RB-98

HOME TELEVISION MAGNETIC-TAPE PLAYER

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A compact black-and-white television tape player, capable of playing on any standard television set the pictures and sound of television programs prerecorded on magnetic tape, has been developed. The new instrument is housed in a cabinet no larger than a high-quality sound tape player. It can be readily attached to any home television receiver.

Quarter-inch magnetic tape running at a speed of 10 feet per second is used to provide approximately four minutes of picture and sound from a standard 7-inch reel. The performance at the present stage of development gives picture quality approaching that of an average broadcast kinescope recording as reproduced on a home television set. The picture steadiness may be compared to that obtained in conventional 8mm home movie equipment.

Introduction

The magnetic-tape home television reproducing unit, Fig. 1, housed in a 19½" × 17½" × 15" cabinet, provides a means for reproducing both television pictures and sound from the information recorded on magnetic tape.

The tape-reproducing unit can be used in conjunction with a standard television receiver in the same manner as a record player is used in conjunction with a standard radio receiver. That is, the video tape unit can be connected to the television set and both sound and picture will be reproduced in much the same manner as sound is reproduced when a record player is attached to the phono input of a radio receiver.

Presently, the tape picture signals are coupled to the television receiver by means of three simple adaptor wafers placed under the appropriate tubes on the video chassis; the sound is coupled to the phono input. In the future, it is quite probable that most television receivers

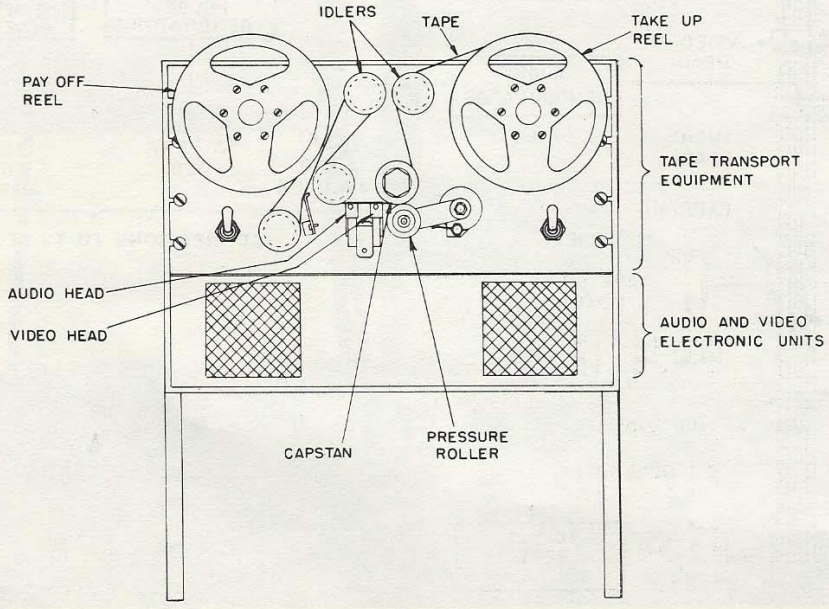

Fig. 1 – Video tape reproducer.

will be provided with a 'tape picture' input jack for the connecting cable from the tape reproducer. Then a simple multiple-contact switch may be used to switch the receiver from 'AIR' to 'TAPE' signals, in the same fashion as the phono switch is used today.

The present model video-tape home reproducer provides four minutes of both picture and sound from a 7-inch reel of ¼" magnetic tape. As a future potential, the tape might be run in both directions to provide at least eight minutes of program on tape of 1-mil thickness, or even longer times on thinner tape.

Basically, the operation of the reproducing unit is as follows. With reference to Fig. 2, the video signal is recorded on the tape on two parallel tracks; one track carries the low-frequency video information and the other carries the high-frequency video information, as shown by the markings on the tape. The audio is recorded on a third parallel track as amplitude modulation on dual high-frequency carriers. The reproducing unit contains three separate magnetic head elements[1] and three separate channels to recover these signals. One channel contains the phase and amplitude correcting network for the low-frequency video components. The second contains a phase and amplitude correcting network for the high-frequency video components, while the third contains a demodulator for the amplitude-modulated audio carriers. The equalized low and high-frequency components, from the two video channels, are combined in an adder network to form a single wide-band video wave at a 1-volt peak-to-peak level.

This reproduced composite video signal is then coupled to two different networks, one a sync pulse separator and the other a wide band video amplifier.

[1]For details concerning the magnetic heads, see *RB-51, A Magnetic Tape System for Recording and Reproducing Standard FCC Color Television Signals*, pp. 19-24.

