May 20, 1947. W. A. DERR 2,420,871

CONTROL SYSTEM AND TELEMETERING CIRCUIT

Filed Feb. 1, 1945 3 Sheets-Sheet 1

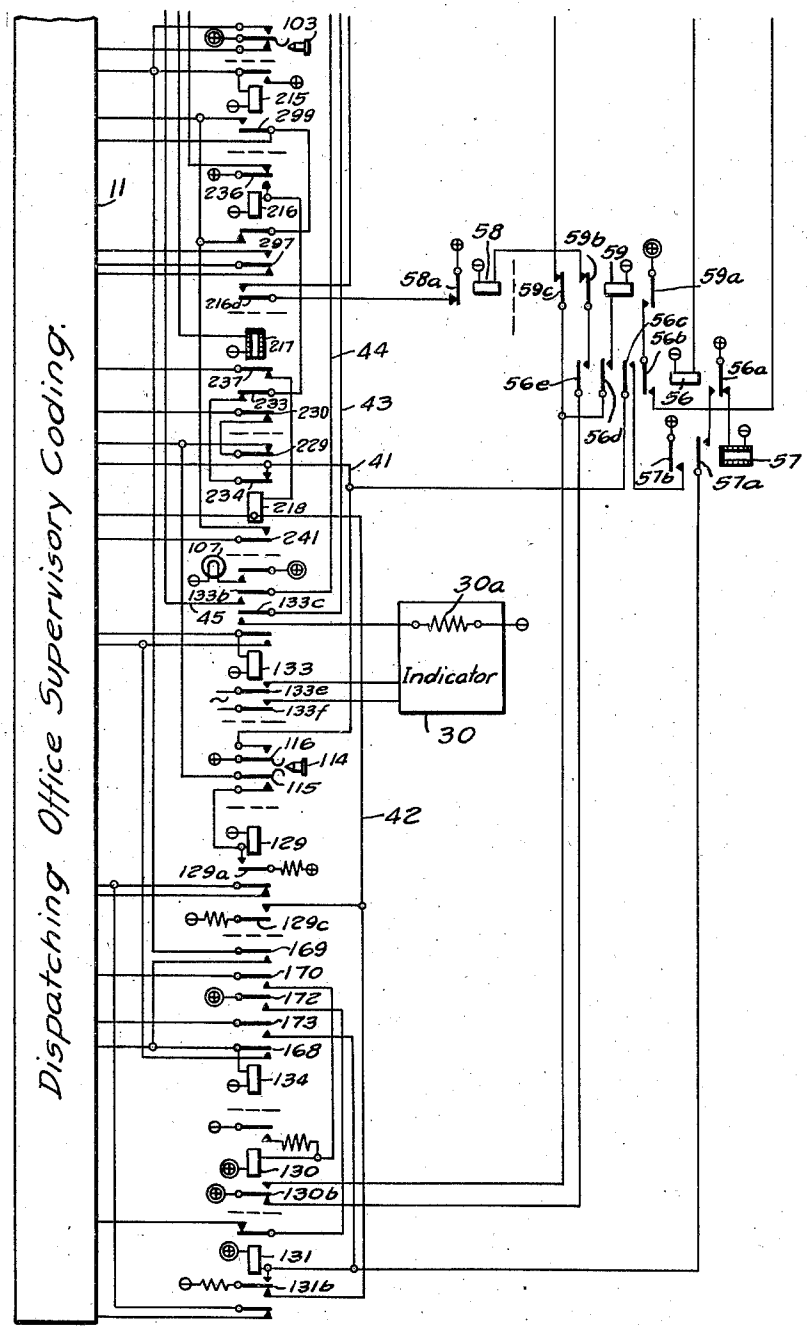


Fig. 1a.

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CONTROL SYSTEM AND TELEMETERING CIRCUIT

