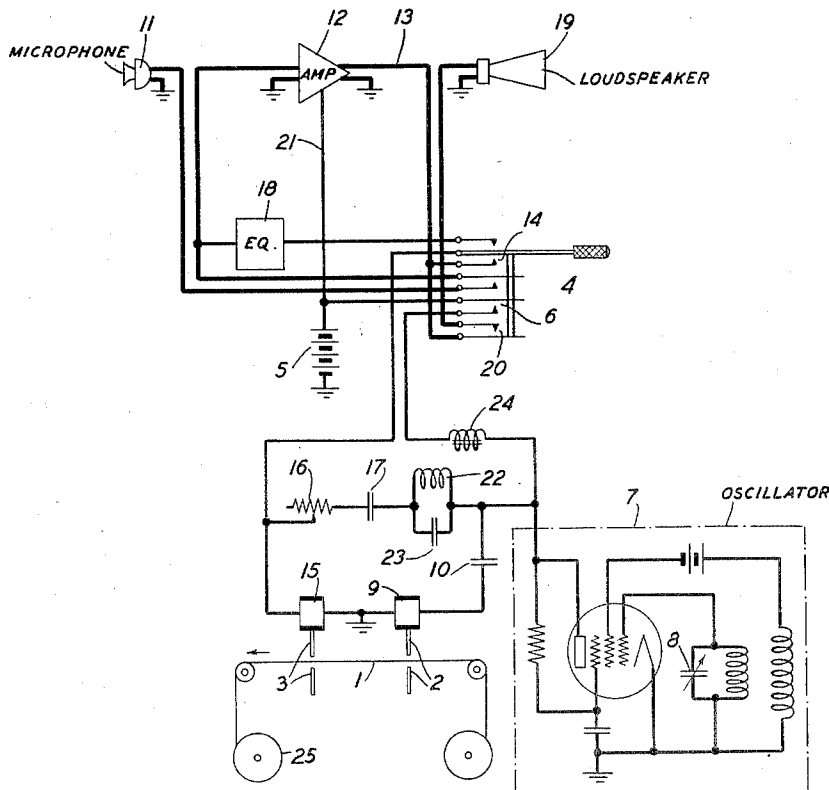


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MAGNETIC TELEGRAPHONE

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MAGNETIC TELEGRAPHONE

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5 Claims. (Cl. 179-100.2)

This invention relates to magnetic telegraphones and particularly to telegraphones which are capable of reproducing a wide range of signal amplitudes with a minimum of extraneous noise.

Various methods of magnetic recording have been suggested but the method most commonly used heretofore involves erasing the previous history of the tape or wire by magnetic saturation and then partially demagnetizing it by a steady biasing flux and subjecting it in this condition to the action of the varying signal flux. It has been suggested that the noise heard during the reproduction of a record made in this manner can be reduced by recording with a biasing flux of high frequency instead of a steady biasing flux. It is, of course, also well known that a magnetic record can be erased by moving the tape through an alternating field to demagnetize it instead of saturating it with a steady flux.

The object of this invention is to extend further the useful volume range of telegraphone systems.

According to this invention high frequency alternating current is used for both the erasing and biasing operation so that as the tape approaches the recording magnets to be agitated by the biasing flux during the actual recording it is already in a completely demagnetized condition due to its passage through the high frequency erasing field. It is found, however, that for best results the erasing flux must be much stronger than the flux required for proper biasing and that the biasing flux should be of considerably higher frequency than is necessary for effective erasing.

These requirements are met in a very convenient and inexpensive manner by generating both of these fluxes from currents derived from a single oscillator which has an output with a large harmonic content. The oscillator is tuned to the frequency required for erasing and connected by frequency selective circuits to both the erasing and recording magnets to supply a large current of fundamental frequency for erasing and a smaller current of a harmonic frequency for biasing.

These and other features of the invention will be more clearly understood from the following detailed description and the accompanying drawing showing a typical telegraphone system according to this invention.

In the drawing the tape record member 1 moves from right to left between the erasing pole-pieces 2, 2 and the recording and repro-

ducing or translating pole-pieces 3, 3 under the control of reeling mechanism 25.

With the switch 4 closed downwardly in the recording position current flows from a power source 5 through contact 6 and a retard coil 24 and energizes the high frequency generator 7 which is preferably of a type having an output with a high harmonic content such as the conventional electron-coupled oscillator shown. The oscillator is tuned to the desired erasing frequency such as 20,000 cycles per second by the condenser 8 and the erasing coil 9 is connected across its output circuit through a condenser 10 which is of such capacity as to resonate with the coil at the oscillator frequency. A current of relatively large amplitude will therefore flow in the coil 9 and produce a strong alternating flux between the pole-pieces 2, 2, which will erase any previous history of the tape and leave it in a completely demagnetized condition as it approaches the magnets 3 to receive the new record.

