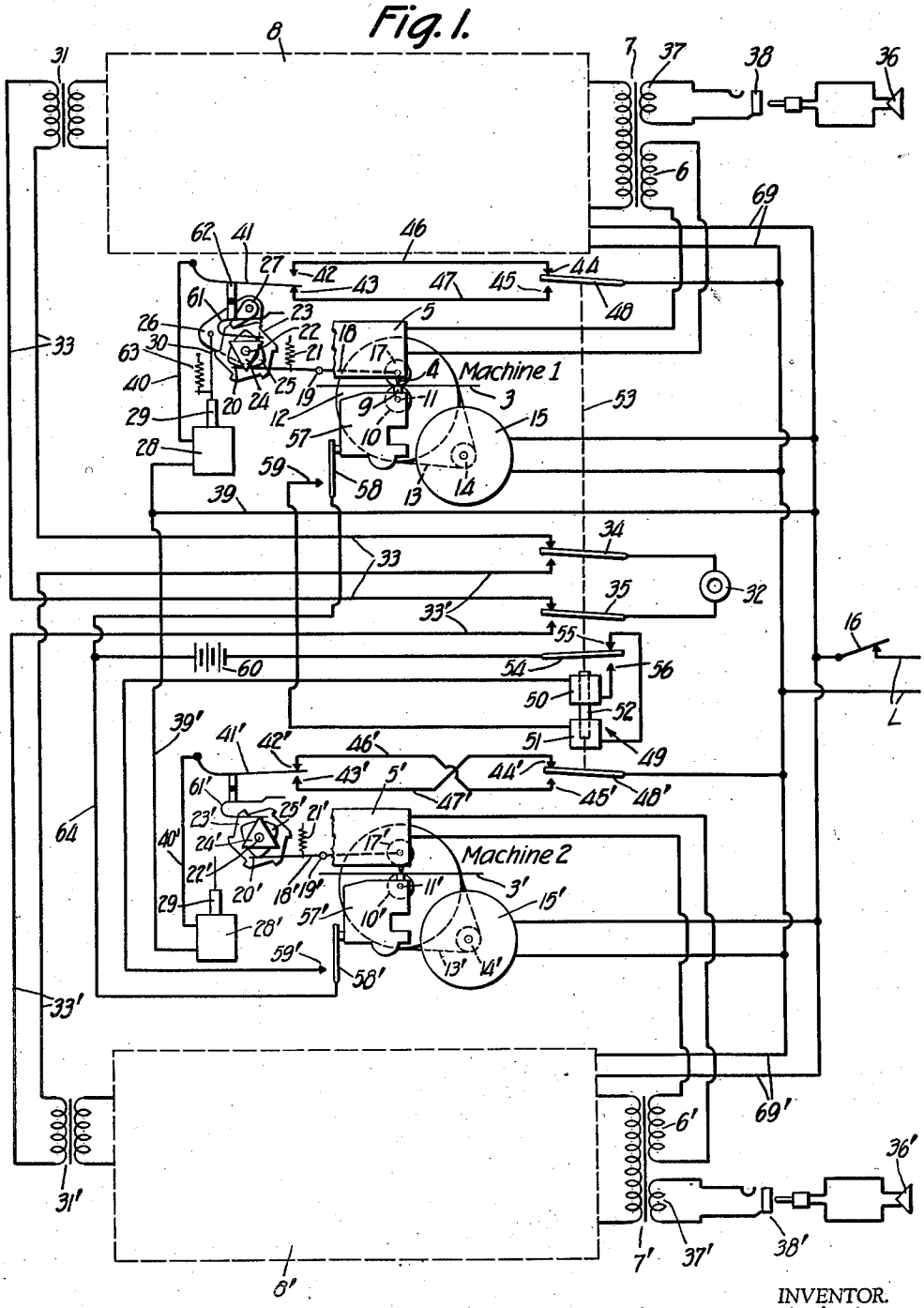
Sept. 26, 1944. F. C. W. THIEDE 2,359,061

MEANS FOR RECORDING SIGNALS

Filed June 25, 1941 2 Sheets-Sheet 1

Fig. 1.