Video Amplifier

The wide-band video amplifier boosts the composite video signal to a 40-volt maximum peak-to-peak level so that it can be coupled directly to the grid of the receiver kinescope by means of an adaptor plate located between the kinescope base and socket. A d-c setter is incorpo-

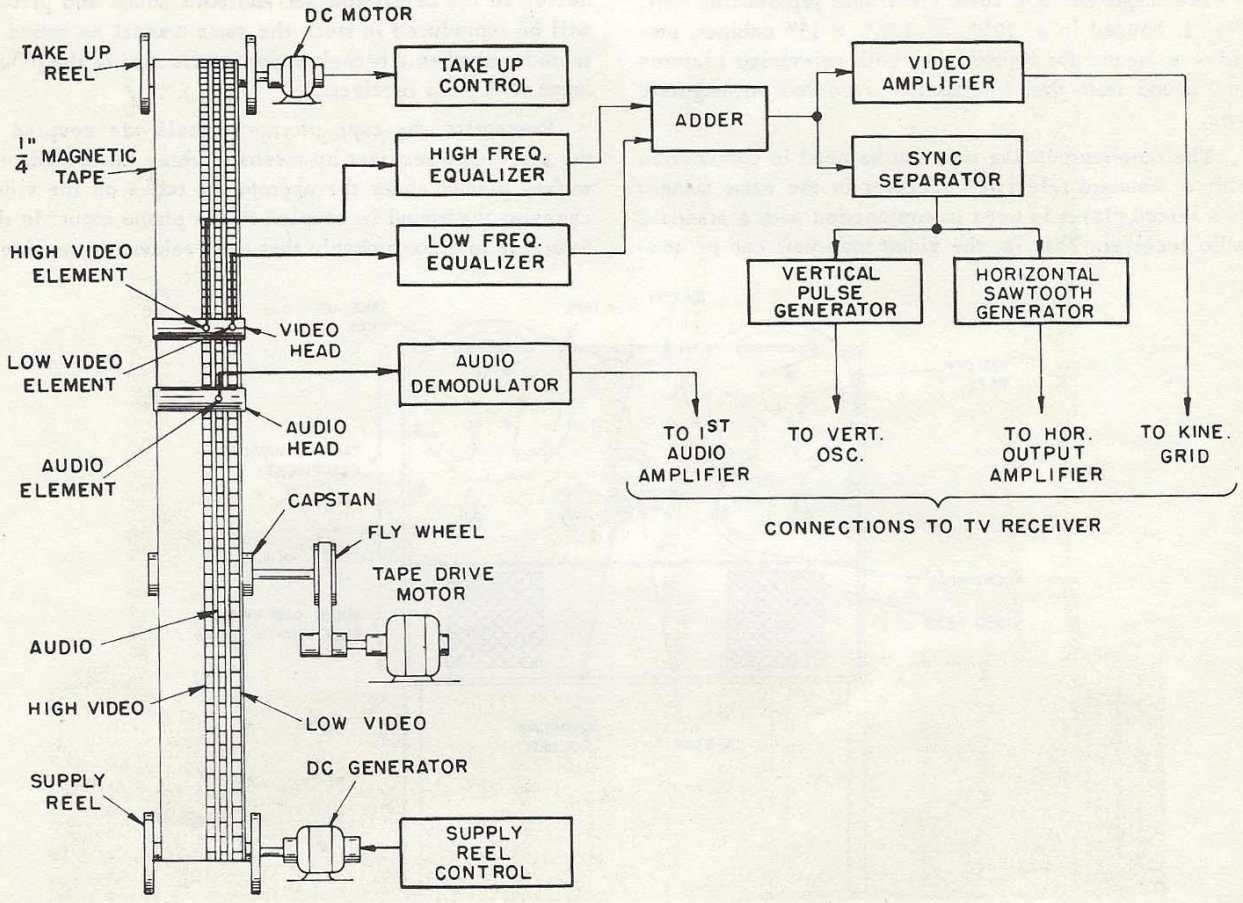

Fig. 2 – Reproducing elements for video tape reproducer.

rated in the amplifier circuit driving the kinescope grid to permit the restoration of the d-c components. The d-c setter is referenced to an appropriate bias voltage so that the normal receiver background control can be used to vary the picture brightness. A separate video gain control, located in the tape unit, provides a means for varying the picture contrast.

Sync Circuits

The composite video signal is also coupled to a synchronizing unit as indicated in Fig. 2. This unit selects the sync pulses from the video signal and produces a horizontal sawtooth wave on one output and a vertical sync locking pulse on another output. The horizontal sawtooth is coupled directly to the control grid of the receiver horizontal-output amplifier by means of an adaptor plate located between the tube base and the chassis socket. The vertical pulse is coupled to the receiver vertical oscillator by means of an adaptor located between the base and socket of the vertical sync pulse amplifier.

The elements of the synchronizing unit, as shown on the block diagram, Fig. 3, are designed to produce a sawtooth wave which has a linear rise time starting at the exact time position of each reproduced sync pulse and lasting until the arrival of the next following pulse.