Filed Feb. 1, 1945 3 Sheets-Sheet 2

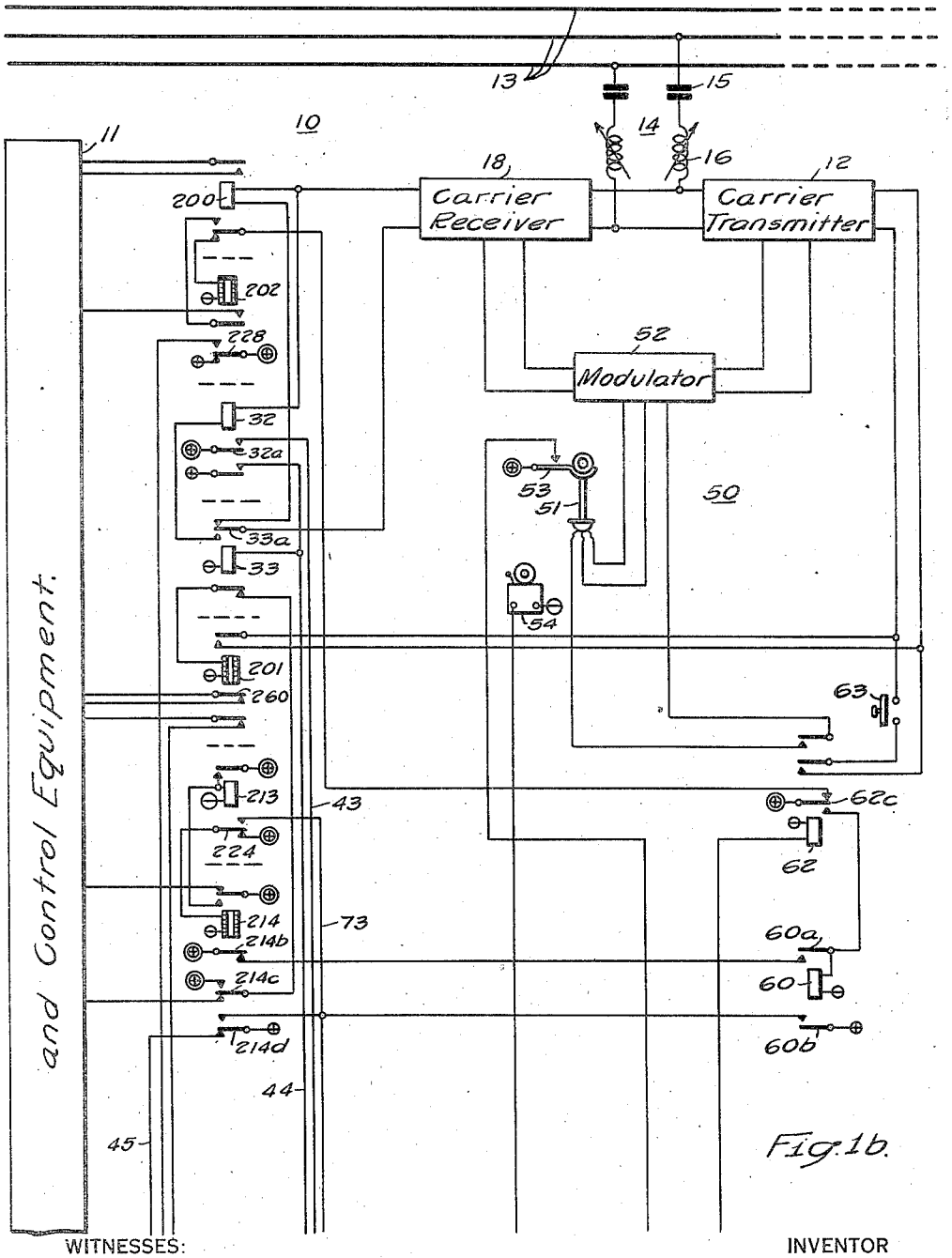


Fig. 1b.

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CONTROL SYSTEM AND TELEMETERING CIRCUIT