The speech or other sounds to be recorded energize the microphone 11 which is now connected to the input of the amplifier 12. The amplifier is energized from the power source 5 over conductor 21 and delivers its output over the conductor 13 and contact 14 of the switch 4 to the voice coil 15 of the recording magnet. The coil 15 is also connected to the output of the oscillator 7 through a variable resistor 16 for controlling the biasing current, a small condenser 17 which resonates with the coil 15 at a suitable harmonic frequency of the oscillator, and a network comprising a coil 22 and a condenser 23 connected in parallel and resonating at the fundamental frequency of the oscillator to keep current of this frequency out of the voice coil 15. If, for example, the third harmonic frequency is used and the fundamental frequency is 20,000 cycles per second, the coil 15 will be energized simultaneously by current representing the signals to be recorded and a 60,000 cycle biasing current. If necessary, more complex networks of known types may be used to give greater frequency discrimination in the recording coil circuit but the simple circuit shown will be quite satisfactory in most cases. As the tape 1 passes the pole-pieces 3, 3 it will be subjected to both the high frequency bias flux and the variable signal flux which leaves the tape variously magnetized in accordance with the signals.

When the recorded matter is to be reproduced the tape 1 is again passed between the pole-pieces in the same direction with the switch 4 operated

upwardly to the reproducing position. In this case the power source 5 is disconnected from the oscillator 7 at contact 6 and hence no erasing or biasing current is supplied to the coils 9 and 15. The microphone 11 is disconnected, the voice coil 15 is transferred from the output to the input of the amplifier through a filter network 18 and the loud-speaker 19 or other receiving circuit is connected to the output of the amplifier at contact 20 of the switch.

Under this condition the passage of the variously magnetized tape between the pole-pieces 3, 3 generates corresponding current variations in the coil 15 which are suitably modified by the network 18 to equalize the response over the desired frequency range before being impressed on the input of the amplifier 12. Since the recording is made on demagnetized tape without the use of any steady biasing flux, the reproduction by the loud-speaker 19 will be substantially free of tape noise and therefore of much wider useful volume range than is obtainable in systems having a high inherent noise level.

As stated above, the erasing flux must be much stronger than the optimum biasing flux. The amplitudes of the currents which must flow in the coils 9 and 15 to produce these fluxes will, of course, depend on the number of turns in the coils and the reluctance of the associated magnetic circuits. The number of turns in the coils will directly affect their inductance and hence the capacities of the condensers 16 and 17 necessary to tune them. In one typical system according to this invention the erasing coil has 1400 turns and the voice coil 400 turns and the oscillator and its associated circuits are adjusted to deliver about .020 ampere to the erasing coil and about .005 ampere to the voice coil.

Even with an erasing coil of many more turns than the voice coil the erasing current required is much larger than the biasing current. It will be noted, however, that the larger current is of the fundamental frequency of the oscillator and that only a fraction of this output is required at the harmonic frequency. This fact makes it practical to obtain the necessary currents of the two frequencies from a single source in a very simple and inexpensive manner.

While the power source 5 is shown as a battery it will be obvious that in practice it may be a conventional rectifier unit energized from the alternating current circuit used for the motor on the reeling mechanism.

What is claimed is:

1. In a telegraphone, a moving record member, erasing and recording pole-pieces spaced along the member, coils on the pole-pieces, a circuit carrying signal currents connected to the recording coil, a source of oscillating currents of high fundamental frequency, means for supplying currents of relatively large amplitude and of fundamental frequency from the source to the erasing coil and means for impressing currents of relatively small amplitude and of a harmonic frequency from the source to the recording coil.

2. In a telegraphone, a moving record member, erasing and recording magnets cooperating with the member, a circuit carrying signal currents connected to the recording magnet, a source of oscillating current of a frequency higher than the signal frequencies and means for impressing on the erasing and recording magnets currents from the source of relatively high and relatively low amplitudes respectively.

3. In a telegraphone, a moving record member, erasing and translating magnets cooperating with the member, a microphone, an amplifier, a loud-speaker, a switch for connecting the microphone to the amplifier and the amplifier to the translating magnets for recording and for connecting the translating magnets to the amplifier and the amplifier to the loud-speaker for reproducing, a generator of alternating currents of different frequencies, frequency selective circuits connecting said source to the erasing and translating magnets and contacts on the switch for energizing the circuits when recording and de-energizing the circuits when reproducing.

4. The method of recording which comprises moving a magnetic record member through a strong erasing magnetic field of a frequency higher than the frequencies to be recorded and then through a composite magnetic field having a component of higher frequency and lower intensity than the erasing field and a varying component representing the signals to be recorded.

5. In a telegraphone, a moving magnetic record member, means for demagnetizing the member, translating pole-pieces cooperating with the member, a single coil on one of the pole-pieces and means for energizing the coil simultaneously with a varying current representing the signals to be recorded and with an alternating current of a frequency higher than the highest signal frequency.

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