June 7, 1949. E. S. PETERSON 2,472,435

WIRE RECORDING SYSTEM

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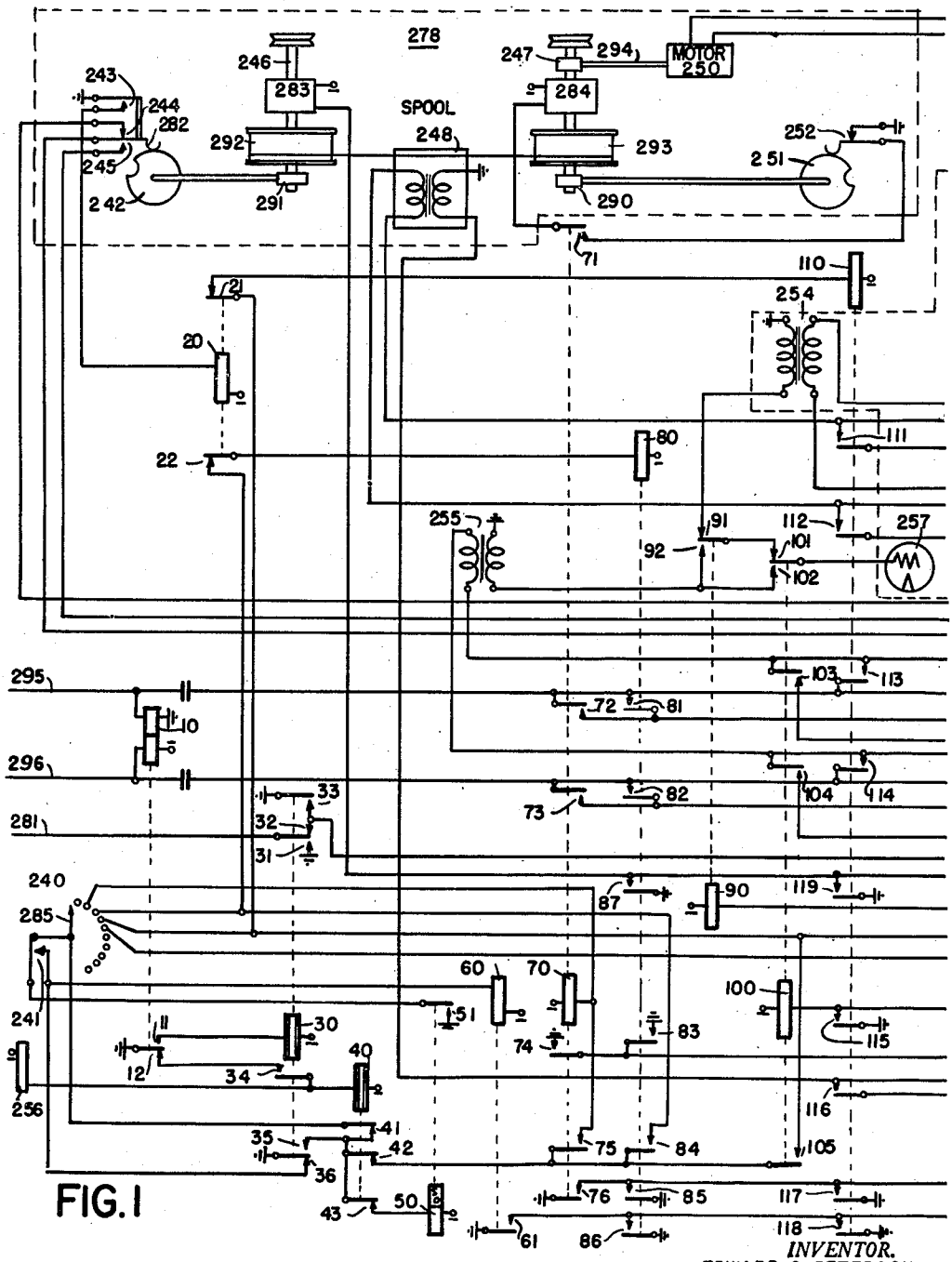

