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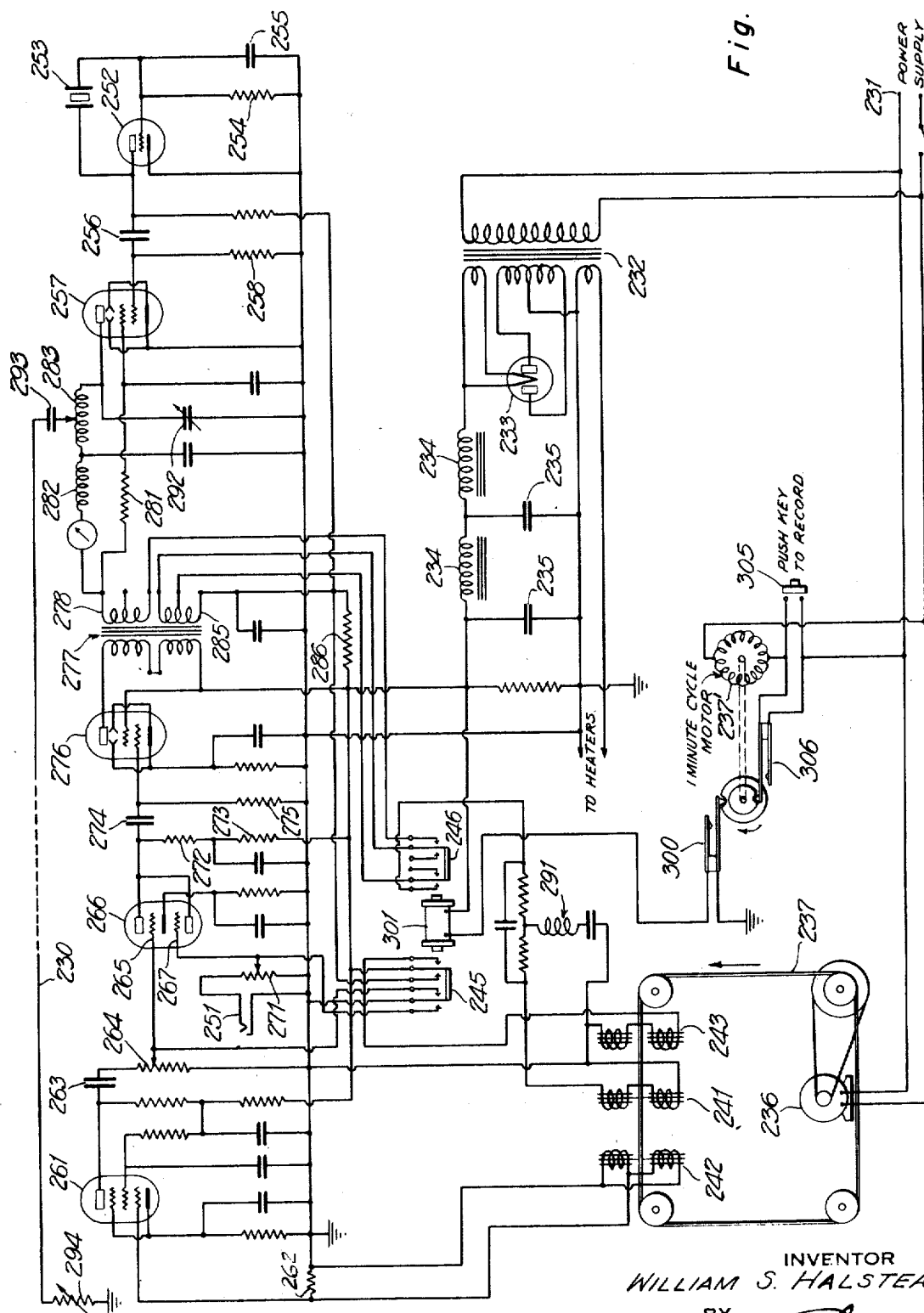
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AUTOMATIC RECORDING AND REPRODUCING SYSTEM