INVENTOR.
Ferdinand C. W. Thiede
BY Moses & Nolte
ATTORNEYS

Sept. 26, 1944. F. C. W. THIEDE 2,359,061

MEANS FOR RECORDING SIGNALS

Filed June 25, 1941 2 Sheets-Sheet 2

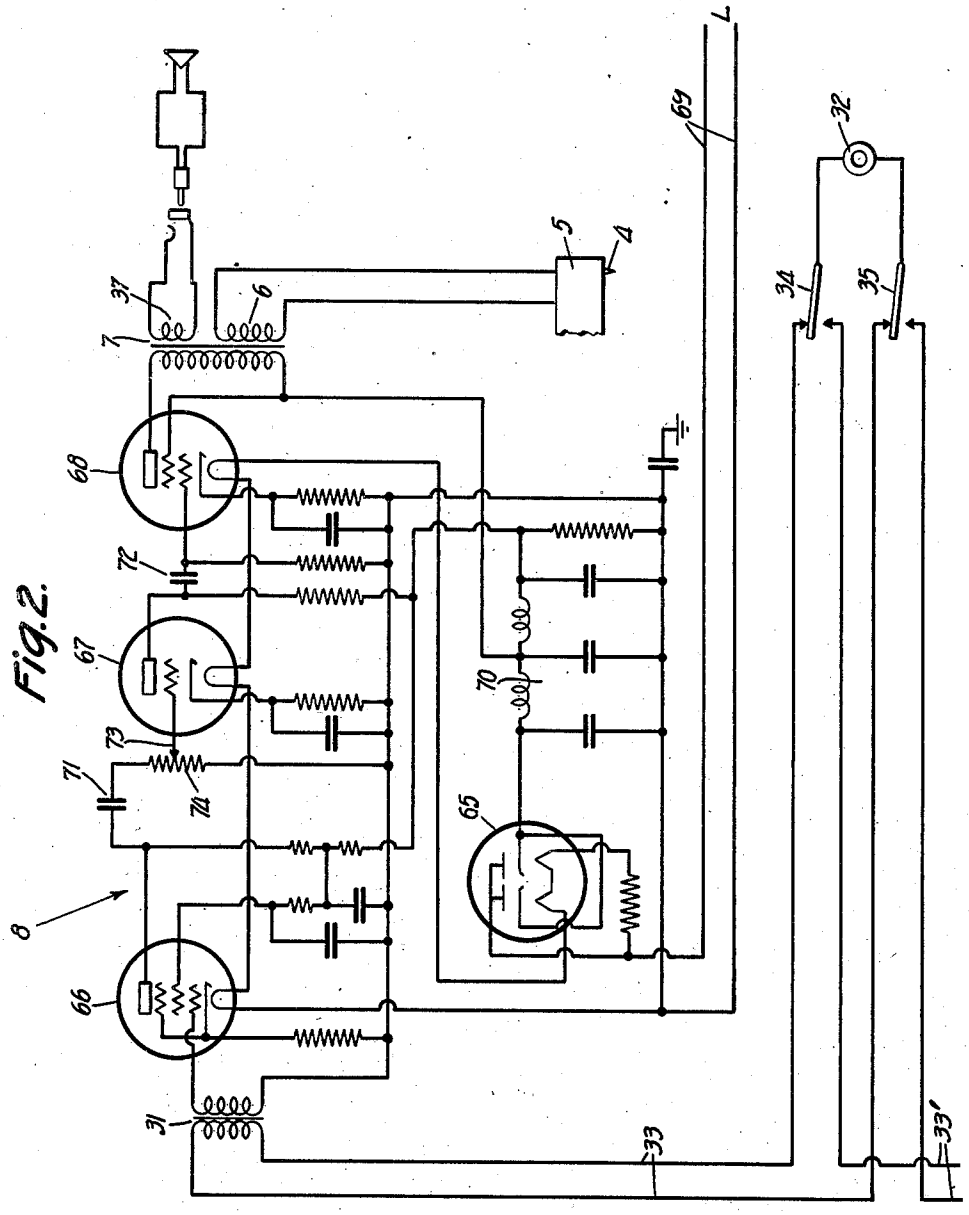


Fig. 2.

