

Oct. 28, 1941.

F. G. HALLDEN

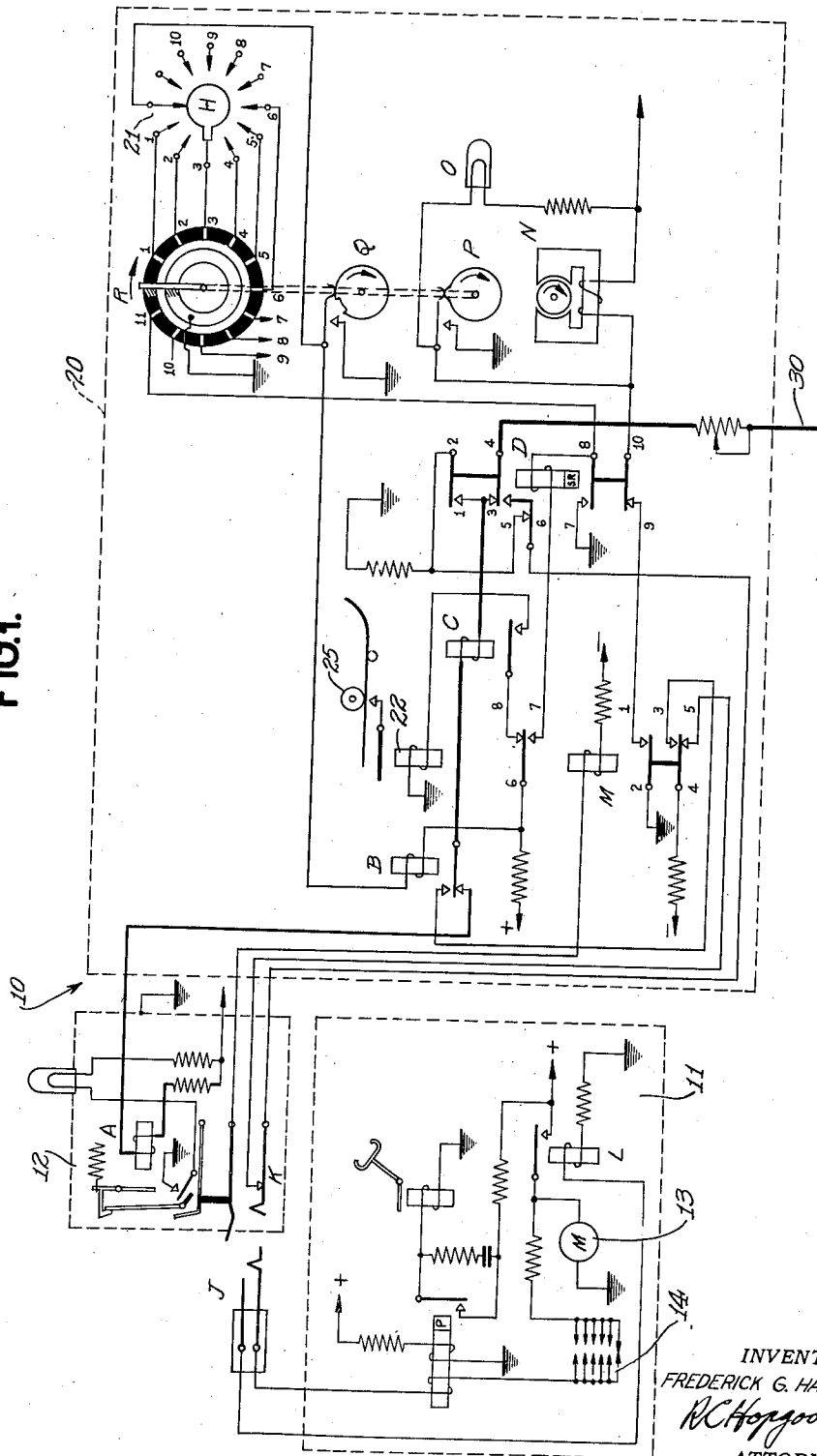
2,260,711

MULTISTATION COMMUNICATION SYSTEM

Filed Feb. 24, 1940

2 Sheets-Sheet 1

FIG. 1.