FIG. 1

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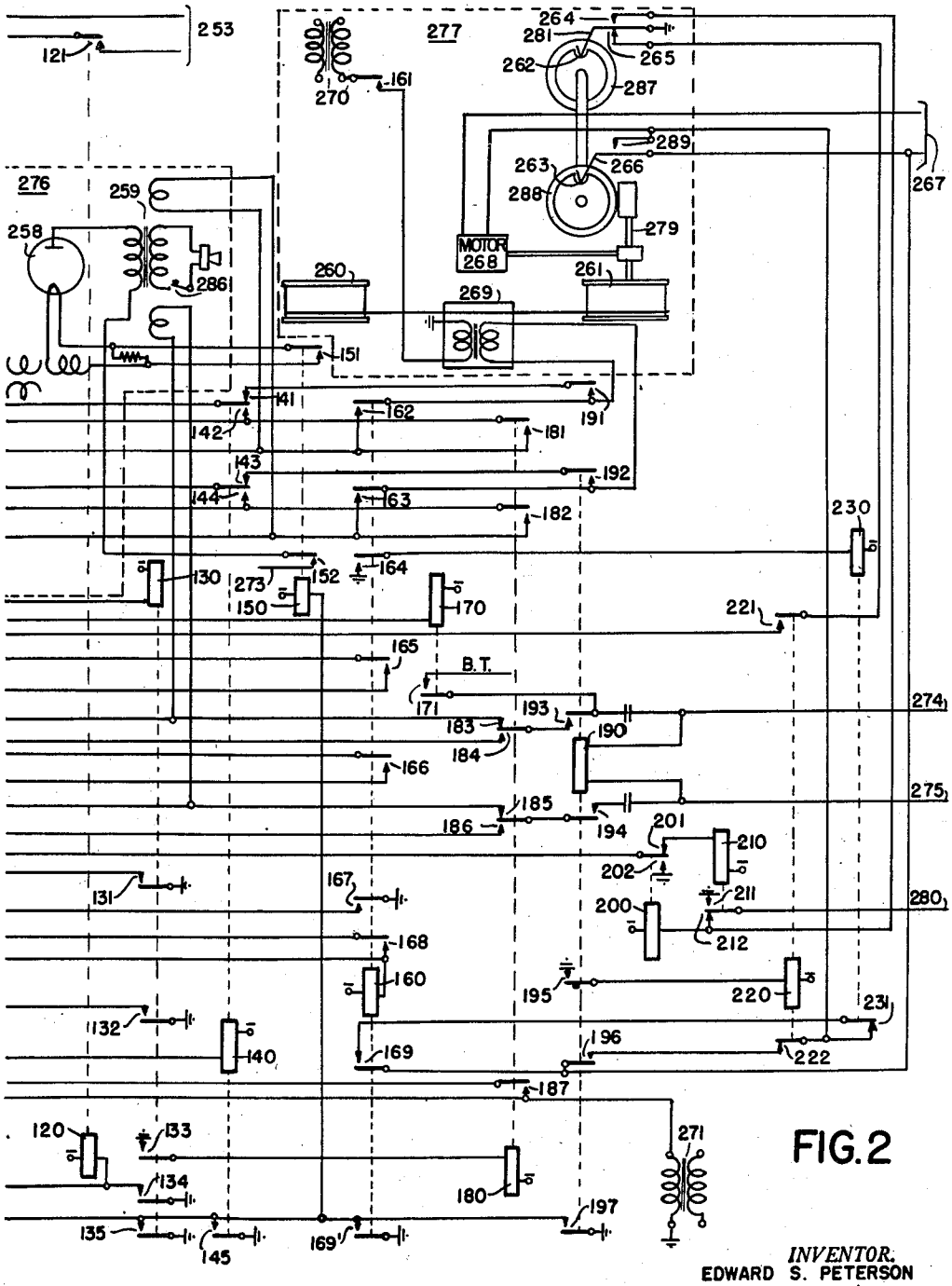

FIG. 2

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WIRE RECORDING SYSTEM

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14 Claims. (Cl. 179—6)

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This invention relates, in general, to systems of recording, and more particularly, to systems involving the use of recorders which are remotely controlled to record and transmit messages.

The object of this invention is to provide a completely automatic recording system wherein a series of subscribers may record messages, and which has means whereby an operator may monitor the accumulated messages whenever desired, and thereafter restore the system to a position for further recording, both the operators position and the subscribers sets being remotely located with respect to the recording system.

A feature of the system is the provision of a pair of wire recorders in an automatic system which are electrically controlled either by an operation of one of a plurality of subscribers sets or by means at an operators position, to record and transmit messages both the subscriber and operator positions being remotely located from the isolated recorders.

Another feature of the invention is the provision of a wire recorder in the system which is energized when seized by a subscriber set to automatically transmit a message to the subscriber.

A further feature of the invention is the provision of automatic means in the recording system for connecting the subscriber set to the second wire recorder on termination of the message transmitted by the first wire recorder, and for automatically terminating operation of the first recorder and resetting the same for use on subsequent calls.

An additional feature is the provision of a control system in the automatic system which prevents recorder operation whenever the available recording section of wire in one of the recorders has been previously used and for so informing the calling subscriber. The control system is also effective to terminate the recorder operation if the end of the available section of recording wire is reached while a subscriber is in the process of recording a message, the system being operative to so inform the subscriber.

Another feature is the provision of a control system in the automatic recording system which prevents operation of the recorder motor for the purpose of rewinding the wire to its initial starting point, if the wire is already at that point, and which is effective to automatically stop the wire at its original starting point when it is in the process of being rewound.

A further feature is the provision of a control system, associated with the recorder set, which is accessible only to an operator and with which

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the operator is able to control the recorders to accomplish any one of a group of operations by dialing one of a group of numbers each specific to one of the operations.

The preferred embodiment of the invention herein described includes an arrangement wherein the recording system is located in an automatic telephone exchange of a small town and the main office is located in a distant town. The subscribers may register their complaints with the recording system and an operator may monitor the accumulated messages at convenient intervals. The system is completely automatic and controlled by operations of the subscriber or operator. Other applications will be immediately noted by those familiar with the art, the advantages of the invention being obvious.