INVENTOR.
Ferdinand C.W. Thiede
BY Moses & Nolte
ATTORNEYS

Patented Sept. 26, 1944

2,359,061

UNITED STATES PATENT OFFICE

2,359,061

MEANS FOR RECORDING SIGNALS

Ferdinand C. W. Thiede, Hempstead, N. Y., assignor to B. A. Proctor Company, Inc., New York, N. Y., a corporation of New York

Application June 25, 1941, Serial No. 399,614

8 Claims. (Cl. 179—100.4)

This invention relates to the recording of dictation or other signals on a plurality of records. A means and method for recording such signals on the records of three recording machines is disclosed in my patent application Ser. No. 357,245, filed September 18, 1940, now Patent No. 2,353,422. In said application a step-by-step switching device is provided for causing the recording to proceed on the next succeeding machine of a bank of machines as soon as, or just before, the recording on a preceding machine has been completed. It is an object of the present invention to provide a simplified switching arrangement in connection with a recording device which includes two similar recording machines in which the recording is commenced and continued on a record of the first machine and upon the completion of the record on the first machine, the record of a second machine is automatically started and the recording then proceeds on the record of the second machine. If the recording is of such a length as to occupy more than two records, the full record of the first machine is replaced by a blank record while the recording is proceeding on the second machine. Upon the completion of the record on the second machine, means is provided whereby the first machine is automatically started and the recording then proceeds on the blank record which has been placed thereupon. This process is continued until the dictation or other signal has been completely recorded, means being provided whereby the record of each machine is automatically started as soon as the record on the other machine becomes filled.

It is a further object of the invention to provide a method and means for recording signals whereby any loss of signal during the shift-over from one machine to the next is prevented. By using very thin flexible records of the type disclosed in patent application Ser. No. 218,082, filed July 8, 1938, in the names of Barton A. Proctor and Ferdinand C. W. Thiede, now Patent No. 2,296,870, and supporting each record on a stationary support as disclosed in said application, instead of on the usual turntable which has a large inertia, the record on the second machine may be started substantially instantaneously upon the completion of the record on the first machine so that there is no loss of signal during the transfer of the recording from one machine to the next even though there is no overlap in the recording on the two machines such as provided for in the aforesaid application Serial No. 357,345.

Another object of the invention relates to the provision of a simple form of switch device in the form of a double throw relay for causing the rotation of the record of the next machine when the record on the active machine is completed. This relay is preferably controlled by means of an electrical circuit including a switch on each recording machine which is actuated by the lateral movement of a carriage on which the record is mounted.

In order to prevent the recording stylus of the first machine from continuously operating while it remains at rest on the completed record thereof and thus damaging it by cutting a hole therein while the recording is proceeding on the second machine, it is a further object of the invention to provide means whereby the aforementioned double throw relay causes the signal source as, for example, a microphone to become disconnected from the input of the first machine as soon as the recording on the second machine commences. By means of the described arrangement, the recording stylus of one machine remains at rest while the recording is proceeding on the other machine so that the presence of an attendant to lift the recording stylus of a machine off its record as soon as the recording thereon stops is not necessary in order to prevent injury to the recorded record. Other and further objects of the invention will become apparent to those skilled in the art as the description thereof proceeds. For a better understanding of the invention, reference is made to the following description taken in connection with the accompanying drawings in which the same reference numeral is used to indicate the same part in the different figures, in which

Fig. 1 illustrates schematically an embodiment of the invention employing two recording machines; and

Fig. 2 illustrates portions of the recording machines shown in Figure 1 and includes the schematic circuit diagram of an amplifier device on one of the machines.

Referring to Fig. 1, the invention is shown in connection with two recording machines numbered 1 and 2, each machine preferably being of the type described in the aforementioned application Ser. No. 218,082 for recording dictation on a very thin flexible cellulose acetate record 3 which is supported on a stationary support (not shown). The recording is effected by a recording stylus 4 of a recording unit 5 to which the amplified signal currents to be recorded are supplied by the secondary winding 6 of a trans-

former 7 which is connected to the output terminals of an amplifier 8. The record 3 is mounted on and rotates a vertical record spindle 9, the lower surface of the record being in engagement with a lower feed roller 10, secured to a shaft 11 which carries a large pulley 12. The pulley 12 is driven by means of a belt 13 which passes over a motor pulley 14 of an electric motor 15, supplied with current from the power lines L, upon the closure of a switch 16. For simplicity the record 3 has been illustrated as plane, but it will be understood that it is preferably curved over a turtleback support, as shown in the aforementioned application Ser. No 218,082.

