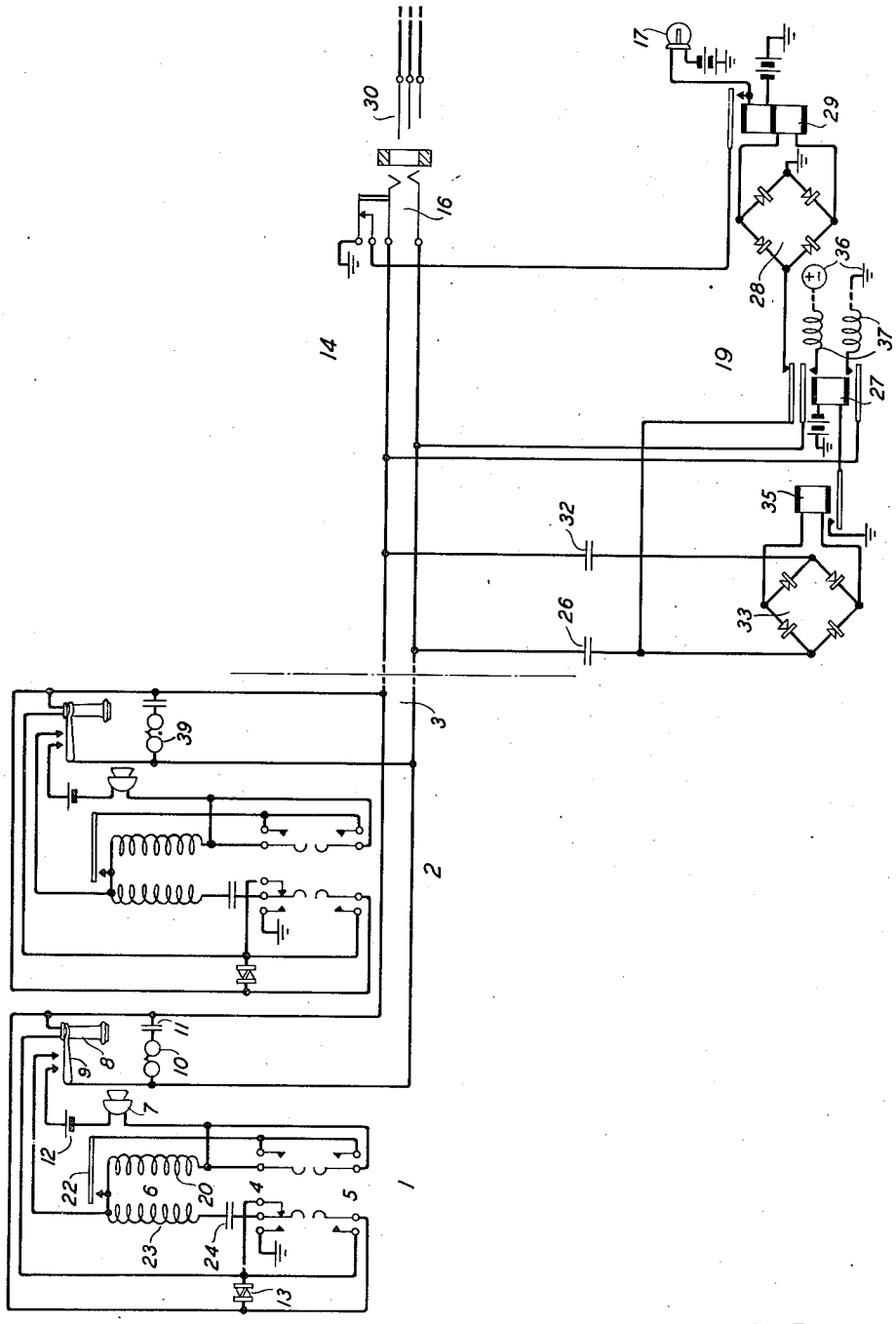
July 6, 1943. L. R. WALLER 2,323,692

TELEPHONE SYSTEM

Filed July 11, 1942



INVENTOR
L. R. WALLER

BY W. C. McKenney

ATTORNEY

Patented July 6, 1943

2,323,692

UNITED STATES PATENT OFFICE

2,323,692

TELEPHONE SYSTEM

Lee R. Waller, Montreal, Quebec, Canada, assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

Application July 11, 1942, Serial No. 450,563

7 Claims. (Cl. 179—84)

This invention relates to telephone systems and particularly to systems for signaling over telephone lines.

An object is to simplify and improve the signaling over telephone lines and particularly in connection with partly lines.

Heretofore in signaling over local battery magneto party line telephone circuits to call the operator at the central office, the calling subscriber must operate the magneto to induce alternating current signals for transmission over the line. These signals also operated the bells at all the stations on the party line. To call another subscriber on the line, the magneto is operated to generate corresponding code signals which operated the bells at all the stations and signaled the operator.