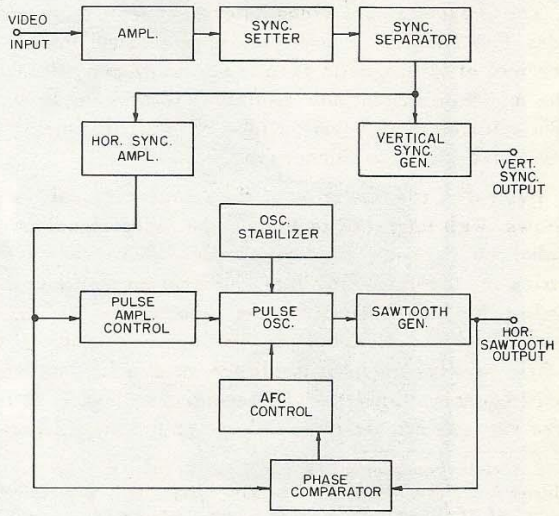

Fig. 3 – Synchronizing unit.

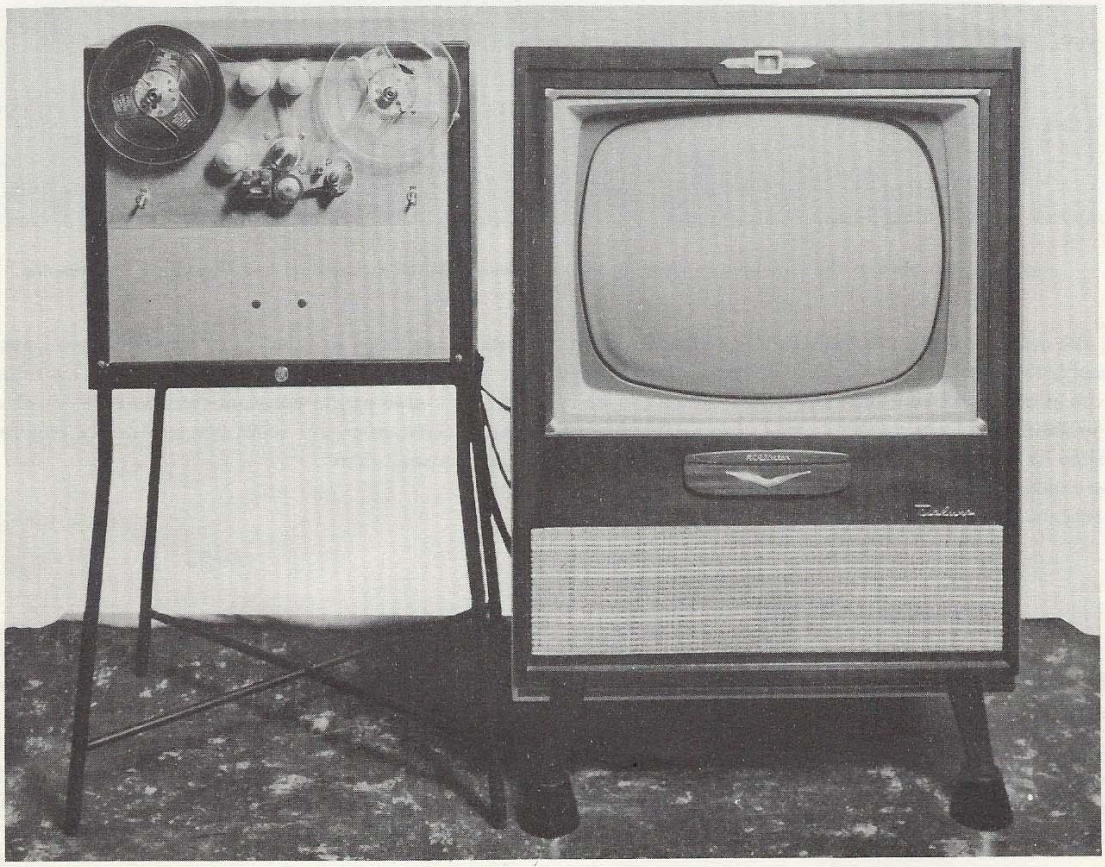

Fig. 4 – Front view of the magnetic tape television reproducer coupled to a 21-inch console television receiver.