Mounted above the record and opposite the lower feed roller 10 is an upper feed roller 17 which may be an idler roller or may be positively driven in a direction opposite to the feed roller 10 by means not herein shown, when brought into engagement with the record. The friction roller 17 is mounted on a lever arm 18 pivoted at 19 and having a tail piece 20 biased upwardly by means of a spring 21. The mechanical means for moving the feed roller 17 into and out of engagement with the record 3 is similar to that disclosed in application Ser. No. 281,811 and comprises a shaft 22 carrying a ratchet wheel 23 and a pair of cams 24 and 25, each of which has three high points and three low points, as shown. For rotating the ratchet wheel 23, a pawl carrying lever 26 is pivoted on the shaft 22 and carries a pawl 27 adapted to actuate the ratchet. For rotating the pawl lever 26 a solenoid 28 is provided, the plunger 29 of which is connected by means of a link 30 to the pawl lever 26.

The amplifiers 8, 8' of the recording machines are provided with input transformers 31, 31' to the primary windings of which the signal source, herein illustrated as a microphone 32, is adapted to be selectively connected by the pairs of leads 33, 33' and the switch blades 34, 35. While the source of the signals to be recorded is shown as a microphone into which the dictator speaks, it will be understood that the source of signals may be the output of a radio receiver or other known signal source. Each machine is also provided with a monitoring loud speaker 36 which may be connected to a secondary winding 37 of the transformer 7 through the circuit shown including a jack 38. This arrangement permits the machine operator to monitor the signal being recorded and to regulate the output volume of the amplifier 8 to provide for optimum recording results by means of a volume control device incorporated in the amplifier 8 and hereinafter described.

Important features and objects of the present invention have to do with the means for controlling the energizing current of the solenoids 28, 28'. The circuit connecting the solenoid coil 28 across the supply lines L is shown as comprising a lead 39 and a lead 40 terminating in a movable switch blade 41 disposed between the contacts 42, 43 which are connected to a similar pair of contacts 44, 45 by the upper and lower conductors 46, 47. The other side of the lines L is connected to a switch blade 48, the movable end of which is disposed between the contacts 44, 45 as shown. In order to secure alternate operation of the two machines, the conductors 46', 47' of machine No. 2 are crossed over to provide the circuit connections shown. A double throw relay 49 having upper and lower windings 50 and 51 is provided with a plunger 52 movable within the relay windings and connected to the switch blades 48, 48', 34 and 35 by a link 53 which also serves to actuate a fifth switch blade 54. The end of switch blade 54 is movable between a pair of upper and lower contacts 55, 56 which are connected to the ends of the relay windings 51 and 50, respectively.

With the relay plunger 52 and its connected switch blades in the position shown in Fig. 1, recording is proceeding on machine No. 1, its record 3 being rotated by the feed rollers 11—17 and voice currents being supplied to the input of its amplifier 8 from the microphone 32 by means of the circuit shown including the leads 33 and switch blades 34—35. The record 3' of machine No. 2 is at rest since, although its motor 15' is running, its upper feed roller 17' is held out of engagement with the record by the lever 18'. When the recording on record 3 is completed and this record is full, a movable carriage frame 57 comes to the end of its travel, having been transported sidewise in a direction to carry the center of the record 3 away from the recording stylus 4 by a screw and nut device (not shown) described in the aforementioned application Ser. No. 218,082. The carriage frame 57 carries a switch blade 58 arranged in its end position to engage a stationary switch contact 59 and thereby complete a circuit through the lower winding 51 of relay 49, contact 55, switch 54 and a local battery 60. Passage of current through this circuit causes the relay 49 to operate, its plunger 52 being drawn down with the result that the switches 48, 34, 35, 54 and 48' are all moved into their lower positions by the link 53.