Filed Feb. 1, 1945 3 Sheets-Sheet 3

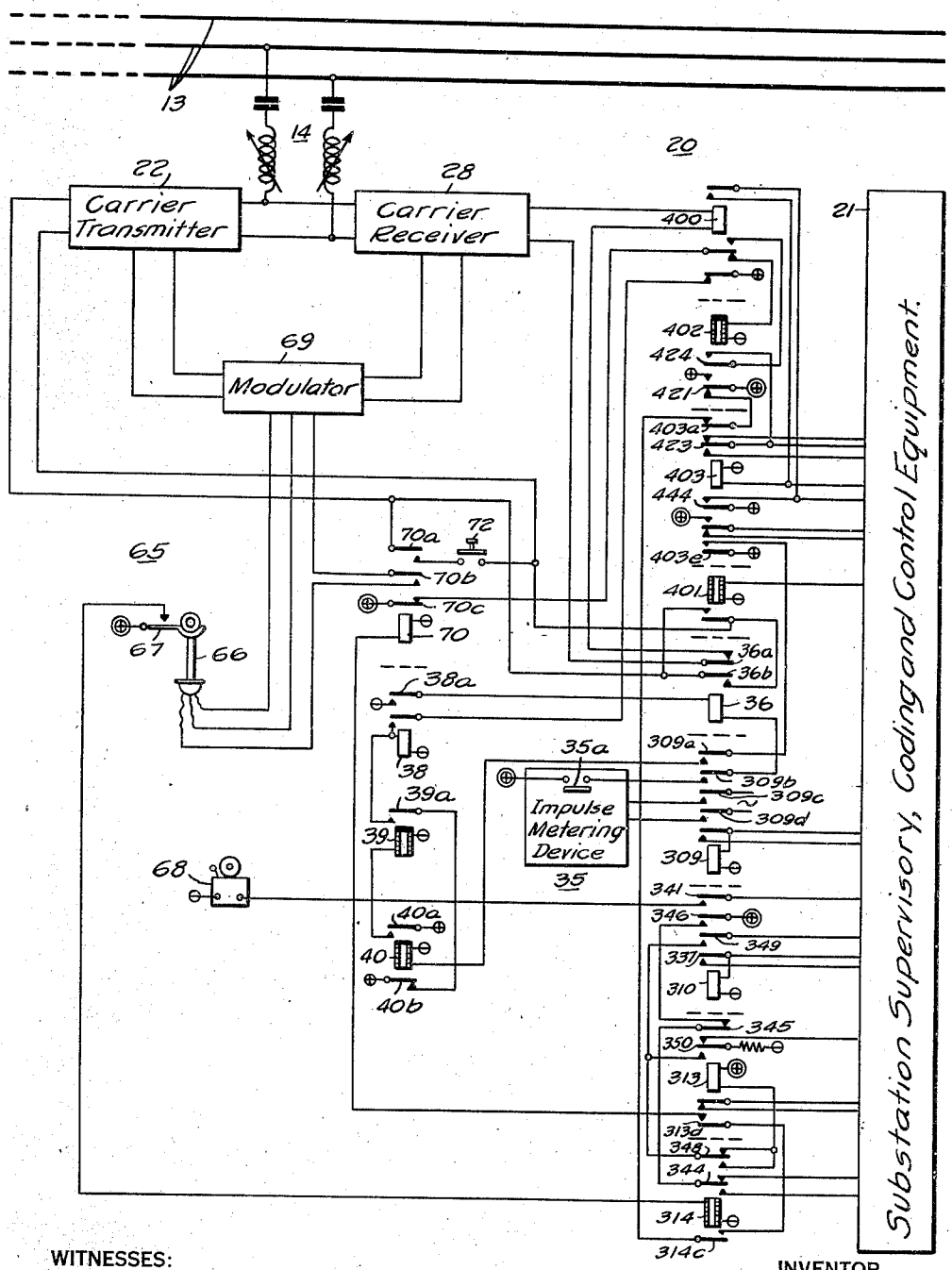


Fig. 2.

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Patented May 20, 1947

2,420,871

UNITED STATES PATENT OFFICE

2,420,871

CONTROL SYSTEM AND TELEMETERING CIRCUIT

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Application February 1, 1945, Serial No. 575,631

10 Claims. (Cl. 179—2)

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My invention relates, generally, to supervisory control systems, and has reference in particular to supervisory control systems for providing telephone and telemetering circuits.

Generally stated, it is an object of my invention to provide a simple and inexpensive supervisory control system having provision for telemetering and telephone operations in addition to other supervisory and control functions, which system shall be easy to operate.

More specifically, it is an object of my invention to provide for selecting metering or telephone communication points in a supervisory control system and rendering the supervisory control equipment inoperative during metering and telephone operations.

It is also an object of my invention to provide for resetting and locking out the supervisory control equipment at both the dispatching office and remote stations, as soon as the supervisory channel is prepared for telephone communication.

Another object of my invention is to provide for using the usual long pulse reset signal in a single frequency carrier supervisory control system, wherein the carrier frequency is also used for telephone and/or metering operations.

Yet another object of my invention is to provide for telephone and telemetering operations in a carrier frequency supervisory control system with a minimum of equipment.

Still another object of my invention is to provide for automatically reconnecting the signal channel to the supervisory equipment and effecting reset of the supervisory control equipment at the end of a telephone communication to restore the supervisory equipment to normal.

A further object of my invention is to provide for selectively connecting a supervisory control signal channel for an impulse metering operation, and for preventing operation of the supervisory control line relays at the dispatching office and at the remote station to prevent interference during the metering operation.

An important object of my invention is to provide for maintaining the supervisory release relays at the dispatching office and at the remote station in the deenergized position during a telephone conversation so as to insure locking out the supervisory equipment.

It is also a further object of my invention to provide for interrupting the operating circuits of the supervisory line relays during metering operations so as to prevent interference with the supervisory equipment.

Other objects will, in part, be obvious and will, in part, be explained hereinafter.

According to my invention, telemetering and telephone communication are effected in a supervisory control system through separate points of the system. A telephone circuit is completed by

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a transfer relay through the carrier supervisory equipment in response to completion of a supervision code which is initiated by the called operator answering. At the same time the usual relatively long reset impulse is sent and the supervisory release relay is deenergized so that the supervisory equipment is locked out during telephone conversation. Upon the termination of a conversation, the release relay is reenergized and another relatively long reset impulse signal is sent from the dispatching office to restore the supervisory equipment to normal when the phone is restored to the hook. In order to provide for effecting restoration of the system to normal after a metering operation by the customary long reset impulse, the line relays are rendered inoperative during the metering operation by opening the operating circuits therefor. Reset after a metering operation is effected in the usual manner.

For a more complete understanding of the nature and scope of my invention, reference may be made to the following detailed description, which may be studied in connection with the accompanying drawings, in which

Figures 1*a* and 1*b* together provide a diagrammatic view of the dispatching office equipment in a supervisory control system embodying the invention in one of its forms, and

Fig. 2 is a diagrammatic view of the remote station equipment of the supervisory control system, associated with the dispatching office equipment shown in Figs. 1*a* and 1*b*.

Referring to Figs. 1*a* and 1*b*, the reference numeral 10 may denote, generally, supervisory sending, receiving and common equipment at the dispatching office of a supervisory control system embodying the invention. The supervisory equipment may, in general, be substantially similar to that described in detail in Patent No. 2,091,301, which issued on August 31, 1937, to H. P. Boswau. For the purposes of simplification, that part of the Boswau equipment which has not been changed in any respect, is represented, generally, by the enclosure 11, while the equipment of the Boswau patent to which any changes have been made, and any additional equipment, are shown in detail, adjacent thereto. Such relays and other apparatus, as are similar to those of the Boswau patent, bear the same designations as in the Boswau patent. All additional equipment is designated by numerals not appearing in the Boswau patent.