The novel features believed to be characteristic of the invention are set forth with particularity in the appended claims. The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the specification taken in connection with the accompanying drawings in which Figures 1 and 2 when combined illustrate an automatic remotely controlled wire recording system having the features of the invention briefly outlined above.

Referring now to combined drawings 1 and 2, the system there illustrated comprises a wire recording system having connections **281**, **295**, **296**, which are accessible to an attendant, and connections **274**, **275**, **280** which are accessible to a subscriber. The outgoing lines **274**, **275**, **280** are connected to a standard type connector. Outgoing lines **281**, **295** and **296** are connected to the switch-thru selector or a selector of the type disclosed in the Tilden Patent 1,815,223, granted July 21, 1931.

The wire recording system illustrated comprises a pair of wire recorders, an amplifier which is common to both of the recorders, a loudspeaker which may be connected to the amplifier output when so desired, and a relay set including a single level rotary switch for remote control of the recorder operations.

Each recorder is equipped with a recorder head of the longitudinal type and there may be means which superimposes a high frequency on the associated recording wire and employs a high frequency for erasing purposes as disclosed in Camras Patent 2,351,009, granted June 13, 1944.

A single amplifier of any suitable nature is used in conjunction with both recorders. The first recorder **277** is used to record and transmit

a message of comparative shortness, i. e. 1–5 minutes. A wire recorder employing the well-known endless wire principle will therefore provide satisfactory results. The driving mechanism for the endless loop of wire, which passes around the pair of aligned rotatably mounted rollers 260 and 261, consists of electric motor 268 which has its driving shaft in engagement with a differential gear set 279, which in turn is connected to the shaft of roller 261 and arranged to drive said roller at the required speed. The second roller 260 acts as a guide roller and is driven by the friction of the moving wire. The recording head 269 is located between the rollers and the wire in its travel from one roller to the other is connected so as to pass through the head.

The recorder further includes a pair of wheels 287 and 288 which are driven by the gear set. Each wheel has an associated cam fastened to its face surface, the cams having detents 262 and 263 located at similar points on their outer peripheries. A pair of springs 266 and 281 are arranged to normally engage the detents on the cams and have their contacts 264, 265 and 289 connected in the recorder operating circuit so as to automatically control further operation of both recorders when actuated. The various parts of the wire recorder are diagrammatically illustrated, the recorders being well known to the art.

The second recorder 278 is arranged to record a series of messages on a recording wire associated therewith until such time as it is convenient to an operator to monitor the recordings. This recorder therefore comprises a pair of spools 292 and 293 having a wire connected therebetween which is of sufficient length to accommodate approximately an hour of recorded messages. Each of the pair of aligned spools 292 and 293 are rotatably mounted on the lower end of their respective shafts 246 and 247. Each roller has a series of grooves notched on its upper face plate for normally engaging associated magnetic clutches 283 and 284 which are keyed to the shafts at a point immediately above the spools. The upper end of each shaft carries a rotatably mounted pulley the pair being aligned for a belt drive therebetween. Shaft 247 is driven through a set of differential gear 294 by an electric motor 250. Shaft 247 in its movement imparts rotation to shaft 246 via the pulley drive. The system is arranged so that during any operation of recorder 278, one of the two clutches 283 and 284 will be energized. The energized clutch disengages itself from its associated spool, allowing the deenergized clutch in turning to wind the wire about its associated spool. When recorder operation is terminated by any one of a group of means, the system is arranged to immediately deenergize the energized clutch, which releases and in a braking manner engages its associated spool to prevent wire slack. Safety cams 242 and 251 are driven by their respective differential gear sets 291 and 290 and are effective to prevent further winding operation of spool when the section available for recording is already wound on same. The wire in its movement passes through combined recording reproducing and erasing head 248 which is located midway between spools 292 and 293. The recording and erasing head 248 may be combined as indicated or may be in two units as shown in the Camras patent.

Rotary switch 240 of the well known type is accessible only to an operator and is used in conjunction with a relay set to control the various operations of the recorders.

A more detailed description of the recorder system operation will be evident in the following disclosure of connections and operations.

A subscriber wishing to register information with the equipment may seize the set by dialing a special number restricted for that purpose. The call will be extended through the associated telephone exchange in a well known manner to the previously mentioned connector which is connected to the recording set at the incoming terminals 274, 275 and 280. The connector completes a circuit for relay 200 over conductor 280 and contacts 212. Relay 200 operates and at its contacts 202 extends ground forward over contacts 32 and conductor 281 thereby preventing a busy potential to prevent a second subscriber or the monitor operator from seizing the recorder when the set is in use.

Line relay 190 also operates on seizure and at its contacts 191 and 192 connects the recording head 269 of the loop recorder 277 to the input transformer 254 of the amplifier unit 276 over contacts 141 and 143, at its contacts 193 and 194 connects the incoming line over contacts 183 and 185 to the output transformer 259 of the amplifier unit, at its contacts 195 completes a circuit to the slow to operate relay 220, at its contacts 196 completes an energizing circuit to motor 268 of the loop recorder 277 from power supply 267 over contacts 222 and at its contacts 197 completes a circuit to relay 150 which operates and at its contacts 151 completes a circuit to supply full current to the tube filament and at its contacts 152 closes power supply circuit 273 to the amplifier plate circuit.

