

June 8, 1943.

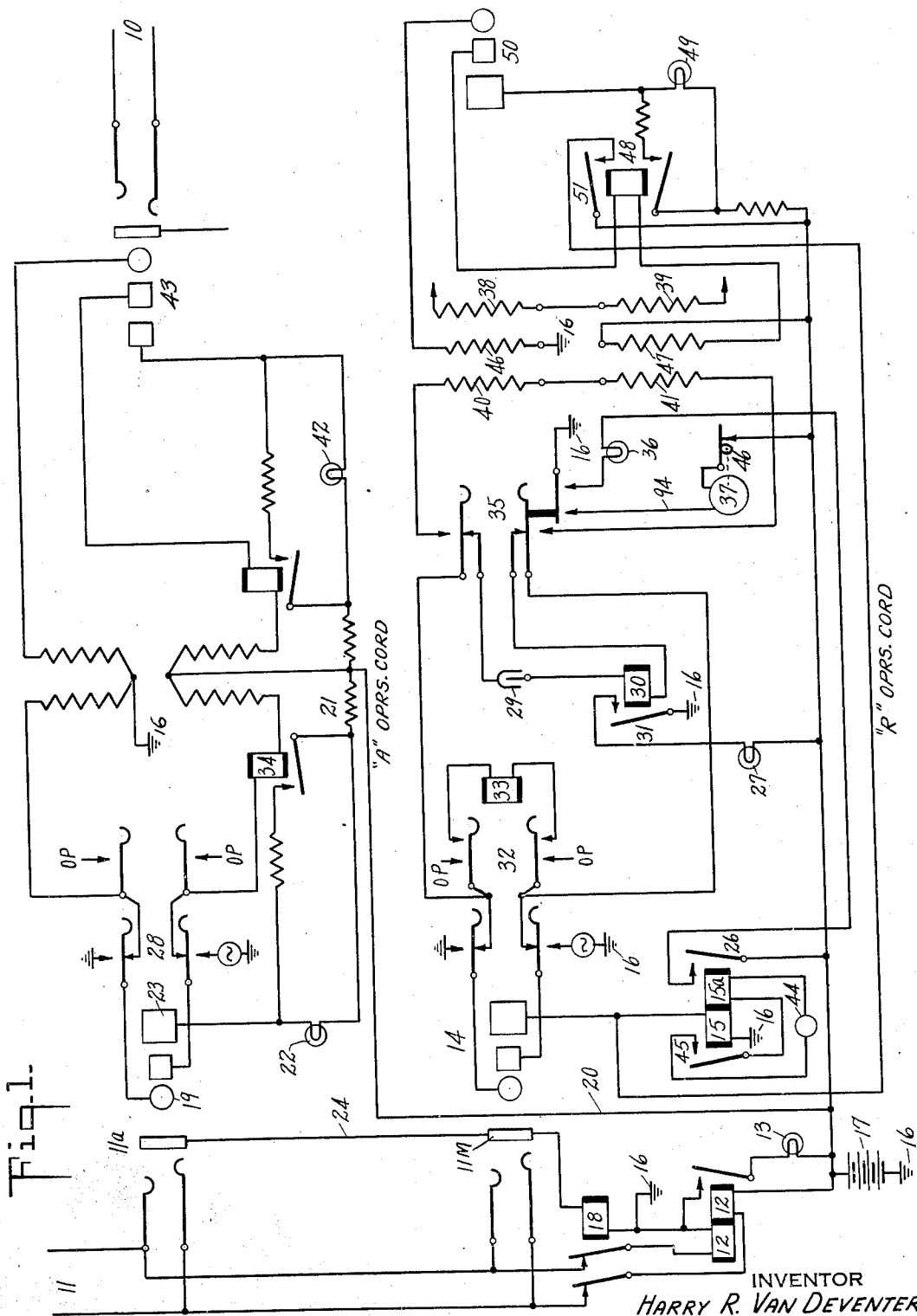
H. R. VAN DEVENTER

2,321,053

TELEPHONE SYSTEM EMPLOYING PHONOGRAPHS

Filed Jan. 13, 1942.