It is a feature of the present invention to provide in local battery party line telephone systems means whereby signaling may be done without the aid of a magneto, whereby one party can call another party by operating a key in code and without causing the code signals to signal the operator at the central office and whereby any party can call the operator by operating another key without ringing the bells at any stations.

This invention has been illustrated in the accompanying drawing which shows two party line subscriber stations equipped in accordance with the applicant's invention, a line to a central office and the equipment required at an operator's position in accordance with this invention.

Referring to this drawing, each of the subscriber stations 1 and 2 on the party line 3 is provided with a key 4 which when operated causes the operator at the central office to be called and a key 5 which when operated in code causes the desired subscriber's station to be called. Otherwise the subscriber station circuits are provided with the induction coil 6, transmitter 7, receiver 8, switchhook contacts 9, bell 10 and associated condenser 11, a local battery 12 and a two-way rectifier 13 the purpose of which will be described hereinafter. The line 3 terminates in the central office 14 in a jack 16 and a calling lamp 17 and other equipments necessary for the carrying out of the applicant's invention as indicated in general with the numeral 19.

If a call is to be made from subscriber station 1 to call the operator at the central office, the subscriber of this station will remove the receiver 8 from the switchhook 9 and operate the key 4. When the receiver 8 is removed from the switchhook 9, the primary winding 20 of induction coil 6 is energized over a circuit from battery 12, transmitter 7, winding 20, switchhook contacts 9, back to battery 12. This causes the armature 22 controlled by the induction coil 6 to be attracted to close a circuit across the primary winding 20 to shunt it when the key 4 is operated as follows: from winding 20, through the front contacts and armature 22, contacts of key 4, back to winding 20. This shunt circuit causes the armature 22 to be released to open the shunt. These operations are then repeated in the same manner as the ordinary buzzer and thereby causes an alternating current of high frequency to be generated in the secondary winding 23 of the induction coil 6 from ground through the condenser 24, secondary winding 23, switchhook contacts 9 over the ring conductor of the line 3. It should be noted that the tip conductor of the line is opened at contacts of key 4. This alternating current signal transmitted over the ring conductor is received at the central office through a condenser 26, contacts of relay 27 and is rectified by the rectifier arrangement shown at 28 to cause a direct current to pass through the lower winding of relay 29 to operate this relay. This relay in operating closes a locking circuit for itself from battery through the upper winding of this relay and its armature and front contact to ground at the contacts of jack 16 and also a circuit for the lighting of lamp 17 from battery through this lamp and the armature and front contact of relay 29 to ground at the contacts of jack 16. When the operator answers this call by inserting plug 30 in the jack 16, in the usual manner, the locking circuit for relay 29 and the circuit for lamp 16 are opened at the contacts of jack 16 so that the lamp is extinguished and the relay 29 is released. It should be understood, of course, that by this time the subscriber at station 1 has released key 4, as it is only required to be operated for a short time sufficient to cause the operation of relay 29.

In case the subscriber at station 1 desires to call station 2, for example, he will operate key 5 in the code recognized by the subscriber at station 2. It should be noted that the key 5 closes the same circuit as key 4 for the primary winding 20 of the induction coil 6 so as to induce an alternating current of high frequency in the secondary winding 23 in the same manner as previously described in connection with a call to an operator. In this case, however, the alternating high frequency signals pass through the winding 23, over both the tip and ring conductors, from the tip conductor through the switchhook contacts 9, the secondary winding 23, condenser

24, contacts of keys 4 and 5 to the ring conductor. The high frequency current signals are received at the central office through the condensers 26 and 32 and the rectifier 33. This produces a rectified current through the winding of relay 35 for the operation of this relay. This relay in operating closes an obvious circuit for the operation of relay 27 which in operating closes a circuit for the transmission of signals over the line from the low frequency alternating current source and ground at 36 through the impedances 37, contacts of relay 27 over the tip and ring conductors out over the line. These low frequency ringing signals will operate the bell 39 at station 2 and also the bell 10 at station 1. The particular code signaled with the key 5 by the subscriber at station 1 will be recognized by the subscriber at station 2 who then removes his receiver from the switchhook and answers the call. When the subscriber at station 1 finally releases the key 5 the induction coil will, of course, cease to produce high frequency signals and relays 35 and 27 will release to stop the transmission of ordinary low frequency ringing current from the source at 36.

When a connection through the operator's position at the central office is to be discontinued the subscriber may give the operator a ring-off signal by operating key 4 for a short interval. The operation of this key will as hereinbefore described cause a low-frequency ringing signal from source 36 to be transmitted over the line which signal will in this case pass through the jack 16 over plug 30 to signal the operator's lamp in the cord circuit in the usual manner.