The loop recorder motor operates and the tape driven through the gear set and spools is passed through the poles of the recorder head 269 and is effective to induce the message recorded thereon in the completed listening circuit. The listening circuit extends from the recorder head to the input transformer of the amplifier, through the amplifier, to the output transformer of the amplifier, over contacts 183 and 185, 193 and 194 to the subscriber over lines 274 and 275. Wheel 288 is likewise driven by the gear train operation. When the loop recorder was in the stopped position, spring contact 266 rested in detent 262 which is located on the outer periphery of the cam attached to the face of wheel 288.

As soon as the cam is rotated from its normal stop position, spring contact 266 closes and completes an auxiliary operation circuit to the motor from the power supply 267. After a brief interval relay 220, which is slow to operate, operates and at its contacts 222 breaks the original operating circuit to the motor 268 and at its contacts 221 prepares a circuit for the spool recorder 278. When the cam has rotated through 360°, the spring contact will fall into the circumference detent and break the auxiliary power supply circuit to the motor. The loop recorder will, therefore, on seizure of the set, automatically start, transmit the message recorded thereon to the subscriber, and stop in a position where it may be seized by a subsequent subscriber. In this specific embodiment a short transcription is desired which may consist merely of instructions to the subscriber as to how to proceed in recording his complaint, and the set is so arranged.

It is to be understood that this recorder may be adjusted to send messages of any length by any one of numerous means, i. e. lengthening or shortening the tape or changing the size of the

cam. A second wheel 287, operated by a shaft connected between its radial axis and that of wheel 288, operates spring 281. Spring 281 in operating closes its contacts 264 and places a secondary ground on conductor 280 insuring busy protection for the set if the connection is broken immediately after completion, until such time as the loop recorder restores itself for subsequent use.

The motor 268 turns the two cams until the springs engage the detents located on the wheels at which point spring 266 breaks the operating circuit to the motor 268. Spring 281 at its contacts 264 breaks the circuit to relay 200 which releases and removes the secondary ground from conductor 280.

Spring 281 in operating completes a circuit over contacts 265, 221 and 244 to relay 130 for starting the spool recorder 278 providing the wire has not been completely wound on spool 293 by prior recordings. A safety cam 242 is connected to and driven by the gear set 291. A detent on the circumference of the cam is positioned so that as the wire is wound on the record spool 292 the detent rotates toward spring 282. As the wire nears its termination on the record spool, the detent engages spring 282 which at its contacts 244 prevents further rotation of the motor and travel of the tape in the recording direction by breaking the circuit to relay 130 and at its contacts 245 completes a circuit to relay 170 which operates and at its contacts 171 sends a busy tone to the subscribers over conductors 274 and 275 as a signal that no further recordings can be made. The same busy tone will be sent to each subsequent subscriber seizing the set until such time as the monitor rewinds the tape to the rewind spool 292 in a manner to be described herein.

Assuming the tape in a position to record, a circuit is completed to relay 130 as described above. Relay 130 operates and at its contacts 131 completes a circuit to the clutch 283 associated with the rewind spool 292. The clutch 283 operates and as described heretofore disengages itself from the rewind spool 292. Clutch 284 remains engaged with spool 293. At contacts 132 of relay 130 a circuit is completed to relay 100, at contacts 133 a circuit is completed to relay 180, at contacts 134 a circuit is completed to relay 120, and at contacts 135 a second energizing circuit is completed to relay 150. Relay 100 operates and at its contacts 102 connects input tube 257 of the amplifier set 276 to the input transformer 255, at contacts 103 and 104 prepare a point in the input circuit to transformer 255, and at contacts 105 complete a circuit having no function at this time.

Relay 180 operates and at its contacts 181 and 182 completes a path from output 259 of the amplifier unit to the recording head of the spool recorder, at contacts 184 and 186 completes the path from the subscribers set over contacts 103 and 104, which were previously prepared to input transformer 255 of the amplifier, and at its contacts 187 starts the oscillator 271 for the spool recording. The oscillator is effective as described in the Camras Patent 2,351,009 to erase previously recorded messages present on the wire before the tape reaches the point in the head where new recordings are to be applied.