Original Filed Aug. 3, 1940

2 Sheets-Sheet 1



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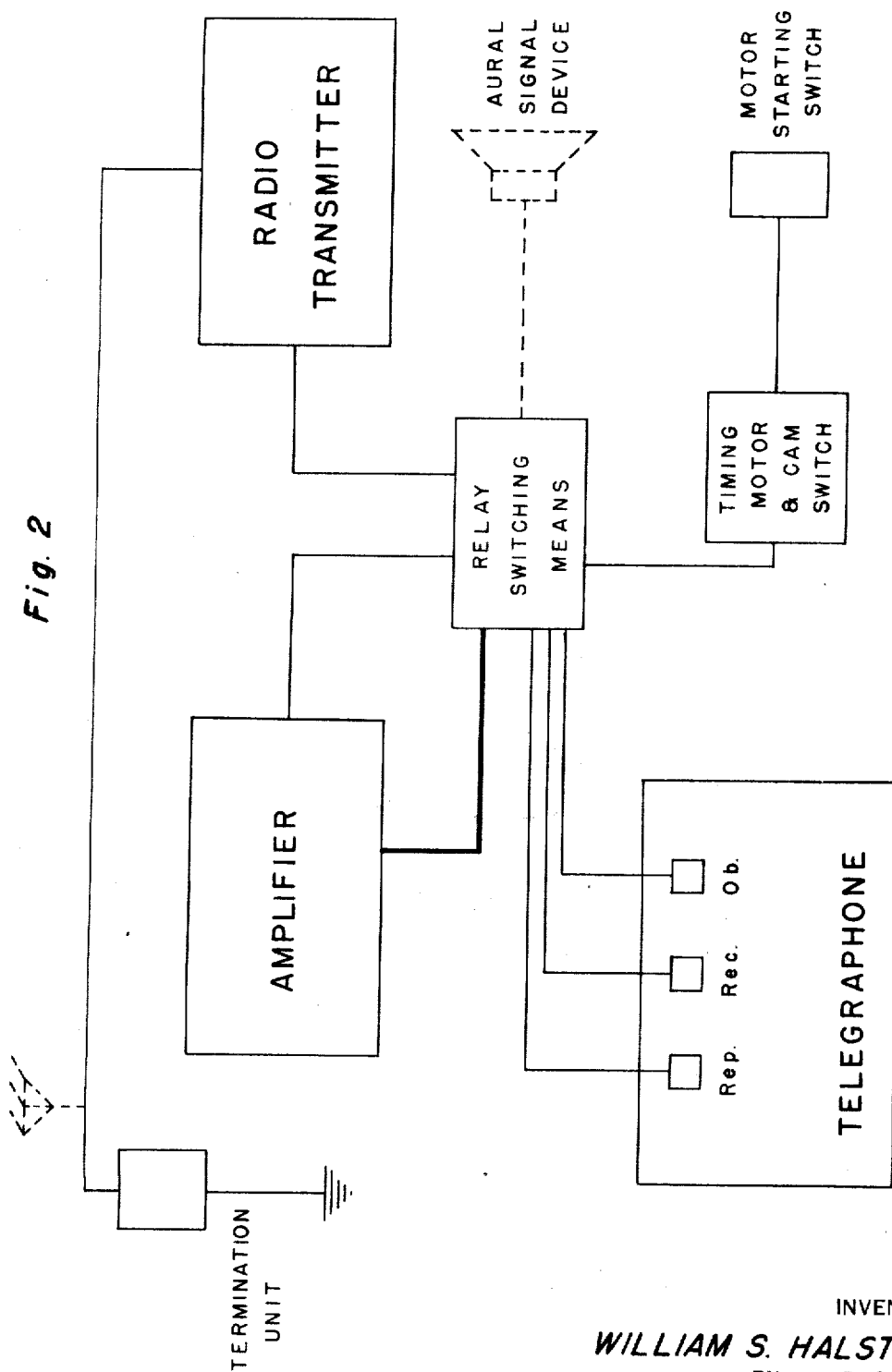
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AUTOMATIC RECORDING AND REPRODUCING SYSTEM

William S. Halstead, Huntington, N. Y.