The varistor element 13 at a subscriber's station is provided to protect the subscriber's telephone set in case the subscriber should be listening while another subscriber operates one of the signaling keys. It should be observed that the condenser 24 may be of such value as to freely pass this high frequency signaling current or voice current but will not pass the low frequency ringing current signals from the source 36 and that condensers 26 and 32 are of such capacity as to effectively block these low frequency ringing current signals from operating relay 35 through the rectifier 33 and that the impedances 37 are of such value as to allow the low frequency current signals from source 36 to pass freely but will effectively block the high frequency current signals induced by the induction coil 20 from reaching the source at 36.

What is claimed is:

1. In a signaling system, party line subscriber stations, a central office, a line extending from said stations to said central office, means at each station for producing code signals of a relatively high frequency for transmission over said line, means at the central office responsive to said high frequency code signals for producing corresponding code signals of relatively low frequency for transmission back over the line, and means at each station responsive to said low frequency code signals for calling a particular subscriber depending on the code transmitted.

2. In a signaling system, party line subscriber stations, a central office, a line extending from said stations to said central office, an operator's position at said central office, means at each station for producing code signals of a relatively high frequency for transmission over both conductors of said line and for producing a relatively high frequency signal for transmission over one conductor of said line, means at the central office responsive to high frequency code signals transmited over both conductors of the line for producing corresponding code signals of relatively low frequency for transmission back over said line, means at each station responsive to said low frequency code signals for calling a particular subscriber depending on the code transmitted, and means at the central office responsive to the high frequency signal transmitted over one conductor of the line for signaling the operator.

3. In a signaling system, party line subscriber stations, each including an induction coil, a source of current at each station, a central office, a line extending from said stations to said central office, means at each station for closing an energizing circuit for the primary winding of the induction coil across the source of current, an armature for the primary winding attracted when the primary winding is energized, a key at each station, means including said key when actuated and the armature when attracted for closing a shunt circuit across the primary winding to deenergize it to release the armature to open the shunt circuit thereby causing the repeated energizing and deenergizing of the primary winding as long as the key is operated, said repeated energizing and deenergizing of the primary winding causing high frequency current to be induced in the secondary winding for transmission over the line, a source of low frequency current at the central office, means at the central office responsive to said high frequency current signals for rectifying them, and means responsive to the rectified current signals for connecting said low frequency source to the line for transmission of low frequency current signals over the line and a signal device at each station responsive to said low frequency current signals.

4. In a signaling system, party line subscriber stations, a central office, a line extending from said stations to said central office, an induction coil at each station, normally open contacts adapted to be closed on the energization of the primary winding of said coil, a source of direct current at each station, means for connecting said source in series with said primary winding to energize it, means for connecting a shunt around said primary winding and including said contacts when closed to cause said induction coil to operate as a buzzer to generate a high frequency current in the secondary winding of said coil for transmission over said line, a low frequency source at the central office, means at the central office responsive to said high frequency current for transmitting current from said low frequency source over the line and signals at said stations responsive to said low frequency current signals.

5. In a signaling system, party line subscriber stations, a central office, a line extending from said stations to said central office, an induction coil at each station, normally open contacts adapted to be closed on the energization of the primary winding of said coil, a source of direct current at each station, means for connecting said source in series with said primary winding to energize it, means for connecting a shunt around said primary winding including said contacts when closed to cause said induction coil to operate as a buzzer and to generate a high frequency current in the secondary winding of said coil for transmission over two conductors of said line in series or to generate a high frequency current in the secondary winding of said coil for transmission over one conductor only of said line, a signal at each station, a low frequency source

at the central office, a signal at the central office, means at the central office responsive to the high frequency current when received over both line conductors in series for transmitting current from said low frequency source back over the line for actuating the signals at said stations or responsive to the high frequency current when received over one conductor of the line only for actuating said signal at the central office.

6. In a signaling system, party line subscriber stations, a central office, a line connecting said stations with said central office, means for signaling any station from any other station including means for transmitting alternating current signals of one frequency from the calling station over the line to the central office for translating said signals into alternating current signals of another frequency at the central office for transmission back over the line, and a signal responsive means at each station responsive to the translated signals.

7. In a signaling system, party line subscriber stations, a central office, a line connecting said stations with said central office, means for signaling the subscriber at any station by code signals from any other station or for signaling the operator at the central office, including means for producing alternating current code signals at a calling station for transmission over both conductors of a line in series or for producing an alternating current signal over one conductor of the line, means at the central office for translating the code signals received over both conductors into alternating current code signals of another frequency for transmission back over the line, a signal at each of the stations responsive to said translated alternating current code signals, and a signal at the central office responsive to the alternating current signal received over one conductor.

LEE R. WALLER.