

March 27, 1945.

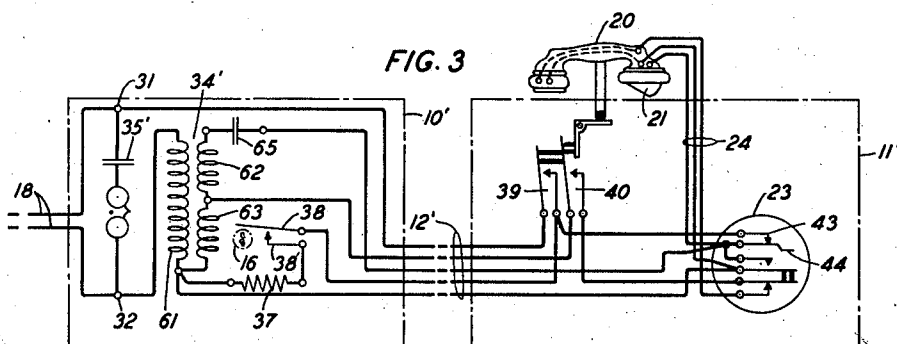
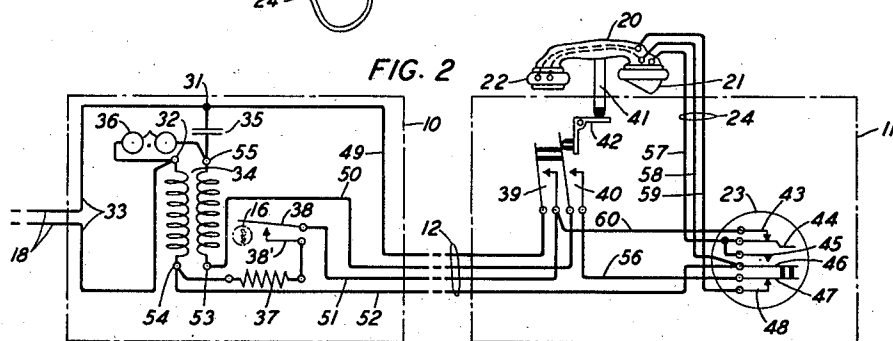
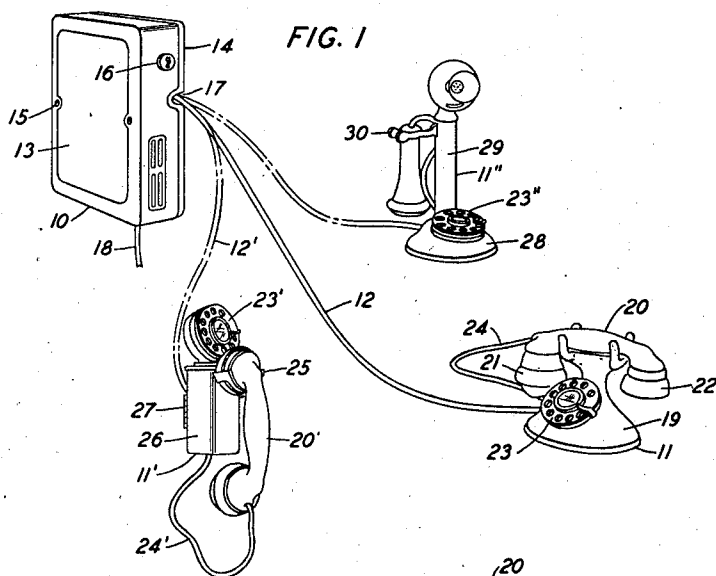
W. H. EDWARDS ET AL

2,372,262

TELEPHONE STATION CIRCUIT

Filed Dec. 4, 1941

4 Sheets-Sheet 1



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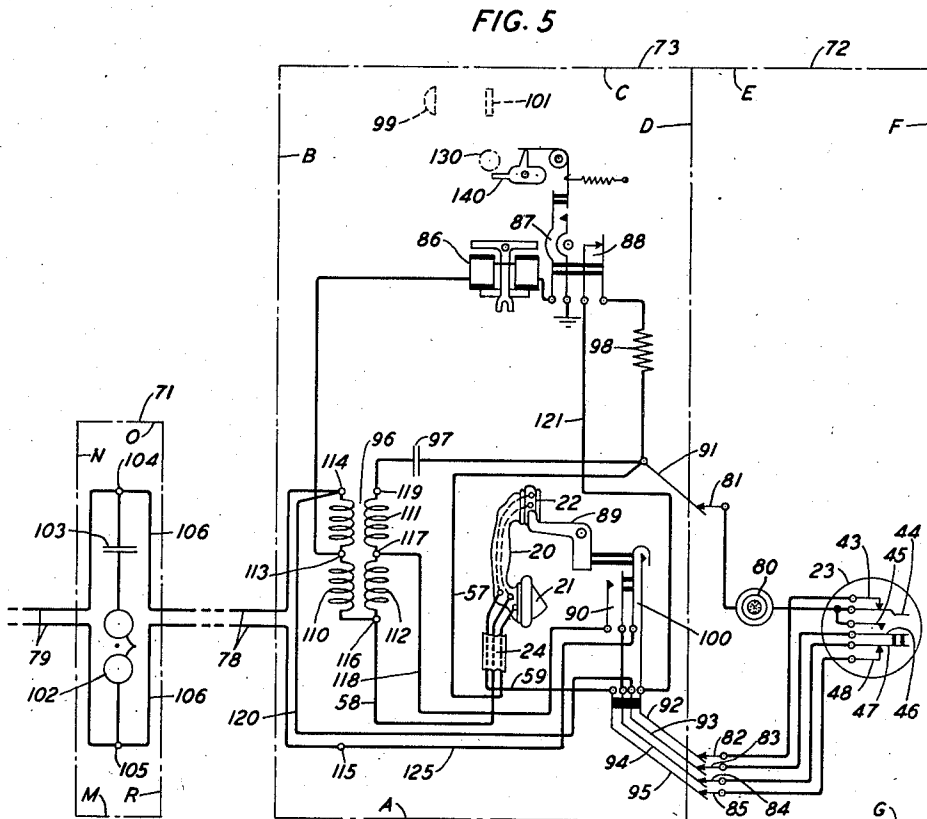
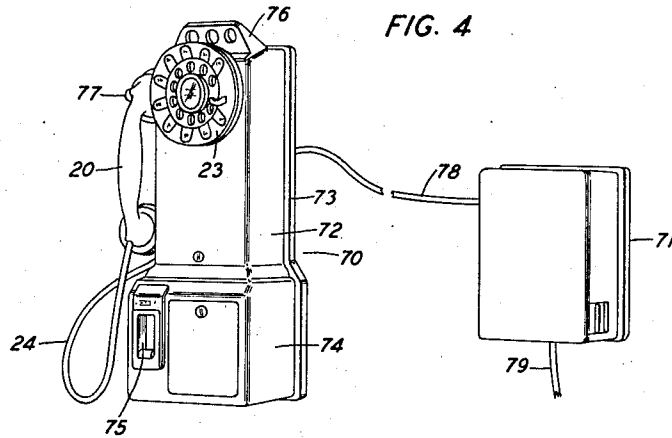
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TELEPHONE STATION CIRCUIT