The movement of the switch 48 into engagement with lower contact 45 completes a circuit through the winding of solenoid 28, said circuit including switch 48, contact 45, conductor 47, contact 43, switch blade 41, lead 40, solenoid coil 28, lead 39 and the power supply lines L. Energization of solenoid 28 causes its plunger 29 to be drawn down and rotate the pawl lever 26, thus causing the pawl 27 to advance ratchet wheel 23 and the cams 24—25 through an angle of 60°, so that the high point on cam 25 depresses the tail piece 20 of lever 18 and elevates the feed roller 17 out of engagement with the record 3 so that the record is no longer driven and immediately comes to rest, there being no rotating turntable having a large inertia tending to continue its rotation. Rotation of the cam 24 causes a high point thereon to engage a spring 61 which is connected to the switch blade 41 by an insulating rod 62 and raises the switch blade 41, thereby breaking the energizing circuit of solenoid 28 at contact 43 and locking the switch 41 in its upper position in engagement with contact 42. Upon the deenergization of solenoid 28 its plunger 29 is returned to its upper position, as shown, by a spring 63 one end of which is attached to the link 30 and the pawl 27 is retracted to its initial position where it engages the next ratchet tooth.

Simultaneously with the stopping of machine No. 1, the record of machine No. 2 is started rotating, and the microphone 32 is connected to the input of amplifier 8' in the following manner. The movement of switch blades 34—35 into their lower position causes the microphone 32 to become connected to the primary winding of transformer 31' through the circuit shown including the switch blades 34—35 and the leads 33' so that the amplified voice currents are applied to the secondary winding 6' and the recording unit 5', thereby causing the operation of the recording stylus 4'. It will also be noted that movement

of the switch blade 48' into its lower position has set up a circuit across the power lines L which causes the solenoid 28' to become energized, said circuit including the switch blade 48', contact 45', conductor 46', switch 41', lead 40', solenoid winding 28', lead 39' and lead 39. Energization of solenoid 28' causes its plunger 29' to be drawn down and rotate the ratchet wheel 23' and the cams 24', 25' through an angle of 60° by mechanical connections (not shown) similar to those above described in connection with the solenoid 28. The withdrawal of the high point of cam 25' away from the tail piece 20' of lever 18' permits the lever to be rotated clockwise so that the upper feed roller 17' is moved into firm engagement with the upper surface of the record 3' under the action of the spring 21'. The rotation of the record 3' immediately commences and the recording of the dictation continues on the record of machine No. 2. The energizing circuit of solenoid 28' is also broken at the contact 42', the rotation of the high point of cam 24' away from the spring 61' permitting the switch blade 41' to drop into its lower position in engagement with contact 43'. Since the stylus 4 of machine No. 1 is not being actuated while recording is taking place on machine No. 2, no harm will be done by it to the record 3 of the first machine should the operator inadvertently neglect to raise it from the record and reload the machine with a blank record as soon as the recording on the first machine is completed and its record is full. Should the dictation be so long as to require more than two records for its complete recording, it will be understood that the operator will remove the recorded record from machine No. 1 while the recording is proceeding on machine No. 2 and will apply a blank record and return the record carriage 57 of machine No. 1 to its initial position shown, thereby withdrawing switch blade 58 from its cooperating switch contact 59 and conditioning machine No. 1 to continue the recording thereon.

Upon the record 3' being completed, the recording is continued on the blank record 3 of machine No. 1 as follows. Upon the carriage 57' reaching its extreme position to the left, its switch blade 58' engages contact 59' thereby completing a circuit through the local battery 60, switch 54, contact 56, upper winding 50 of relay 49, contact 59', switch 58' and lead 64, thus operating the relay 49. Movement of the relay plunger 52 upwardly into the position shown causes the link 53 to return all the switch blades 48, 34, 35, 54 and 48' into their upper or initial positions, as shown. Movement of the switch blade 48' into engagement with the upper contact 44' completes a circuit through the winding of solenoid 28' across the power lines L causing the energization of this solenoid and the rotation of the ratchet wheel 23' and cams 24', 25' through an angle of 60° into the position shown. The cam 25' causes the tail piece 20' to be lowered and the upper feed roller 17' to be elevated above the completed record 3' so that this record immediately comes to rest. Rotation of the cam 24' causes the spring 61 to be raised which in turn raises the switch blade 41' into its upper position thereby breaking the energizing circuit of solenoid 28' at contact 43'. Movement of the switch blades 34—35 into their upper position disconnects the microphone 32 from the input of amplifier 8' and reconnects it to the input of amplifier 8 through the circuit shown and heretofore described. Movement of the switch blade 48 into its upper position, as shown, completes the energizing circuit of solenoid 28, said circuit including the power lines L, switch 48, conductor 46, contact 42, switch 41, lead 40, solenoid winding 28 and lead 39. Operation of the solenoid 28 causes its plunger 29 to rotate the ratchet wheel 23 and the cams 24—25 so that a low point on cam 25 permits the feed roller 17 to be moved into the position shown in firm engagement with the upper surface of record 3, thereby causing the immediate rotation of said record and the continuation of the recording thereon. The withdrawal of the high point on cam 24 away from the spring 61 permits the switch blade 41 to drop down into its lower position thereby breaking the energizing circuit of solenoid 28 at contact 42, so that its plunger 29 and associated parts are returned to their upper initial position under the action of the spring 63.