Instead of having the impulse-sending relay 201 of the Boswau patent energize a pair of line conductors by connecting them to a direct current source as in the Boswau patent, the impulse-sending relay 201 is, in the present application, arranged to key a carrier transmitter 12 which may be connected to the conductors 13 of a power system or the like, by suitable coupling

means 14 comprising, for example, a tuned circuit of capacitors 15 and inductance coils 16. The line relay 200 of the present application may be arranged for operation through a carrier receiver 18 which may likewise be coupled to the conductors 13 through the coupling means 14.

Referring to Fig. 2, the reference numeral 20 may denote, generally, the supervisory control sending, receiving, and common equipment at a remote station of the supervisory control system. The equipment 20 may, as in the case of the equipment at the dispatching office, be substantially similar to that described in the Boswau patent. Such equipment, as is identical with that of the Boswau patent, may be represented by the enclosure 21, while that which has been changed in any respect, and any additional equipment, are shown in detail adjacent thereto.

As in the case of the equipment at the dispatching office, the impulse-sending relay 401 may be arranged for operating a carrier frequency transmitter 22 which may be coupled to the conductor 13 by coupling means 14. The line relay 400 may likewise be connected for operation from a carrier frequency receiver 28 which may also be coupled to the conductors 13, through coupling means 14.

Referring again to Figs. 1*a* and 1*b* it will be seen that in order to provide for transmitting metering indications from the remote office to the dispatching office, point 1 of the supervisory control system of the Boswau patent may be used as a metering point, so that the point selection key 114 may be designated as the metering key. Means, such as the indicator 30, may be provided at the dispatching office for operation under the control of a metering impulse receiver relay 32 for indicating the value of a quantity to be metered. The impulse receiver relay 32 may be connected to the carrier receiver 18 under the control of a metering transfer relay 33, which may be energized under the control of the metering supervisory point relay 133. The indicator 30 may be of any suitable type being, for example, responsive to an impulse of the carrier frequency in each of successive cyclic intervals of predetermined duration, said impulses being of different durations dependent on the amount of the quantity to be metered.

Referring to Fig. 2, the reference numeral 35 may designate a metering device for measuring at the remote station the value of a quantity to be metered. The metering device 35 may be of any suitable type being, for example, provided with contact means 35*a* for providing an impulse in each of a number of cyclic intervals of predetermined duration, said impulses being of different durations dependent on the value of the quantity being metered. In order to provide for connecting the metering device 25 to send such metering impulses whenever the metering point is selected, a metering impulse relay 36 may be provided for operating the carrier transmitter 22 to transmit impulses of different predetermined durations in each of successive cyclic intervals in response to operation of the metering device. The metering device 35 may operate continuously during a metering operation so that a meter control relay 38 may be provided for completing the operating circuit of the meter impulsing relay 36, only when the metering point relay 309 operates in response to a selection of the metering point from the dispatching office. Auxiliary metering control relays 39 and 40, which may be of the delayed drop-out type, may be provided for producing a single timed impulse in response to selection of the metering point for operating the meter control relay 38.

In order to secure a metering indication from the remote station, the metering key 114 at the dispatching office is operated. An energizing circuit for the individual point relay 129 is provided through moving contact 115, back contact and armature 229 of relay 218, and back contact and armature 230 of relay 217 to indirect positive through circuits of the equipment in the enclosure 11, so that the point relay locks in over its front contact and armature 129*a* to indirect positive. At the same time, an energizing circuit is provided for the auxiliary start supervisory relay 216 from indirect positive through moving contact 116 and front contact of key 114, conductor 41, back contact and armature 234 of relay 218, back contact and armature 233 of relay 217, through the operating winding of the auxiliary start relay 216.

Operation of the individual point relay 129 connects the operating winding of the supervisory start relay 218 to negative through front contact and armature 129*c*, and conductor 42. This completes the operating circuit for the supervisory control start relay 218 which starts the point selection code for selecting the metering point at the remote station. The point selection code is terminated in the usual manner after sending one operating impulse. The point relay 309 at the remote station operates upon the termination of the point selection code and the point selection check code is sent in the same manner as described in the Boswau patent.

Upon the receipt of the point selection check code at the dispatching office, the metering point relay 133 operates and connects the indicator 30 to a source of alternating current through armatures 133*e*, 133*f* and front contacts. At the same time, the metering lamp 107 lights, and the operating winding 33*a* of the indicator is connected to a front contact of the metering impulse receiver relay 32, through front contact and armature 133*c*, and conductor 43, so as to prepare the indicator for operation in response to impulses received from the remote station. An operating circuit is also provided for the metering transfer relay 33 extending from negative through the operating winding of the relay, conductor 44 through armature 133*b* and front contact of the point relay 133, conductor 45, and back contact and armature 214*d* of the reset relay 214 to indirect positive. Operation of the transfer relay 33 interrupts the operating circuit for the line relay 200 at armature 33*a* and back contact to render it inoperative and completes an operating circuit for the metering impulse receiver relay 32 from the carrier receiver 18 through armature 33*a* and front contact.