Filed Dec. 4, 1941

4 Sheets-Sheet 2

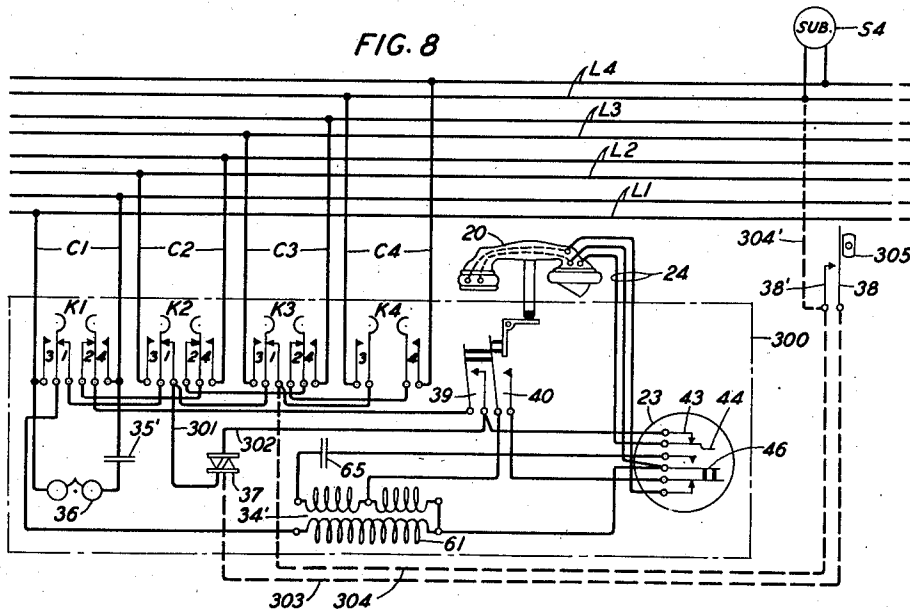


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4 Sheets-Sheet 3



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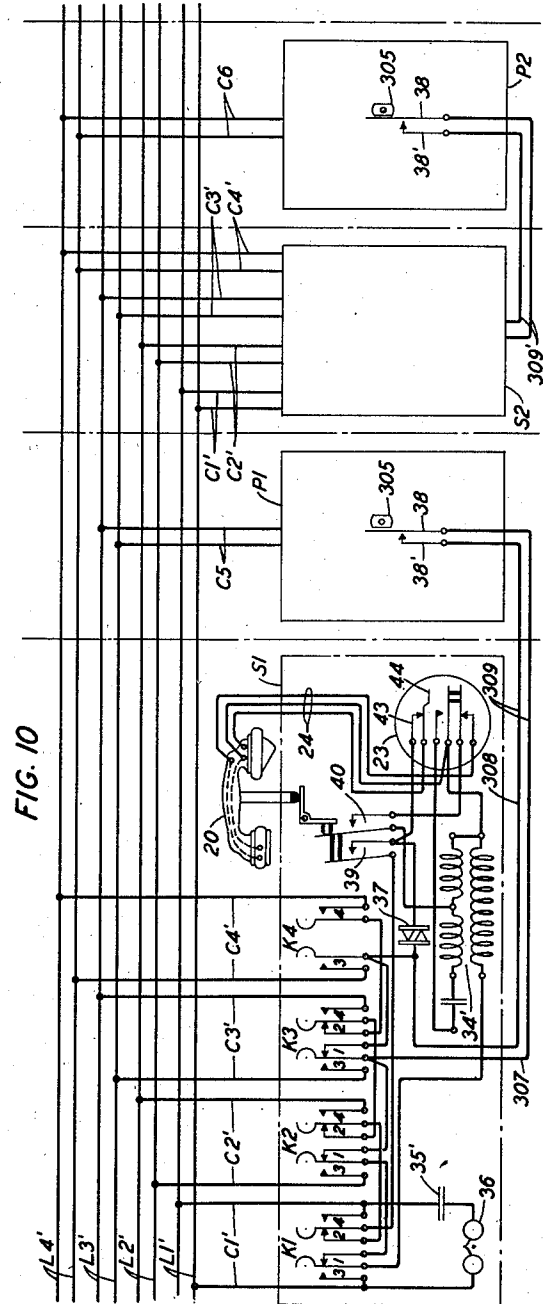
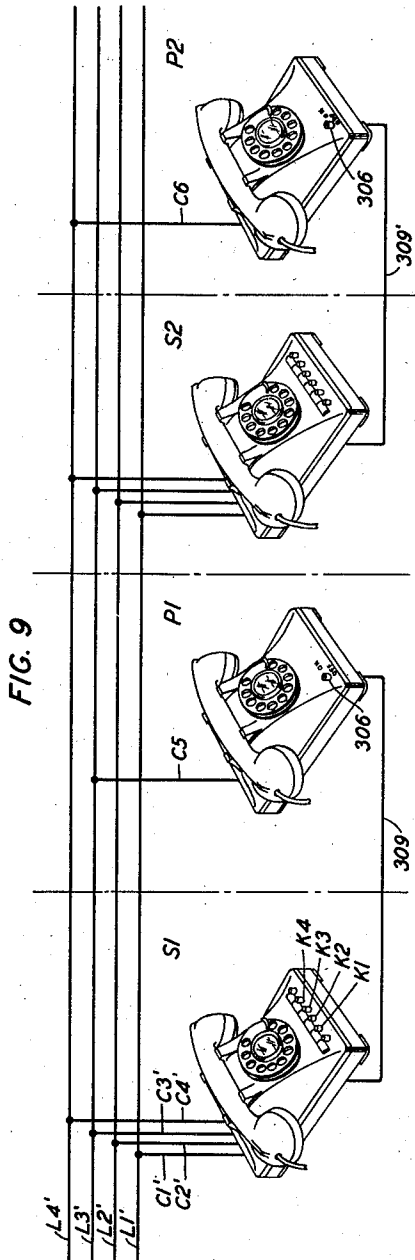
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TELEPHONE STATION CIRCUIT

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,372,262

TELEPHONE STATION CIRCUIT

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Application December 4, 1941, Serial No. 421,534

27 Claims. (Cl. 179—6.3)

The invention relates to telephone station circuits.

An object of the invention is to protect dial type telephone stations against unauthorized use.

Telephone station circuits including a calling dial or signaling or pulsing device, for inclusion in so-called automatic telephone systems, are becoming increasingly common. The telephone station may be intended for, and be so located as to be available for, use by only one or by a relatively few persons, as in a private home or in an office. On the other hand, the telephone station may be intended for use by the general public, and may be mounted on a wall or in an enclosure, such as a booth in a public place.

In the former case, the subscriber or subscribers, that is, the private individual or family or the office occupant, may wish to restrict the use of the telephone to himself, and to protect it when he is not present against unauthorized use by others in the house or office who have or who might contrive to have physical access to it. At the same time, it will be desirable to have the station, while so protected, in a condition to receive incoming calls and/or to be available for emergency outgoing calls. In some cases where a key telephone set for a secretary is provided with facilities to pick up and answer one or more principal lines, it may be desired, if it could be done simply, to restrict the use of the line for outgoing calls to the principal station or stations, at the same time permitting the secretarial station to be used for outgoing or incoming calls on another line or lines. It is desired also to accomplish this with the minimum additional equipment, wiring or cord conductors, or less than would be required if the dial contacts were short-circuited directly.

In accordance with one feature of the invention a key or lock controlled impedance, specifically, a resistance, for example, having a negative resistance voltage characteristic, such as a silicon carbide varistor, is provided in the telephone station circuit. This impedance normally is open-circuited, but when it is desired to protect the circuit against unauthorized use, operation of the key or lock connects it in shunt with the microphone or transmitter (and, when convenient from a wiring standpoint, with the induction coil primary winding also) and with the pulsing springs or contacts of the calling dial of the circuit. The impedance is of selected value such that dial pulses are effectively short-circuited but the transmitter's (and, when so connected, the induction coil's) effectiveness for talking purposes is not affected appreciably. For example, when a

varistor is employed, with the dial contacts open, the varistor would have a comparatively high voltage across its terminals and its resistance would drop to a low level. However, with the dial contacts closed in the talking condition, the voltage across the varistor would be comparatively low and its resistance would be comparatively high.

In installations in which the station components other than receiver, transmitter, calling dial and mounting therefor, are located in an enclosure at a removed or relatively inaccessible location, the shunt impedance and the contacts to connect it may be housed in such enclosure. Since the transmitter is not affected appreciably by the shunt, use of the station in answering incoming calls is not impaired. The station may be used for emergency outgoing calls by removal of the receiver or handset (if the station is equipped with the latter) and waiting for the sender monitor or the dial system A operator to come in on the line when dialing is not started after a reasonable period of time.