Relay 120 operates and at its contacts 121 closes an operating circuit to motor 250 which drives the record spool 293 and winds the tape in the direction suitable for recording, the rewind clutch having been disengaged by operation of relay 130 as described above. Relay 150 operates and at its contacts 151 supplies full current to the amplifier tube filaments and at its contacts 152 closes the power source 273 to the amplifier plate supply. At this point, a connection exists from the subscriber to the amplifier input, the amplifier is energized, the amplifier output is connected to the recording head, the recording head oscillation is energized, and the motor is passing the wire through the recording head in a recording direction. As previously described, the combination erasing-recording head erases the previously recorded messages before the tape reaches the point in the head where the new recordings are made. The subscriber proceeds with the recording of the message and on completion restores the receiver to the subscriber hookswitch, whereupon relay 190 releases and at its contacts 191 and 192 disconnects the playback head of the loop recorder from the input 254 to the amplifier, at its contacts 193 and 194 breaks the connection to the incoming line, at its contacts 195 breaks the circuit to relay 220 which deenergizes and at its contacts 221 breaks the circuit to relay 130. Relay 130 deenergizes and at its contacts 134 breaks the operating circuit to relay 120 which in turn breaks the circuit to the spool recorder motor, at its contacts 131 opens the clutch operating circuit for clutch 283 which releases to reengage the rewind spool. Relay 130 at its contacts 132 opens the circuit to relay 100 and at its contacts 133 opens the circuit to relay 180. Relay 100 releases and at its contacts 103 and 104 breaks a further point in the incoming circuit to the amplifier. Relay 180 releases and at its contacts 181 and 182 opens the connections between the amplifier output and the spool recorder, at its contacts 184 and 186 opens a further point in the incoming connections to the input side of the amplifier and closes a point from the output of the amplifier to the point of connection of a subsequent incoming call, and at its contacts 187 opens the oscillating circuit for the recording head of the spool recorder.

A restricted number is provided for the purpose of monitoring the recordings by an operator. The operator in dialing this restricted number seizes the relay equipment over the connector mentioned heretofore and completes a circuit for relay 10. Relay 10 operates and at its contacts 11 completes a circuit to slow-to-release relay 30. Relay 30 operates and at its contacts 31 places ground on conductor 281 providing busy protection for the set and at its contacts 33 completes a circuit for relay 210 over contacts 201, at its contacts 34 completes a circuit for relay 40 and at its contacts 35 prepares a point in the circuit to the switch wiper 285. Relay 210 operates and at its contacts 211 places ground on conductor 280 providing busy protection for the set thereby preventing seizure by a subscriber while the set is being monitored. Relay 50 operates and at its contacts 51 prepares a circuit for relay 60. The set is now prepared for monitoring and the attendant may cause the set to operate in any one of a series of manners by dialing any one of a group of numbers. In this particular application digit 1 is designated as the release number, digit 2 as the rewind number, 3 as the spool recorder listening number, 4 as the spool recording number, and 5 as the loop recording number. A more detailed description of

the operations associated with the above designations is given herein.

The tape, when used by the subscribers, passes from the rewind spool 292 to the recording spool 293. Before the operator can listen to the recordings on the tape, the tape must be rewound on the rewind spool 292. The attendant therefore after seizing the set, dials the digit 2 to transmit two impulses. On the first break of the first impulse, relay 10 releases and at its contacts 11 opens the operating circuit to relay 30, which being slow-to-release holds for the open interval of the impulse, at its contacts 12 closes an operating circuit to relay 40 over closed contacts 34 and also energizes rotary magnet 256. The rotary magnet operates and advances the wiper arm to the first step on contact bank 240 at the same time closing the off normal contacts 241.

Relay 40 operates at the same time and at its contacts 41 opens the wiper circuit, at its contacts 42 prepares a circuit having no purpose at this time, and at its contacts 43 opens the circuit for relay 50. On the first make after the first break, relay 10 energizes and at its contacts 11 again completes a circuit to relay 30, and at its contacts 12 breaks the operating circuit to relay 40 which is a slow to release relay and therefore holds during the make. On the second break, relay 10 releases and the rotary magnet steps the wiper to the second contact of the bank as described above. On the second make after the second break, the operating circuit to relay 40 is broken and after an interval, relay 40 releases, while relays 10 and 30 remain energized. Relay 40, on releasing, completes a circuit for relay 70 over contacts 35, its own contacts 41 and the second contact of bank 240, at its contacts 42 prepares a holding circuit for rewind relay 70, and at its contacts 43 completes a circuit for relay 50. Rewind relay 70 operates and at its contacts 71 completes a circuit to recording spool clutch 284 over contacts 252 provided there is any wire on the record spool 293. Cam 251 which operates in a manner similar to cam 242 has a detent on its outer periphery located so as to allow the spring to break the operating circuit to clutch 284 whenever there is no wire on the record spool 293. Rewind relay 70 at its contacts 72 and 73 connects the output 259 of the amplifier to the operator lines 285 and 286, at its contacts 74 completes a circuit to relay 140, at its contacts 75 completes a self-holding circuit over contacts 42 and 35, and at its contacts 76 completes a circuit to relay 120. Relay 50 energizes at the same time and at its contacts 51 completes a circuit for release relay 60, which energizes and restores wiper arm 285 to its normal position and the off normal springs open the operating circuit to relay 60, and at its contacts 61 energizes relay 150. Relay 150 energizes and completes the circuit to the plate amplifier supply at its contacts 152 and at its contacts 151 supplies full current to the amplifier tube filaments. Relay 140 operates and at its contacts 142 and 144 connects the spool recording head 248 to the input transformer 254 of the amplifier, at contacts 145 completes a secondary holding circuit to relay 150. Relay 120 operates and at its contacts 121 completes a power supply to motor 250 for rewinding the tape on spool 292. Dialing number 2 therefore causes the set to disengage the clutch 284, energize the motor which in turn rewinds the tape to the rewind spool 292 connects the recording head to the amplifier input, energizes the amplifier and connects the amplifier output to the operators line. In as much as the tape is running backwards the attendant will not be able to understand the recordings per se but will be able to tell when the recorded conversations have been rewound before the wire end is reached and the automatic stop is actuated. If the attendant wishes to terminate the rewinding process at any point, the release number 1 is dialed. On the break caused by the dialing of number 1, relay 10 releases and at its contacts 12 completes a circuit to relay 40. Relay 40 operates and at its contacts 41 opens a further point in the original operating circuit to relay 70, at its contacts 42 opens the holding circuit to rewind relay 70, and at contacts 43 opens the circuit to relay 50. Relay 50 releases and at its contacts 51 opens a further point in the circuit to release relay 60. Relay 70 releases and at its contacts 71 opens the operating circuit to the clutch 284 which releases and reengages the record spool 293 at its contacts 72 and 73 disconnects the amplifier output from the subscriber lines 285 and 286, and at contacts 74 opens the circuit to relay 140, at contacts 75 opens a further point in its own holding circuit and at its contacts 76 opens the circuit to relay 120. Relay 140 deenergizes and at its contacts 142 and 144 disconnects the spool recording head from the input transformer of the amplifier, and at its contacts 145 opens the circuit to relay 150. Relay 150 releases and at its contact partially deenergizes the amplifier tubes. Relay 120 deenergizes and opens the operating circuit to motor 250. Relay 40 releases a short interval after the break and the set is restored, relays 10 and 30 remaining energized as long as the operator holds the connection.

