July 21, 1942. G. G. SMITH 2,290,817

SYSTEM OF COMMUNICATION

Filed March 20, 1941 2 Sheets-Sheet 1

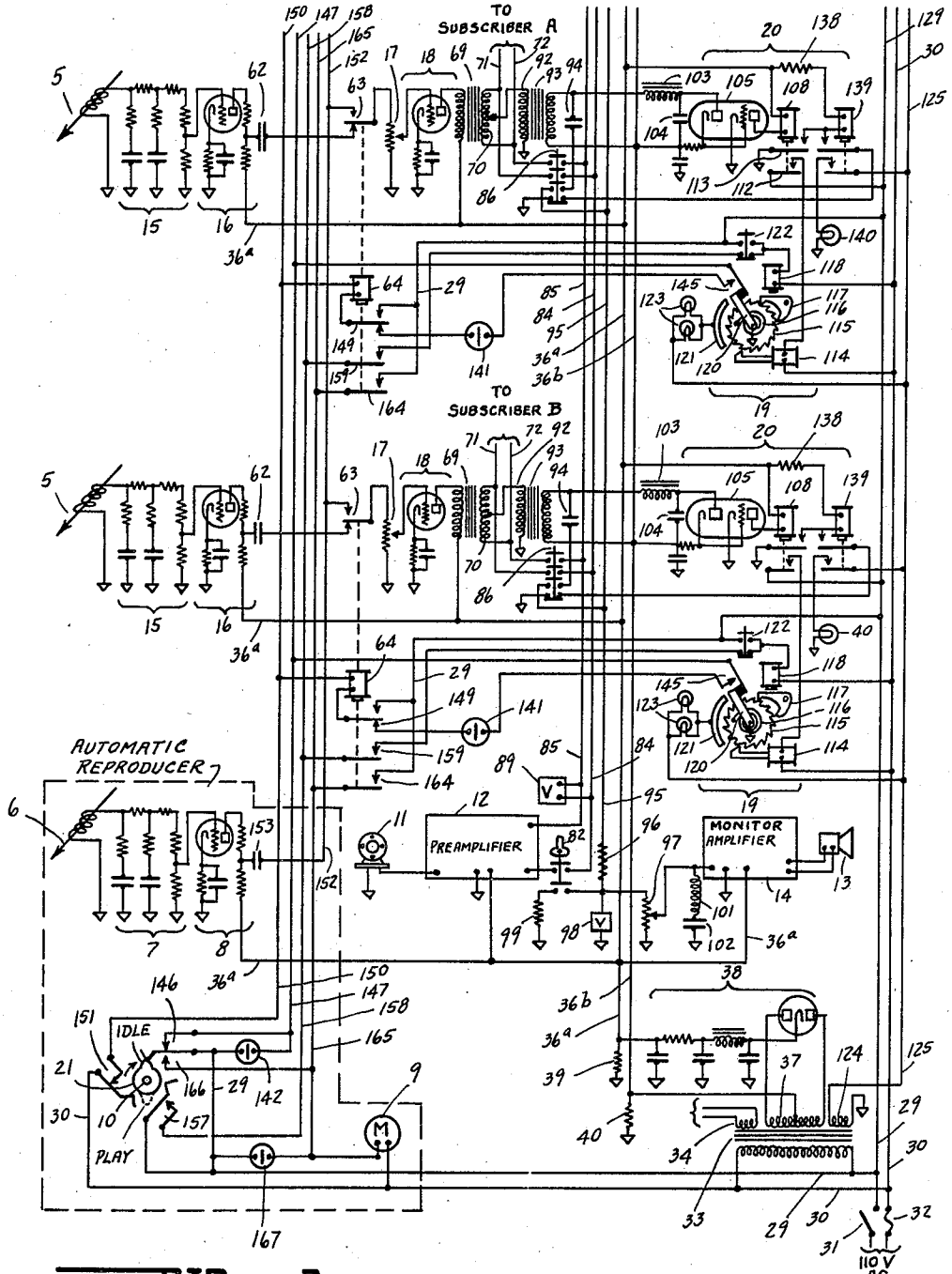


FIG. 1

INVENTOR.
GERALD G. SMITH.

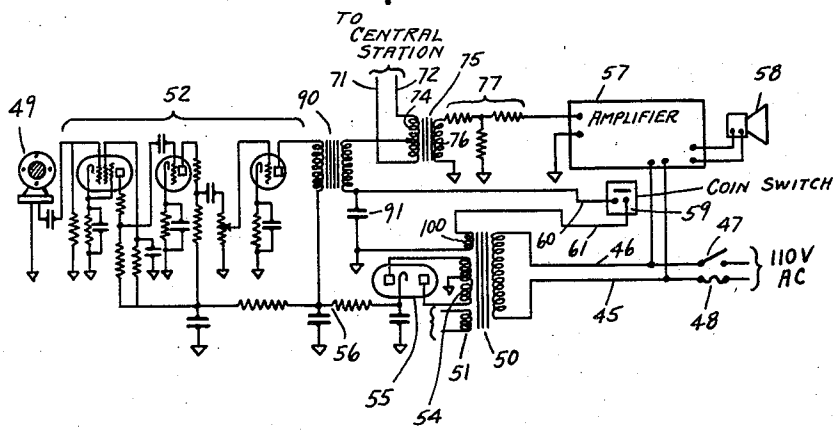
BY Lockwood, Goldsmith & Galt,
ATTORNEYS.

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SYSTEM OF COMMUNICATION

Filed March 20, 1941 2 Sheets-Sheet 2

FIG. 2



INVENTOR.
GERALD G. SMITH.

BY Lockwood, Goldsmith & Galt,
ATTORNEYS.