In installations in which all of the station components are associated with a so-called combined telephone set, that is, one in which all of the station components are mounted on or enclosed in a single housing or mounting, the shunt impedance and the contacts to connect it may be housed in the combined set, or the shunt impedance and the contacts to connect it may be housed separately so as to be mounted in a position less conspicuous or more remote from the position of the possible unauthorized user of the telephone, but accessible to the legitimate user. For example, a telephone set might be provided on a counter or in a cashier's booth in a store where anyone might use the telephone for incoming calls, but be unable to use it for outgoing dial calls until the shunt impedance circuit is opened. In a key telephone set, the shunt impedance could be mounted in the set and permanently connected in the wiring thereof in such a way that dialing out is disabled on one or more lines and unaffected on other lines picked up by the same set. If desired, however, a control could be provided from some remote point which would determine what line could be used for outgoing calls from the key telephone set in question.

In pay station telephones or coin collector stations that include a calling dial and that require the deposit of a coin or token to initiate a call to another party or to get the operator, it is a known practice to provide normally a shunt around the pulsing contacts or springs of the dial, the shunt

being removed by the deposit of the coin or token. This insures that should the line circuit somehow be completed to the automatic exchange or central office without the deposit of a coin, the dial remains inoperative for pulsing purposes. When the coin collector station is of the handset type it is known, also, to include in the station a coin signal microphone or transmitter for the sole purpose of picking up the sound of a deposited coin or coins, and transmitting the sound or sounds to the operator in the case of a toll or other call requiring the operator to be signaled. To simplify the station circuit, the coin signal microphone may be connected in series with the dial pulsing contacts or springs. With a preferred coin collector structure and circuit arrangement provision of the pulsing spring shunting arrangement involves shunting the signal microphone also. As will be brought out in greater detail hereinafter this is not entirely advantageous since, under certain circumstances, the coin signal microphone is not effective for its intended purpose.

In accordance with another feature of the invention, the shunting circuit for the dial pulsing springs includes an impedance, specifically a resistance, so proportioned that, until the shunting circuit is opened or disconnected, operation of the dial is ineffective to transmit pulses to the line but the coin signal microphone effectiveness for transmission of coin deposit sounds is not substantially affected.

Still other objects and features comprehended in the present invention will become apparent from the detailed description that follows, taken in conjunction with the appended drawings, wherein:

Fig. 1 illustrates typical telephone station equipment in which the invention may be embodied, alternative supporting structure for the handset, or transmitter and receiver, and calling dial being shown;

Fig. 2 shows a circuit arrangement embodying the invention, which circuit and whose components are adapted to be included in the telephone station of Fig. 1;

Fig. 3 shows a modification of the circuit arrangement of Fig. 2, incorporating anti-sidetone;

Fig. 4 illustrates a typical pay telephone or coin collector station;

Fig. 5 shows a circuit arrangement embodying this invention, which circuit and whose components are adapted to be included in the coin collector station of Fig. 4;

Fig. 6 illustrates a subscriber's station installation including a main and an extension set each equipped with a calling dial, one of which may be disabled for outgoing calls therefrom by inclusion in its circuit of the shunt impedance means of this invention;

Fig. 7 shows a circuit arrangement for the installation illustrated in Fig. 6;

Fig. 8 shows the circuit arrangement for a key telephone set including the shunt impedance means of this invention, whereby the key telephone set may be restricted against making outgoing dial calls on one or more of the lines with which the set is associated;

Fig. 9 illustrates an installation for an office in which one or more of the secretaries to one or more principals or executives are provided with key telephone sets including the shunt impedance means of the invention, whereby each secretary may be precluded from making outgoing dial calls

on a particular line or lines of the installation; and

Fig. 10 shows the circuit arrangement involved in the installation of Fig. 9, in so far as concerns the application of the invention thereto.

With particular reference to Fig. 1, there are shown a subscriber's substation set or "bell box" 10 and a telephone set 11 connected together through a telephone cord 12. The substation set comprises a cover member 13 secured to a back plate or mounting portion 14 by fastening members or screws 15. The cover supports a key-operated device or lock 16, of which more hereinafter; has an aperture 17 in a lateral wall for entrance of the cord; and has an aperture (not shown) in its lower horizontal wall for the wiring 18 containing conductors for connecting the substation set with a telephone line. The telephone set comprises a mounting 19, a handset 20 comprising a transmitter 21 and receiver 22, a calling dial or signaling device 23, and a cord 24 for connecting the handset instruments with appropriate terminals in the mounting.

The telephone set is adapted to be supported on a table, desk or other horizontal supporting surface at a distance removed from the substation set dependent on the length of the cord 12. The set 10 may be adapted to be mounted on any suitable horizontal or vertical surface, for example, on a wall, under or on the side of a desk, or the like, and, if desired, may be located in an out-of-the-ordinary or relatively inaccessible place.

Alternative telephone sets to the set 11 are identified by reference characters 11', 11''. The set 11' is of the so-called hang-up type comprising a handset 20', a calling dial 23', a handset support or hook 25 cooperating with two pairs of contact springs (not shown) within the case or box 26. The latter may be mounted on a suitable vertical surface by a bracket 27. The set 11'' is of the so-called desk-stand type comprising a base portion 28 supporting a tubular standard 29 surmounted by a transmitter. A switch-hook 30 supports a receiver and cooperates with contact springs (not shown) in the standard. A calling dial 23'' is mounted on the base portion.

Fig. 2 shows a circuit arrangement in accordance with the invention that may be embodied in the substation set and telephone set of Fig. 1. The substation set 10 encloses a pair of terminals 31, 32 to which the telephone line conductors 33 of wiring 18 are adapted to be connected, a two-winding induction coil 34, a condenser 35, a ringer or station signal 36, an impedance 37 consisting of a silicon carbide varistor, a reactance, or a resistor, a pair of contact members 38, 38', and a key-controlled device or lock 16 associated with the contact members for opening or closing the contacts upon key operation of the lock. The set 11 provides a support and enclosure for the handset 20, the calling dial 23 and two pairs of normally open (that is, with the handset resting in the cradle of the mounting) contact springs 39, 40. The weight of the handset on the plunger member 41 acting through suitable linkage 42 forces each pair of springs out of contact; removal of the handset enables the springs to engage. The dial comprises a pair of normally closed pulsing contacts or springs 43, 44, a pair of normally open contacts or springs 45, 46, and a pair of normally closed contacts or springs 47, 48.

The two equipment assemblies are interconnected by the multiconductor cord 12 containing four conductors 49, 50, 51, 52. Conductor 49 con-

nects line terminal 31 with the left spring of contact springs pair 39; conductor 50, terminal 53 of the secondary winding of induction coil 34 with the left spring of contact springs pair 40; conductor 51, contact member 38 with the right spring of contact springs pair 39; and conductor 52, terminal 54 of the induction coil's primary winding with dial spring 46. In the substation set, the remaining circuit connections are: condenser 35 is connected between line terminal 31 and terminal 55 of the coil secondary winding, ringer 36 is connected between line terminal 32 and terminal 55, and impedance 37 is connected between primary winding terminal 54 and the contact member 38'. In the telephone set, the remaining circuit connections are: wire 56 connects right spring of contact springs pair 40 with dial spring 47 and wire 60 connects right spring of pair 39 with dial spring 43; the cord 24 comprises conductors 57, 58, 59, of which conductors 57, 58 connect the terminals of transmitter 21 with dial springs 44 and 46, one transmitter terminal being common to the transmitter and to the receiver 22, conductor 59 connecting the other terminal of the receiver to dial spring 48.

The circuit arrangement of Fig. 2 represents the normal or idle condition of the telephone station. If an incoming call is assumed, the station is signaled over a ringing circuit comprising the conductors 33, condenser 35 and ringer 36. Removal of the handset 20 from its support results in the closure of the springs of contact pairs 39, 40, those of pair 40 making or engaging last. This completes a talking or transmitting circuit that may be traced from conductor 33, terminal 32, primary winding of coil 34, terminal 54, conductor 52, dial spring 46, conductor 58, transmitter 21, conductor 57, dial pulsing springs 44, 43, wire 60, contact pair 39, conductor 49, terminal 31, to the other conductor 33 of the wiring 18. Closure of contact pair 40 completes the following receiving or listening circuit bridged across the series-connected transmitter, dial pulsing springs, and contact pair 39: from terminal 31, condenser 35, terminal 55, secondary winding of coil 34, terminal 53, conductor 50, contact pair 40, wire 56, normally closed dial springs 47, 48, conductor 59, receiver 22, conductor 58, to dial spring 46.