INVENTOR.
FREDERICK G. HALLDEN
R. C. Hargood
ATTORNEY

Oct. 28, 1941.

F. G. HALLDEN

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2 Sheets-Sheet 2

FIG. 1a.

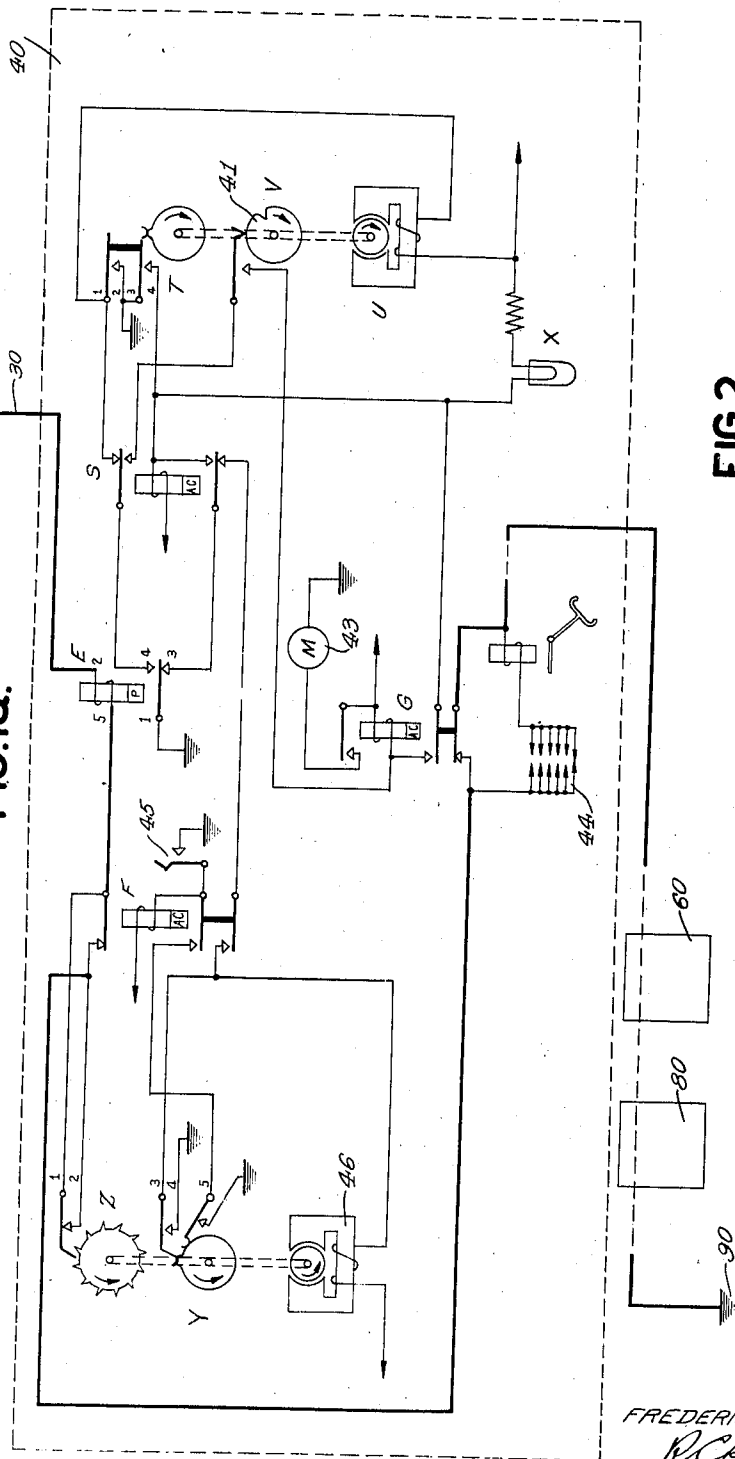
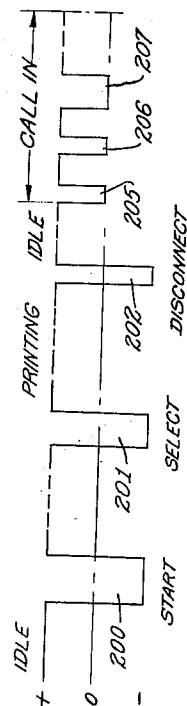


FIG. 2.



