Oct. 30, 1934. F. S. KINKEAD 1,979,112

REMOTE CONTROL SYSTEM

Filed Feb. 20, 1932

FIG. 1

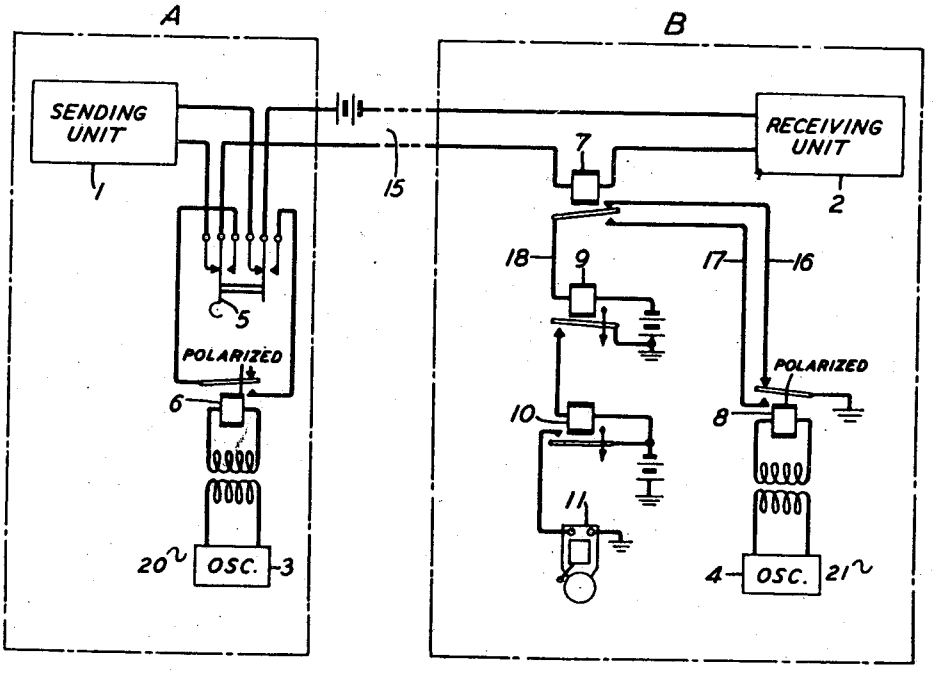
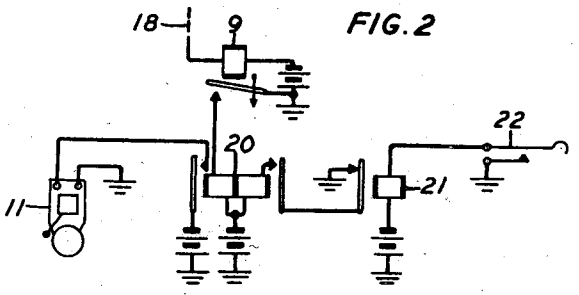


FIG. 2



INVENTOR
F. S. KINKEAD

BY E. V. Griggs

ATTORNEY

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REMOTE CONTROL SYSTEM

Fullerton S. Kinkead, Brooklyn, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

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3 Claims. (Cl. 178—2)

This invention relates to signaling circuits and more particularly to a selective arrangement responsive to a received signal of a particular frequency. An object of this invention is to provide a remote control arrangement for a printing telegraph set whereby a control device such as a switch or a supervisory lamp responds to a particular control signal but not to the printing telegraph signals.

In the usual printing telegraph systems, current through the telegraph line is interrupted by a transmitter producing a current having a low frequency of interruption, say twenty-four interruptions per second. Incidental to the transmission of printing telegraph signal impulses, other signal waves or impulses are frequently transmitted over the same line, which will be referred to hereinafter as "control signals" and whose functions are quite different from those of the telegraph signals. The control functions may be to ring a bell when a call is initiated; to start or to stop a motor at an idle station; to flash a lamp for notifying an operator that a subscriber has discontinued using his set; etc. The control signal may be sent at a time when the receiving printer is not in use, and for that reason the apparatus which responds to the control signal must be operated independently of the printing mechanism. Furthermore, the control apparatus must be prevented from responding to a telegraph signal. It is necessary therefore to devise a selecting mechanism which responds to the control signal but not to the telegraph signals.

The difference between the frequency of the control signal and the fundamental frequency of the telegraph signals cannot be very great for the following reasons: If the control frequency be selected at a much lower frequency than the telegraph signals, considerable delay is required in operating the control function. On the other hand, it is necessary to transmit as much of the telegraph signal harmonics as possible in the narrow band allotted for telegraph in order to prevent distortion. The necessary reduction in harmonics transmitted in order to provide an additional channel for control purposes would tend to increase distortion.

The present invention has for another object to provide a selecting means for discriminating between two frequencies separated by a difference of only a few cycles per second.

A further object of this invention is to provide discrimination betwen currents in the low frequency range, such as employed in printing telegraphy.