3 Sheets-Sheet 1



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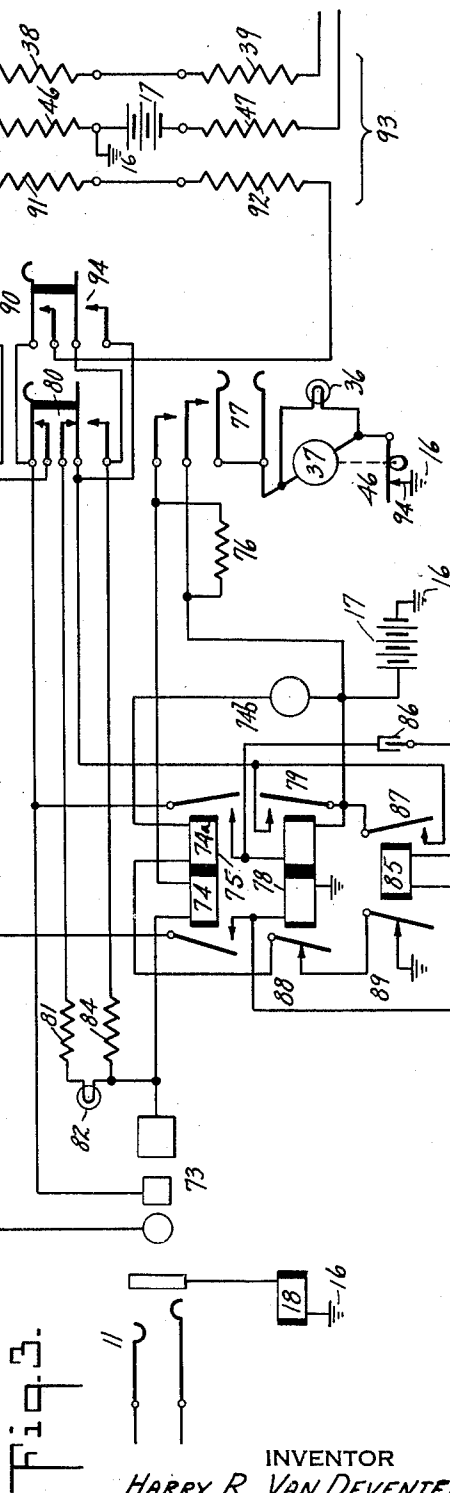
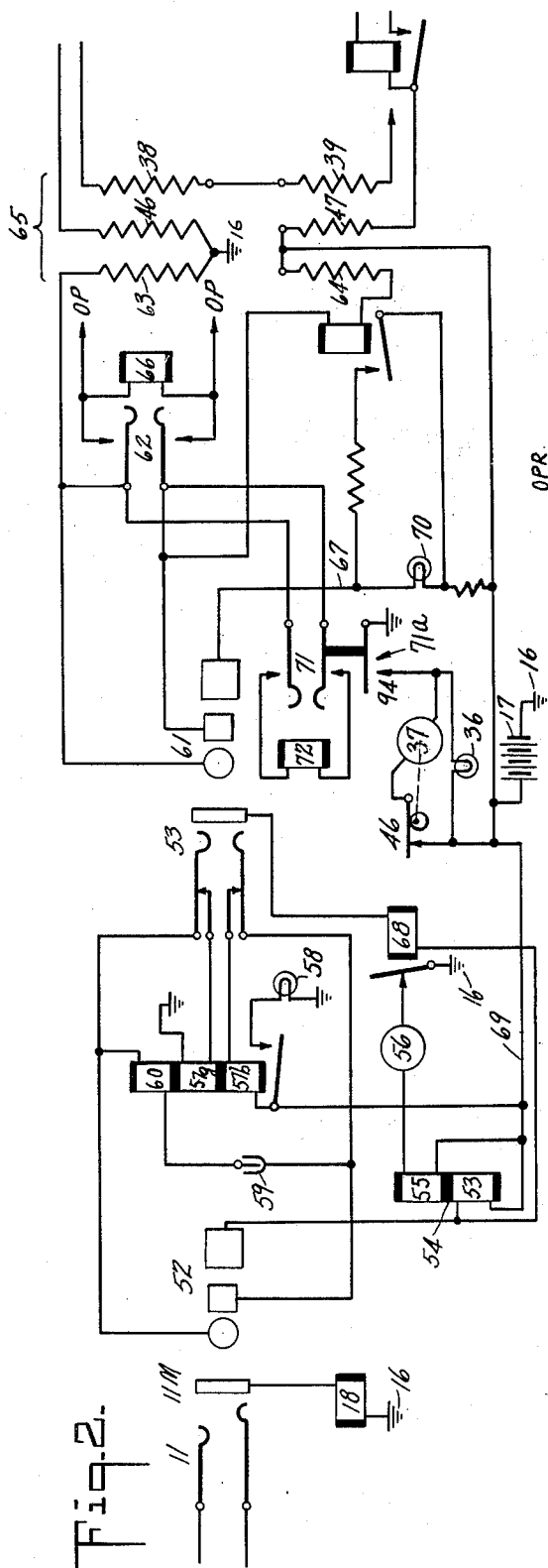
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3 Sheets-Sheet 2



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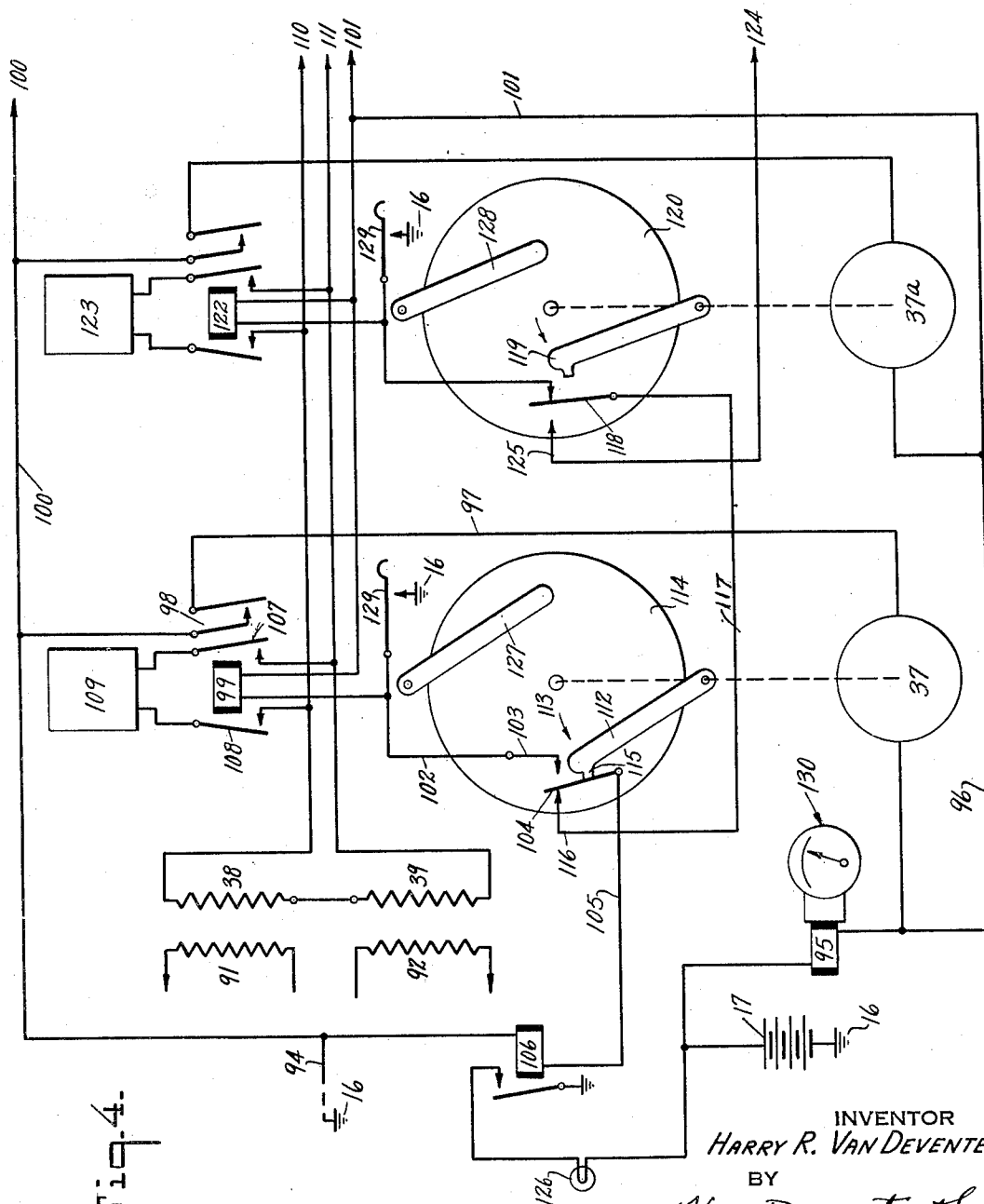
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TELEPHONE SYSTEM EMPLOYING PHONOGRAPHS