Original application August 3, 1940, Serial No. 350,972. Divided and this application March 19, 1943, Serial No. 479,812

10 Claims. (Cl. 179-100.2)

This invention pertains in general to a signaling system and more particularly to a signaling system employing a telegraphone or equivalent recording medium which may be used for a traffic signaling and communication system.

This invention is a division of my co-pending application Ser. No. 350,972, filed August 3, 1940, for Traffic signaling system.

Heretofore, in systems employing a telegraphone device, wherein the magnetizable material has recorded thereon signaling intelligence or communications of any nature, it has been the practice to use individual controls to change from recording to reproducing. The present invention employs a momentary contact switch for initiating an obliterating and recording period, having a predetermined time cycle which is automatically transferred to a reproducing period. The change-over from recording to reproducing is automatic after the initiating of the timing motor. The play-back of the recorded signal or communication may be heard over an aural signal device, such as a loudspeaker or headset.

In the present disclosure a radio transmitter is used in conjunction with a radio antenna or wave guide depending on whether the signals are to be restricted to a specific signaling zone or not. At the end of the recording period, the reproducing period will be automatically started and the output of the amplifier will be automatically connected to the radio transmitter for re-broadcast in any desirable form.

The term wave guide, transmission line, radio antenna or other expressions may be used interchangeably and it is to be understood that any convenient method or device may be used from the output of the radio transmitter.

It is therefore an object of the present invention to provide a recording system with an automatic play-back, which play-back or reproduced signal may be connected to either an aural signal device, a radio transmitter, or both.

A further object of the invention is to provide a traffic signaling system whereby a recorded message may be made and reproduced automatically by a single actuation of the electrical contact.

A further object of the invention is to provide a traffic signaling system wherein a recording device or transcription of message may be changed so as to record and reproduce the recorded message by a single operating impulse.

Further and other objects may be and may become apparent to one skilled in the art without departing from the spirit of the present invention except as defined by the subjoined claims.

In the drawings:

Fig. 1 is a schematic diagram of an electronic amplifier and a radio transmitter used in conjunction with a telegraphone device having relay switching means for automatically recording and reproducing said recorded message to transmit same over a radio transmitter.

Fig. 2 is a block diagram of Fig. 1 showing generally important features of the invention and their approximate associated relation with one another.

In Figs. 1 and 2 a radio transmitter is shown as being connected to the output of the amplifier. However, it is pointed out that the telegraphone device may be used in a studio, home, school or other location. Consequently, the feature of a momentary electrical contact for initiating the complete recording and reproducing period may be employed with a telegraphone employing an aural signal device, such as a loudspeaker.

In actual use, without the radio transmitter for broadcasting in any form, the telegraphone device may be operated to initiate the recording period so that at the end of the recording period the reproducing period will begin and the intelligence impressed upon the magnetizable material of the telegraphone will be converted to aural intelligence which may be heard in a loudspeaker. When the telegraphone device is used in conjunction with a traffic signaling or communication system, the radio transmitter may be cut out of the circuit until after the recorded message has been played back for the purpose of monitoring to make sure that the message contains the proper information with the desired quality of recorded intelligence.

The invention pertains fundamentally to an automatic recording and reproducing system which may be used, such as, for entertainment and voice training, or in conjunction with a signaling system, such as, for traffic control or broadcasting.

In Figure 1 there is shown a modification of a zone transmitter and a repeating telegraphone or other sound storage unit for broadcasting signals to aurally instruct the operator of vehicles within the zone. The wave guide 230 parallels the lane to which the transmission is to be confined as illustrated in Figure 1.

The circuit illustrated provides means for impressing upon the wave guide 230 a carrier current modulated by signals recorded upon a telegraphone tape and in addition provides means whereby the message recorded upon the telegraphone tape may be altered.

A microphone is employed as hereinabove described for impressing signals upon the recording coils of the telegraphone and the circuit permits the utilization of the same electrical channels for both recording and reproduction.

The power line 231 is joined to a source of power which may be of the conventional low frequency alternating current type and through the transformer 232 currents are obtained to operate the heaters of the vacuum tubes and the anodes of the rectifier 233.