To make an outgoing call, the subscriber removes the handset 20 from its support, thereby enabling closure of contact pairs 39, 40. The circuits traced in the preceding paragraph are completed. The subscriber then operates the dial 23 in accordance with the code for the party he desires to call or for the operator. For each digit or letter dialed, the pulsing springs 43, 44 will break-and-make the number of times determined by the arc through which the turnable element of the dial has been turned. During such pulsing, dial springs 45, 46 are and remain closed while dial springs 47, 48 are and remain opened until the break-and-make ceases. Closure of springs 45, 46 during dial pulsing places a bridge around the transmitter, and the opening of springs 47, 48 opens the receiver circuit. Such functioning of a calling dial is well-known. With springs 45, 46 closed, and springs 47, 48 open, the dial pulsing circuit between the line terminals 31, 32 may be traced as follows: terminal 22, primary winding of coil 34, terminal 54, conductor 52, springs 46, 45, pulsing springs 44, 43, wire 60, contact pair 39, conductor 49 to terminal 31.

If it is now assumed that the subscriber wishes to protect his station against unauthorized use,

for example, during a period or periods when he is not in its vicinity, he inserts a key into the lock 16 (which could be adapted to receive a special-shaped key) and locks the circuit against such use by causing closure or engagement of contact members 38, 38'. This connects the impedance 37 in bridge of or in shunt with the dial pulsing springs 43, 44 and the transmitter 21, the shunt circuit being from terminal 54, through impedance 37, contact members 38, 38', conductor 51 to the right spring of pair 39. The impedance is sufficiently high in resistance to permit the transmitter 21 to remain substantially as effective for talking purposes, but sufficiently low in resistance to render dial operation ineffective, i. e., to short-circuit dial pulses. This action is aided by the use of an impedance with a negative resistance-voltage characteristic, such as a silicon carbide varistor. Since the transmitter is not affected appreciably by the presence of the protective short circuit, there is no impediment to the use of the station in responding to incoming calls. If the telephone station is connected in a dial system in which a sender monitor or dial system A operator is brought in on a connection after a certain time if dialing is not started, an emergency outgoing call could be made by anyone, since removal of the handset would complete a line circuit to the central office or exchange, and the operator would eventually cut in, and, satisfied of the emergency character of the call, complete the desired connection. The protective shunt circuit would be opened or disconnected by reverse operation of the lock 16. Although a key-actuated or controlled device or lock and spring contact members 38, 38' have been shown for closure and opening of the protective short circuit, it will be appreciated that any suitable device, for example, a combination lock involving suitable contact members, could be employed for this purpose.

Instead of being included in the set 10, the protective shunt circuit could be housed in the set 11, contact member 38 being connected with right spring of pair 39 and the end of impedance 37 shown connected to terminal 54 being connected instead with dial spring 46. This would enable the use of a three-conductor cord between the sets 10, 11 in place of the four-conductor cord 12. So located, however, the protective shunt circuit might be subject to more ready tampering by an unauthorized user intent on making a call using the calling dial. It will be understood, of course, that the impedance 37, and the contact members 38, 38' could be placed in an enclosure separate from either set 10 or set 11, and connected therewith to provide the protective circuit over a two-conductor cord. The arrangement described with respect to Fig. 2 appears at this time, however, to be a preferred one. In certain situations, as before stated, it may be found advantageous to employ a variable resistance for the impedance 37, for example, a unit having a negative resistance-voltage characteristic, for example, a unit of silicon carbide.

Fig. 3 shows the invention embodied in a telephone station whose subscriber set 10' includes a three-winding induction coil 34', and separate condensers 35', 65 for the ringer and the receiver circuits, respectively. The induction coil 34' comprises a line or primary winding 61, a receiver circuit winding 62, and a balancing winding 63 to provide, with the receiver and transmitter, an anti-side tone circuit of the Campbell type. This circuit arrangement utilizes a five-conduc-

tor cord 12' for interconnecting the set 10' and set 11'. As in the arrangement of Fig. 2, the protective shunt circuit is connected between the transmitter end of the primary winding and the right spring of pair 39 so as to be connected in shunt with the series-connected transmitter and dial pulsing springs.

Figs. 6 and 7 illustrate how the invention may be applied to a subscriber's station installation comprising a main telephone set 200 and an extension telephone set 201, each provided with a calling dial 23. Set 200 is connected to the conductors of line 202 through the conductors of cord 203 and connector block 204, and set 201 through the conductors of its cord 205 and the additional connector block 206 and cord or wiring 207. The sets 200, 201, might be located at different places in, for example, a store, an office or a home, and it might be desired to have the extension set normally disabled for or protected against unauthorized outgoing dial calls, without restricting the main telephone set 200. This may be accomplished by suitable connection in the circuit of the set 201 of the shunt impedance means of this invention over the conductors of cord 209, the connector block 206 and a pair of the conductors of the cord 205. The shunt impedance means and its associated contact members may be enclosed in any suitable container 208, positioned, for example, in the vicinity of the main set or at any preferred location accessible to the subscriber or other authorized person. As illustrated in Fig. 6, the telephone set may be of the so-called combined set type, that is, the type in which the calling dial, induction coil, condenser or condensers, ringer, switching spring assembly and handset are enclosed in or supported on a single housing or mounting.

As shown in Fig. 7, the telephone set 201 could be used to make an outgoing dial call in that the contact members 38, 38' are in open condition. Closure of the contact members 38, 38', however, connects a dial pulse shorting circuit across the series-connected induction coil primary winding 61, transmitter 21 and dial pulsing springs 43, 44 that may be traced as follows: right spring of contact pair 39, conductor 210 of cord 205, terminal 211 of connector block 206, conductor 212 of cord 209, impedance 37, contact members 38, 38', conductor 213 of cord 209, terminal 214 of connector block 206 and conductor 215 of cord 205 to the terminal 32 of the winding 61. Dialing at the set 200 would remain unaffected when the handset 20 is in its cradle and the contact pair 39 in the normal or open position.

In a particular situation the telephone set 201 might be provided on a counter or in a cashier's booth in a store where anyone might use the set for incoming calls but only authorized persons be able to use it for outgoing calls, the shunt impedance circuit being normally closed. It will be understood that a manually operated two-position switch could be substituted for the lock 16 and members 38, 38', and mounted in such a position behind the counter or in the cashier's booth that only those authorized to dial calls could reach the switch to operate it. Another arrangement could involve a non-locking switch normally closing the shunt impedance circuit; it is apparent that this might be a foot-operated switch which could be held open during dialing and thereafter released or closed, thus providing a convenient and inconspicuous control means.

It will be understood, of course, that the set 201 and the shunt impedance circuit arrangement associated with it could comprise the subscriber's station installation, that is, the set 201 need not necessarily be an extension set of a station installation.