The operator in order to hear the messages recorded in the tape dials listen number 3. Relay operation similar to that initiated when number 2 was dialed occurs in the set, the wiper in this instance being advanced to position 3. Relay 40 which was held energized during the series of impulses releases a short period after the final make which follows the impulses and at its contacts 43 energized relay 50 which operates and at its contacts 51 completes a circuit over the off normal springs to release relay 60. Relay 40 at its contacts 41 completes a circuit for relay 80 over contacts 22, the third contact of bank 240, the wiper, contacts 41 and 35 to ground provided there is a nominal amount of tape wound on the rewind spool 292. If the tape has been completely wound on the recording spool the detent on cam 242 and the spring 282 will engage as described heretofore and the spring at its contacts 243 will complete a circuit to relay 20. Relay 20 will energize and at its contacts 22 prevent relay 80 from operating. Assuming the wire has been rewound to the rewind spool, relay 80 operates and at its contacts 81 and 82 connects the output of the amplifier to the attendants connection, at its contacts 83 completes a circuit for relay 140, at its contacts 84 completes a holding path for itself over contacts 42 and 35, at its contacts 85 completes a circuit to relay 120, at its contacts 86 completes a circuit to relay 150 and at its contacts 87 energizes the clutch armature 283 on the rewind spool which disengages the clutch from the spool 292 and allows the tape to be wound on the recording spool 293 by the motor 250. Relay 60 operates and restores the wiper to its normal position, the off normal springs opening the operating circuit to relay 60. Relays 120, 140 and 150 operate and at their contacts in a manner previously described herein start the

motor which pulls the tape through the recording head, supplies plate and filament current for the amplifier tube and connects the spool recording head output to the input transformer of the amplifier. The messages are transmitted to the operator over the connection until such time as the wire nears its terminating end on the rewind spool whereupon safety cam 242 prevents further movement of the tape, or until the operator dials the release number 1. The release number 1 is effective in the manner heretofore described. Relay 10 releases and at its contacts 12 completes a circuit for relay 40. Relay 40 operates and at its contacts breaks the circuit to relay 50 and 80 which release and further initiate release of energized relays 120, 140, 150 and the rewind clutch 283. The set is now restored to its normal seized condition, i. e., only relays 10 and 30 operated. Relay 10 then is energized as previously described to release relay 40 to thereby cause release of wiper 285 as explained.