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,321,053

TELEPHONE SYSTEM EMPLOYING
PHONOGRAPHS

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Application January 13, 1942, Serial No. 426,630

41 Claims. (Cl. 179—6)

This invention relates to telephone systems in which phonographs may be associated with special cord circuits at the exchange to deliver and record messages from the subscribers' lines.

The object of the invention is to provide circuits and apparatus by which any subscriber's line can be connected to a phonograph located at the exchange without disturbing the existing line or cord circuits and without substantially changing the operative procedure now in common use. Another object is to provide means for connecting a phonograph to any subscriber's line terminating in the exchange in such a manner that the phonograph is under the control of the operator making the connection between the calling and the called line, the latter being connected to the phonograph. Another object is to provide a system of the class described in which a plurality of phonographs are available to a recording operator equipped with special cord circuits which may be used to plug each phonograph into a subscriber's line, each phonograph and its associated apparatus being connected to a separate plug which can be placed in a jack connected to the subscriber's line with which it is desired to connect the phonograph. Other objects will be apparent from a perusal of the following specification where, by way of illustration, telephone exchange circuits are shown of a type in common use. It will be understood, however, that once the inventive concept herein disclosed is understood, these circuits and the arrangement of the apparatus can be varied within wide limits without departing from the invention as defined by the appended claims.

And while preferred embodiments of the inventive idea are shown by way of illustration it will be further understood that once the result attained by the circuits and arrangement of apparatus (particular to the phonograph circuit and its associated devices as distinguished from the telephone exchange circuits per se) herein disclosed is understood, many modifications and changes will be obvious to those skilled in the art and that these also may be made without departing from the scope of the appended claims.

In the accompanying figures:

Figure 1 is a schematic wiring diagram of a standard line and an A operator's cord circuit and a recording or R operator's cord circuit embodying the invention.

Figures 2 and 3 are schematic diagrams of alternate forms of recording or R cord circuits.

Figure 4 is a schematic diagram of circuits and the arrangement of apparatus used to operate a

plurality of phonographs with any of the R cord circuits (Figures 1 to 3 inclusive).

In Figure 1 a standard A or answering operator's cord circuit is shown, of the repeating coil type. It will be understood, however, that this may be of any type; likewise the line circuits and equipment may be of any other type than that shown.

For the sake of illustration the numeral 10 will denote the calling line, and 11 the called line.

An operator is provided with special cord circuits and this operator is hereafter designated as the R operator and the special cord circuits for connecting the phonograph to subscribers' lines as the R cords.

Assuming that line 11 desires phonograph service, the subscriber upon removing his telephone receiver from the hook, operates line relay 12 and line lamp 13 in the usual manner and his regular A operator answers the call as usual. Upon being told that the phonograph service is wanted, the A operator notifies the R operator over the usual order wire circuit and the R operator plugs into a jack 11m of line 11 with one of the plugs 14 of an R cord circuit.

The sleeve relay in this cord has a winding 15 connected to the grounded sides 16 of the exchange battery 17, and therefore the insertion of plug 14 in the line jack 11m does not operate the cut-off relay 18 connected to line 11, nor will the jacks of line 11 test "busy" to any A operator. As the line relay 12 is operative, should the subscriber connected to line 11 call the exchange, his call will be received by his A operator as usual, who can therefore connect him via an A cord circuit with any other line in the usual way. However, should any A operator receive a call for line 11, and plug in with her A calling plug 19, battery will be applied to the sleeves of all the jacks connected to line 11 via conductor 20, resistance 21, supervisory lamp 22 and sleeve 23 of the plug 19. Current now flows via conductor 24 through cut-off relay 18, operating the latter and disconnecting line relay 12 and lamp 13 from line 11.

A circuit is also established from conductor 24 via sleeve of jack 11m through sleeve relay winding 15 operating this relay, which closes contacts 25, 26, thereby connecting battery to lamp 27.

If the A operator now rings on line 11 in the usual way, via ringing key 28, ringing current will flow over the tip and ring conductors of plug 19 and via the line wires of line 11. As the subscriber does not answer and as the line relay 12 is disconnected from the line, the only path for

the ringing current is via the tip and ring conductors of the R cord through condenser 29 and the ring-down drop on relay 30 which operates, closing its contacts 31 and completing the circuit through lamp 27, lighting the lamp and signalling the R operator.

The R operator, upon seeing the signal 27, operates the listening key 32, which bridges the holding coil 33 across the R cord circuit. This extinguishes the A operator's supervisory lamp 22 by operating the usual supervisory relay 34.

The R operator upon hearing that the calling party connected to line 11 via the A cord circuit wishes to use the phonograph, operates recording key 35. This disconnects the signal relay 30 and extinguishes lamp 27 and lights the recording lamp 36, which remains illuminated while the phonograph 37 is in operation, the operating circuit through same being completed via the contacts on key 35 as shown.

The talking circuits of the phonograph are connected to the windings 38, 39, of a repeating coil also having windings 40, 41, connected across the R cord as shown when key 35 is operated. This furnishes a path for current to operate relay 34 in the A operator's cord and consequently the calling supervisory signal 22 is out, while key 35 in the R cord is thrown.

When the calling subscriber has finished with the phonograph, the A answering supervisory lamp 42 lights as usual and upon seeing this, the A operator disconnects both plugs 19 and 43. This releases the sleeve relay 15 in the R cord and extinguishes the recording light 36, whereupon the R operator restores key 35, thereby disconnecting the lamp 36 and phonograph 37.