The invention may be embodied in a key telephone set adapted to pick up a plurality (for example, four) of dial central office or private branch exchange extension lines, or a combination of both. Fig. 8 shows a key telephone set 300 comprising a handset 20, a calling dial 23, induction coil 34', switching contact pairs 39, 40, condensers 35' and 65, ringer 36 and four keys K1, K2, K3, K4 connected to lines L1, L2, L3 and L4, respectively, over conductor pairs C1, C2, C3, C4, respectively. Each of keys K1, K2, K3 comprises a pair of inner normally closed contact sets 1, 2 and a pair of outer normally open contact sets 3, 4. Key K4 comprises a pair of normally open contact sets 3, 4. The conductor pairs C1, C2, C3, C4 are connected to the outer contacts of the contact sets 3, 4 of the respective keys. The ringer and ringing circuit condenser for the set 300 may be connected across the line L1. An impedance 37, illustrated as a varistor, is so connected by wires 301, 302 as to prevent dialing out from the key telephone set over, by way of illustration, lines L3, L4. Wire 301 is connected with the right spring of contact set 1 of key K2 and with the left spring of contact set 1 of key K3. Wire 302 is connected with the right spring of contact pair 39. With the handset 20 removed from its support and, consequently, with contact pairs 39, 40, closed, and either key K3 or key K4 operated so that its contact sets 3, 4 are closed, a dial pulse shorting circuit in parallel with the series-connected contact set 1 of keys K2 and K1, induction coil primary winding 61, transmitter 21, and dial pulsing springs 43, 44 may be traced as follows: right spring of contact pair 39, wire 302, impedance 37 and wire 301 to the right spring of contact set 1 of key K2. The impedance 37, of course, would be proportioned to offer a low resistance to dial pulsing voltage when the dial pulsing contacts 43, 44 are opened but a high resistance to the relatively low direct current and voice frequency voltage drop across the induction coil primary winding 61, transmitter 21 and dial pulsing springs 43, 44 in the talking condition.

In a particular installation it might be desired that dialing out from the key telephone set would normally be possible on each of the lines with which the set is connected but that there be provision for preventing, if desired, dialing out on a particular line. The arrangement of Fig. 8 may be readily modified to this end. Let it be assumed that it is line L4 from which the key set is to be excluded with respect to outgoing calls from the key set, the exclusion to be under the control of a person at a point remote from the key telephone set, for example, the user of the telephone S4 connected to the line L4. The connection provided by wire 302 would be retained but wire 301 would be eliminated and replaced by the wires 303, 304 shown by dotted lines, wire 303 being connected between the impedance 37 and contact member 38, and wire 304 being connected between the contact member 38' and the right spring of contact set 1 of key K3. Contact members 38 and 38' remain in open condition as shown until closed by rotation of the cam element 305. With contact members 38 and 38' in open condition, it is obvious that there is no

short-circuit present with respect to the dialing circuit of the key telephone set. With contact members 38, 38' in closed condition, however, the following circuit in parallel with the series circuit of dial pulsing springs 43, 44, transmitter 21, induction coil primary winding 61 and the contact sets 1 of keys K1, K2 and K3 may be traced; the right spring of contact pair 39, wire 302, impedance 37, wire 303, contact members 38, 38', wire 304 to the right spring of contact set 1 of key K3. An alternative connection for the wire 304 is indicated and designated 304'.

Figs. 9 and 10 illustrate how the invention may be embodied in a telephone secretarial system comprising a pair of principal or master stations P1, P2 and a pair of secretarial stations S1, S2. The latter are adapted to be connected over conductor pairs C1', C2', C3' and C4' with the telephone lines L1', L2', L3', L4' originating in a dial central office or private branch exchange. The stations P1, P2 are connected over conductor pairs C5, C6, respectively, with the telephone lines L3', L4', respectively. Each secretarial station may be similar to the key telephone set of Fig. 8, corresponding components bearing like identifying characters, except as to the manner in which the impedance 37 may be included in its circuit. In Fig. 10, the impedance 37 is shown connected between the right spring of contact set 3 of key K4 and the right spring of contact pair 39. This prevents the station S1 from dialing out on line L4', i. e., it prevents the secretary of the principal of station P1 from dialing out on the line of the principal of station P2, although, as already explained hereinabove, the station S1 is not precluded from picking up a call incoming on line L4'. By including in the telephone set of station P1 a pair of contact members 38, 38', normally in open condition, as shown, and adapted to be closed by rotation of the cam member 305 on turning the button 306 from its "off" to its "on" position, the principal at station P1 may exclude his secretary from dialing out on his line, i. e., on line L3', so long as the button 306 is adjusted to its "on" position. Conductors or wires 307, 308 of the cord 309 connect the contact members 38, 38', to the spring common to contact sets 1, 3 of key K3 and to one terminal of the impedance 37. With contact members 38, 38' in closed condition, with handset 20 removed from its support and key K3 operated so as to open its contact sets 1, 2 and close its contact sets 3, 4, the dial pulsing circuit is short-circuited through the contact members 38, 38' over the following circuit: key K3 contact set 3, conductor 307, members 38, 38', conductor 308, impedance 37 and contact pair 39. It will be apparent that in the key telephone set of station S2, the impedance 37 included therein would be so connected as to short-circuit dialing out through its key connected to line L3', and that the conductors of cord 309' would be connected so as to short-circuit dialing out through the key of station S2 connected to line L4'. Thus, the station S2 normally would be precluded from dialing out over the line L3' of station P1, and could be precluded by the principal at station P2 from dialing out over the latter's line L4'.

Figs. 4 and 5 illustrate the application of the invention to pay telephone or coin collector stations.

Pay station telephones that include a calling dial are frequently arranged so that it is necessary for a calling party first to deposit a coin before dialing in order to establish connection with the operator at the central office, or with

the called party. The arrangement is such usually that the deposit of the coin causes closure of the line circuit to the central office so that operation of the calling dial at the pay station causes transmission of dial pulses over the line to pulse-actuated relays or switching devices at the central office or exchange, for completion of the connection in accordance with the code dialed. Should the calling party somehow be able to complete the line circuit without the deposit of a coin, the company or individual operating the pay station might be defrauded or deprived of revenue to which it is entitled. To obviate this possibility, it has already been proposed that the pay station circuit be arranged so that, until a coin has been deposited, the pulsing springs of the calling dial are short circuited. Deposit of the coin not only completes the line circuit but also removes the short circuit on the dial pulsing springs. Accidental or fraudulent completion of the line circuit in the absence of the deposit of a coin becomes, then, of no utility so far as effective use of the calling dial is concerned.

In that type of pay station in which the transmitter and the calling dial are supported on the housing or enclosure for the coin chute or runway, the coin signals, the coin collect and refund relay and the coin box, and the receiver is supported on a switchhook carried by the housing, the location of the transmitter enables it to convey to the operator, in situations where the operator needs to be informed of the amount being deposited at the pay station by a calling party, the characteristic sounds associated with the deposit of coins of particular denominations.

In pay stations otherwise the same as that of the preceding paragraph, but in which the transmitter is included with the receiver in a hand telephone set or handset supported on the switchhook, the transmitter is no longer advantageously located for picking up the mechanical and acoustical vibrations arising from the deposit of the coin or coins, and a coin signal transmitter or microphone has been included in the pay station for the sole purpose of conveying the coin deposit characteristic sounds or vibrations to the operator.

A general practice with respect to pay station telephone sets has been to arrange the components of the set on a pair of interfitting housing portions, all electrical connections between the housing portions being effected through a plurality of contact members or springs on one housing portion adapted for frictional engagement with a corresponding plurality of contact members or prongs on the other housing portion. With such an arrangement, the interfitting housing portions may be readily separated or disassembled without the necessity of disconnecting or breaking wires, or of reconnecting wires when the housing portions are again assembled. In the interest of cost and space economy and of circuit simplicity, the endeavor has always been to keep the number of these interconnecting contact members to a minimum.

The arrangement of L. H. Allen Patent 2,262,571 of November 11, 1941, is illustrative of a pay station telephone of the type referred to in the third preceding paragraph. In the Allen arrangement, four contact members 29 on the one housing portion or cover 24 engage with four contact members 43, 44, 45, 46 on a second housing portion 32 and the dial pulsing short-circuiting means (contact springs 63, 64) of the coin collect relay is connected across a pair of con-

tact members 44, 45 on the second housing portion 32.