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UNITED STATES PATENT OFFICE

2,290,817

SYSTEM OF COMMUNICATION

Gerald G. Smith, Kenmore, N. Y., assignor to The Rudolph Wurlitzer Company, Cincinnati, Ohio, a corporation

Application March 20, 1941, Serial No. 384,253

15 Claims. (Cl. 179—6)

This invention relates to a system of communication particularly adapted for dispensing music or other forms of audible entertainment from a central station to a plurality of subscriber's stations. The invention may be used in conjunction with a communication system such as described in Hayslett and Schmidt Patent No. 2,241,663, issued May 13, 1941, but is useful in other types of systems, as for example, that disclosed in Adrian Patent No. 2,122,550, issued July 5, 1938.

In systems of this type there is provided a central station and a plurality of subscriber's stations, the central station having one or more phonograph reproducer mechanisms and the subscriber's stations having speakers which may be connected to a central station reproducer preferably in response to coin signals. In the Hayslett and Schmidt system disclosed in the copending application previously mentioned, two-way voice transmission is provided and a central station operator manually operates a number of phonograph mechanisms to supply each subscriber station with such music as the customers may call for by voice. Each subscriber's station, in addition, is provided with a fully equipped record-changing phonograph mechanism to be used during hours when the central station operator is off duty. In the system disclosed in the Adrian patent before mentioned, no central station operator is employed and the operation of the central station phonograph is completely automatic and non-selective.

One object of the present invention is to provide a relatively simple system in which a central station reproducer may be automatically operated to supply a plurality of speakers in the subscriber's stations so arranged that each subscriber receives full value for each coin deposited. When used in a purely automatic system, such as disclosed in the Adrian patent, the present invention provides a much simplified and more satisfactory operation than that of the Adrian construction.

Another object of the invention is to provide a central station system of the Hayslett and Schmidt type in which the necessity for individual phonograph mechanisms at the subscriber's stations is eliminated and a single automatic reproducer at the central station may be used when the central station operator is off duty.

Another object of the invention is to provide ready means for changing such a system from automatic to manual control and vice versa. In this connection it is to be noted that a change from one type of control to the other cannot be conveniently made simultaneously for all subscriber's stations served by a single central station. The reason for this is the fact that when it is time for the operator to come on duty some stations may be operating on automatic control and their operation should not be disturbed but other stations not so operating should be immediately prepared for selection by voice. Similarly, when it is time for the operator to go off duty, some stations may be operating on manual control and stations not so operating should be immediately prepared for automatic operation without disturbing the manually controlled operation then in progress. Thus, it is necessary to arrange the system in such manner that automatic and manual operation of different subscriber's stations may take place simultaneously. The present invention provides a simple and convenient method for attaining this object.

In the Adrian patent before mentioned, means are provided for insuring full value for coins received at one station during the time that the central station reproducer is operating to supply the requirements of another station. This means in the Adrian patent requires the generation of additional coin value impulses to provide for this contingency. One object of the present invention is to eliminate the necessity for such additional impulses and so to simplify the apparatus required.

Other objects and features of the invention will be understood from the accompanying drawings and the following description and claims:

Fig. 1 is a wiring diagram of electrical parts and connections of a central station employed in a preferred form of the invention. Fig. 2 is a similar diagram for one of the subscriber's stations.

In the drawings and in the following description the invention is described as applied to a system of the Hayslett and Schmidt type in which a central station operator is employed. Since the application of the invention to a fully automatic system requires only the elimination of the parts not required for the manual operation, the construction and operation of a fully automatic system in accordance with the invention will be obvious.

Central station apparatus

At the central station, there are provided a number of manually operated phonograph mechanisms corresponding to the number of subscriber's stations to be served. Since these

mechanisms are well known in the art, they are not shown in detail in the drawings. It is sufficient to say that each includes a turntable, mechanism for rotating the turntable and the usual stylus and pickup circuits. In the drawing the pickups 5 of two such mechanisms are shown diagrammatically.

There is also provided at the central station an automatic record changing phonograph reproducer unit which may be of any well known type. The parts of said mechanism which are pertinent to the invention are shown in the drawing enclosed within a broken line indicated "Automatic reproducer" and consist of a pickup 6, filter circuits 7, a stage of amplification 8, a motor 9, a cam shaft 10 and associated switches to be described hereinafter. The motor 9 may be the usual single motor used for operating the record changing mechanism and rotating the turntable and the cam shaft may be the usual one-revolution cam shaft used in mechanisms of this type and which controls the record-changing operation. In such mechanisms, the cam shaft normally makes one complete revolution for each record changing cycle and stops in a "play" position during the playing of a record. If the phonograph is to remain idle between the playing of records, the motor is stopped during the record-changing cycle with the cam shaft in an "idle" position. Usually the idle position of the cam shaft is reached after a record has been removed from the turnable and placed in the magazine and before another record has been removed from the magazine for playing. In the drawing a cam 21 carried by the cam shaft 10 is shown in full lines in the idle position. The position assumed by the nose of the cam in the play position is shown in broken lines indicated "Play."

There is also provided a central station transmitter 11 having a pre-amplifier 12 associated therewith. Said transmitter and amplifier are employed in manual operation for transmitting the operator's voice to the various subscriber's stations. A speaker 13 and monitor amplifier 14 are provided for reception and amplification of speech from the subscriber's stations to the central station.

Each of the manually operated pickups 5 is provided with a filter circuit 15 and a stage of amplification 16 similar to those provided for the pickup 6. A volume control potentiometer 17 and a second stage of amplification 18 is likewise provided for each of the pickup circuits. A plurality of coin register and checkoff devices 19 are provided and each such device is associated with one of the subscriber's stations. Other central station apparatus includes a plurality of coin signal receiving units 20, each of which is adapted to receive coin signals from one of the subscriber's stations and to transmit the same to the associated coin register 19 as will be described in more detail hereinafter.