In accordance with this invention, the station at which the control signal is received is provided with a relay which vibrates at a constant frequency of, say, twenty-one cycles. The control signal is transmitted at a frequency differing slightly from the frequency of the vibrating relay, for example, twenty cycles. A second relay, responding to the signals received from the telegraph line has an armature connected in a circuit with the armature of the vibrating relay in such a manner that the current in the latter circuit has a frequency which represents the difference between the constant frequency of the vibrating relay and the frequency of the received signal. When a twenty-cycle current is received, the armatures of the two relays cooperate to produce current of a beat frequency having a fundamental variation at the rate of one fluctuation per second. A feature of this invention is a slow-release relay responsive to the above described beat frequency current and arranged to release upon receiving a beat having a frequency of one cycle per second. The release of the slow-release relay is effective to close a circuit for energizing the control apparatus.

A full understanding of the operation of the circuit contemplated by this invention as well as an appreciation of its various features may be obtained by reference to the following description when considered in connection with the attached drawing. In Fig. 1 of the drawing there is shown at A, in schematic form, the sending unit of a printing telegraph system and at B the receiving unit. Certain of the apparatus associated with each unit is shown in detail in order to properly illustrate the invention. A modification of a part of the apparatus associated with station B is shown in Fig. 2.

Referring now to Fig. 1 of the drawing, there is shown at station A, polarized relay 6 which is driven at a constant rate of twenty cycles per second by oscillator 3 which may be of any well known type, for example, that shown in Patent 1,356,763, issued October 26, 1920 to R. V. L. Hartley. A key 5 is provided by which the armature circuit of relay 6 may be connected into line 15, the sending unit 1 being by the same operation disconnected from the line.

It is assumed for purposes of illustration that the sending frequency of unit 1 is twenty-four cycles per second, that is, the unit when in operation interrupts the current in the line at the rate of twenty-four times a second.

A line 15 connects station A to station B either directly or through a central telegraph switching office such, for example, as disclosed in the copending application of Locke and Kinkead, Serial No. 459,684, filed June 7, 1930.

At station B there is shown associated with receiving unit 2, relay 7 which is connected in series with the line and relay 8 which is driven at a constant rate of twenty-one cycles per second by oscillator 4. The armature of relay 7 is so associated, by leads 16 and 17, with the armature of relay 8 that, when both relays are vibrating, a current of beat frequency, i. e. having a frequency equal to the difference between the frequencies of the two relays, is produced in lead 18. The winding of slow-release relay 9 is associated through lead 18 with the armature circuits of relays 7 and 8.

Also shown at station B is bell 11, associated through slow-release relay 10 with the armature circuit of relay 9. It is assumed, for purposes of illustration, that it is desired to be able to ring bell 11 by operating key 5 in order to notify subscriber B that subscriber A wishes to initiate a call to his (B's) station.

Let it now be assumed that subscriber A, in order to ring the bell at station B, operates key 5. This disconnects sending unit 1 from line 15 and connects thereto the armature circuit of relay 6. As the armature of relay 6 is being driven at a rate of twenty cycles per second by oscillator 3, impulses of this frequency are impressed on the line and relay 7 is driven at this same rate as it is connected in series with the line.

When relay 7 is in a stable normal, i. e., operated position, impulses of a frequency of twenty-one cycles per second are impressed on the winding of relay 9 due to the vibration at this rate of the armature of relay 8. Relay 9, being slow to release, remains operated on impulses of this frequency. As pointed out above, however, after key 5 has been operated, relay 7 starts to vibrate at a frequency of twenty cycles per second and current of the beat frequency of the operating frequencies of relays 7 and 8, i. e., one cycle per second, is now impressed on the winding of relay 9. As the operating time of relays 7 and 8 is appreciable, no current flows through the winding of relay 9 for a certain period of the beat frequency and the armature of relay 9 is so adjusted that it will release during such a period of zero current.

Relay 9, therefore, releases at this time and completes a circuit from battery, through the winding of relay 10, break contact of relay 9 to ground and relay 10 operates. The operation of relay 10 completes a circuit from battery, make contact of relay 10, winding of bell 11 to ground and bell 11 is caused to ring, this being the desired result of operating key 5.

The operating circuit of bell 11 may, of course, be connected directly to the armature of relay 9 but slow-release relay 10 may advantageously be employed as shown as it provides a method of controlling the period of energization of the bell independent of the released periods of relay 9. Thus, for example, relay 10 may be so adjusted that, once operated, it will remain so for ten seconds, thereby assuring that the bell will be sounded for ten seconds even though key 5 is held operated only momentarily.