The arrangement of O. A. Shann et al. Patent 2,235,648 of March 18, 1941, is illustrative of a pay station telephone of the type referred to in the second and third preceding paragraphs. With reference to Fig. 2 of the Shann et al. patent, it will be seen that the inclusion of the two coin signal transmitters 16, 17 or of a single coin signal transmitter 61 requires that five pairs of contact members 41-45 be provided to interconnect the components on the interfitted housing portions. The circuit arrangement of the Shann et al. patent does not include any means for normally short-circuiting the dial pulsing springs. When it is desired that the Shann et al. circuit arrangement also include provision for rendering the calling dial ineffective for transmission of dial pulses until after a coin is deposited by the calling subscriber, it might appear that the expedient of the Allen patent could be readily incorporated. It will be observed, however, that not only would the dial pulsing springs be shunted, so would the coin signal transmitter. Consider the following situation: The calling party has deposited a coin and, hence, has been able to dial the operator at the central office. The operator informs the calling party that she is returning the deposited coin, and that he should deposit a specified amount. The return of the coin restores the two pairs of relay contacts to their normal condition. When the calling party deposits the coin representing the specified amount or the first of the number of coins required to make up the specified amount, the dial pulsing springs and the coin signal transmitter will be short-circuited. Since the coin signal transmitter will not be effective to transmit the characteristic vibration of a deposited coin until after the first coin deposited has disabled the shunt on the coin signal transmitter, the operator will have no information as to the denomination of the first or only coin deposited. This undesirable condition could be obviated by an arrangement that short-circuits only the dial pulsing springs. The coin-relay contact set for short-circuiting the pulsing springs could be connected across the pulsing springs only, by providing a sixth pair of contact members for interconnecting the pay station components on the housing portions. This latter expedient, however, is in the direction of increasing the number of interconnecting contact members on the housing portions.

In accordance with the invention, the pay station telephone, in general similar to that of the O. F. Forsberg Patent 1,043,219 of November 5, 1912, but whose coin collect and refund relay includes an additional pair of contact springs, for example, as provided in the Allen patent, and which includes the handset, coin runway, coin signals and the single coin signal transmitter arrangement of the Shann et al. patent, has its components arranged so that the coin signal transmitter and the pulsing springs of the calling dial are connected in series with a pair of contact members on one of the interfitted housing portions of the pay station, and the additional pair of contact springs of the coin relay are included in a normally closed bridging or shunting circuit connected between the pair of contact members on the other housing portion that engages the first-mentioned pair of contact members when the housing portions are interfitted or assembled. The bridging circuit includes an im-

pedance element of such resistance that, although dial pulses are effectively short-circuited or prevented from being transmitted from the station while the before-mentioned coin relay contact springs are closed, the resistance is sufficiently large compared to that of the coin signal transmitter so as substantially not to interfere with transmission from the station by the coin signal transmitter of current characteristic of coin signal vibration resulting from the deposit of a coin and before the coin relay contact springs are effected by the deposited coin. The impedance element may be a so-called constant or linear resistance, or may be of the type having a negative resistance voltage characteristic, for example, a silicon carbide unit.

Fig. 4 illustrates a typical pay telephone or coin collector station. It comprises a coin collector 70 and a subscriber's set or "bell box" 71. The coin collector comprises a cover, front or upper housing portion 72, and a back plate or rear housing portion 73, the lower portion of the latter comprising a casing 74 for a coin box (not shown) and a coin return chute 75, the cover portion being removable as a unit from the rear portion. The cover includes a coin slot or guide 76 and supports a calling dial 23. A hook or support 77 carried by the back plate 73 supports a handset 20, the cord 24 for which extends through a suitable aperture (not shown) in the back plate into the interior of the coin collector. The components in the set 71 are connected with the components of the coin collector through the conductors of cord or wiring 78, connection to a telephone line being made through the conductors of a cord or wiring 79.

In Fig. 5, the area bounded by the broken lines ABCD represents the coin collector rear housing portion 73, that bounded by the broken lines DEFG represents the coin collector removable cover portion 72, and that bounded by broken lines MNOR represents the set 71.

The coin collector components include the calling dial 23, a coin signal microphone or transmitter 80, and a plurality of contact members or prongs 81, 82, 83, 84, 85 mounted on the cover portion 72 which would also provide a support for a multiple runway coin chute and a plurality of coin actuatable or vibratable coin signals, for example such as is disclosed in the Forsberg or the Shann et al. patents. Additional components are mounted on the rear portion 73 and comprise a coin collect and refund relay 86 including two sets 87, 88 of contact springs, one set 87 being normally open and the other set 88 being normally closed, and being adapted to close and to open, respectively, when a coin is deposited at the station; the switchhook 89 providing a support for the handset 20; two sets 90, 100 of contact springs associated with the switchhook and adapted to close when the handset is off the switchhook; a plurality of contact members, blades or springs 91, 92, 93, 94, 95 whose free end portions are adapted to be frictionally engaged by serrated end portions of the contact prongs 81-85, respectively; an induction coil or transformer 96; a condenser 97; and an impedance element 98. The transformer comprises a two-section or mid-tapped primary winding 110, a receiver circuit winding 111 and a balancing network or winding 112 proportioned to provide, with the transmitter 21 and receiver 22 of handset 20, an anti-side tone circuit of the Campbell type. The primary winding is provided with central terminal 113 between which and ground

the coin collect relay 86 is adapted to be connected, in accordance with the teachings of W. H. Edwards et al. Patent 2,024,280 of December 17, 1935. The element 98 is a resistor, either a so-called constant or linear resistance, or, in a particular case, of the type having an asymmetrical or non-linear resistance characteristic, for example, a silicon carbide unit. The handset 20 and its associated cord 24 may be the same as those of the arrangements of Figs. 2 and 3, as may be, also, the calling dial, corresponding parts bearing like reference numerals. Coin signal bell 99 and gong 101 are indicated in dotted outline above the coin relay in the area ABCD, although they would actually be supported on the cover portion 72. The set 71 contains only the station signal or ringer 102 and blocking condenser 103 connected in series between terminals 104, 105, and may be located, if desired, at a point remote from the coin collector, and with the conductors 106 of the cord 78 concealed.

The circuit connections are as follows: The telephone line 79 connecting the pay station with a central office or exchange is connected to terminals 104, 105 of the bell box. Conductors 106 of cord or wiring 78 are connected with terminals 114, 115 in the coin collector, the former also constituting one terminal of the coil winding 110. The conductor 106, terminated at terminal 115 could, of course, be of sufficient length to terminate at the left spring of pair 100, thereby obviating the need for terminal 115 and wire 125. Transformer terminal 116, common to the primary and the balancing windings, is connected by conductor 58 of cord 24 to one terminal of transmitter 21; transformer terminal 117, common to the balancing and the receiver circuit windings, is connected by wire 118 to left spring of pair 90; transformer terminal 119 is connected through condenser 97 with contact member 91; and transformer terminal 114 is connected by wire 120 to contact member 93. Cord conductor 57 connects the second terminal of transmitter 21 with contact member 91, and cord conductor 59 connects one receiver terminal to contact member 95, the other receiver terminal, as indicated, being the first-mentioned transmitter terminal. The right spring of pair 90 is connected with contact member 94, and the right spring of pair 100 is electrically unitary with contact member 92. A series circuit comprising wire 121, the normally-closed relay contact springs 83 and the impedance 98 is connected between contact members 91, 92. The coin signal microphone 80, which may be similar to that of A. F. Bennett Patent 1,863,322 of June 14, 1932, is connected between contact prong 81 and dial pulsing spring 44, dial springs 43, 46, 47, 48 being connected with contact prongs 82, 83, 84, 85, respectively. It will be observed that, as shown in Fig. 5, the series circuit including the impedance 98 is connected in shunt with or in bridge of the series-connected coin signal transmitter and dial pulsing springs between contact prongs 81, 82 that engage with contact members 91, 92, respectively.