Power for operating the central station is received from any suitable source on power mains 29 and 30 and preferably is the usual commercial 110 volt alternating current. One of said power mains has connected therein a cutout switch 31 and the other carries the usual overload fuse protection 32. A transformer 33 has its primary winding connected to the mains 29 and 30 and has a secondary winding 34 providing alternating current at a low voltage suitable for heating the cathodes of the vacuum tubes used in the various amplifiers at the central station. The connection of the cathode heaters may be conventional and for that reason is not shown in the drawings. Direct current is supplied to a pair of distributory conductors 36a and 36b from a secondary winding 37 of transformer 33 connected through a conventional rectifier unit 38. Said distributory conductors are grounded through resistors 39 and 40 respectively. Resistor 39 is proportioned to maintain the conductor 36a at a suitable positive potential to supply plate current for the several amplifier units and to operate certain direct current relays. Resistor 40 is proportioned to maintain conductor 36b at a negative potential of a few volts.

Subscriber's station electrical apparatus

Referring now to Fig. 2 in which there is shown the electrical apparatus of one subscriber's station, power for operating the station is supplied by a pair of power mains 45 and 46 connected to any suitable source, preferably 110 volt, alternating current. One of said power mains is provided with a cutout switch 47 and the other carries a protecting fuse 48. Said power mains are connected to the primary winding of a transformer 50 and said transformer is equipped with a secondary winding 51 adapted to supply low voltage alternating current for heating the cathodes of vacuum tubes used in a local microphone pre-amplifier 52 associated with a local microphone 49. The transformer 50 is provided with a secondary winding 54 connected to a rectifier tube 55 supplying direct current at a suitable potential above ground to a conductor 56. Within the pre-amplifier 52 suitable plate voltages are secured by conventional connections to the conductor 56. Other apparatus at the subscriber's station includes an amplifier 57, a speaker 58 and a coin switch 59. The coin switch may be of any well known type adapted to make a momentary closure between a pair of conductors 60 and 61 each time a coin of a given value is received thereby. The type of switch in which multiple momentary closures are made in response to coins of greater value may also be used. The construction and operation of such switches are well known in the art and need not be described in detail.

Wiring and operation

The wiring connections shown in Figs. 1 and 2 may best be described in connection with a description of the operation of the apparatus.

Manual phonograph transmission from central station

The output of each of the pickups 5 at the central station is amplified by its associated amplifier 16 which is coupled to the volume control rheostat 17 through a coupling condenser 62 and a two-way switch 63 operated by a relay 64 and normally maintained in the position shown in Fig. 1 when said relay is deenergized. The output of the amplifier stage 18 is impressed on the primary winding of an output transformer 69. The secondary winding 70 of said transformer has its terminals connected to a pair of conductors 71 and 72 leading to the corresponding subscriber's station. The volume of the output impressed on the conductors 71 and 72 is controlled by the volume control rheostat 17.

At the subscriber's station the conductors 71 and 72 are connected to the terminals of the primary winding 74 of an input transformer 75. The secondary winding 76 of said transformer

has one terminal grounded and the other terminal connected through a series of resistance units 77 to the amplifier 57 and speaker 58. The function of the resistance units 77 is to modify the output received from the transmission lines 71 and 72 to give it substantially the same characteristics as the output of a phonograph pickup, so that a standard phonograph amplifier may be used at 57.

By means of these connections each of the phonograph pickups 5 at the central station is connected by a two-wire metallic circuit to the corresponding subscriber's station and each may be manually operated by a central station operator to deliver a desired selection to the subscriber's speaker.

Voice transmission, central station to subscriber's station

The output of the central station transmitter 11 is amplified by its pre-amplifier 12. One of the output terminals of said pre-amplifier is connected through a normally open switch operated by a key 82 to a bus line 84 and the second of said terminals is connected to a bus line 85. Said bus lines may be selectively connected to the conductors 71 and 72 of any given subscriber's station by operation of normally open switches controlled by push buttons 86, one of said push buttons being provided for each of the subscriber's stations. The push buttons 86 are mechanically interlocked in a well known manner so as to be mutually exclusive. That is, each push button when pressed is latched in position to connect its associated subscriber's station to the bus lines 84 and 85 and automatically releases to the normal position any of said push buttons which have been perivously pressed. The volume of the output is controlled by suitable volume control means associated with the pre-amplifier 12. A meter 89 is connected across the bus lines 84 and 85 to indicate the energy level of the output to whichever subscriber's station is connected to said bus lines.

By means of the connections just described, the amplified output of the central station transmitter may be impressed on the two-wire metallic circuit leading to any one of the subscriber's stations by operation of the appropriate push button 86 and the talking key 82.

Voice transmission from subscriber's station to central station

The output of the subscriber's station transmitter 49 is amplified by its pre-amplifier circuits 52 and is fed to the primary winding of an output transformer 90, the secondary winding of which has one terminal connected to the mid-point of the winding 74 of transformer 75 and the other terminal grounded through a condenser 91 having proper capacity for freely transmitting alternating current of audible frequencies. At the central station the mid-point of winding 70 of each transformer 69 is connected to one terminal of the primary winding 92 of a transformer 93, the opposite terminal of which is grounded. The connections just described will be recognized as a grounded half phantom circuit in which alternating current energy induced in the secondary winding of transformer 90 is transmitted over conductors 71 and 72 in parallel, through windings 70 and 92 to ground and returns through ground and condenser 91 to transformer 90.

One terminal of the secondary winding of transformer 93 is connected through a condenser 94 and a normally open switch controlled by push button 86 to a bus line 95 which is grounded through a resistance 96 and a potentiometer 97. The opposite terminal is connected to ground through the distributory conductor 36b and resistance 40 to complete a secondary circuit. The potentiometer 97 controls the volume input to the amplifier 14 and speaker 13. The volume level is indicated by a meter 98 connected across the potentiometer 97. Said volume level is also controlled by a resistor 99 shunted across the potentiometer 97 by operation of the talking key 82 as described in the Hayslett and Schmidt application before mentioned.