At the remote station, operation of the point relay 309 in response to receipt of the point selection code connects the impulse metering device 35 to a source of alternating current through armatures 309*c* and 309*d* for energizing the operating motor thereof and, at the same time connects the operating winding of the metering impulse relay 36 to the impulse metering device 35 through armature 309*b* and front contact. Operation of the metering impulse relay is prevented during transmission of the supervisory point check code, since the meter control relay 38 holds the operating circuit open. During the transmission of the point check code the transfer relay 403 pro-

vides an energizing circuit for the auxiliary metering control relay 40 extending through armature 309a and front contact, and front contact and armature 403e. Relay 40 picks up auxiliary metering control relay 39. When the transfer relay 403 of the supervisory control equipment deenergizes at the end of the point selection check code, the energizing circuit for the auxiliary meter control relay 40 is interrupted at armature 403e and front contact.

The control relay 40 remains in the energized position for a predetermined time interval and then returns to the deenergized position interrupting the energized circuit for the auxiliary control relay 39 at armature 40a and front contact. However, the auxiliary control relay 39 remains in the energized position for a predetermined time interval due to its time delay characteristics. Accordingly, an energizing circuit is provided for the meter control relay 38, extended from the negative terminal through the operating winding of the control relay 38, front contact and armature 39a, and back contact and armature 40b to the positive terminal. The energizing circuit for the metering impulse relay 36 is thus set up through armature 38a and front contact of the meter control relay 38, so that the metering impulse relay operates each time the operating contact 35a of the metering device closes. Each time the metering impulse relay 36 operates, the carrier transmitter 22 is energized through armature 36b and front contact to transmit a carrier frequency impulse along the conductors 13. Each time the metering impulse meter operates, the operating circuit for the carrier receiver 28 is interrupted at armature 36a and back contact so as to prevent operation of the line relay 400.

At the dispatching office, the metering impulse receiver relay 32 operates each time a carrier frequency impulse is received by the carrier receiver 18. The line relay 200 is inoperative since its energizing circuit is held open during metering at armature 33a. The energizing circuit for the operating winding 30a of the metering indicator 30 is, accordingly, energized for a predetermined time in each cyclic interval, depending on the value of the quantity being metered, so as to give an indication of the quantity being metered. The operating circuit extends from negative through the operating winding 30a, front contact and armature 133c of the point relay, conductor 43, and front contact and armature 32a of the metering impulse receiver relay to direct positive. At the end of a metering operation, the supervisory control equipment may be reset by operating the reset key in the usual manner. If the release key is held down during a nonpulsing period of the impulse transmitted, the line relay 400 picks up and drops the release relay 402. Upon release, the point relays and the metering transfer relays are deenergized and the supervisory equipment is restored to a normal operating condition.

Referring to Figs. 1a and 1b, the reference numeral 50 may denote, generally, telephone equipment which is disposed to be used in conjunction with the carrier receiver 18 and carrier transmitter 12 over the signal channel of the supervisory control system. The telephone equipment may comprise a handset 51 which may be connected to the carrier receiver and carrier transmitter through a modulator 52. Means, such as the hook switch 53, may be provided in conjunction with the handset for controlling the operation of the supervisory control equipment.

A bell 54 may be provided for signalling the operator when a call is being received.

In order to provide for telephone communication over the signal channel, a point of the supervisory control system may be used for setting up a telephone circuit. For example, point 4 of the supervisory control system, as shown in the Boswau patent, may be adapted for selecting a telephone point at the remote station and providing a telephone communication channel between the stations. Instead of initiating the operation by the use of a point key, such as the key 124 shown in the Boswau patent, the hook switch 53 may be utilized in conjunction with auxiliary telephone relays 56 and 57 for dropping the point supervisory relay 131 to provide for initiating a telephone operation. A reset control relay 58 may be provided for effecting reset of the supervisory control equipment at the commencement of a telephone conversation in order to prevent operation of the carrier transmitter during phone conversation from operating the supervisory control equipment. An auxiliary relay 59 may be provided for controlling the operation of the bell and controlling the transfer to telephone operation.

An additional auxiliary reset relay 60 may be provided for resetting the supervisory control equipment at the end of a telephone conversation so as to restore it to a normal condition for performing other supervisory and control functions as may be desired. Means, such as the transfer relay 62, may be provided for operation under the control of the auxiliary relay 59, for effecting connection of the carrier frequency transmitter 12 for control by a push-to-talk switch 63 during telephone conversation. In order to prevent interference of the carrier frequency transmitter by the supervisory control equipment during a telephone conversation, the transfer relay 62 may be arranged to disconnect the supervisory release relay 202 from direct positive at the armature 62c, during the reset pulse and keep it disconnected throughout the telephone operation.

At the remote station, as shown in Fig. 2, telephone equipment 65 comprising a handset 66 with a hook switch 67 and bell 68 may be arranged for operation in conjunction with the carrier transmitter 22 and receiver 28 by means of a modulator 69 through circuits provided by the point relay 310 at point 4 of the supervisory control equipment. The auxiliary relay 314 normally used in conjunction with the auxiliary switch 321 of the Boswau patent, may be arranged for operation under the control of the hook switch 67 for initiating a telephone point selection operation from the remote station and controlling operation of the bell on an incoming call. A transfer relay 70 may be provided for transferring the carrier transmitter 22 to the operation of a push-to-talk switch 72 for use in telephone conversation. The transfer relay 70 may likewise provide for locking out the supervisory control equipment at the remote station during a telephone conversation by removing direct positive from the supervisory release relay 402 at armature 70c and back contact.