As shown the pay station telephone of Fig. 5 is not in use. Let it be assumed that a calling party wishes to make a local call, that is, one that does not require the operator at the central office or exchange for the station to come in on the call. The removal of the handset from the hook or support 89 enables the closure of the contact pairs 90, 100, and the deposit of the appropriate coin 130 by the calling party trips

the trigger 140 of the coin relay and the contact sets 87, 88 of the coin relay close and open, respectively. The closure of contact set 87 places ground on one line wire of the cord 79 over the coin relay winding, that portion of the transformer primary winding between terminals 113, 114, one conductor 106 of the cord 78 and terminal 104, and enables, in known manner, the operation of the line relay at the central office and the seizure of the line by a line finder. The opening of contact set 88 removes the bridge or short-circuit on the series connected coin signal transmitter 80 and dial pulsing springs 43, 44. Closure of the switchhook contact pair 100 completes the following circuit across the terminals 104, 105; terminal 104, conductor 106, transformer primary or line winding 110, conductor 58, transmitter 21, conductor 57, contact member and prong 91, 81, coin signal transmitter 80, dial pulsing springs 44, 43, contact prong and member 82, 92, contact pair 100, wire 125, conductor 106 to terminal 105. Closure of switchhook contact pair 90 completes the following bridge across the transmitter 21: common terminal of transmitter 21 and receiver 22, receiver 22, conductor 59, contact member and prong 95, 85, dial springs 48, 47, contact prong and member 84, 94, contact pair 90, wire 118, transformer winding 111, condenser 97, contact member 91, conductor 57, back to the other terminal of transmitter 21. During the dial pulsing, dial springs 45, 46 are closed thereby short-circuiting the coin collector circuit, and springs 47, 48 are disengaged thereby opening the receiver circuit. The dial pulsing circuit between terminals 104, 105, is as follows: Terminal 104, conductor 106, wire 120, contact member and prong 93, 83, dial springs 46, 45, dial pulsing springs 44, 43, contact prong and member 82, 92, contact pair 100, wire 125, conductor 106, to terminal 105. After the calling party has restored the handset to the switchhook and the relay has been operated to dispose of the coin, the pay station circuit is again in the condition shown in the drawings.

Let it be assumed that the calling party is endeavoring to defraud the company or individual providing the coin collector service and, without depositing the requisite coin or token, somehow is able to connect the coin relay line conductor to ground so that, if the bridging circuit including contact set 88 and resistor 98 were not included in the station circuit, a dial pulsing circuit would be completed when the handset is removed from the switchhook and the fraudulent party would be able to make a local call without charge. The presence of the short-circuit across the series-connected coin signal microphone and dial pulsing springs effectively defeats such a practice.

Let it be assumed, however, that the calling party at the pay station wishes to make a call that requires connection with the operator and the subsequent deposit of a specified amount at the operator's direction. The operator, of course, must be able to determine at her remote position that the specified amount is deposited. To establish connection with the operator, after removal of the handset, the calling party deposits a coin or token at the station and dials the appropriate code. The operator responds and after ascertaining the connection desired by the calling party, informs the latter of the amount to be deposited and by application of current of appropriate polarity to the coin relay line conductor, operates the coin relay so as to return the

coin the calling party has already deposited and to restore the coin relay to the condition shown on the drawings.

Before the first or perhaps the only coin to be deposited by the calling party affects the condition of the coin relay contact sets 87, 88, it strikes once or more against one or more of the coin signals that is, bell or spiral gong, as it passes down the coin runway to the hopper of the coin collector. It is not until the coin operates the trigger projecting through the coin hopper that the contact set 88 opens to remove the shunt across the coin signal microphone and the dial pulsing springs. In the absence of the resistor 98, the coin signal microphone would not be effective to pick-up the characteristic vibration of the coin actuated signal until the first coin has already passed the signal. By choosing an appropriate magnitude of resistance for resistor 98, the shunt circuit will be ineffective substantially to affect the effectiveness of the coin signal microphone in the assumed situation, while remaining effective to prevent fraudulent operation of the pay station and its calling dial, that is, dial pulsing is effectively short-circuited but not coin signal transmission. This resistance, depending upon the handset transmitter and the coin signal microphone employed, may be of the order of about 100 to 200 ohms and less than about 500 to 1000 ohms so long as the battery supply loss introduced by it is not excessive and the alternating current output of the coin signal transmitter is reduced only slightly from what it would be if the bridging circuit were not present.

In some circumstances it may be found desirable to replace the resistor 98 with a variable resistance device or unit. If pulsing battery of 24 or 48 volts at the central office is assumed, the variable resistance would be arranged so that when the pulsing springs of the dial were opened, but with relay contact set 88 closed, the resistance would assume a low value thereby effectively to short-circuit the dial pulses. So far as the coin signal microphone is concerned, with the pulsing springs closed, the potential across it would be comparatively low in which case the variable resistance would have a comparatively high resistance and have no substantial effect on the coin signal microphone.

The inclusion of the induction coil and condenser within the coin collector instead of housing them in the bell box, has various advantages. The number of wires or conductors required between the coin collector and the bell box is reduced to two and at the same time provision may be made readily in the coin collector for the balanced circuit connection for the coin relay and induction coil to regulate the inductive susceptibility of the circuit, and for the short-circuiting of the induction coil primary winding during dialing with a minimum size loop between these elements due to their physical proximity thereby decreasing the radiation of radio frequencies during dialing. The arrangement, furthermore, permits of greater flexibility in mounting the coin collector and the bell box primarily from the standpoint of improving the appearance of installations that are not in a booth or other enclosure. It will be observed, also, that the wiring required within the coin collector is relatively of simple character.

Although this invention has been disclosed with reference to what are believed at this time to be preferred embodiments, it will be understood that

it is not limited thereto, but is of a scope evidenced by the appended claims.

What is claimed is:

1. A telephone station circuit comprising a transmitter, a calling dial including a pair of pulsing contacts connected in series with said transmitter, and means to protect said circuit against unauthorized use, said means comprising a circuit to be shunted across said series connection to disable said calling dial without disabling said transmitter.
2. A telephone station circuit comprising a transmitter, a calling dial including a pair of pulsing contacts connected in series with said transmitter, and means to protect said circuit against unauthorized use, said means comprising a circuit to be shunted across said series connection to disable said calling dial without disabling said transmitter and disconnectable therefrom only by an authorized user.
3. A telephone station circuit comprising a transmitter, a calling dial including a pair of pulsing contacts connected in series with said transmitter, and means to protect said circuit against unauthorized use, said means comprising a circuit including an impedance to be shunted across said series connection to disable said calling dial without disabling said transmitter.
4. A telephone station circuit comprising a transmitter, a calling dial including a pair of pulsing contacts connected in series with said transmitter, and means to protect said circuit against unauthorized use, said means comprising a circuit including a resistance to be shunted across said series connection to disable said calling dial without disabling said transmitter.
5. A telephone station circuit comprising a transmitter, a calling dial including a pair of pulsing contacts connected in series with said transmitter and means to protect said circuit against unauthorized use, said means comprising a circuit including a varistor shunted across said series connection to disable said calling dial without disabling said transmitter.
6. A telephone station circuit comprising a calling dial and a transmitter, said calling dial including a pair of pulsing contacts connected in series with said transmitter, a normally open circuit connected in shunt with said series connection and including an impedance, and means to close said shunt circuit.
7. The circuit of claim 6 in which, when said shunt circuit is closed, said impedance renders operation of said dial ineffective to transmit signal pulses without substantially affecting the effectiveness of said transmitter.
8. A telephone station circuit comprising a calling dial and a transmitter, said calling dial including a pair of pulsing contacts connected in series with said transmitter, and a circuit connected in shunt with said series connection and including an impedance, said impedance rendering operation of said dial ineffective to transmit signal pulses and having substantially no effect on the effectiveness of said transmitter.
9. A telephone station circuit comprising a calling dial and a transmitter, said calling dial including a pair of pulsing contacts connected in series with said transmitter, a circuit connected in shunt with said series connection and including a resistance, said resistance being proportioned to render operation of said dial ineffective to transmit dial pulses but having no appreciable effect on the effectiveness of said transmitter,

and switching means to open and close said shunt circuit.

10. In combination, an equipment assembly comprising a receiver, a transmitter, a calling dial including a pair of pulsing contacts, and a pair of contact springs; a second equipment assembly comprising an induction coil, an impedance, a pair of contact members, and a pair of line terminals; and a multiconductor cord for connecting said assemblies; one winding of said induction coil, two conductors of said cord, the pulsing contacts of said dial, said contact springs and said transmitter being connected in series between said line terminals; and said impedance, said contact members and a third conductor of said cord being connected in series with each other and in shunt with said dial pulsing contacts and said transmitter.