By means of these connections the output of any one of the subscriber's transmitters may be connected to the central station speaker 13 by operation of the proper push button 86.

Coin signal transmission

The conductors 60 and 61 at each subscriber's station are connected respectively to the mid-point of transformer winding 74 through the secondary winding of transformer 90 and to one terminal of a secondary winding 100 of transformer 50, the opposite terminal of which is grounded. By this means the operation of the coin switch when momentary connection is made between the conductors 60 and 61 impresses on the half phantom transmission circuit to the central station a signal in the form of an alternating voltage having the frequency of the alternating current power supply.

At the central station the incoming low frequency coin signal is transmitted to the secondary circuit of transformer 93 in the same manner as the incoming voice signals but the coin signal is prevented from reaching the amplifier 14 by a reactance unit 101 and condenser 102 connected in series across the input lines to said amplifier and serving to filter out the lower frequencies. A reactance 103 and a condenser 104 connected in series across the secondary terminals of transformer 93 serve as a low pass filter to transmit the coin signal to a tube 105 having suitable electrodes and connections for both rectification and amplification. The output circuit of said tube receives plate voltage from the positive direct current distributory conductor 36a which is connected to the amplifier anode of said tube through the winding of electromagnetic relay 108. Said relay, therefore, is momentarily actuated each time a coin signal is received from the associated subscriber's station.

Each actuation of the electromagnet 108 momentarily closes a pair of normally open switches 112 and 113. The operation of the switch 112 completes a circuit from the alternating current power mains 29 and 30 for operation of an electromagnet 114 which forms a part of the coin register device 19. Said device includes a ratchet wheel 115 normally urged in the clockwise direction by a coil spring 116 and held in position by an escapement 117 operated by a check-off magnet 118. The ratchet wheel 115 is moved against the action of the spring 116 by operation of the magnet 114, said movement being the equivalent of one tooth for each such actuation. Similarly, each actuation of the check-off magnet 118 operates the escapement 117 to permit the ratchet wheel to return a distance corresponding to one tooth.

The ratchet wheel 115 carries a grounded contact member 120 adapted to engage a contact

segment 121. In the normal idle position of the apparatus when no coin signals have been received from the subscriber's station, the contact member 120 is out of engagement with the contact segment 121 as shown in the drawing. When one or more coin signals have been received, the ratchet wheel 115 is moved to engage the contact member 120 with the segment 121 and said engagement is maintained until a corresponding number of actuations of the check-off magnet 118 have been made. In manual operation, the check-off magnet 118 is operated by a manual push button 122 which completes a circuit for said magnet from the power mains 29 and 30. In automatic operation the check-off magnet 118 is operated by other means to be hereinafter described.

The engagement of contact members 120 and 121 completes a circuit for a pair of signal lamps 123, said circuit leading from a secondary winding 124 of transformer 33 through a conductor 125 to said lamps and then through said contact members to ground and to a grounded terminal of winding 124. The signal lamps 123 are used as described in the co-pending application of Hayslett and Schmidt, heretofore mentioned, to indicate to the operator the fact that coin values have been registered and have not been checked off. The position of the ratchet wheel 115 is made apparent to the operator by a suitable indicating device and shows how many such coin values are registered.

The operation of switch 113 when the electromagnet 108 is actuated completes a circuit from the positive direct current supply line 36a through a resistor 138, an electromagnetic relay 139 and switch 113 to ground. The relay 139 is provided with a "stick" circuit leading from ground through a normally closed switch operated by the push button 86 and through a normally open switch operated by said relay to the relay itself. Said relay thus remains energized after a momentary actuation of relay 108 until the corresponding push button 86 has been pressed. Said relay when actuated completes a circuit for a signal lamp 140 from the low voltage alternating current power main 125. The lamp 140 when lighted indicates to the operator that a coin value has been received at the corresponding station and that the corresponding push button 86 has not yet been pressed for the purpose of answering the call.

Résumé of manual operation

In the manual operation of the apparatus so far described, the receipt of a coin at any subscriber's station causes the corresponding lamps 123 and 140 to be lighted at the central station. The operator then presses the corresponding push button 86, extinguishing the lamp 140, connecting the subscriber's transmitter 49 to the central station speaker 13 and conditioning a circuit for connection of the central station transmitter 11 to the subscriber's speaker 58. The operator at the same time may operate the key 82 to complete the last named connection. The operator then requests the customer to name his choice of music and the customer answers by speaking into his transmitter 49. When the customer has named the selection or selections he desires, the operator manually starts the corresponding phonograph mechanism and checks off one coin value by operating the corresponding switch 122. The key 82 and the push button 86 may then be released.

Automatic central station operation

Several types of automatic central station operation are possible with the arrangement disclosed in Fig. 1. The automatic reproducer mechanism may be operated intermittently in response to the registry of coin values on the several coin register units 19, said mechanism resting in the idle position when no such coin values are registered. Or, for installations involving a large number of subscriber's stations where the reproducer would normally operate almost continuously, the circuits by which the register units control the operation of the reproducer may be omitted and the motor 9 may be operated continuously to run the mechanism continuously through successive cycles of operation. In either case, the connection of the several subscriber's speakers to the automatic reproducer mechanism is controlled by their corresponding register units 19.

The several speakers may be connected to the reproducer unit at the instant a coin value is registered on their corresponding register units. In that event a coin value registered at one station during the playing of a record called for by another station makes it possible for the remaining fraction of the record to be heard at the first mentioned station in addition to the full record called for by its own coin value. In the alternative, the speaker connection may be delayed until the playing period is completed, when only the full record called for by the coin value will be heard. The former mode of operation may be called the "method of audible fractions" and the latter mode may be called the "method of silent fractions." Either of these methods may be used with either continuous or intermittent motor operation.