In operation, if the operator at the dispatching office desires to call the remote station he merely lifts the handset 51 from the hook. An obvious circuit is thereby provided through the hook switch 53 for energizing the auxiliary start relay 56. The auxiliary start relay 56 picks up and interrupts the energizing circuit for the time

delay auxiliary start relay 57 which remains in the energized position for a predetermined time. Accordingly, a shunting circuit is provided for a predetermined interval of time for the telephone supervision point relay 131, extending from indirect positive through armature 56a and front contact, armature 57a and front contact, through the operating winding of the telephone supervision relay 131 to direct positive.

Relay 131 drops, connecting negative polarity to the supervisory start relay 218 to complete its energizing circuit from armature 131b through conductor 42, the operating winding of relay 218, and thence through a circuit shown and described in detail in the Boswau patent. The reset control relay 58 is energized through armatures 59b and 56e to direct positive at armature 130b and back contact. At the same time, an energizing circuit is provided momentarily for the auxiliary start relay 216 through armature 57b and front contact, front contact and armature 56c, conductor 41, back contact and armature 234, back contact and armature 233, and operating winding of the auxiliary start relay 216. Accordingly, a point selection code is transmitted in the usual manner which results in the operation of the point relay 310 at the remote station.

The point selection check code is thereupon returned in the usual manner. This results in the point relay 134 at the dispatching office being picked up. A circuit is, accordingly, provided through armature 169 and front contact to indirect positive on the counting chain for energizing the operate code start relay 215 which, accordingly, transmits an operate code of five operating impulses. Receipt of the operate code at the remote station results in operation of the operate relay 414 in the Boswau patent which places direct positive on the telephone bell 68 through a circuit extending from the bell through front contact and armature 341 of the point relay 310 to the "close" bus and direct positive through front contact and armature 450 of the operate relay 414 of the Boswau patent (now shown).

The bell rings until the operator at the called station answers. Lifting of the handset 66 from the hook switch 67 interrupts the operating circuit for the bell by interrupting the energizing circuit for the relay 414 within the supervisory equipment represented by the enclosure 21, and provides an obvious energizing circuit for the auxiliary relay 314. Operation of the auxiliary relay 314 interrupts the energizing circuit for the point supervision relay 313 at armature 348.

Operation of the point supervisory relay 313 provides an energizing circuit for sending a point supervision code in the usual manner. When the supervisory code terminates, an energizing circuit is prepared for the telephone transfer relay 70 through a circuit extending from negative through the operating winding of the transfer relay 70, through front contact and armature 313d of the point supervisory relay, front contact and armature 314c of the telephone point relay, back contact and armature 403a to the back contact of armature 421 of the supervisory release relay 402 to direct positive. The transfer relay 70 cannot, however, operate since its energizing circuit is held open at armature 421 until the reset pulse is transmitted from the dispatching office to drop relay 402.

At the dispatching office, receipt of the operation code results in operation of the supervisory control relay 132 within the enclosure 11 in the usual manner. An energizing circuit is thereby provided for the point operate relay 130 through armature 170 and front contact of the point relay 134. Point operate relay 130 connects direct positive to the auxiliary relay 59 at armature 130b, and at the same time interrupts the operating circuit for the reset control relay 58. An energizing circuit is now provided for the transfer relay 62 extending from negative through operating winding of the transfer relay through front contact and armature 56b of the auxiliary control relay 56, and front contact and armature 59a of the auxiliary relay 59 for connecting the telephone for conversation.

The reset control relay 58 drops at about the same time and connects in direct positive to the supervisory reset relay 214 through armature 58a and back contact, front contact and armature 216d of the auxiliary start relay 216, conductor 73, front contact and armature 224 of the battery supervision relay 213, to the operating winding of the reset relay 214. A reset pulse is, accordingly, sent for restoring the supervisory equipment to normal. At the termination of the reset pulse, the release relay 202 remains in the deenergized position locking out the supervisory control equipment since the energizing circuit, therefore, is held open at armature 62c and front contact of transfer relay 62.

At the remote station the energizing circuit for the transfer relay 70 is completed when the supervisory release relay 402 drops during the reset pulse from the dispatching office. The handset 66 is connected to the modulator 69 and the carrier transmitter 22 is connected for control by the push-to-talk switch 72 through armatures 70b and 70a. The supervisory equipment 20 is locked out of operation by removing direct positive from the supervisory release relay 402 at armature 70c. Telephone conversation may now be carried on from either station by pushing the push-to-talk switches 63 and 72, which energize the carrier transmitters 12 and 22, respectively, when it is desired to talk from the dispatching office or the remote station. The auxiliary reset relay 60 is picked up through armature 62c and front contact of the transfer relay. It locks in through armature 60a and front contact and back contact and armature 214b of the supervisory reset relay.