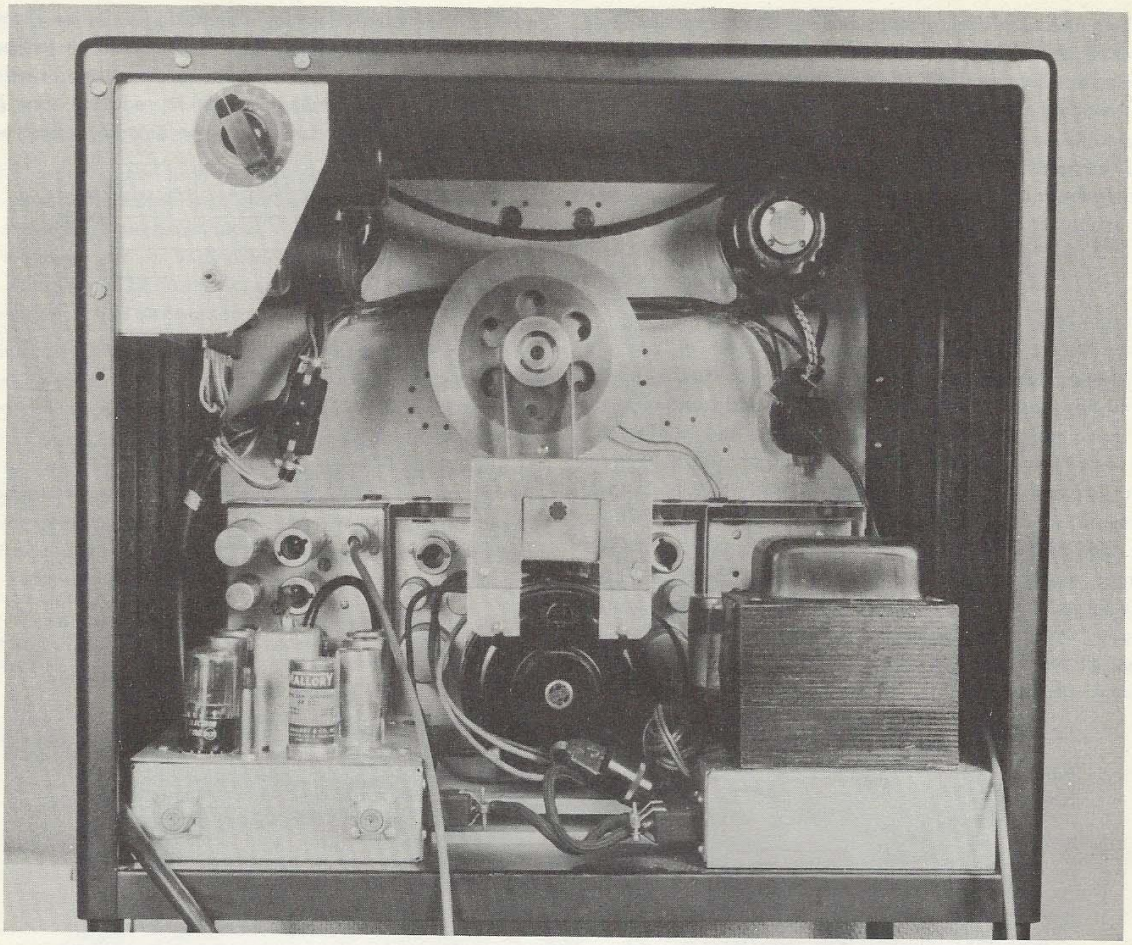

Fig. 5 – Rear view of the tape player, showing the arrangement of the mechanical and electronic components.

Since the sync and picture signals are recorded simultaneously, the resulting sawtooth is in exact timeregistry with the picture information. Therefore, when the sawtooth is used to deflect the kinescope electron beam, and the video is used to modulate the beam intensity, the picture remains stationary within the raster on the kinescope screen.

Mechanical Details

The mechanical portion of the system, shown diagramatically in Fig. 2, operates as follows.

The tape drive capstan is of the belt-driven flywheel type which rotates at a constant velocity determined by the inertia of the flywheel and the stability of the induction motor referenced to the 60-cycle line frequency.

The supply reel is of the constant-tension variety which operates to produce a constant-power output from a generator affixed to the reel shaft. The take-up reel drive is also of the constant-tension type which operates as a constant-power input motor directly coupled to the take-up reel shaft[2].

Audio

The audio system used in the home reproducer contains the necessary circuitry for detecting the two carrier a-m signals that are recorded on the tape. That is, the audio signal is recorded on the tape as a complex wave consisting of two separate carriers that are independantly modulated with a 1800 phase relation. The circuitry in the reproducer contains filter networks to separate the carriers, detector networks to remove the audio from the

[2]For details of the reel control operation, see pp. 32 and 33 of *RB-51*.

separated carriers and a mixing network to combine the detected signals. With this arrangement, noise cancellation is achieved because the audio signals are added in phase while the noise bursts are added with a 1800 phase relation.[3]

[3]For details of the Audio System, see pp. 38 and 39 of *RB-51*.

Adaptation

The photograph of Fig. 4 is a front view of the tape player connected to a standard RCA 21" black and white television receiver. Fig. 5 is a rear view of the tape player showing the arrangement of the mechanical and electronic components.

William D. Houghton

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