The recording may be continued in the manner described on the two machines until the entire dictation or other communication or signal has been completely recorded on two or more records, the operator loading one machine with a blank record and returning its record carriage to its initial position while the recording operation is proceeding on the other machine. The invention thus provides means involving the use of only two recording machines which is especially adapted for the continuous recording of long letters, notes, memoranda, broadcast radio programs, programs sent by wired wireless, code signals or other known type of signaling communication.

The amplifiers 8 and 8' may be of the type disclosed in the aforementioned application Ser. No. 353,612, the amplifier 8 shown schematically in Fig. 2 comprising a rectifier tube 65 and three amplifying tubes 66, 67 and 68. Current is supplied to the rectifier 65 from the power lines L through the leads 69 and the output of the rectifier, after passing through a suitable filter circuit 70, is applied to the several electrodes of the tubes 66, 67 and 68 through the circuits shown. The tubes 66—67 and 67—68 are coupled together by the resistance networks shown which include the coupling condensers 71 and 72. The grid of tube 67 is connected to a contact 73 which is adjustable along a resistor 74 and provides an efficient volume control device suitable for regulating the output volume of the amplifier in such a manner as to cause the recording stylus 4 to properly deform the record material and form a sound track thereon which is a faithful representation of the original sound.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. A device for recording a signal on a plurality of thin disc records comprising, in combination, a first transmission means including opposed friction rolls of small inertia for directly engaging and driving a first record, a second transmission means including opposed friction rolls of small inertia for directly engaging and driving a second record, continuously running motive means for driving the respective records through the respective transmission means, a control member reciprocable between two limit positions, a first recording means operable on said first record, a second recording means operable on said second record, means responsive to the positioning of said control member in one limit po-

sition thereof to establish the drive of the first record through pressing the opposed friction rolls toward one another and directly against opposite faces of the record and to render said first recording means effective to record a portion of the signal on the first record only, means automatically responsive to the driving means of the first record as the first record becomes exhausted to move said control member into its second limit position, and means automatically responsive to the positioning of the control member in its second limit position to establish the drive of the second record through pressing the opposed friction rolls toward one another and directly against opposite faces of the record and to render the second recording means effective to record a subsequent portion of the signal on the second record only and simultaneously to interrupt the drive of the first record by separation of the friction rollers which engage it and to render the first recording means ineffective to record any part of the subsequent portion of the signal on the first record.

2. A device for recording a signal on a plurality of records comprising, in combination, means for driving a first record, means for driving a second record, a control member reciprocable between two limit positions, a first recording means operable on said first record, a second recording means operable on said second record, means responsive to the positioning of said control member in one limit position thereof to render said first recording means effective to record a portion of the signal on the first record, means automatically responsive to the driving means of the first record as the first record becomes exhausted to move said control member into its second limit position, and means automatically responsive to the positioning of the control member in its second limit position to render the second recording means effective to record a subsequent portion of the signal on the second record, a single microphone for supplying signal currents to both the first and second recording means, and a two position switch electrically connected to the terminals of said mcrophone and mechanically connected to said control member.