INVENTOR.
FREDERICK G. HALLDEN
R. C. Hopgood
ATTORNEY.

UNITED STATES PATENT OFFICE

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MULTISTATION COMMUNICATION SYSTEM

Frederick G. Hallden, Bellerose, N. Y., assignor to
Postal Telegraph-Cable Company (New York),
New York, N. Y., a corporation of New York

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9 Claims. (Cl. 178—2)

This invention relates to printing telegraph circuits and more particularly to printing telegraph circuits utilizing a single line conductor to interconnect a multiplicity of printing telegraph instruments.

In printing telegraph systems it is often desired to have a plurality of way-stations which may be selectively interconnected with a printer set at a main office for communication. It is desirable that such systems be made as simple as possible and that a simplified selective arrangement be provided at the main office for selecting any desired one of the way-stations for communication. It is also desirable that in such systems the operators at any of the way-stations may be able to call the main station when they desire. Such systems have been devised utilizing a separate wire other than the printer signalling line for conducting the call and selective operations. However, in the interest of simplicity it is desirable that the selection and calls may be made over the same line that carries the usual communication.

In accordance with my invention I provide a communication circuit such as a printing telegraph circuit of the general type described above, having a simplified selecting, calling and recording arrangement utilizing the common communication line.

It is an object of my invention to provide a selecting means under control of a main station for making operative the printing telegraph apparatus at another station.

Another object of my invention is to provide a simple, inexpensive selecting device and one which may be operated entirely by alternating current.

Another object of my invention is to maintain inoperative the printing equipment at all stations except the one selected by the controlling station.

A further object of my invention is to provide for recording calls from any of the stations at the main controlling station.

A still further object of my invention is to provide an arrangement for storing a code signal corresponding to a call signal when the circuit is in operative condition for communication, and to make this storage means operative to transmit the call signal immediately upon termination of the communication circuit.

According to a main feature of my invention the main or controlling station includes a message call circuit register with an associated operating relay, a selector unit with its associated

relays and an answering jack and signal jack arrangement with an associated printer set. Each way-station includes a polar relay with a selector unit and associated alternating current relays, a code transmitter for transmitting calls to the central station with associated alternating current relays and a standard printer set.

Further objects and features of my invention will become apparent from the particular description of my invention made in connection with the accompanying drawings, in which

Figs. 1 and 1A taken together show a circuit diagram of an arrangement in accordance with my invention, and

Fig. 2 is a diagram indicating the line signals for selecting and calling.

In Fig. 1 is shown a control station 10, comprising a printer set 11, a drop jack unit 12, and a main office selector 20 connected over a line 30 to a plurality of way-stations 40, 60, and 80. Fig. 1A, the line being grounded at 90. The wiring at station 40 only has been illustrated, it being understood that stations 60 and 80 have substantially similar circuits.

In the normal idle condition positive battery extends through winding of drop relay A, break and armature contacts of relay B, winding of relay C, break and armature contacts of relay D to line 30. At each station the line 30 extends through the winding of a polar relay E, armature and back contacts of relay F, break and armature contacts of relay G, and at the last station 80 to ground at 90. Polar relays E will operate whenever negative battery is applied to the line from the control station 10.

Method of selecting a station

Whenever it is desired to select a particular station, the rotor H of a rotary selector switch 21 is turned to engage one of its contacts 1 to 10 corresponding to the station to be selected. For purposes of illustration it may be assumed that the switch rotor H has been turned to engage its contact 3, which contact corresponds to way-station 40. Plug J connected to main printer 11 is then inserted into the jack K. The sleeve of plug J will complete a circuit from negative battery through the winding of relay M, sleeve contacts of jack K, winding of relay L to ground. Relay L operates closing its contacts and causing the energization of the printer motor 13 over an obvious circuit and also connecting positive battery through contacts 14 of the printer to the tip of plug J which, since it is inserted in jack K, extends positive battery through the make-

before-break contacts of relay D to ground. At the same time the inner spring contacts of jack K are opened.