Speaker connections

For the purpose of changing from manual to automatic operation there is provided a manual snap switch 141 associated with each subscriber's station. Each of said switches is closed when automatic operation of the corresponding subscriber's station is desired and opened when manual operation is to be employed. A manual snap switch 142 is used for changing from the method of silent fractions to the method of audible fractions, said switch being open in the former case and closed in the latter case. The connections for the method of silent fractions will first be described.

There is provided on each of the coin register devices 19 a switch 145 which is opened by the contact member 120 when the register device has no coin values registered thereon but which is closed when one or more coin values have been registered but have not been checked off. Said switch is included in a circuit for actuating the corresponding relay 64. Said circuit leads from the power main 29 through a phonograph operated switch 146, a bus line 147, the switch 145, the snap switch 141, and a switch 149 operated by relay 64 to the coil of said relay and thence through a bus line 150 and a phonograph operated switch 151 to the power main 30. In this circuit the switch 146 is closed only when the phonograph mechanism is in or passing through the idle position. The switch 151 is normally closed and is opened momentarily at any convenient point in the cycle of phonograph operation after a record has been played and before the mechanism reaches the idle position. The switch 141 is closed whenever automatic opera-

tion is desired and is opened when the corresponding subscriber's station is to be supplied by manual control. The switch 149 is normally in the position shown in the drawing when the relay 64 is deenergized but is provided with a front contact connected to a branch of the power main 29. Switch 147 is so adjusted that the front contact is made before the back contact is broken. By means of this circuit each relay 64 is energized when a coin value is registered on a corresponding register device 19 provided that the phonograph mechanism is in the idle position. The actuation of relay 64 closes the front contact of switch 149 and thus retains the magnet thereafter irrespective of the position of switches 145 and 146. Each relay 64 remains energized until the retaining circuit therefor is broken by the opening of switch 151 after a record has been played. The operation of each relay 64 actuates the corresponding switch 63 to disconnect the subscriber's line from the manual pickup 5 and to connect the same to the automatic reproducer pickup 6 through a bus line 152, a coupling condenser 153, the amplifier 8 and the filter circuits 7.

By means of the connections just described it will be apparent that connections may be established between the subscriber's speakers and the automatic reproducer unit only when a coin value has been recorded on the corresponding coin register unit 19 and when the reproducer mechanism is in or passing through the idle position. A coin value registered after the idle position is passed has no effect in connecting the speaker. When once connected the speakers remain connected irrespective of the position of the coin register devices 19 until the switch 151 is opened momentarily after the play of a record. When the idle position of the apparatus is again reached, only such speakers as still have coin values registered on their corresponding units 19 are reconnected to the phonograph.

For operation by the method of audible fractions, the switch 142 is closed and the switch 146 is thus short circuited. Under these conditions, the circuits previously described for actuating the relays 64 may be completed at any time that a coin value is registered irrespective of the position of the reproducer mechanism. Thus when a coin is received at station A during the playing of a record called for by station B, the remaining fraction of the record is audible at station A.

Check off circuits

For automatically checking off coin values on the several coin register units 19 there is provided a phonograph operated check-off switch 157 which is momentarily closed at a convenient time in the cycle of phonograph operation. The switch 157 has one terminal connected to a branch of the power line 29 and the opposite terminal connected to a bus line 158. Each of the relays 64 is provided with a switch 159 connected to said bus line and to the corresponding check-off magnet 118 through a back contact of the manual check-off push button 122. By means of this arrangement, the check-off magnet 118 corresponding to each subscriber's station whose speaker is connected to the automatic phonograph mechanism is actuated when switch 157 is closed.

When the method of audible fractions is used it is important that the check-off switch 157 be operated at or near the start of the playing period. Thus, if a coin value is registered before play begins, the corresponding speaker is connected to the phonograph and the coin value is immediately checked off as the play of the record is started. If the coin value is registered after the record has started, its speaker is connected for the remaining fraction of the record but the coin value is not checked off until the start of the next record. In the interim said coin value has been effective to reconnect the speaker after switch 151 has been actuated. Preferably the check-off switch 157 is operated during the movement of the cam shaft 10 just before the playing position is reached. It sometimes happens that the mechanism is designed so that the cam shaft movement continues for a short time after the playing of the record is started. It is therefore possible that the check-off may occur slightly after the start of play. This is not objectionable since a speaker connected at that time will receive substantially a complete record in return for the coin value checked off.

When the method of silent fractions is employed the check-off switch 157 may be operated at any time in the cycle after switch 146 has been opened and before switch 151 has been returned to its normal closed position after an actuation thereof.

Motor circuits

For intermittent operation of the motor 9 the starting of the motor may be controlled directly from suitable switches operated by the coin register units 19 or may be controlled by said register units through the action of the relays 64 as illustrated in Fig. 1. Each of said relays operates a normally open switch 164 connected between a branch of the power main 29 and a bus line 165 leading to one terminal of the motor 9. The opposite terminal of the motor is connected to power main 30. Thus the operation of any of the relays 64 starts the motor and moves the cam shaft 10 away from the idle position. The first movement of the cam shaft closes a switch 166 which is open in the idle position only and which is connected in parallel with the switches 164. The operation of said switch thus retains the motor circuit through a complete cycle of operations independent of the relays 64. At the end of said cycle, the switch 166 is opened and the motor is stopped unless there is a coin value registered and one of the relays 64 is energized as a result thereof. In the latter case another cycle of operations is immediately initiated.

For continuous motor operation a snap switch 167 is closed to connect the motor 9 directly across the power mains 29 and 30. When the system is to be used with continuous operation only, the switches 164 and associated wiring may be eliminated and the switch 167 is then used to stop the motor when all stations have been returned to manual control and to start the motor when automatic operation is again desired.