3. A device for recording a signal on a plurality of records comprising, in combination, means for driving a first record, means for driving a second record, a control member reciprocable between two limit positions, a first recording means operable on said first record, a second recording means operable on said second record, means responsive to the positioning of said control member in one limit position thereof to render said first recording means effective to record a portion of the signal on the first record, means automatically responsive to the driving means of the first record as the first record becomes exhausted to move said control member into its second limit position, and means automatically responsive to the positioning of the control member in its second limit position to render the second recording means effective to record a subsequent portion of the signal on the second record, the means for driving the first and second records comprising a pair of electric motors, and means for causing the continuous rotation of both said motors during the recording of the entire signal.

4. A device for recording a signal on at least three thin disc records comprising, in combination, means for rotating and bodily translating a first and later a third disc record, means for rotating and bodily translating a second disc record, a control member reciprocable between two limit positions, a first recording means operable on said first record and later on said third record, a second recording means operable on said second record, means responsive to the positioning of said control member in one limit position thereof to render said first recording means effective to record a portion of the signal on the first record, means automatically responsive to the driving means of the first record as the first record becomes exhausted to move said control member into its second limit position, means automatically responsive to the positioning of the control member in its second limit position to render the second recording means effective to record a subsequent portion of the signal on the second record, means automatically responsive to the driving means of the second record as the second record becomes exhausted to return said control member to its first limit position, and means automatically responsive to the positioning of the control member in its first limit position to render the first recording means effective to record the remaining portion of the signal on the third record.

5. A device for recording a signal on a plurality of thin disc records comprising, in combination, means for rotating a first disc record comprising a pair of opposed record engaging feed rolls, means for rotating a second disc record comprising a pair of opposed record engaging feed rolls, a first recording means operable on said first record, a second recording means operable on said second record, a relay having a pair of windings and an armature, means for passing a current through one of said relay windings to adjust said armature into a first limit position thereof, means connected to said armature to render said first recording means effective to record a portion of the signal on the first disc record only and to establish the drive of said record means automatically responsive to the driving means of the first record as the first record becomes exhausted to cause the passage of a current through the other of said relay windings to adjust said armature into a second limit position thereof, and means connected to said armature and automatically responsive to the adjustment thereof into its second limit position to render the second recording means effective to record a subsequent portion of the signal on the second disc record only and to establish the drive of said record.

6. A device for recording a signal on a plurality of records comprising, in combination, means for driving a first record, a second means for driving a second record, a first recording means operable on the first record, a first amplifying device having its output terminals connected to said recording means, a second recording means operable on the second record, a second amplifying device having its output terminals connected to said second recording means, a relay having a pair of windings and an armature, means for passing a current through one of said relay windings to adjust said armature into a first limit position thereof, a microphone, means responsive to the positioning of said armature in its first limit position for connecting said microphone to the input terminals of the first amplifying device and for rendering said first driving means effective for driving the first record whereby a portion of the signal is recorded on the first record only, means automatically responsive to the driving means of the first record as the first record be-

comes exhausted to cause the passage of a current through the other of said relay windings and thereby adjust said armature into a second limit position thereof, and means automatically responsive to the adjustment of said armature into its second limit position for connecting said microphone to the input terminals of the second amplifying device and for rendering said second driving means effective to drive the second record whereby a subsequent portion of the signal is recorded on the second record.

7. A device for recording a signal on a plurality of disc records comprising, in combination, means comprising a first friction roller for rotating a first disc record, means comprising a second friction roller for rotating a second disc record, a first recording means operable on the first record, a second recording means operable on the second record, a relay having a pair of windings and an armature, means for passing current through one of said relay windings to adjust said armature into a first limit position thereof, means connected to said armature to cause said first friction roller to be moved into engagement with the surface of the first record to cause the rotation thereof and to also render said first recording means effective to record a portion of the signal on the first disc record only, means automatically responsive to the rotation of the first record as said record becomes exhausted to cause the passage of current through the other of said relay windings to adjust said armature into a second limit position thereof, and means automatically responsive to the adjustment of the armature into its second limit position, to cause said second friction roller to be moved into engagement with the surface of the second record to cause the rotation thereof and to also render said second recording means effective to record a subsequent portion of the signal on the second disc record.

8. A recording device as claimed in claim 7 in which each of the first and second records comprises a thin disc of freely flexible material and in which additional friction rollers are arranged to engage the lower surfaces of the records at regions thereon opposite the said first and second friction rollers.

FERDINAND C. W. THIEDE.