Operation of relay M causes closing of its contacts 1 and 2 completing a circuit through the lower break contacts of relay D for operating a synchronous motor N in the selecting set. Guard lamp O in series with a resistor and across the motor, will also light at this time. Synchronous motor N rotates its cams P and Q and the brush R. Contacts on cam P will close almost immediately and insure that the motor will rotate for one complete revolution of cams P and Q and the brush R. As soon as cam Q has rotated a short distance its contacts will close operating relay B over an obvious circuit, transferring the line from the break to the make contact of this relay, and negative battery will be applied to line 30 from negative source over contacts 3, 4 of relay M, and a make contact of relay B.

Relay B will be released immediately after cam Q is rotated past the small depression provided therein. This operation and release of relay B causes operation of polar relay E at each way station. The short negative impulse produced by operation of relay B is represented by the start impulse 200 shown in Fig. 2. Relay E operates closing contacts 1 and 4, completing an obvious circuit to an alternating current source causing motor U to operate, rotating cams T and V with it. Contacts 1 and 2 on cam T will close almost immediately and insure that the motor U will run one complete revolution of cams T and V. The guard lamp X will also light at this time and serves as an indication that the line is busy. Contacts 3 and 4 of cam T also close causing operation of relay S.

As motor N at the selecting station continues to rotate the brush R will pass over commutator segments 1 to 11, inclusive, in succession. As segment 3 is reached a circuit will be established from ground, brush R, segment 3, rotor H, winding of relay B to positive battery, operating relay B. Relay B will release as the brush R leaves segment 3. This sends out on line 30 another negative impulse, selecting impulse 201, Fig. 2, which is shorter than the start impulse 200, this short impulse of negative current transmitted over line 30 reoperates relay E. As cam V has been rotating during this period, the indent 41 on its periphery will permit its contacts to close momentarily at this point in its revolution. At the selected station, in this instance station 40, this will occur at the time when the selecting impulses cause relay E to close its contacts. At the other stations the cams V are arranged so that their notches are in different positions so that the contacts will not be closed at any except the selected station. Alternating current relay G will operate from an A. C. source, winding of relay G, contacts of cam V, upper make contact of relay S, make contact of relay E to ground, and will lock up through its own make contacts and contacts 3, 4 to cam T. The other make contacts of relay G will extend power to the motor receptacle 43 over an obvious circuit for operation of the way-station printer motor, and the lower break contact of relay G opens, removing the short circuit from the printer magnets 44 at the way-station.

Just before the end of the revolution of motor N at the selecting station, brush R will pass over segment 11 causing energization of relay D from ground, brush R, contact 11, winding of relay D, upper make contact of relay M to posi-

tive battery. Relay D will operate and lock up through contacts 7 and 8. The line is transferred from contact 3 to contact 6 of relay D, the tip of jack K, plug J to the main office printer set. Contacts 1 and 2 of relay D, hold relay C in its operated position, contacts 9 and 10 of relay D open. Almost immediately after this operation of relay D, contacts of cam P will open thereby breaking the circuit for motor N causing it to stop. At this same time contacts 1 and 3 of relay E and the contacts of relay S have completed a locking circuit for relay S which will remain operated. The contacts of cam T will also open causing synchronous motor U to stop. Intercommunication may now be carried on between the main station 10 and way-station 40. Cam V is adjustable on the shaft of motor U so that it may be positioned properly to close its contacts only when the selecting impulse corresponding to the station, is transmitted by the control station. As the cams V at the various stations are positioned to correspond to different station numbers only one can be selected at a time by the control station.

To terminate a connection, plug J is removed from jack K at the control station. As the plug is removed the inner spring contacts of jack K close. A moment later relays M and L deenergize. As relay M releases its contacts 6 and 7 open the circuit of relay D. Relay D is a slow release relay and will remain operated a short period after the circuit to its winding has been opened. During this interval a circuit is established from negative battery through contacts 4 and 5 of relay M, tip and inner spring of jack K, contacts 6 and 4 of relay D to line 30, sending a very short disconnect signal 202 of Fig. 2 to the line. Relay E is operated, opening contacts 1 and 3 of relay E and deenergizing relays S and G. Relay D then releases, restoring positive battery to the line at its upper break contacts and reestablishing the line circuit to its idle condition. This negative impulse 202 is shorter than the start or select impulses and does not maintain relay E operated long enough for motor U to start after relay S has released.