Provision is made for the attendant to record a message on the spool recorder tape by dialing number 4. The wiper is advanced to the fourth contact of bank 240 by the relay operation previously described. A short interval after the final make following the final break, relay 40, which remained in the energized condition during the dialing, releases. Relays 10 and 30 remain in the energized condition. A circuit is completed by the release of relay 40 to relay 110 over contacts 21, the fourth contact of bank 240, contacts 41 and 35, provided there is wire on the rewind spool. If all the wire has been wound on the recording spool 251, cam 242 operates as before to energize relay 20 which at its contacts 22 opens the operating circuit to relay 110 and prevents operation of the spool recorder. Assuming wire on the rewind spool, relay 110 operates and at its contacts 111 and 112 connects the amplifier output 259 to the spool recording head input, at its contacts 113 and 114 connects the incoming lines 295 and 296 to the amplifier input 255, at its contacts 115 completes a circuit to relay 100, at its contacts 116 completes an energizing circuit for oscillator 271 for use with the spool recording head 248, at its contacts 117 completes a circuit to relay 120, at its contacts 118 completes a circuit to relay 150 and at its contacts 119 completes a circuit for energizing rewind spool clutch 283. At the same time relay 40 at its contacts 43 completes a circuit for relay 50. Relay 50 operates and at its contacts 51 completes a circuit to release relay 60. Release relay 60 operates and restores the wiper arm 285 to normal, the off normal springs breaking the original operating circuit to relay 60. Relay 100 operates and at its contacts 102 connects the input transformer 255 to the input tube of the amplifier. The other contact operations of relay 100 at this time do not have a function. Relays 120 operate as described before to start the motor which drives the clutch in the recording direction, the clutch 283 having disengaged on energization, and relay 150 operates to supply plate current to the amplifier. The message is recorded on the tape as the operator talks. The set operation may be terminated at any time by dialing the release number 1, or if the tape runs down, operation will be terminated by cam 242 and its associated mechanism. The release number 1 is effective to restore the set to its normal seized condition, i. e., only relays 10 and 30 operated.

In order for the operator to record a message on the loop recorder 277, the number 5 is dialed. The wiper 285 is advanced to the fifth contact of bank 240 by the relay operation previously disclosed. Relay 40, which held up during the dialing, releases on the termination of impulses, relays 10 and 30 remaining operated. A circuit is completed for relay 160 by release of relay 40 which extends over the fifth contact of bank 240, wiper 285, contact 41, and contact 35. Relay 160 operates and at its contacts 161 completes a path for energizing oscillator 270 used with loop recorder head 269, at its contacts 162 and 163 connects amplifier output circuit 259 to the input side of loop recorder head 269, at its contacts 164 completes a circuit to relay 230 which is slow to operate, at its contacts 165 and 166 connects the incoming lines 285 and 286 to the input transformer 255 of the amplifier, at its contacts 167 completes a circuit to relay 90, at its contact 168 completes a holding circuit for itself over contacts 105, 42 and 35, at its contacts 169 completes a starting circuit to motor 268 from power supply 267 which extends over contacts 169 and 231; and at its contacts 169' completes a circuit to relay 150. Relay 60 operates as described previously and restores the rotary switch to its normal position. Relay 90 operates and at its contacts 92 completes a circuit between input transformer 255 and tube 257. Relay 150 operates and at its contacts 151 completes a circuit for the tube filament supply and at its contacts 152 completes a circuit for plate supply to the amplifier. Motor 268 rotates and through gear mechanism 279 drives wheels 287 and 288 thereby dislocating springs 266 and 281 from their respective cam detents 263 and 262 as described previously. Spring 266 at its contacts completes a second energizing circuit for motor 268. The operation of springs 281 at this time has no function. Relay 230 operates after an interval and at its contacts 231 opens the original starting circuit to motor 268. Therefore when the detent again engages spring 266 after one revolution of the cam and wheel, the spring at its contacts will open the second operating circuit to the motor and the tape will be stopped. The attendant is limited in speech to the length of time the cam requires to make one complete revolution. The connection can be released by dialing number 1 which will be effective to return the set to its normal seized condition as previously described herein. The attendant may hang up at any time and the set will restore to its normal condition and the loop recorder will automatically reset itself.

If the attendant were to hang up after any one of the previously described operations had been completed, relay 10 would release and at its contacts 11 open the circuit to relay 30, and at its contacts 12 complete a circuit for relay 40 over contacts 34. Relay 40 would operate and at its contacts 43 open the circuit to relay 50, and at its contacts 41 and 42 open the holding circuit to the functional relay and its associated relays which were originally energized over the rotary switch. Relay 30 has meantime released and at its contacts 34 opened the circuit to relay 40 which after an interval releases. All relays are now released and the set is again ready to receive a call from either a subscriber or attendant.

If the operator were to hang up immediately after an operating number were dialed, relay 10 would release and at its contacts 11 break the operating circuit to relay 30 and at its contacts

12 completes a circuit over contacts 34 to relay 40, relay 38 being slow to release. Relay 40 remained energized during the impulse period and will remain so until relay 38 releases. Relay 38 in releasing completes a circuit at its contacts 36 to release relay 60 over the off normal springs. Relay 60 operates and the rotary switch is restored to normal, the off normal springs breaking the operating circuit to relay 60. All relays are therefore restored to their deenergized condition.

The loudspeaker which is shown diagrammatically connected to the output of the amplifier unit is normally located at the recorder location and can therefore be energized by switch 286 when local reception is desired.

Although the invention has been illustrated by a particular embodiment thereof, it should be apparent that numerous modifications may be made therein without departing from the true spirit and scope of the invention as defined in the subjoined claims.

What is claimed is:

1. In a telephone system, a line, a pair of wire recorders, means for establishing a connection between said line and one of said recorders, means responsive to the establishment of said connection for transmitting a message from said one recorder over said connection, means automatically operated only on termination of said message to operate the other of said recorders for the purpose of recording a message transmitted from said line, a second line, an initial starting point for said other recorder, means for connecting said second line to said other recorder, to operate said other recorder to transmit said recorded message over said second line, and to automatically reset said recorder to its initial starting point; said other recorder thereafter operated on receipt of further messages over either of said lines to automatically remove said first message on said other recorder.