11. In combination, an equipment assembly comprising a transmitter, a calling dial having a pair of pulsing contacts, and a pair of contact springs; a second equipment assembly comprising an induction coil, a resistor, a pair of contact members, and a pair of line terminals; and a multiconductor cord for connecting said assemblies; one winding of said induction coil, two conductors of said cord, said contact springs, the pulsing contacts and said transmitter being connected in series between said line terminals; and said resistor, said contact members and a third conductor of said cord being connected in series with each other and in shunt with said dial contacts and said transmitter.

12. In combination, an equipment assembly comprising a transmitter, a calling dial including a pair of pulsing contacts, and a pair of contact springs; a second equipment assembly comprising an induction coil, a resistor, a pair of contact members, and a pair of line terminals; a multiconductor cord for connecting said assemblies; one winding of said induction coil, two conductors of said cord, said contact springs, the pulsing contacts and said transmitter being connected in series between said line terminals; said resistor, said contact members and a third conductor of said cord being connected in series with each other and in shunt with said dial contacts and said transmitter; and means to open and to close said contact members whereby said shunt circuit may be opened and closed to remove and retain respectively said resistor in shunt with said dial springs and said transmitter.

13. A telephone station circuit comprising a calling dial and a transmission device, said calling dial including a pair of pulsing contacts connected in series with said device, and pulsing contact disabling means adapted to be bridged across said contacts and said device without disabling said device when disabling said pulsing contacts.

14. A telephone station circuit as claimed in claim 13 in which said disabling means includes an element offering a low impedance to dial pulse currents and a high impedance to transmission device currents.

15. A telephone station circuit comprising a calling dial including a pair of pulsing contacts, a transmitter relatively closely associated physically with said calling dial, and pulsing contact disabling means relatively distant from said transmitter and dial, said means being adapted to be bridged across said contacts and transmitter, without disabling said transmitter when disabling said pulsing contacts.

16. A telephone pay station comprising a handset, a calling dial having a pair of pulsing con-

tacts for transmitting signal pulses from said station, a coin vibratable signal, means connected in series with said contacts for translating vibrations of the signal into a characteristic current for transmission from said station, a shunting circuit bridged across said contacts and said vibration translating means to render said contacts inoperative for signaling purposes until a coin has been deposited at said station, and coin actuatable means to disable said shunting circuit upon the deposit of a coin at the station.

17. A telephone pay station as claimed in claim 16 in which said shunting circuit includes an impedance of a magnitude sufficient to short-circuit dial pulses without having any substantial effect on said vibration translating means.

18. A telephone pay station as claimed in claim 16 in which said shunting circuit includes a resistance element.

19. A telephone pay station comprising a handset, a calling dial having a pair of pulsing contacts for transmitting signal pulses from said station, a coin vibratable signal, means connected in series with said contacts for translating vibrations of the signal into a characteristic current for transmission from said station, a shunting circuit bridged across said contacts and said vibration translating means to render said contacts inoperative for signaling purposes until a coin has been deposited at the stations, and coin actuatable means to disable said shunting circuit upon the deposit of a coin at the station, said shunting circuit including a variable resistance device.

20. A telephone pay station comprising a handset, a calling dial having a pair of pulsing contacts for transmitting signal pulses from said station, a coin vibratable signal, means connected in series with said contacts for translating vibrations of the signal into a characteristic current for transmission from said station, a shunting circuit bridged across said contacts and said vibration translating means to render said contacts inoperative for signaling purposes until a coin has been deposited at the stations, and coin actuatable means to disable said shunting circuit upon the deposit of a coin at the station, said shunting circuit including a unit of silicon carbide.

21. A telephone pay station as claimed in claim 16 in which said shunting circuit comprises a pair of normally closed contacts in series with impedance.

22. A telephone pay station comprising a calling dial having a pair of pulsing contacts for transmitting signal pulses from said station, a coin vibratable signal, means connected in series with said contacts for translating vibrations of the signal into a characteristic current for transmission from said station, a shunting circuit bridged across said pulsing contacts and said vibration translating means to render said contacts inoperative for signaling purposes until a coin has been deposited at the station, and coin actuatable means to disable said shunting circuit upon the deposit of a coin at the station.

23. A telephone pay station comprising a calling dial having a pair of pulsing contacts for transmitting signal pulses from said station, a coin vibratable signal, means in series with said contacts for translating vibrations of the signal into a characteristic current for transmission from said station, a shunting circuit bridged across said pulsing contacts and said vibration

translating means to render said pulsing contacts inoperative for signaling purposes until a coin has been deposited at the station, said shunting circuit being without any substantial effect upon the effectiveness of said vibration translating means, and coin actuatable means to disable said shunting circuit upon the deposit of a coin at the station.

24. A telephone pay station comprising line terminals, a handset, a switchhook for said handset, a coin collect relay including two contact sets, one contact set being normally open and the other normally closed, two sets of switchhook contacts, each switchhook contact set being open when the handset is on the switchhook and being closed when the handset is off the switchhook, a calling dial including a pair of pulsing contacts, a coin deposit signal, a coin deposit microphone, a plurality of contact prongs, a plurality of contact springs, said microphone and said dial contacts having all their circuit connections made to each other and said contact prongs, and said handset and line terminals having circuit connections to said switchhook contacts and said contact springs, and a bridging circuit for said microphone and the contacts of the dial, said bridging circuit terminating at a pair of said contact springs and including the normally closed contact set of the relay.

25. A telephone pay station comprising a handset, a calling dial having a pair of pulsing contacts for transmitting signal pulses from said station, a coin vibratable signal, means in series with said dial contacts for translating vibrations of the signal into a characteristic current for transmission from said station, a shunting circuit bridged across said contacts and said vibration translating means to render said contacts inoperative for signaling purposes until a coin has been deposited at the station, and coin actuatable means to disable said shunting circuit upon the deposit of a coin at the station, said coin vibratable signal and said coin actuatable means being positioned such that upon the deposit of a coin at the station, the deposited coin acts first on said signal, and said shunting circuit being of an impedance effectively to short circuit the dial contacts without having any substantial effect upon the coin signal vibration translating means.

26. A telephone pay station comprising a housing having a plurality of interfitting portions, each portion supporting some of the components

of the circuit of said station and all of the electrical connections between the components on said portions being effected through a plurality of contact prongs on one portion adapted, when the portions are interfitted, frictionally to engage a corresponding number of contact springs on another portion of the housing, a coin deposit microphone and a calling dial having a pair of pulsing contacts supported on said one housing portion, said microphone and said dial contacts being connected in series between a pair of said contact prongs, means on said other housing portion connected between the pair of contact springs corresponding to said pair of contact prongs to shunt said series-connected microphone and dial contacts, said means including a pair of normally closed contacts, and coin actuatable means responsive to the deposit of a coin at the station to open said normally closed contacts and to remove the shunt around said series-connected microphone and dial contacts.

27. A telephone pay station comprising an equipment assembly having a pair of line terminals, a coin collect relay comprising an energizing winding and including two pairs of contact springs, one pair being normally closed and the other normally open, one spring of the latter being connected to ground and its second spring being connected through the relay winding to one of said line terminals, a handset, a support for said handset, two pairs of switching springs, each pair of switching springs being open when the handset is on said support and closed when the handset is off said support, and a plurality of contact blades; and a second equipment assembly comprising a coin deposit microphone, a calling dial and a plurality of contact prongs, all electrical connections between said equipment assemblies being effected through frictional engagement between said contact blades and said contact prongs, said microphone and the pulsing contacts of said dial being connected in series between a pair of said contact prongs, a circuit connected in bridge of the series-connected microphone and pulsing contacts and including said normally closed springs of the relay, the bridging circuit being terminated at that pair of contact blades engaged by said pair of contact prongs.

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