If desired, further, the energizing circuit of bell 11 may be controlled through a locking relay circuit in such a way that once it has been completed through the operation of relay 9, it will so remain until released through some other means such, for example, as operation of a key by subscriber B. A part of the apparatus associated with station B modified to include a locking arrangement of this nature is shown in Fig. 2. The method of controlling the release at the desired time of relay 9 is the same as previously described and will not therefore be again described. Assuming now that, due to operations previously described, relay 9 releases, a circuit is completed from battery, left-hand winding of relay 20, break contact of relay 9 to ground and relay 20 operates and locks up on a circuit from battery, right winding of relay 20, right make contact of relay 20, break contact of relay 21 to ground. The operation of relay 20 completes a circuit from battery, left make contact of relay 20, winding of bell 11 to ground and bell 11 is caused to ring. As relay 20 is held in an operated position through the locking circuit, bell 11 rings continuously until relay 20 is tripped by some means, the means here selected for illustration being key 22 which when operated, completes a circuit from battery, winding of relay 21 to ground causing relay 21 to operate. The operation of relay 21 removes the ground from the right-hand winding of relay 20 and this relay releases, thereby opening the energizing circuit of bell 11 and discontinuing the signal.

During the time sending unit 1 is transmitting over the line, relay 7 vibrates at the rate of twenty-four cycles per second and current of a beat frequency of three cycles per second is impressed on the winding of relay 9. Relay 9 is so adjusted that it will not release during a beat of this frequency and the energizing circuit of the bell is not, therefore, affected by the telegraph signals.

It will be apparent from the above description that this invention provides a control system which, while it utilizes current of a frequency not differing greatly from the fundamental frequency of the telegraph currents, will not be affected by such telegraph currents.

While the invention has been described as a method of controlling the energization of a bell, this is only one application selected for illustration. The system may be arranged to control the operation of a switch, the lighting of a lamp or any other similar operation. Nor is the invention limited in its application to printing telegraph systems, it being capable of use on any other signaling system over which it is desirable to be able to transmit an independent control current.

What is claimed is:

1. In a telegraph system utilizing impulses of a fundamental frequency for message transmission and including a sending unit and a receiving unit and a line for connecting the sending and receiving units, means associated with the sending unit for producing telegraph message impulses of the fundamental frequency, means for impressing these impulses on the line, additional means also associated with the sending unit for producing current of a second frequency which differs from the fundamental frequency, means for impressing this current on the line, a relay associated with the receiving unit having an armature and two alternative contacts with which said armature may engage and having its operating winding in series with the line whereby it is operated at the particular frequency which is impressed on the line, a second relay also having an armature and two alternative contacts with which said arma-

ture may engage, a source of current of a third frequency differing from the two frequencies before mentioned, means for impressing current from said last mentioned source on the operating winding of the second relay, the first relay having its two contacts connected respectively to the two contacts of the other relay whereby two alternative current paths are formed, an additional current path associated at one extremity with said alternative current paths through the armature of the first mentioned relay and associated at the other extremity with a source of current, and means having an operating winding connected in series with said additional current path between the extremities thereof, for operating to produce an indication only on current of the frequency impressed on said additional path when currents of said second frequency are impressed on the line.

2. In a telegraph system utilizing impulses of a fundamental frequency for message transmission and including a sending unit and a receiving unit and a line for connecting the sending and receiving units, means associated with the sending unit for producing telegraph message impulses of the fundamental frequency, means for impressing these impulses on the line, additional means also associated with the sending unit for producing current of a second frequency which differs from the fundamental frequency, means for impressing said second frequency current on the line, a relay associated with the receiving unit having an armature and two alternative contacts with which said armature may engage and having an operating winding in series with the line whereby said relay is operated at the particular frequency of the current which is impressed on the line, a second relay also having an armature and two alternative contacts with which said armature may engage, a source of current of a third frequency differing from the two frequencies before mentioned, means for impressing current from said last mentioned source on the operating winding of the second relay, means for connecting the two contacts of the first relay respectively to the two contacts of the other relay whereby two impulse current paths are formed and means associated with said two impulse current paths through the armature of the first mentioned relay for producing an indication only on the series of interruptions in the impulse current paths which results when currents of said second frequency are impressed on the line.

3. In a telegraph system utilizing impulses of a fundamental frequency for message transmission and including a sending unit and a receiving unit and a line for connecting the sending and receiving units, means associated with the sending unit for producing telegraph message impulses of the fundamental frequency, means for impressing these impulses on the line, additional means also associated with the sending unit for producing current of a second frequency which differs from the fundamental frequency, means for impressing the current of this second frequency on the line, a relay associated with the receiving unit having an armature and two alternative contacts with which said armature may engage and having its operating winding connected in series with the line whereby it is operated at the particular frequency which is impressed on the line, a second relay associated with the receiving unit also having an armature and two alternative contacts with which said armature may engage, means for producing current of a third frequency differing from the two frequencies beforementioned, means for impressing this current upon the winding of said second relay whereby it operates at said third frequency each of the relays having its two contacts connected respectively to the two contacts of the other whereby two alternative current paths are formed, an additional current path associated at one extremity with said alternative current paths through the armature of the first mentioned relay and associated at the other extremity with a source of current, and means associated with said additional current path for operating to produce an indication only on current of the frequency impressed on said additional path when currents of said second frequency are impressed on the line.

FULLERTON S. KINKEAD.