Résumé of automatic central station operation

When it is desired to change from manual to automatic central station operation, a choice may be made between intermittent and continuous motor operation and between the methods of audible fractions and silent fractions. If intermittent motor operation is to be used, switch 167 is left open. If continuous operation is to be used, switch 167 is closed, but need not be closed before one or more of the subscriber's stations have been switched to automatic control. For the method of silent fractions, switch 142 remains

open. For audible fractions, switch 142 is closed. For any of the several types of operation, the snap switches 141 are individually closed to provide automatic operation as the manual operations of the associated stations are completed. Thus some stations may be operating on automatic control while others are still operating manually. The switches 141 are included in the circuits used to establish connections for the relays 64 and said relays can not be energized while said switches are open. Since the relays 64 control the speaker connections to the automatic reproducer, the motor starting circuits (in intermittent operation) and the automatic check-off circuits, the operation of one of the coin register devices while the corresponding switch 141 is open can not interfere with the speaker connection to the manual pickup or affect the operation of the automatic reproducers. Similarly, the operation of the automatic reproducer can not affect the check-off magnets of those stations whose switches 141 are open. The provision of the back contacts in the manual check-off switches 122 insures that an inadvertent operation of the switch 122 of a station operating automatically will effect a check-off on that station only and not on other stations then operating automatically.

Assuming operation by silent fractions (switch 142 open) and intermittent motor operation (switch 167 open), the automatic reproducer stands in the idle position when the first of the switches 141 is closed. If one or more coin values are registered on one of the register devices 19 when the corresponding switch 141 is closed or if a coin value is registered thereafter, the corresponding relay 64 is immediately energized to connect the subscriber's speaker to the automatic reproducer by switch 63 and to energize the motor circuit by switch 164.

As soon as the mechanism has left its idle position, switch 146 opens and it becomes impossible for additional relays 64 to be energized although coin values may be registered thereafter on their corresponding register units. At or about the time that the actual play of a record commences, switch 157 is closed to check off a coin value from each register unit whose speaker is then connected to the automatic phonograph. Since the relays 64 of stations which have received coins after the phonograph mechanism was started are not energized such coin values will not be checked off at the start of play. After the playing of a record and before the idle position of the mechanism is reached, switch 151 is opened to deenergize all of the relays 64. Motor operation continues since switch 166 is closed. If unsatisfied coin values are still registered on any of the register units 19 when the idle position of the apparatus is reached, the operation of switch 146 immediately energizes the corresponding relays 64 and initiates another cycle of operation. If there are no such coin values registered, the operation of switch 166 when the idle position of the apparatus is reached opens the motor circuit and stops phonograph operation.

Assuming operation by audible fractions (switch 142 closed) and intermittent motor operation (switch 167 open), the start of operation is the same as just described for operation by silent fractions. When a coin value is registered after the phonograph mechanism has started the associated relay 64 is immediately energized through the closed switch 142 and the associated speaker is connected to the automatic reproducer. At or about the time that the actual play of the record commences, switch 157 is closed to check off a coin value from each register unit whose speaker is then connected to the automatic reproducer. Since stations which have received coin values since the phonograph started are connected, coin values are checked off from such stations. The registry of coin values after the start of play similarly results in the actuation of the corresponding relays 64 so that the remaining fraction of the record is audible. Since the check off has already occurred such coin values are not checked off until the next operation. After the play of a record, switch 151 is momentarily opened to deenergize all of the relays 64. When switch 151 is again closed all of said relays whose register units still have coin values registered thereon are reenergized and their speakers are again connected to the automatic reproducer. If there are any such relays energized when the idle position of the apparatus is reached, switch 166 is ineffective to stop the motor and another cycle of operations is immediately initiated.

Assuming continuous motor operation (switch 167 closed) the operation is the same as just described except that cycles of phonograph operation follow each other automatically and continuously. The registry of coin values has the effect of connecting the speakers when the mechanism passes through the normal idle position for operation by silent fractions or connecting the speakers whenever such coin values are registered in the method of audible fractions. The check-off is operated in the same manner as before.

When it is desired to change a subscriber's station from automatic to manual operation the corresponding switch 141 is opened. If the station is then operating automatically the opening of switch 141 has no effect since relay 64 remains energized by its stick circuit until the play of a record is completed and switch 151 is opened. When switch 151 is again closed, the open switch 141 prevents reenergizing of relay 64. Coin values remaining unsatisfied are indicated by the signal lamps 123 and may be satisfied manually.

When continuous operation has been employed, the switch 167 is opened after all of the switches 141 have been opened. The motor continues to operate under control of switch 166 until the idle position is reached whereupon said switch is opened to stop the motor.

When the invention is to be used in a fully automatic system such as disclosed in the Adrian patent before mentioned, obviously much of the apparatus illustrated in the drawings may be eliminated. At the subscriber's stations the microphones 49 and amplifiers 52 are not needed. At the central station the manual pickups 5 and associated circuits, the transmitter 11, speaker 13 and amplifiers 12 and 14 may be dispensed with and the connections of the automatic reproducer to the subscriber's lines may be much simplified. Even though the method of audible fractions is used, there is no necessity for additional coin impulses as in the Adrian apparatus.

The invention has been described in one of its preferred forms, the details of which may be varied without departing from the scope of the invention as defined by the appended claims. The subscriber's stations may be located in separate establishments in different parts of a city and may be connected to the central station by com-

mercial telephone lines permanently connected at the telephone central. In the drawings the conductors 71 and 72 may be considered to be such commercial telephone lines. Alternatively the subscriber's stations may be in different apartments of the same establishment—for example, the private dining rooms and bedrooms of a hotel or apartment house. In the claims the term "subscriber's station" is not to be considered as limiting such stations to separate establishments.