It will be seen that whenever an A operator has a plug 19 in a line jack on line 11 all jacks on that line will test "busy" to all other A operators. In some cases it may be desirable to give all operators an indication that the line 11 is connected to an R operator. This may be accomplished by providing the winding 15a in inductive relation to winding 15 of the R cord sleeve, relay 15a being in series with a suitable interrupter 44 and contacts 45, which close whenever the sleeve relay is energized by an A operator plugging into line 11. This arrangement will give a distinctive tone-signal to all A operators testing while the circuit is in use.

The phonograph may be provided with a switch 46 in series therewith and also controlling lamp 36. This switch can be operated after any predetermined length of recording, or at the end of a record when it is exhausted, or nearly exhausted, so that a new one is necessary, or in any other manner desired so as to control the phonograph 37 and the associated signal lamp 36.

It will be seen that if the subscriber on line 11 should return to his telephone and attempt to use it while the R operator was recording, he would be in on the conversation, getting talking battery via the A operator's cord circuit and being connected to the phonograph via the repeating coils 38, 41 inclusive. The apparatus can therefore record a 2-way conversation. By adding another pair of windings 46, 47, to the repeating coil, relay 48, supervisory lamp 49 and plug 50, the R operator can dispense with the services of the A operator, so far as the use of the A cord circuits is concerned.

Upon receiving a call for phonograph service, line 11, the A operator plugs in that line and upon getting the R operator, repeats to R the number of the calling line. The A operator then

disconnects from the calling line and the R operator picks it up in the multiple with plug 50. R operator has ordinary supervision via relay 48 and lamp 49 over the calling line.

Sleeve relay winding 15 is energized via contacts 51 on the relay 48, therefore, as long as the plug 50 is up on a line, the other end of the R circuit operates the same as previously described where an A plug 19 was up on line 11.

Another form of phonograph connecting and control circuit is shown in Figure 2. Here the R operator has a plug 52, the tip and ring conductors of which connect to the tip and ring contacts of a jack 53; when 52 is inserted in a line jack 11m, the cut off relay 18 of that line is operated, by battery flowing from 17 via winding 53 of tone signal coil 54 to sleeve of plug 52 and jack 11m. By winding 55 and interrupter 56 a special signal "busy" is impressed on the sleeves of all line 11 jacks, thereby notifying all operators testing that the line is connected to an R operator.

When the plug 52 is plugged in a line the battery and ground windings 57b and 57g of signal relay 57 are connected to the circuit via the inside of cut off springs of jack 53, therefore should the subscriber on line 11 signal the exchange, relay 57 will operate, lighting lamp 58.

Lamp 58 and jack 53 are associated and now may be used instead of the usual answering jack and line lamp of the line connected via plug 52. Thus the equipment described thus far acts as a transfer circuit to transfer incoming calls over line 11 from the regular A operator that would answer them to a position in front of the R operator who has a transfer circuit plugged into the line.

If, instead of subscriber 11 calling, some A operator would call on line 11, first the A operator would, upon testing line 11, get the signal tone impressed thereon by the interrupter 56 and coil 54, but would disregard this and plug into the line and ring. Ringing current will flow in the circuit via condenser 59 and winding 60 of relay 57, operating the latter and illuminating the lamp 58.

When the R operator plugs into the transfer jack 53 with plug 61 and operates listening key 62, battery is supplied to line 11 in the ordinary way via windings 63, 64, of the repeating coil 65. A holding coil 66 bridged across the operator's telephone operates the supervisory relay 34 in an A operator's cord, if such a cord is connected to line 11.

When a plug 61 is in a jack 53 battery flowing via conductor 67 to sleeve of jack 53 operates relay 68 via the cut off relay winding 18 to ground, disconnecting the signal-tone winding 55 on coil 54; this leaves winding 53 thereon connected to battery via conductor 69, and therefore the sleeves of all jacks on line 11 will test "busy" in the ordinary way as long as an R operator has one of the 61 plugs up on the line. This circuit also completes the circuit to the supervisory lamp 70, which operates in the usual way.

To start the phonograph the R operator throws the recording key 71. This bridges the holding coil 72 across the cord circuit, extinguishing the supervisory lamp 70 and also extinguishing the supervisory lamp such as 22 in the A operator's cord circuit if one is up. Contacts 71—A are closed when key 71 is thrown, thereby lighting the recording lamp 36 and starting phonograph motor 37.

The operation of the repeating coil windings

38, 39, is the same as previously described. Also the right hand end of the circuit, Figure 2, operates like an ordinary A cord circuit, should the R operator desire to use it for directly picking up calling lines in the multiple, as described in connection with the use of plug 50 of Figure 1.

Another form of phonograph connecting and control circuit is shown in Figure 3. Here the R operator has a plug 73 which may be inserted in a jack of line 11. When so inserted it does not affect the normal operation of that line except to put a signal-tone on the sleeve of the line jacks, which is obtained via windings 74, 74a, of sleeve relay 75 and interrupter 74b, as previously described in connection with the similar arrangement shown in the preceding figures. A resistance 76 is in series with the winding 74 of the sleeve relay so that it does not pass sufficient current to operate the cut off relay 18 of line 11. However, when 76 is short circuited by the contacts on starting key 77 as presently described, the cut off relay will operate.

Assuming the circuit is as shown, should the subscriber on line 11 call the exchange he will get his regular A operator and the call is handled as usual, but should the R operator have the recording key 77 thrown and the subscriber calls in, relay 75 having operated and closed its contacts, the R signal relay 78 will close its contacts 79, which establishes a circuit from the battery 17, contacts 80, resistance 81, lamp 82, to the sleeve of plug 73 and to ground 16 via relay 18, thus lighting the lamp 82. The R operator receiving this signal throws the listening key 83, breaking the contact 80 and establishing a shunt circuit via resistance 84 around lamp 82, which is extinguished. This also bridges the operator's telephone across the R cord circuit, and the operator can talk to the calling subscriber, who is supplied with talking battery via the windings on relay 78.