To call from a way-station

Should a way-station desire to initiate a call, the operator thereat may operate the code transmitter provided at each station. The code transmitter is provided with a code wheel Z arranged to send several short impulses to the line and then a long impulse. The code wheel is adjustable on its motor shaft so that any predetermined number of short impulses may be transmitted to the line preceding the long impulse. For example, station 40 may cause the register to record 2 short impulses, 205, 206 and one long impulse 207, Fig. 2. Stations 60 and 80 may have three short impulses followed by a long impulse and four short impulses followed by a long impulse, respectively. For the purposes of explanation, we will assume that way-station 40 is calling. The operator there presses the call key 45, assuming that at this time the line is in its idle condition. Alternating current relay F will operate from A. C. source to ground over key 45 opening its upper contacts and will lock up through its own contacts and contacts 5 and 6 of cam Y of the code transmitter. The closure of the lower outer make contacts of relay F completes an obvious circuit to an alternating current source causing synchronous motor 46 of the code transmitter to rotate. Cams Z and Y rotate with the motor.

Contacts 3 and 4 of cam Y almost immediately close and insure rotation of the cams for one complete revolution. As the motor continues to rotate, contacts 1 and 2 of cam Z cause interruptions in the line circuit. These interruptions are a series of short impulses followed by a longer impulse caused by the projections on cam Z. Upon transmission over the line these impulses will cause relay C to operate a like number of times and recorder 25 will record the call over a circuit extending from positive battery, contacts 5, 6 of relay M, contacts of relay C, winding of relay 22, to ground. The number of short signals preceded by the long signal determines which of the stations has called. The first interruption of the line by the contacts of cam Z, will release drop A at drop jack unit 12, closing the drop contacts and line calling lamp. The procedure for connecting the calling station for communication is then identical with that previously described in connection with initiating a call from the main station.

Let us now consider the case when the way-station calls at the time when the line circuit is in a busy condition. Upon closing key 45 relay F will again operate and lock through its own contacts and contacts 5, 6 of cam Y. Closure of the outer make contacts of relay F prepares a circuit from an alternating current source through the motor 46 of the code transmitter. However, the circuit cannot be completed at this time due to the fact that the circuit is open at the lower make contacts of relay S. Relay S will be locked up at this time and the code transmitter cannot yet start. The moment the line circuit becomes idle by the removal of plug J at the main station, relay S will deenergize. This completes a circuit through the break contacts of relay S and contacts 3, 1 of relay E, causing synchronous motor and the code transmitter to rotate. The succeeding operations of recording the call are then the same as previously described.

If more than one way-station initiates a call when the line circuit is in the busy condition, relays F at each of these stations will lock up and prepare the circuits as previously described. As soon as the circuit becomes idle, the code transmitters at all such stations will become operative and will simultaneously transmit their code impulses to the line. Since all of these code transmitters operate synchronously the record on the tape will indicate by the number and position of the long impulses, the number of each of the stations which is called. As an illustration, if stations 60 and 80 having the codes previously set forth had initiated a call during a busy period their code signals when made operative would cause register 25 to record three short dashes followed by two long dashes indicating that both stations 4 and 5 had called. The operator then at the main selecting station could set rotor H to one of these stations answering the call and when that call was terminated, set the rotor to the other station to complete a call there.

By use of this arrangement, it is seen that a simple operating printing telegraph system is provided, wherein calls from the way-stations may be initiated during periods when the line is busy and will be answered from the main station as soon as the busy condition of the line is terminated. Furthermore, a simple selective means utilizing merely the time adjusting of the cams is provided so that complicated code signal controls are entirely avoided.

While I have disclosed by way of illustration a single embodiment of my invention, it should be

distinctly understood that this illustration was made merely by way of example and not as a limitation of the scope thereof. Various adaptations, modifications and applications of my invention may be made within the spirit and scope of this disclosure, as defined in the accompanying claims.