At the end of a telephone conversation, if the dispatcher hangs up, the energizing circuit for the auxiliary start relay 56 is interrupted at the hook switch 53. The auxiliary start relay 56 drops, interrupting the energizing circuit for the transfer relay 62 at armature 56b. The auxiliary start relay 57 is energized over an obvious circuit extending through armature 56a and back contact of the auxiliary start relay 56. When the transfer relay 62 drops, the release relay 202 is energized and direct positive is reconnected over armature 228. A momentary circuit for the reset relay 214 is provided through armature 60b and front contact, conductor 73, front contact and armature 224 of the battery supervision relay 213 through the operating winding of the reset relay 214, and the reset relay operates to transmit a relatively long reset impulse to restore the supervisory control equipment at the dispatching office to normal.

Since the operator at the remote station has not returned the handset to its hook, the supervisory equipment at the remote station remains

locked out, and the reset impulse transmitted from the dispatching office has no effect thereon. When the handset **66** is restored to the hook at the remote station, the hook switch **67** interrupts the energizing circuit for the telephone relay **314** at the remote station. The energizing circuit for the telephone supervisory relay **313** is interrupted at armature **348** so that the phone point supervision relay drops and initiates the sending of a point supervision code in the usual manner. Since the supervisory equipment at the dispatching office is reset, the telephone point at the dispatching office is selected in the usual manner and a point selection check code is sent from the dispatching office. At the termination of the point selection check code, the point relay **310** operates and a supervision code is sent. Relays **130** and **131** pick up and a reset impulse is transmitted from the dispatching office in the usual manner resetting both the dispatching office and the remote station supervisory equipment.

If the operator at the remote station should return his handset to the hook switch first, the telephone relay **314** is dropped as usual and the telephone point supervisory relay **313** sends a point selection code in the usual manner. However, since the supervisory equipment at the dispatching office is still locked out, nothing happens. Upon the dispatcher returning his handset to the hook switch, a reset pulse is sent as previously described. However, since the auxiliary phone relay **314** is down, a point selection code is transmitted by the remote station in the usual manner after reset is effected from the dispatching office. The dispatching office and remote station supervisory equipments operate in the usual manner to send point check and supervisory codes terminating in a long reset impulse. The supervisory equipment is thus restored to normal for effecting subsequent supervisory or control operations.

If telephone communication is initiated from the remote station, lifting of the handset **66** from the hook switch **67** picks up the telephone relay **314** and interrupts the energizing circuit for the telephone supervision relay **313** at armature **348**. Accordingly, a point selection code is sent out from the remote station in the usual manner, which is received at the dispatching office and results in operation of the point relay **134**. A point selection check code is sent in the usual manner whereupon the point relay **310** operates to send a supervision code. An energizing circuit is thereupon provided for the telephone bell at the dispatching office through the point operate relay **130** at armature **130***b* and front contact.

When the operator at the dispatching office answers the telephone and lifts the handset **51**, the hook switch **53** provides an energizing circuit for the auxiliary start relay **56**. Auxiliary relay **59** is thereupon energized through front contact and armature **56***d*. Relay **59** picks up, opening the bell circuit at armature **59***c*, so that ringing of the bell is terminated. A circuit for the transfer relay **62** is provided through armature **56***b* and **59***a*, and the reset control relay **58** drops. A reset pulse is sent by the reset relay **214** as previously described, and the transfer relays **62** and **70** both operate to connect the telephone equipment for operation and to lock the supervisory equipment out.

From the above description and the accompanying drawings, it will be apparent that I have provided for telephone and telemetering operations in a supervisory control system with an absolute minimum of equipment. During operation of the carrier transmitter for either telephone or telemetering operation, the supervisory equipment is rendered substantially inoperative. Accordingly, no additional equipment is necessary for providing for reset of the supervisory equipment, and the usual long reset impulse may be used, since the supervisory equipment is not required to distinguish the reset impulse from the telemetering impulses or impulses of carrier during telephone operation.

Since certain changes may be made in the above described construction and different embodiment of the invention may be made without departing from the spirit and scope thereof, it is intended that all of the matter contained in the above description and shown in the accompanying drawings shall be considered as illustrative and not in a limiting sense.

I claim as my invention:

1. In a signal system for a control office and a remote station connected by a single signal channel, a carrier transmitter and a carrier receiver at both the office and the station coupled to the signal channel and operating on the same frequency, supervisory control means at both the office and the station including sending equipment for operating the transmitters and receiving equipment operated by the receivers for selecting any of a number of different control and supervision points, means selectable through a selection point of the supervisory control equipment for operating one of the carrier transmitters independently of the supervisory control equipment for performing a predetermined function, and means for preventing normal operation of the supervisory control receiving equipment in response to operation of the carrier transmitter during the performance of said function.

2. For use in a signal system for a control office and a remote station connected by a single signal channel, a carrier frequency transmitter and a carrier frequency receiver coupled to the channel at both the office and the station, supervisory sending means controlling the transmitters and supervisory receiving means normally controlled by the receivers at the office and at the station for selecting different of a plurality of selection points at the station or office, means at the office and the station for selectively operating the supervisory equipment to select a point for performing a function requiring operation of one or the other of the carrier transmitters, and means responsive to the selection of said point for controlling the operation of the carrier transmitter in the performance of said function and rendering the supervisory receiving equipment non-responsive to said carrier operation.