If, instead of subscriber 11 calling the exchange as just described, some A operator gets a call for line 11 and plugs into that line with an A cord and rings on the line, relay 85 in series with condenser 86 across the R cord will close its contacts 87 and operate lamp 82, same as relay 78 previously described.

It will be seen that contacts 88 on relay 78 and contacts 89 on relay 85 are in series with each other and the tone signal winding 74a and interrupter 74b, and that when either 78 or 85 are energized the signal tone circuit is disabled and the sleeve of line 11 jacks will give an ordinary "busy" test to any A operator testing.

To record, the R operator throws recording key 90. This bridges windings 91, 92, of repeating coil 93 across the R circuit. If the subscriber 11 is on the circuit, he gets talking battery via the windings on relay 78. Supervisory lamp 82 is extinguished by the contacts 94 on key 90 placing the shunt resistance 84 across the lamp 82.

The operator now throws key 77 which starts the phonograph motor 37 and illuminates the recording lamp 36. The cam switch 46 operates as previously described. The phonograph talking circuits are connected to windings 38, 39, as previously described. If the repeating coil is provided with another set of windings 46, 47, a supervisory relay 48, lamp 49, and plug 50 like those shown in Figure 2, the R operator can use such a plug 50 in the same manner as described for Figure 2.

In Figure 4 is shown a circuit that can be used with any of the circuits shown in the preceding figures to operate a plurality of phonograph turn

tables so that recording can be continued over a longer period than can be accomplished on a single record. The phonographs can be located at a point remote from the R operator but the control circuit wire 94 connects to the R circuits previously described so that it is grounded when these circuits are set up to record. Therefore when the conductor 94 is grounded by the operation of any one of the R circuits, as previously described, a circuit exists from the battery 17, winding 95 of a time recording meter or message measuring device (several of these can be in series or multiple if desired), conductor 96, phonograph motor 37, conductor 97, contact 98 of relay 99, and, when this is closed, via conductor 100 to ground 16 via conductor 94, thereby completing the circuit, through motor 37 when relay 99 is operated. Relay 99 operates because the following circuit is closed: battery 17, conductors 96, 101, winding on relay 99 via conductor 102 to contact 103 on record table switch which may have its arm 104 in contact with said front contact 103, then via conductor 105 through the winding of relay 106 and to conductor 94 to ground 16, thereby completing the circuit through the relay 99.

When relay 99 closes its contacts 107, 108, the amplifier 109 is connected across the common wires 110, 111, connected to the repeating coil windings 38, 39, so that the talking circuits of the phonograph are thereby connected via—for example—windings 91, 92 (which may be connected at their centre taps), to the R cord, Figure 3, and recording proceeds.

The cutter arm 112 starts at the inside of the record and travels outwardly in the direction of the arrow 113, and just before the record 114 is full, the pin 115 in the arm moves switch arm 104 into contact with the rear contact member 116, which switches the conductor 105 to the conductor 117, disconnecting relay 99, which opens its contacts, stopping motor 37 and disconnecting amplifier 109.

The conductor 117 connects to the arm 118 of the next table switch, the cutter arm 119 thereof being near the centre of the record 120, so the arm 118 is in contact with contact 119, which controls relay 122 connected to the common wire 101. Relay 122 operates in the same manner as relay 99 and controls amplifier 123 and motor 37a.

By extending the wire 124 from the contact 125 to the front contact on the next phonograph mechanism, and connecting common wires 100, 101, 110, 111 to the relay and motor thereat, any member of such mechanisms can be sequentially operated as just described (conductors 96 to 101 and 105 constituting an operating circuit for the motors and relays and conductors 110, 111 constituting a common amplifier circuit).

It will be understood that the turn table for record 120 will start shortly before the record 114 is exhausted, and so on through the series, so that the recording on several records will be continuous, a short portion, of the end of the first record and the beginning of the next, and so on, being duplicated, if the relays such as 99 are made slow-acting, so that each one starts operations before the preceding one disconnects the apparatus controlled thereby. The recording lamp 126 will remain lighted when any of the phonographs are in operation.

The play back arms or reproducers 127, 128, may be used to play back the records in the usual way. The switching mechanism for connecting

the play-back to the amplifier instead of the cutters forms no part of the present invention, so it will not be described in detail, many suitable arrangements being known. Each phonograph may have a key 123 to independently close the motor and amplifier circuit to enable play-back to be accomplished.

While for the sake of illustration the table switches are shown as controlled by the position of the arms 112-119 relative to their associated records, it will be obvious that these series switches may be operated in any suitable way to sequentially control their associated apparatus to effect continuous progressive recording.

The time or message recorder indicated at 95 may be located on the R operator's table. This may have a dial 130 on which total elapsed time is recorded, or this dial may record the total number of messages, that is, the number of times the R circuit connected thereto is used during the period the circuit is connected to a given line. The construction of such time and/or message recorders forms no part of the present invention so is not described in detail. Such meters are known that provide a ticket or tape the operator can mark, and on which the elapsed time or the number of messages is automatically recorded.

What is claimed is:

1. In combination with a line circuit having exchange signalling equipment normally connected thereto, a cord circuit connected to said line circuit, a second cord circuit, signal means in said cord circuit responsive to ringing current supplied via said second cord circuit, switching means in said first cord circuit for disconnecting said signal means therefrom, a phonograph having a motor controlled by said switching means, and talking circuits for said phonograph connected to said first cord circuit.

2. In combination with a line circuit having exchange signalling equipment normally connected thereto, a cord circuit connected to said line circuit, signal means in said cord circuit responsive to ringing current, switching means in said cord circuit for disconnecting said signal means therefrom, a phonograph having a motor controlled by said switching means, talking circuits for said phonograph connected to said cord circuit, and means in said cord circuit for impressing on the sleeve of any jack into which the plug thereof may be inserted, a distinctive signal-tone whereby any operator testing said line circuit will know that said cord circuit is connected thereto.

3. In combination with a line circuit having exchange signalling equipment normally connected thereto, a cord circuit connected to said line circuit, a second cord circuit, signal means in said cord circuit responsive to ringing current supplied via said second cord circuit, switching means in said first cord circuit for disconnecting said signal means therefrom, a phonograph having a motor controlled by said switching means, and talking circuits for said phonograph normally disconnected from said first cord circuit and connectible thereto by the operation of said switching means.

