of the apparatus which has been developed. Details of the circuit will be reported in a separate communication. Figure 2 is a photograph of the instrument. A differential amplifier is employed, which minimizes the effect of 60 cycle interference. A 250 cycle square wave carrier which is amplitude modulated is used. The frequency of the square

![Block diagram of magnetic tape recording electrocardiograph.](image)

other low frequency phenomena has been developed.

DESCRIPTION OF METHODS

The electrocardiogram is recorded on magnetic tape of the type used in audio recording. The frequencies involved in the electrocardiogram are so low that it is not possible to record directly on magnetic tape. A carrier wave is necessary, and this is modulated by the amplifier carrier wave does not limit the frequency of the impulses which may be recorded in the way in which the frequency of a sine wave carrier does. It is possible to record frequencies as high as and higher than the frequency of the carrier. Amplitude modulation is used because the recorded information is distorted less by fluctuations in the speed of the tape than when frequency modulation is employed. The modulated carrier wave is taken off the magnetic tape by the play-back head of the tape recorder, amplified and visualized on a

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cathode ray tube either during recording or when reviewed later. The sweep speed of the cathode ray tube is variable, the slowest sweep being six seconds, which makes rapid calculation of the heart rate simple. If more detailed study is required or if a permanent record is desired, the carrier can be rectified and the current picked up by the lead wires of any clinical electrocardiograph. Otherwise the tape is erased and used again. The tape speed during recording is 7.5 inches per second. When the recording is reviewed the tape speed can be 7.5 or 15 inches per second. The more rapid speed enables one to review the record in half the time in which it is recorded. The 10.5 inch reels (2400 feet of tape) run for 64 minutes. Figure 3A illustrates an electrocardiogram directly recorded on a string galvanometer, and figure 3B is an electrocardiogram from the same patient which was magnetically recorded and played back through the same string galvanometer. Equally satisfactory results are obtained with tape speeds as low as 1.87 inches per second, and at this speed continuous records for more than four hours are possible.

**Discussion**

The apparatus described has been in clinical use since July 1952. It is employed for continuous recording during anesthesia. It may also prove helpful in certain physiologic in-
vestigations, in studying the effect of drugs on cardiac arrhythmias, and in determining the electrocardiographic changes immediately preceding death. Teaching of electrocardiography may be facilitated by the use of this instrument. At present the apparatus is being modified so that voice, heart sounds and other phenomena may be recorded simultaneously with the electrocardiogram.

Summary

A method of magnetic tape recording of the electrocardiogram is presented.

Sumario Español

Un método de registrar el electrocardiograma en cinta magnética se describe y sus posibles aplicaciones se mencionan.
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