The invention claimed is:

1. In a communication system having a phonograph reproducer at a central station and speakers at a plurality of subscriber's stations, coin register and check off means associated with each subscriber's station and controlling the operation of the reproducer to initiate a cycle of operation thereof when one or more coin values have been registered and not checked off, and phonograph operated means for actuating said check off means at a time in the cycle of phonograph operation preceding the playing of a record, whereby a coin value registered during the playing of a record is not checked off until said record has been played and another cycle of phonograph operation has been initiated.

2. In a communication system having a phonograph reproducer at a central station and speakers at a plurality of subscriber's stations, coin register and check off means associated with each subscriber's station and controlling the operation of the reproducer to initiate a cycle of operation thereof when one or more coin values have been registeerd and not checked off, and phonograph operated means for actuating said check off means at approximately the beginning of play of the record, whereby a coin value registered during the playing of a record is not checked off until said record has been played and another cycle of phonograph operation has been initiated.

3. In a communication system having a phonograph reproduced at a central station and speakers at a plurality of subscriber's stations, coin register and check off means associated with each subscriber's station and controlling the operation of the reproducer to initiate a cycle of operation thereof when one or more coin values have been registered and not checked off, and phonograph operated means for actuating said check off means and operative after a cycle of operation has been initiated and before the playing of a record has progressed substantially beyond its starting point, whereby a coin value registered during at least the greater portion of the playing time of a record is not checked off until the playing of the record is complete and said coin value has been effective to initiate another cycle of operation.

4. In a communication system having a phonograph reproducer at a central station and speakers at a plurality of subscriber's stations, a coin register and check off device associated with each subscriber's station, electric circuits controlled by said devices and controlling the operation of said reproducer to initiate a cycle of operation thereof when a coin value has been registered on any one of said devices and not checked off, and to connect the reproducer to the speaker associated with the device having such coin value registered thereon, phonograph controlled retaining circuits adapted to retain said speaker connections through the complete playing of a record independent of said check off devices, and phonograph operated means for actuating said check off devices to check off a coin value on each of said devices having its speaker connected to said reproducer, said means being effective at a time in the cycle of phonograph operation preceding the playing of the record, whereby a coin value registered during the playing of a record is not checked off until said record has been played and another cycle of phonograph operation has been initiated.

5. In a communication system having a phonograph reproducer at a central station and speakers at a plurality of subscriber's stations, a coin register and check off device associated with each subscriber's station, electric circuits controlled by said devices and controlling the operation of said reproducer to initiate a cycle of operation thereof when a coin value has been registered on any one of said devices and not checked off, and to connect the reproducer to the speaker associated with the device having such coin value registered thereon, phonograph controlled retaining circuits adapted to retain said speaker connections through the complete playing of a record independent of said check off devices, and phonograph operated means for actuating said check off devices to check off a coin value on each of said devices having its speaker connected to said reproducer, said means being effective at approximately the beginning of play of the record, whereby a coin value registered during the playing of a record is not checked off until said record has been played and another cycle of phonograph operation has been initiated.

6. In a communication system having a phonograph reproducer at a central station and speakers at a plurality of subscriber's stations, a coin register and check off device associated with each subscriber's station, electric circuits controlled by said devices and controlling the operation of said reproducer to initiate a cycle of operation thereof when a coin value has been registered on any one of said devices and not checked off, and to connect the reproducer to the speaker associated with the device having such coin value registered thereon, phonograph controlled retaining circuits adapted to retain said speaker connections through the complete playing of a record independent of said check off devices, and phonograph operated means for actuating said check off devices to check off a coin value on each of said devices having its speaker connected to said reproducer, said means being effective at a time in the cycle of phonograph operation before the playing of a record has progressed substantially beyond its starting point, whereby a coin value registered during at least the greater portion of the playing time of a record is not checked off until the playing of the record is complete and said coin value has been effective to initiate another cycle of operation.

7. In a communication system having a central station and two or more subscriber's stations, an automatic record changing phonograph unit at the central station, a speaker and a coin receiving device at each of said subscriber's stations, a coin register and check off device associated with each of said coin receiving devices and adapted to register the value of coins received thereby in terms of records to be played, electric circuits controlled by said coin registers and adapted to initiate an operation of said phonograph unit when a coin value has been registered on any one of said coin registers and not checked off, and to connect said phonograph unit to the

speakers associated with the coin registers having coin values registered thereon, electric circuits controlled by operation of said phonograph unit and adapted to operate at a point in the cycle of phonograph operation before play of the record has progressed substantially beyond its starting point to check off a coin value on each of the coin registers whose associated speakers are then connected to said phonograph unit, and retaining circuits controlled by operation of said phonograph unit and adapted to carry said unit through a complete cycle of operation and to retain the connection of said unit to said speakers through the playing of a record independent of said check off.

8. In a communication system having a central station and two or more subscriber's stations, an automatic record changing phonograph unit at said central station operable through successive cycles including periods of play and intermediate periods during which records are changed, a coin register and check off device associated with each subscriber's station, electrical apparatus controlled by said coin register devices and adapted to connect to said phonograph unit the speakers corresponding to the coin register units having coin values registered thereon, phonograph controlled check off circuits operable before the record playing period has progressed substantially beyond its starting point and adapted to check off a coin value on each coin register device corresponding to a speaker then connected to said phonograph, and phonograph controlled retaining circuits adapted to retain said speaker connections through a complete playing period independent of said check off.