In the conventional manner, the alternating current is rectified and filtered by means of the filter chokes 234 and condensers 235. In addition, current derived from the power line is employed to operate the two sources of motive power 236 and 237. The source of motive power 236 continuously rotates a steel tape or wire 237 through a plurality of coils disposed thereabout. By means of coils 241 electrical variations corresponding to speech variations are impressed upon the tape 237 to produce the desired recording. The magnetic variations in the steel tape 237 cause corresponding fluctuations in voltage in pick-up coils 242 when moving therethrough and these electrical variations are impressed upon an amplifying and modulating circuit as will hereinafter be more completely described. Coil 243 is employed to remove any magnetic variations from the tape 237 when it is desired to change the message recorded thereon.

The switches 245 and 246 may be operated to selectively impress the speech voltages generated in pick-up coil 242 upon the modulating circuit; or electrical signals entering the microphone connection 251 upon the recording coils after having passed through the necessary amplifying circuits.

The transmitter employed in conjunction with the wave guide 230 is preferably of the crystal controlled type as illustrated in Figure 6 and the power requirements thereof will be determined by the particular transmission requirements, that is the length of the wave guide 230 and the like.

As illustrated, the transmitter comprises an oscillator tube 252, the frequency of which is controlled in the conventional manner by crystal 253. The required grid biasing is secured by means of resistor 254 and its associated by-pass condenser 255. The output of the oscillator is coupled from the anode thereof, by means of condenser 256 and resistor 258, to the grid of a power amplifier 257 which, as illustrated, is a beam power tube. The power amplifier may be of the well known class C type and modulation of the carrier wave may be effected within this amplifier.

During the transmission of the signal recorded upon the telegraphone tape the fluctuating voltage developed within the pick-up coil is transferred to the grid of a conventional amplifier 261 which is herein illustrated as a pentode. The anode circuit of this pentode is connected to the source of direct current through the load resistor 262 and as indicated, the screen grid and anode circuits employ a decoupling filter.

The amplified signal is then coupled by means of condenser 263 and volume control 264 to the grid 265 of another amplifying tube 266 which is herein illustrated as a duplex triode.

Another amplifier control grid 267 of this tube is joined through volume control 271 to the microphone connection. As indicated, both anodes of the duplex tube are joined together and thus the signal appearing across load resistor 272 will depend upon the signals impressed upon

both grids. The switches 245 and 246 insure that when signals are impressed upon one grid, the other is at ground potential or otherwise inoperative.

The anodes of the amplifying tube 266 are joined to the direct current source through load resistor 272 and as indicated through a decoupling filter 273 and the amplified signal is coupled by means of condenser 274 and resistor 275 to the control grid of an amplifier 276 which provides in the output thereof a signal large enough to modulate the carrier current originating at the oscillator.

The anode circuit of the amplifier 276 is electrically joined to the source of direct current through modulating transformer 277, the secondary of which is divided and contains a plurality of taps for reasons which will be more fully described.

One end of a section 278 of the secondary coil of transformer 277 drives a grid of the Class C power amplifier 257 through resistor 281 and is in addition joined to the anode of tube 257 through a radio frequency choke coil 282 and through the inductance 283 of the transmitting tank circuit. The other end of this section of the secondary coil is joined to one contact of the switching member 246. The radio frequency choke 282 is the filter system previously described for precluding radiations from the power supply.

The second section 285 of the secondary coil is joined to one pole of the switching member 245 and in addition to the source of high voltage through resistor 286. The opposite end of section 285 of the secondary and the center tap thereof are in addition joined to poles of the switch 246.

Also joined to contacts of switch 245 are both grids of amplifier tube 266. The direct current source is connected to a pole of switch 245 as shown. The recording coils 241 are joined through an equalizing network 291 to a contact of switch 246.

It may now be seen that the operation of switches 245 and 246 will provide means for permitting recording upon tape 237 or means for transmitting the message contained thereon over the wave guide 230. Thus when the switching member 245 is moved to the left as viewed in Figure 1 and the switching member 246 is moved to the right, the voltage generated in the pick-up coil 242 will be amplified in amplifier 261 and impressed upon the grid 265 of amplifier 266 while grid 267 of this tube will be grounded through switch 245. Accordingly the signal recorded upon the tape will be amplified by tube 266 and again by the beam power tube 276 and will be impressed on the secondary of the modulating transformer 277.