What is claimed is:

1. A communication system comprising a main control station, adjustable way-station selective means at said control station, a plurality of way-stations, printing telegraph apparatus and selective call receivers at each of said way-stations, a communication line interconnecting said main station and said way-stations, means at said main station for transmitting a start signal over said line, means at said main station and way-stations responsive to said start signal for starting operation of said way-station selective means and said selective call receivers respectively, means responsive to operation of said station selective means for transmitting over said line a selecting signal dependent upon the adjustment of said means, and means at the selected way-station controlled by said selective signal and said selective call receiver for rendering the associated printing telegraph apparatus operative for communication over said line.

2. A communication system according to claim 1, wherein said means for transmitting said start signal transmits a signal of longer duration than said select signal.

3. A communication telegraph system according to claim 1, further comprising synchronously operating motor means for operating said way-station selective means and said selective call receivers, and means operative after one cycle of operation of said motors for stopping them.

4. A communication system comprising a main control station, printing telegraph apparatus thereat, adjustable way station selective means at said control station, comprising an adjustable selecting switch, a rotary selective transmitter operatively associated with said selecting switch, and synchronous drive means for said transmitter, a plurality of way-stations, printing telegraph apparatus and selective call receivers at each of said way-stations, comprising synchronously operating drive means, and selective cam means driven by said synchronously operating drive means, a communication line interconnecting said main station and said way-stations, means at said main station and way-stations responsive to said start signal for starting operation of said synchronous drive means, means responsive to operation of said rotary selective transmitter for transmitting over said line a selecting signal dependent upon the adjustment of said switch, and means at the selected way-station controlled by said selective signal and said selective cam means for rendering the associated printing telegraph apparatus operative for communication over said line.

5. A communication system according to claim 1, further comprising means at each station for transmitting over said line call signals, means at said control station responsive to said call signals for recording said calls, means at said way-stations for storing calls in event said line is connected for communication, and means responsive to disconnection of said line after termination of communication for transmitting said stored signals over said line to said means for recording said calls.

6. A communication system comprising a main

station, a plurality of way-stations, a transmission line interconnecting said main station and said way-stations, means for selectively establishing communication between said main station and a selected one of said way-stations, call transmitting means at each way-station for transmitting calls over said line to said main station, recording means at said main station for recording said calls, signal storage means at each way-station for storing call signals when said line is being used for communication, and means responsive to disconnection of said line from communication condition for successively transmitting said call signals over said line to said recorder.

7. A communication system comprising a control station, printing telegraph apparatus, a call recorder and an adjustable way-station selective means at said control station; a plurality of way-stations; printing telegraph apparatus, a selective call receiver, and a control station calling means at each of said way-stations; a communication line interconnecting said control station and said way-stations; means at said control station for transmitting over said line start signals to initiate operation of said selective call receivers at all of said way-stations; means for transmitting over said line a station selective signal dependent upon the adjustment of said way-station selective means; means at the way-station selected, responsive to said station selective signal, for rendering the printing telegraph apparatus at the selected station opera-

5 tive; said control station call means comprising call transmitting means for transmitting a distinctive signal from each of said way-stations over said communication line to operate said call recorder at said control station; means for initiating operation of said call transmitting means; said last named means preparing a circuit for initiating said operation in event the line is in use for communication; and means responsive to termination of communication connections for operating said transmitter.

8. A communication system comprising a main station, a plurality of way-stations, a transmission line interconnecting said main station and 15 said way-stations, call transmitting means at each way-station for transmitting call signals over said line to said main station, means at said main station for recording said calls, signal storage means at each way-station for storing 20 call signals and means responsive to a change in condition of said line for transmitting said call signals to said recorder.

9. A communication system according to claim 8, wherein said call transmitting means comprises means for transmitting a plurality of short impulses followed by a long impulse, the number of short impulses preceding the long impulse being different at each of said stations, whereby said signals will be distinguishably recorded at said main station even when simultaneously transmitted. 30

FREDERICK G. HALLDEN.