9. In a communication system having a central station and two or more subscriber's stations, an automatic record changing phonograph unit at said central station operable through successive cycles including periods of play and intermediate periods during which records are changed, a coin register and check off device associated with each subscriber's station, speaker connecting means controlled by said coin register devices and by said phonograph unit and adapted to establish connections between said unit and the speakers corresponding to such coin register devices as have coin values registered thereon, phonograph controlled circuit retaining means adapted to retain said speaker connections, said retaining means being effective from a predetermined point in the record changing period, through the playing period and to a second predetermined point in the succeeding record changing period and being ineffective between said points, said speaker connecting means being effective to establish speaker connections during a part at least of the record changing period after said retaining means has become effective and being ineffective to establish such connections at least through the major portion of the playing period, and phonograph operated check off circuits operating at a point in the cycle of operation when the speaker connecting means is ineffective to check off a coin value on each coin register device corresponding to a speaker then connecttd to said phonograph.

10. In a communication system having a central station and two or more subscriber's stations, an automatic record changing phonograph unit at said central station operable through successive cycles including periods of play and intermediate periods during which records are changed, a coin register and check off device associated with each subscriber's station, a speaker operating stick relay associated with each subscriber's station and each adapted when actuated to connect its associated speaker to the phonograph unit, actuating circuits for said relays each controlled by its associated coin register device to actuate said relay when a coin value is registered thereon, retaining circuits for said relays controlled by phonograph operation to retain said relays throughout the record playing period, and a check off circuit for each of said coin register devices, each such circuit being controlled by the associated relay and operated by said phonograph at approximately the starting point of the playing period to check off a coin value on each register device associated with an actuated relay.

11. In a communication system having a central station and two or more subscriber's stations, an automatic record changing phonograph unit at said central station operable through successive cycles including periods of play and intermediate periods during which records are changed, a coin register and check off device associated with each subscriber's station, a speaker operating stick relay associated with each subscriber's station and each adapted when actuated to connect its associated speaker to the phonograph unit, actuating circuits for said relay each controlled by its associated coin register device to actuate said relay when a coin value is registered thereon, retaining circuits for said relays controlled by phonograph operation, said retaining circuits being ineffective during a portion of the record changing period but effective during the playing period and during a portion of the record changing period immediately preceding the playing period, said relay actuating circuits being controlled by phonograph operation so as to be effective in at least a part of the last mentioned portion of the record changing period but ineffective during the playing period, and a check off circuit for each of said coin register devices, each such circuit being controlled by the associated relay and operated by the phonograph at a point in the cycle of operations when the relay actuating circuits are ineffective, to check off a coin value on each register device associated with an actuated relay.

12. In a communication system having a central station and a plurality of subscriber's stations, a plurality of manually controlled phonograph reproducer units, an automatic record changing phonograph reproducer unit, a transmitter and a receiver at said central station, a speaker, a transmitter and a coin receiving device at each subscriber's station, electric circuits connecting said central station and said subscriber's stations and normally connecting each of said manual phonograph units to one of said subscriber's speakers, and including keying means adapted selectively to connect the central station transmitter and receiver to the speaker and transmitter at any of said subscriber's stations for two way conversation, and manually operated means at said central station associated with each of said subscriber's stations and adapted to establish electrical connections by means of which the subscriber's speaker may be connected to the automatic phonograph unit and said automatic phonograph unit may be controlled by the associated coin receiving device.

13. In a communication system having a central station and a plurality of subscriber's stations, a plurality of manually controlled phonograph reproducer units, an automatic record

changing phonograph reproducer unit, a transmitter and a receiver at said central station, a speaker, a transmitter and a coin receiving device at each subscriber's station, electric circuits connecting said central station and said subscriber's stations and normally connecting each of said manual phonograph units to one of said subscriber's speakers, and including keying means adapted selectively to connect the central station transmitter and receiver to the speaker and transmitter at any of said subscriber's stations for two way conversation, coin register and check off devices at said central station each connected to and controlled by one of said coin receiving devices, and adapted to indicate to an operator the number of coin values received at said station and not checked off, manual check off means for checking off coin values from said devices, automatic check off means operable by said automatic phonograph to check off coin values from said devices, said means being normally ineffective, and manually operated means associated with each of said subscriber's stations and adapted to establish electrical connections by means of which said automatic phonograph unit may be connected to the subscriber's speaker, and the corresponding coin register device may control the operation of said automatic phonograph unit and said automatic check off means is rendered effective.

14. In a communication system having a central station and a plurality of subscriber's stations, a plurality of manually controlled phonograph reproducer units, an automatic record changing phonograph reproducer unit, a transmitter and a receiver at said central station, a speaker, a transmitter and a coin receiving device at each subscriber's station, electric circuits connecting said central station and said subscriber's stations and normally connecting each of said manual phonograph units to one of said subscriber's speakers, and including keying means adapted selectively to connect the central station transmitter and receiver to the speaker and transmitter at any of said subscriber's stations for two way conversation, and manually operated means at said central station adapted to establish electrical connections by operation of which the subscriber's speakers may be connected to the automatic phonograph unit and said automatic phonograph unit may be controlled by said coin receiving devices.

15. In a communication system having a central station and a plurality of subscriber's stations, a plurality of manually controlled phonograph reproducer units, an automatic record changing phonograph reproducer unit, a transmitter and a receiver at said central station, a speaker, a transmitter and a coin receiving device at each subscriber's station, electric circuits connecting said central station and said subscriber's stations and normally connecting each of said manual phonograph units to one of said subscriber's speakers, and including keying means adapted selectively to connect the central station transmitter and receiver to the speaker and transmitter at any of said subscriber's stations for two way conversation, coin register and check off devices at said central station each connected to and controlled by one of said coin receiving devices, and adapted to indicate to an operator the number of coin values received at said station and not checked off, manual check off means for checking off coin values from said devices, automatic check off means operable by said automatic phonograph to check off coin values from said devices, said means being normally ineffective, and manually operated means at the central station adapted to establish electrical connections by operation of which the subscriber's speakers may be connected to the automatic phonograph unit, said coin register devices may control the operation of said automatic phonograph unit and said automatic check off means is rendered effective.

GERALD G. SMITH.