Switch 246 when in the position mentioned interconnects both sections of the secondary coil of modulating transformer 277 and switch 245 connects one end of the secondary to the source of direct current. The transformer 277 will function when the switches are thus oriented to modulate the carrier current supplied by oscillator 252.

The anode circuit of the class C amplifier 257 contains the tank circuit including inductance 283 and variable tuning condenser 292, and through condenser 293 the modulated carrier is coupled to the wave guide 230. This wave guide as previously described must be suitably terminated in order that the signals be confined to the particular lane while not interfering with

broadcast transmissions. Thus the wave guide 230 is grounded through variable resistor 294.

When it is desired to record upon the tape 237 switching member 245 is displaced to the right and switching member 246 to the left.

This orientation of the switches grounds grid 265 of the duplex tube 266 and thus voltage fluctuation in pick-up coil 242 are not amplified nor passed on to succeeding amplifying stages. On the other hand, grid 267 is no longer grounded and thus electrical variations entering through microphone connection 251 will be impressed upon grid 267 and amplified within the duplex tube 266. In the movement of switching member 245 from the left to the right as described, the resistor 288 is inserted between the anodes of tubes 257 and 252 and the source of direct current which results in a decrease in the anode potentials thereof thus rendering the tubes practically inoperative.

Also magnetizing coil 243 is joined to the source of high potential and thus the magnetic fluctuations within the tape are removed as the tape passes through its associated pole-pieces. Switching member 246 connects section 285 of the secondary of transformer 277 to the recording coils through the equalizing network 291 and thus signals entering the microphone connection 251 are amplified by tubes 266 and 276 and are impressed upon the recording coils 241.

It is obvious of course that the tape 237 must pass through magnetizing coils prior to its passage through the recording coil in order that the message previously recorded thereon be removed. The speech to be recorded is derived from a microphone as mentioned hereinabove which may be at the transmitter or which may be joined thereto over a telephone line as pointed out in connection with the preceding figures. The operation of the tape 237 is continuous at a speed determined by the motor 236.

The message which is to be recorded upon the tape 237 must be of a length predetermined to correspond approximately with the time required for the tape to complete one cycle of rotation. Thus I employ a small timing motor 237' to initiate the recording cycle when desired and terminate the same automatically. As illustrated, the motor 237' is started by momentarily depressing push button 305. This will actuate, by means of switch 300, the electromechanical device 301 to orient both switching members 245 and 246 to the positions previously described for recording. Thus signals entering through microphone connection 251 will be recorded upon the tape 237. Switch 306 is connected in parallel with push button 305 and is closed as rotation of the motor is commenced, thereby permitting the operator to release push button 305.

Upon the completion of a predetermined cycle, the motor 237' is automatically halted inasmuch as switch 306 is opened at the termination of each revolution and the circuit through electromechanical device 301 is thus automatically opened by means of switch 300. The switching members 245 and 246 then assume their normal orientation which is that required for the repeated broadcasting of the message contained upon the tape.

In Fig. 2 the block diagram shows a telegraph device having symbols Rep., Rec. and Ob., which stand respectively for reproducing, recording and obliterating heads. These three heads disposed within the telegraph device are small

coils having a pole piece disposed adjacent the magnetizable material, such as a steel tape.

A motor timing switch is shown connected to a timing motor and cam switch for controlling operation of the relay switching means. An amplifier having input and output conductors is also shown connected to the relay switching means. A radio transmitter is shown connected to the relay switching means with an output connected to a wave guide which leads to a termination unit. An aural signal device may be connected either independently or simultaneously with the radio transmitter.

The block diagram shows the general arrangements of certain parts of the system, but it is to be understood that this is only symbolic, and the schematic diagram shown in Figure 1 is a preferred embodiment of a specific disclosure. The radio antenna, shown dotted, may be used in lieu of the wave guide. It is to be understood that the transmitter output may be connected to any desirable element depending on the type of transmission desired.