4. In combination with a line circuit having exchange signalling equipment normally connected thereto, a cord circuit having a plug adapted to make connection to said line circuit, signal means responsive to ringing current connected to said plug, switching means in said cord circuit adapted when operated to disconnect said

signal means therefrom, a phonograph having a motor controlled by the operation of said switching means, a second plug connected to said cord circuit, supervisory means connected to said second plug and operable by a telephone line circuit connectible thereto, and means for coupling said plugs to the talking circuits of said phonograph.

5. In combination with a line circuit having exchange signalling equipment normally connected thereto, a cord circuit connected to said line circuit and having a plug adapted to make connection to said line circuit, signal means responsive to ringing current connected to said plug, switching means in said cord circuit adapted when operated to disconnect said signal means therefrom, a phonograph having a motor controlled by the operation of said switching means, a second plug connected to said cord circuit, supervisory means connected to said second plug and operable by a telephone line circuit connectible thereto, means for coupling said plugs to the talking circuits of said phonograph, and means in circuit with said first plug for impressing on the sleeve of any jack into which said plug may be inserted, a distinctive signal-tone whereby any operator testing said line circuit will know that said cord circuit is connected thereto.

6. In combination with a line circuit having exchange signalling equipment normally connected thereto, a three-wire transfer circuit connected to said line circuit and signalling equipment, means for impressing a signal-tone upon the sleeve of any jack to which said transfer circuit is connected, signal means responsive to ringing current connected to said transfer circuit, battery supply means for supplying current to said transfer circuit, a signal operable by said battery supply means when said line circuit is closed, switching means for disconnecting said battery supply means from said circuit, and means for connecting a phonograph to said transfer circuit.

7. In combination with a line circuit having exchange signalling equipment normally connected thereto, a three-wire transfer circuit connected to said line circuit and signalling equipment, means for impressing a signal-tone upon the sleeve of any jack to which said transfer circuit is connected, signal means responsive to ringing current connected to said transfer circuit, battery supply means for supplying current to said transfer circuit, a signal operable by said battery supply means when said line circuit is closed, switching means for disconnecting said battery supply means from said circuit, means for connecting a phonograph to said transfer circuit, and means operable conjointly with said switching means for disabling said signalling tone leaving an ordinary busy test on any jack to which said transfer circuit is connected.

8. In combination with a line circuit having exchange signalling equipment normally connected thereto, a three-wire transfer circuit connected to said line circuit and signalling equipment, battery supply means for supplying current to said transfer circuit, switching means for disconnecting said battery supply means from said circuit, a listening key adapted to connect an operator's telephone to said transfer circuit, a switching key adapted to bridge a holding coil across said transfer circuit, said key having an additional pair of contacts, a phonograph motor and a source of current therefor serially included with said additional set of contacts and controlled by same,

a second source of current supply for said transfer circuit, means for connecting said second source of current supply to said transfer circuit.

9. In combination with a line circuit having exchange signalling equipment normally connected thereto, a three-wire transfer circuit connected to said line circuit and signalling equipment, battery supply means for supplying current to said transfer circuit, switching means for disconnecting said battery supply means from said circuit, a listening key adapted to connect an operator's telephone to said transfer circuit, a switching key adapted to bridge a holding coil across said transfer circuit, said key having an additional pair of contacts, a phonograph motor and a source of current therefor serially included with said additional set of contacts and controlled by same, a second source of current supply for said transfer circuit, operable conjointly with said switching means.

10. In combination with a line circuit having exchange signalling equipment normally connected thereto, a three-wire transfer circuit connected to said line circuit and signalling equipment, battery supply means for supplying current to said transfer circuit, switching means for disconnecting said battery supply means from said circuit, a listening key adapted to connect an operator's telephone to said transfer circuit, a switching key adapted to bridge a holding coil across said transfer circuit, said key having an additional pair of contacts, a phonograph motor and a source of current therefor serially included with said additional set of contacts and controlled by same, a second source of current supply for said transfer circuit operable conjointly with said switching means and means for coupling the talking circuits of said phonograph to said line circuit, a second line circuit, means connected to said second source of current supply to feed current to said second line circuit, and means for coupling the talking circuits of said phonograph to both said line circuits.

11. In combination with a telephone line circuit having a line jack and line signalling equipment, a plug-and-jack transfer circuit, the plug of same being connectible to said line jack, means in said transfer circuit for disconnecting said line signalling equipment from said line, a second line signalling equipment in said transfer circuit adapted to replace said first mentioned line equipment to display a line signal upon closing of the line circuit, means connected to said transfer plug to raise the potential on the sleeve of the line jack into which said plug is inserted to provide a test signal to other operators testing said line for connections thereto, a second plug, means connected to said second plug whereby when same is placed in said transfer jack, the character of said test signal is altered, and a phonograph and means for operating the same, said phonograph having talking circuits connected to said second plug whereby said phonograph may be operatively connected to said transfer circuit.

12. In combination with a telephone line circuit having a line jack and line signalling equipment, a plug-and-jack transfer circuit, the plug of same being connectible to said line jack, means in said transfer circuit for disconnecting said line signalling equipment from said line, a second line signalling equipment in said transfer circuit adapted to replace said first mentioned line equipment to display a line signal upon closing of the line circuit, means connected to said trans-

fer plug to raise the potential on the sleeve of the line jack into which said plug is inserted to provide a test signal to other operators testing said line for connections thereto, a second plug, means connected to said second plug whereby when same is placed in said transfer jack, the character of said test signal is altered, a phonograph and means for operating the same, said phonograph having talking circuits connected to said second plug whereby said phonograph may be operatively connected to said transfer circuit, a third plug adapted for insertion into line jacks of a switchboard, and means for coupling said third plug to said first and second plugs whereby two lines and the talking circuits of said phonograph are connected.