2. In a telephone system, a plurality of lines, a pair of wire recorders, means for establishing a connection between one of said recorders and any one of said lines, said recorder automatically operated to transmit a message over said connected line in response to said connection, means operated to connect said other recorder after a definite time interval to said line for the purpose of recording a message from said connected line, said one recorder arranged to transmit the same message each time any one of said lines is connected thereto, said other recorder arranged to accumulate messages transmitted thereto each time a connection is established, a control position, means for selectively establishing a connection between said control position and either of said recorders, said means operative to effect simultaneously the removal of the recorded message on the selected recorder and the recording of a further message transmitted over said connection from said position.

3. A system as claimed in claim 2 in which there are means connected to said other recorder operated after a definite time interval of operation of said recorder to deenergize same and send a busy tone to any line connected thereto.

4. In a telephone system, a remote-controlled wire-recording set having a pair of wire recorders, an amplifier common to both recorders, a line, means operated when seized over said line to connect said amplifier to one of said recorders and to operate said recorder to transmit a message over the connection to said amplifier, said amplifier connected to said incoming line and controlled by said means to transmit said message over same, means operated on termination of said message to connect said amplifier to said incoming line to receive a message over same, to connect the other of said recorders to said amplifier, and to operate said other recorder to record the message received by said amplifier.

5. A remotely controlled recording set, a pair of incoming lines, a wire recorder, means operated responsive to a plurality of series of impulses from one of said pair of incoming lines, said means operated in response to one series of said plurality to cause said recorder to transmit messages over said one line, and responsive to a second series of said plurality to cause said recorder to record messages from said one line, and means operated responsive at times to seizure over the other of said pair of lines to cause said recorder to record a message from said other line.

6. A remotely controlled recording set having an incoming line, a wire recorder, a pair of spools in said recorder, a recording wire connected between said spools, means operated at times responsive to impulses received over said line to operate one of said spools to wind said wire in one direction and at other times to operate the other of said spools to wind said wire in the other direction, said recorder operated responsive to operation of said means to record when said wire travels in said one direction, and to transmit when said wire travels in either direction.

7. A recording set as claimed in claim 6 in which said means is further operated in response to impulses to terminate operation of said spools.

8. A remotely controlled recording set, an incoming line, a wire recorder, means operated responsive to one series of impulses received over said line to control said recorder to record a message, and means operated responsive to a second series of impulses received over said line to control said recorder to transmit a message, said means operated responsive to a third series of impulses received over said line to terminate a recording or transmitting operation of said recorder, said means operated responsive to a fourth series of impulses to condition the recordings for transmission in the order they were recorded.

9. A remotely controlled recording set as claimed in claim 8 having means operated at times to prevent operation of said first means on receipt of certain of said series of impulses.

10. In a telephone system, a remotely controlled wire recording system, a pair of incoming lines, means controlled from said lines to seize said system, means in said recording system automatically responsive to each seizure over one of said pair of lines to transmit a message over same and to record each message received from said one line, means in said system responsive to signals over another of said pair of lines to automatically remove said messages recorded thereon and reset the recorders for subsequent use.

11. A recording arrangement associated with a telephone system comprising a recording set accessible to the subscribers of the system and having a pair of recorders, one of said recorders having a message of instructions recorded thereon and operated responsive to seizure thereof by a subscriber to automatically transmit said message and connect the other recorder to the subscriber, said other recorder operated thereafter to record any message transmitted by the subscriber, a monitor located at a remote point and

having means for seizing the arrangement, and means responsive to control from the monitor for causing retransmission of recorded messages from the second recorder and for changing the recorded message on the said one recorder.

12. A remotely controlled recording set having an incoming line, a wire recorder, a pair of spools in said recorder, a recording wire connected between said spools, a pair of magnetic clutches normally engaged with said pair of spools to prevent rotation of same, means operated at times responsive to a series of impulses received over said line to energize one of said clutches to disengage itself from one of said spools to permit said wire to be wound on the other of said spools, said means operated at other times responsive to a second series of impulses to energize the other of said clutches to disengage itself from the other of said spools to cause said wire to be wound on said one spool, said recorder responsive to different operations of said means to cause different effects on said wire.

13. In a telephone system, a remote controlled wire recording set having a pair of wire recorders, a pair of incoming lines connected to said recording set, means in said set operated in response to seizure over one of said lines to operate one of said recorders to transmit an outgoing message over said one line, means in said re-

corder operated after a definite time interval to terminate operation of said one recorder and to connect the other of said recorders to said one line, said other recorder responsive to record an incoming message from said one line, means for seizing said set over the other of said lines, and means in said set operated responsive to a signal over said other line to operate said one recorder to record a message from said other line.

14. In a system as claimed in claim 13 which includes a third line, means for connecting said third line to said recording set, said set arranged to transmit said messages received and transmitted by said recorders over said third line when connected thereto by said means for monitoring purposes.

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