Having shown and described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a signaling system employing a magnetic recording and reproducing device including a pick-up coil and a recording coil, a signal obliterating means, an amplifier, relay means for operably connecting the amplifier in cascade arrangement with either the pick-up coil or the recording coil, said pick-up coil and recording coil being connected with an input circuit and an output circuit, respectively, of said amplifier, so that said amplifier raises the level of the energy output of said pickup coil when connected thereto and delivers amplified energy input to said recording coil when connected thereto, said relay means automatically connecting a source of energy to the signal obliterating means when the amplifier is connected to the recording coil, a radio transmitter having a modulating circuit thereof operatively connected to an output of said amplifier when an input of said amplifier is connected with said pick-up coil, a source of anode potential for said radio transmitter, said radio transmitter being simultaneously connected by said relay means directly to said source of anode potential so as to be in operative condition when the amplifier is connected to the pick-up means.

2. An electronic recording and reproducing device comprising, in combination, a pick-up coil, a recording coil, and a signal obliterating means; an amplifier, relay means for operably connecting said amplifier in cascade arrangement with either said pick-up coil or with said recording coil during reproducing and recording periods, respectively, said relay means automatically connecting a source of energy to the signal obliterating means when the amplifier is connected to the recording coil, normally-open contact means connected in series with said relay means and a source of E. M. F., timing means including a motor and motor-driven cam for closing said contact means during a recording period of predetermined duration, and remote recording control means including a momentary contact switch in series with said motor for initiating operation of said timing means.

3. In a signaling system employing a magnetic recording and reproducing device including a pick-up coil and a recording coil, a signal obliterating means, an amplifier, relay means for op-

eratively connecting the amplifier in cascade arrangement with either the pick-up coil or the recording coil, said pick-up coil being connected with an input of said amplifier and said recording coil being connected with an output of said amplifier so that said amplifier raises the level of the energy output of said pick-up coil when connected thereto and delivers amplified energy input to said recording coil when connected thereto, a radio transmitter having a power circuit operably connected by said relay means for energizing said signal obliterating means when said amplifier is operatively connected in cascade arrangement with said recording coil and for energizing said transmitter when said amplifier is operatively connected in cascade arrangement with said pick-up coil, and circuit means also connected with said relay means for operatively connecting said amplifier as a modulator of said transmitter when said amplifier is operatively connected with said pick-up coil.

4. In a recording and reproducing system, a magnetic recording and reproducing device including a pick-up coil, a recording coil, and a signal obliterating means; an electronic amplifier, a signal source external to said recording and reproducing device, relay means for operatively connecting an input circuit of said amplifier either with said pick-up coil or with said signal source during reproducing and recording periods, respectively, said relay means also connecting an output circuit of said amplifier to said recording coil and connecting a source of E. M. F. to said signal obliterating means during recording periods, a timing means including a motor and motor-actuated contact-closure means for operating said relay means during a recording period of predetermined duration, switching means remote from said relay means and said timing means for initiating operation of said timing means, and a stick circuit for said timing means to maintain operation of said timing means throughout the recording period.

5. A magnetic recording and reproducing system of the class described comprising a magnetizable material of closed-loop type for recording signal intelligence thereon, means for moving said magnetizable material, signal pick-up, recording, and obliterating means disposed adjacent said magnetizable material, electronic amplifier means, relay switching means for operably connecting said amplifier means and said pick-up means to effect reproduction of signals impressed on said magnetizable material and for operably connecting said amplifier means to said recording means and for connecting said obliterating means to effect recording of signals on said magnetizable material during recording periods, contact means connected in series with said relay means and a source of E. M. F., timing means for closing said contact means during a predetermined recording cycle, the time of said recording cycle being substantially equal to the time required for said magnetizable material of closed-loop type to make one complete revolution, and a momentary contact switch for initiating the operation of said timing motor.

6. A magnetic recording and reproducing system of the class described comprising a magnetizable material of closed-loop type for recording signal intelligence thereon, a motor for continuously moving said magnetizable material, a signal pick-up coil, a recording coil, said coils being disposed adjacent said magnetizable material, electronic amplifier means, relay switching

means for normally connecting said amplifier means and said pick-up coil for amplifying signals impressed on said magnetizable material and for operably connecting said amplifier means to said recording coil during a predetermined recording period, a timing motor for establishing the predetermined recording period, the time of said recording period being substantially equal to the time required for said magnetizable material of closed-loop type to make one complete revolution, contact means operated by said timing motor and connected in series with said relay means and a source of E. M. F. for operating said relay means only during the predetermined recording period, and a momentary contact switch for initiating the operation of said timing motor.