13. In combination with a telephone line circuit having a plurality of line jacks and a line and cut off relay, an operator's plug adapted to fit said jacks, means connected to said plug whereby when same is inserted in one of said jacks it will provide a test signal to other operators testing said line for connection thereto, said cut-off relay remaining in non-operated position the while to permit the operation of said line relay by the closing of said telephone line circuit, switching means connected to said plug for raising the potential on the sleeve of same to operate said cut-off relay, a first signal relay and means for connecting it to the tip and ring conductors of said plug whereby said signal relay will be operated by the closing of said telephone line circuit connected thereto, a second signal relay in multiple with said first signal relay and having a condenser in series with its winding whereby same is opaque to direct current whereby said second relay may be operated by the application of ringing current to said telephone line circuit, a signal connected to the sleeve of said plug and conjointly controlled by the insertion of said plug in a line jack and either of said signal relays, connecting means for bridging an operator's telephone across the tip and ring conductors of said plug to answer incoming calls from a subscriber connected to said telephone line circuit, while same is supplied with current via a winding on said first signal relay, means for restoring said signal operable by said connecting means, a phonograph and means for connecting same via said plug with said telephone line.

14. In combination with a telephone line circuit having a plurality of line jacks and a line and cut-off relay, an operator's plug adapted to fit said jacks, means connected to said plug whereby when same is inserted in one of said jacks it will provide a test signal to other operators testing said line for connection thereto, said cut-off relay remaining in non-operated position the while to permit the operation of said line relay by the closing of said telephone line circuit, switching means connected to said plug for raising the potential on the sleeve of same to operate said cut-off relay, a first signal relay and means for connecting it to the tip and ring conductors of said plug whereby said signal relays will be operated by the closing of said telephone line circuit connected thereto, a second signal relay in multiple with said first signal relay and having a condenser in series with its winding whereby same is opaque to direct current whereby said second relay may be operated by the application of ringing current to said telephone line circuit, a signal connected to the sleeve of said plug and conjointly controlled by the insertion of said plug in a line jack and either of said signal relays, con-

necting means for bridging an operator's telephone across the tip and ring conductors of said plug to answer incoming calls from a subscriber connected to said telephone line circuit, via another operator's cord circuit and supplied with current thereby, means for restoring said visual signal operable by said connecting means, a phonograph and means for connecting same via said plug with said telephone line.

15. In combination with a telephone line circuit having a plurality of line jacks and a line and cut-off relay, an operator's plug adapted to fit said jacks, means connected to said plug whereby when same is inserted in one of said jacks it will provide a test signal to other operators testing said line for connection thereto, said cut-off relay remaining in non-operated position the while to permit the operation of said line relay by the closing of said telephone line circuit, switching means connected to said plug for raising the potential on the sleeve of same to operate said cut-off relay, a first signal relay and means for connecting it to the tip and ring conductors of said plug whereby said signal relay will be operated by the closing of said telephone line circuit connected thereto, a second signal relay in multiple with said first signal relay and having a condenser in series with its winding whereby same is opaque to direct current whereby said second relay may be operated by the application of ringing current to said telephone line circuit, a signal connected to the sleeve of said plug and conjointly controlled by the insertion of said plug in a line jack and either of said signal relays, connecting means for bridging an operator's telephone across the tip and ring conductors of said plug to answer incoming calls from a subscriber connected to said telephone line circuit, while same is supplied with current via a winding on said first signal relay, means for restoring said signal operable by said connecting means, a phonograph, means for connecting same via said plug with said telephone line, and a second plug adapted for insertion in a line jack and having circuits connected thereto for coupling the same to said first plug.

16. In combination with a telephone line circuit having a plurality of line jacks and a line and cut-off relay, an operator's plug adapted to fit said jacks, means connected to said plug whereby when same is inserted in one of said jacks it will provide a test signal to other operators testing said line for connection thereto, said cut-off relay remaining in non-operated position the while to permit the operation of said line relay by the closing of said telephone line circuit, switching means connected to said plug for raising the potential on the sleeve of same to operate said cut-off relay, a first signal relay and means for connecting it to the tip and ring conductors of said plug whereby said signal relay will be operated by the closing of said telephone line circuit connected thereto, a second signal relay in multiple with said first signal relay and having a condenser in series with its winding whereby same is opaque to direct current whereby said second relay may be operated by the application of ringing current to said telephone line circuit, a signal connected to the sleeve of said plug and conjointly controlled by the insertion of said plug in a line jack and either of said signal relays, connecting means for bridging an operator's telephone across the tip and ring conductors of said plug to answer incoming calls from a subscriber connected to said telephone line circuit, via another operator's cord circuit and supplied with current thereby, means for restoring

said visual signal operable by said connecting means, a phonograph, means for connecting same via said plug with said telephone line, and a second plug adapted for insertion in a line jack and having circuits connected thereto for coupling the same to said first plug.

17. In combination, a source of current, switching means for opening and closing a circuit, a circuit including said current source and means, a plurality of phonographs each having a motor, and control means operated by each of said phonographs for sequentially connecting said phonographs to said circuit to successfully operate said phonographs.

18. The combination as claimed in claim 17 wherein said control means includes a movable contact member adapted to open the circuit through its associated motor and complete a circuit through the motor of the next phonograph to be operated.

19. The combination as claimed in claim 17 wherein said control means includes a movable contact member adapted to be operated by a cutter arm of its associated phonograph.

20. The combination as claimed in claim 17 wherein said control means includes a movable contact member adapted to be operated by a cutter arm of its associated phonograph at a point in the travel of said arm between the inner and outer end of the recording on the phonograph record.

21. The combination as claimed in claim 17 wherein the circuit including the current source has connected thereto a measuring device whereby the total elapsed time or total number of messages recorded by all the phonographs in a sequentially operated group can be ascertained.

22. The combination as claimed in claim 17 wherein said switching means includes a manually operable switch having other contacts connecting to an operator's cord circuit in a telephone switchboard.

23. In combination, a source of current, switching means for opening and closing a circuit, a circuit including said current source and means, a plurality of phonographs each having a motor, control means operated by each of said phonographs for sequentially connecting said phonographs to said circuit to successively operate said phonographs, an amplifier for each phonograph, a common circuit for all said amplifiers, and means under the control of said control means for connecting each of said amplifiers to said common circuit.