3. In a signal system for an office and a remote station connected by a signal channel, a carrier frequency transmitter and a carrier frequency receiver coupled to the channel at both the office and the station, supervisory control means at the office and the station including sending means for operating the transmitters to transmit impulse signals and receiving means normally for operation from the carrier receiver in response to impulse signals of the carrier frequency, said supervisory control means being normally reset by a relatively long impulse signal at the termination of an operation, means for selecting a predetermined point at either the office or station for performing a function requiring operation of the carrier transmitter over relatively

long periods longer than the reset pulse, and means responsive to the preparation of the signal channel for such operation of the transmitter for preventing operation of the supervisory control means during the performance of such a function.

4. In a signalling system for a dispatching office and a remote station connected by a signal channel, supervisory control sending and receiving equipment at the office and station, a carrier transmitter for operating over the channel controlled by the sending equipment and a carrier receiver for operating the receiving equipment at both the dispatching office and remote station, telephone equipment at the dispatching office and the remote station for operating over the channel through the carrier transmitters and receivers through a point of the supervisory system, and means for locking out the supervisory sending and receiving equipment to prevent operation thereof by the carrier transmitters during a telephone communication.

5. For use in a signalling system over a single signal channel between an office and a remote station, telephone transmitting and receiving equipment at the office and station, a carrier transmitter and a carrier receiver coupled to the channel at the office and the station operating on a common frequency, supervisory control means at the office and remote station including line relays operated by the carrier receivers and impulse relays for operating the transmitters to produce impulse signals and point selection equipment for providing a telephone circuit over the channel, means responsive to the answering of the operator at the remote station for locking out the supervisory equipment during a telephone conversation, means responsive to the termination of a telephone communication for sending a reset impulse to restore the supervisory equipment to normal.

6. The combination in a signal system for an office and a remote station connected by a single signal channel, of telephone equipment including a transmitter and receiver at each of the office and station, supervisory control sending and receiving equipment having a plurality of points including one for establishing a telephone circuit over the channel, means responsive to the establishment of a telephone circuit over the channel for rendering the supervisory equipment inoperative during a telephone conversation, and auxiliary reset means responsive to the termination of the conversation to transmit a reset impulse and restore the supervisory equipment to normal.

7. In a supervisory control system for a control office and a remote station connected by a single signalling channel, supervisory control sending and receiving equipment at the office and station having a plurality of selection points, a carrier transmitter coupled to the signalling channel at the office and station operated by the supervisory sending equipment on a common carrier frequency for transmitting signal impulses over the channel, a carrier receiver coupled to the channel at the office and station for operating the supervisory receiving equipment in response to impulses transmitted by the transmitters, telephone equipment at the office and station, means at the office and station for initiating a point selection through the supervisory equipment, means responsive to the operator at the station answering for transmitting a supervision code to effect reset of the supervisory equipment, means responsive to the termination of the supervision code for connecting the carrier transmitter for telephone operation and locking out the supervisory equipment, and circuit means responsive to the termination of a telephone conversation for restoring the supervisory equipment to normal.

8. The combination in a signal system for a control office and a remote station connected by a signal channel, of telephone transmitting and receiving equipment at the office and station, a carrier frequency transmitter of a common frequency coupled to the channel at each of the office and station, a carrier frequency receiver coupled to the channel at each of the office and station for operating on said common frequency, supervisory sending and receiving equipment at each of the office and station for operating the transmitters and operation by the receivers, said supervisory equipment having a plurality of selection points including one for providing a circuit for the telephone equipment over the signal channel, and control means responsive to the selection of a telephone circuit over the channel for connecting the carrier transmitters for operation under the control of the telephone equipment and render the supervisory equipment nonresponsive to carrier frequency impulses, said control means being responsive to the termination of a conversation to restore the supervisory equipment to the control of carrier frequency impulses.

9. A supervisory control system for a control office and a remote station having impulse metering means at the station and impulse recording means at the office together with telephone receiving and transmitting means at both the office and station comprising, supervisory control sending and receiving equipment at the office and station having a plurality of separate selection points including one for providing a telephone circuit and another for providing an operating circuit for the metering means, and reset means for sending a relatively long impulse signal for restoring the supervisory equipment to normal, means responsive to the selection of the telephone point for sending a supervision code to reset and lock out the supervisory control means at the office and station and connect the transmitter for operation with the telephone equipment, additional means responsive to selection of the metering point for disconnecting the supervisory receiving means from the receiver and connecting the carrier transmitter for operation with the metering means, and means for operating the reset means at the termination of a metering or telephone operation to restore the supervisory equipment to normal by means of the long impulse signal.

10. In a carrier frequency supervisory control system, supervisory control sending and receiving means at a control office and at a remote station having a plurality of selection points for providing circuits over a single signal channel for performing different functions, a carrier frequency transmitter and a carrier frequency receiver of the same frequency at each the control office and remote station operated by the sending means and arranged to operate the receiving means respectively, metering means at the remote station operable in response to selection of a metering point to effect operation of the remote station carrier transmitter to transmit a plurality of impulse signals over the channel indicative of a quantity to be metered, means at the office operable under the control of the carrier frequency receiver at the office in response

to said impulses to indicate the value of the quantity metered, and means at the office responsive to said impulses upon the selection of the metering point to disconnect the supervisory receiving means from the receiver.

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