7. In a system of the class described comprising a magnetizable material for recording signal intelligence thereon, a motor for continuously moving said magnetizable material, a signal pick-up coil, a recording coil, said coils being disposed adjacent said magnetizable material, a signal amplifier, a source of high frequency carrier wave energy, means for modulating said carrier wave energy, relay switching means normally connecting said amplifier and modulating means in cascade arrangement with said pick-up coil to effect modulation of carrier wave energy during reproducing periods, said relay switching means operatively connecting said amplifier with said recording coil during recording periods, a timing motor for establishing a predetermined recording period, contact means operated by said timing motor and connected in series with said relay means and a source of E. M. F. for operating said relay only during the predetermined recording period, and a momentary contact switch for initiating the operation of said timing motor.

8. An electronic recording and reproducing device comprising, in combination, a pick-up coil, a recording coil, and a signal obliterating means; an amplifier, relay means for operably connecting said amplifier in cascade arrangement with either said pick-up coil or with said recording coil during reproducing and recording periods, respectively, said relay means automatically connecting a source of energy to the signal obliterating means when the amplifier is connected to the recording coil, normally open contact means connected in series with said relay means and a source of E. M. F., timing means including a motor and motor-driven cam for closing said contact means during a recording period of predetermined duration, a recording control switch having normally open contacts connected in series with said motor and a source of E. M. F. for initiating operation of said timing means, and normally open contact means connected in shunt with said recording control switch, said last mentioned contact means being closed by movement of said cam during the recording period.

9. In a signaling system employing a magnetic recording and reproducing device including a pick-up coil and a recording coil, a signal obliterating means, an amplifier, relay means for operably connecting the amplifier in cascade arrangement with either the pick-up coil or the recording coil so that said amplifier raises the level of the energy output of said pickup coil when connected thereto and delivers amplified energy input to said recording coil when connected thereto, said pick-up coil being connected to the amplifier input, and said recording coil being connected to the amplifier output respectively,

said relay means automatically connecting a source of energy to the signal obliterating means when the amplifier is connected to the recording coil, normally open contact means serially connected with the relay means and a source of E. M. F. for energizing said relay means, a timing means including a motor for closing said normally open contact means for a predetermined period of time, motor-initiating contact means connected in series with the motor of said timing device for initiating operation of said motor, a radio transmitter having a modulating circuit thereof operatively connected with said amplifier when said amplifier is connected with said pick-up coil, a source of anode potential for said radio transmitter, and signal emitting means connected to the output of said radio transmitter, said radio transmitter being connected by said relay means directly to said source of anode potential when the amplifier is connected to the pick-up means.

10. A signaling system employing a magnetic recording and reproducing device including a pick-up coil and a recording coil, a signal obliterating means, an amplifier, relay means for operably connecting the amplifier in cascade arrangement with either the pick-up coil or the

recording coil, said pick-up coil being connected to an input circuit of said amplifier and said recording coil being connected to an output circuit of said amplifier so that said amplifier raises the level of the energy output of said pick-up coil when connected thereto and delivers amplified energy input to said recording coil when connected thereto, said relay means automatically connecting a source of energy to the signal obliterating means when the amplifier is connected to the recording coil, normally open contact means connected in series with the relay means and a source of E. M. F. for energizing said relay means, a timing means including a motor for closing said normally open contact means for a predetermined period of time, a radio transmitter having a modulating circuit thereof operably connected with said amplifier when said amplifier is operably connected with said pick-up coil, a source of anode potential for said radio transmitter, said radio transmitter also being operably connected by said relay means directly to said source of anode potential when the amplifier is operably connected to the pick-up coil, and signal emitting means connected to the output of said radio transmitter.

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DISCLAIMER

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Hereby enters this disclaimer to claims 2, 4, 5, 6, and 8 in said specification.
[Official Gazette Sept. 16, 1947.]

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