24. In combination, a source of current, switching means for opening and closing a circuit, a circuit including said current source and means, a plurality of phonographs each having a motor, control means operated by each of said phonographs for sequentially connecting said phonographs to said circuit to successively operate said phonographs, an amplifier for each phonograph, a common circuit for all said amplifiers, and means associated with each amplifier and under the control of its associated phonograph for connecting the amplifier to said common circuit.

25. In combination, a source of current, switching means for opening and closing a circuit, a circuit including said current source and means, a plurality of phonographs each having a motor, control means operated by each of said phonographs for sequentially connecting said phonographs to said circuit to successively operate said phonographs, an amplifier for each phonograph, a common circuit for all said amplifiers, means

associated with each amplifier and under the control of its associated phonograph for connecting the amplifier to said common circuit, and all said last means being under the control of the switching means.

26. In combination, a source of current, an operating circuit including said source of current, phonographs each having a motor, and control means for each of said phonographs and operated thereby for sequentially connecting said phonographs to said circuit to successively operate said motors from said source of current.

27. The combination as claimed in claim 26 wherein said control means include a switch adapted in one position to connect its associated phonograph in operative connection to said operating circuit, and in another position to open said circuit to its associated phonograph and complete said circuit to another phonograph.

28. In combination, a source of current, an operating circuit connected thereto, a plurality of phonographs, driving means for said phonographs, and a plurality of control switches, each switch adapted to be actuated by one of said phonographs when the cutter head thereof is in a predetermined position, whereby said phonographs will operate sequentially.

29. In combination, a source of current, an operating circuit connected thereto, a plurality of phonographs, driving means for said phonographs, a plurality of control switches, each switch adapted to be actuated by one of said phonographs when the cutter head thereof is in a predetermined position, whereby said phonographs will operate sequentially, an amplifier for each of said phonographs, a common amplifier circuit, and means controlled by said switches for connecting each amplifier to said common amplifier circuit.

30. In combination, a source of current, an operating circuit connected thereto, a plurality of phonographs, driving means for said phonographs, a plurality of control switches, each switch adapted to be actuated by one of said phonographs when the cutter head thereof is in a predetermined position, whereby said phonographs will operate sequentially, an amplifier for each of said phonographs, a common amplifier circuit, means controlled by said switches for connecting each amplifier to said common amplifier circuit, means for coupling said common amplifier circuit to the cord circuit of a telephone switchboard, and means in said cord circuit for controlling said operating circuit.

31. In combination with a telephone line having a jack and line signalling equipment normally connected thereto, a cord circuit having a plug adapted for insertion in said jack, means in said cord circuit for disabling said line signalling equipment, signal means in said cord circuit responsive to current reaching said means via said plug and jack, switch means in said cord circuit for disabling said signal means, and a phonograph connected to said cord circuit.

32. In combination with a telephone line having a jack and line signalling equipment normally connected thereto, a cord circuit having a plug adapted for insertion in said jack, means in said cord circuit for disabling said line signalling equipment, signal means in said cord circuit responsive to current reaching said means via said plug and jack, switch means in said cord circuit for disabling said signal means, and a phonograph controlled by said switch means and connected to said cord circuit.

33. In combination with a telephone line having a jack and line signalling equipment normally connected thereto, a cord circuit having a plug adapted for insertion in said jack, means in said cord circuit for disabling said line signalling equipment, signal means in said cord circuit responsive to current reaching said means via said plug and jack, switch means in said cord circuit for disabling said signal means, a phonograph connected to said cord circuit, and a second plug connected to said cord circuit and adapted to connect said phonograph with another telephone line.

34. In combination with telephone lines having the usual jacks and line and cut-off relays connected thereto for normal telephone exchange operation, a cord circuit having plugs, means including a supervisory relay in said cord circuit for completing a circuit through the cut-off relay of any connected line to disconnect the line relay therefrom and to establish a test potential on the jack of the line connected to said cut-off relay, a repeating coil forming an inductive link between said plugs and feeding battery circuit to one of them, said supervisory relay being operated by said current, signal means in said cord circuit operable by current entering the circuit via a connected plug and jack, and a phonograph having its talking circuits connected to said cord circuit.

35. The combination as claimed in claim 34 wherein the cord circuit has switching means therein for disconnecting said signal means and for controlling the operation of said phonograph.

36. In combination with telephone lines having the usual jacks and line and cut-off relays connected thereto for normal telephone exchange operation, a transfer circuit having means therein for operating the cut-off relay of any telephone line when said transfer circuit is connected thereto, signal means in said transfer circuit for receiving an incoming signal from the connected telephone line, a cord circuit adapted to connect to said transfer circuit and thereupon disable said signal means therein, means in said cord circuit to supply talking battery to the transfer circuit, including a supervisory signal, a phonograph connected to said cord circuit, and switch means controllable by the cord circuit operator for starting and stopping the phonograph.

37. In combination with telephone lines having the usual jacks and line and cut-off relays connected thereto for normal telephone exchange operation, a transfer circuit having means therein for operating the cut-off relay of any telephone line when said transfer circuit is connected thereto, signal means in said transfer circuit for receiving an incoming signal from the connected telephone lines, a cord circuit adapted to connect to said transfer circuit and thereupon disable said signal means therein, means in said cord circuit to supply talking battery to the transfer circuit, including a supervisory signal, a phonograph connected to said cord circuit, switch means controllable by the cord circuit operator for starting and stopping the phonograph, and a holding coil bridged across said cord circuit by the operation of said switch means.

38. In combination with a telephone line, phonographs, and means for sequentially connecting said phonographs to said line, whereby one phonograph will begin operation before another phonograph has ceased, whereby a longer

message can be recorded or reproduced than can be contained on a single phonograph record.

39. The combination as claimed in claim 38 wherein said phonographs each have an amplifier under the control of said means which includes slow-acting relays adapted for overlapping sequential operation under the control of said phonographs.

40. In a telephone-phonograph system of the class described, means for connecting phonographs to telephone circuits including a circuit and common switching means therein controlling

all phonographs, each phonograph having individual switching means under the control of its own driving means for connecting and disconnecting itself from said circuit.

5 41. A system as claimed in claim 40 wherein the common switching means is located upon an operator's keyboard as part of a cord circuit equipment, and said individual switching means are located upon and form part of the phonograph instruments.

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