

Nov. 11, 1941.

L. H. ALLEN

2,262,571

TELEPHONE STATION CIRCUIT

Filed March 30, 1940

3 Sheets-Sheet 1

FIG. 2

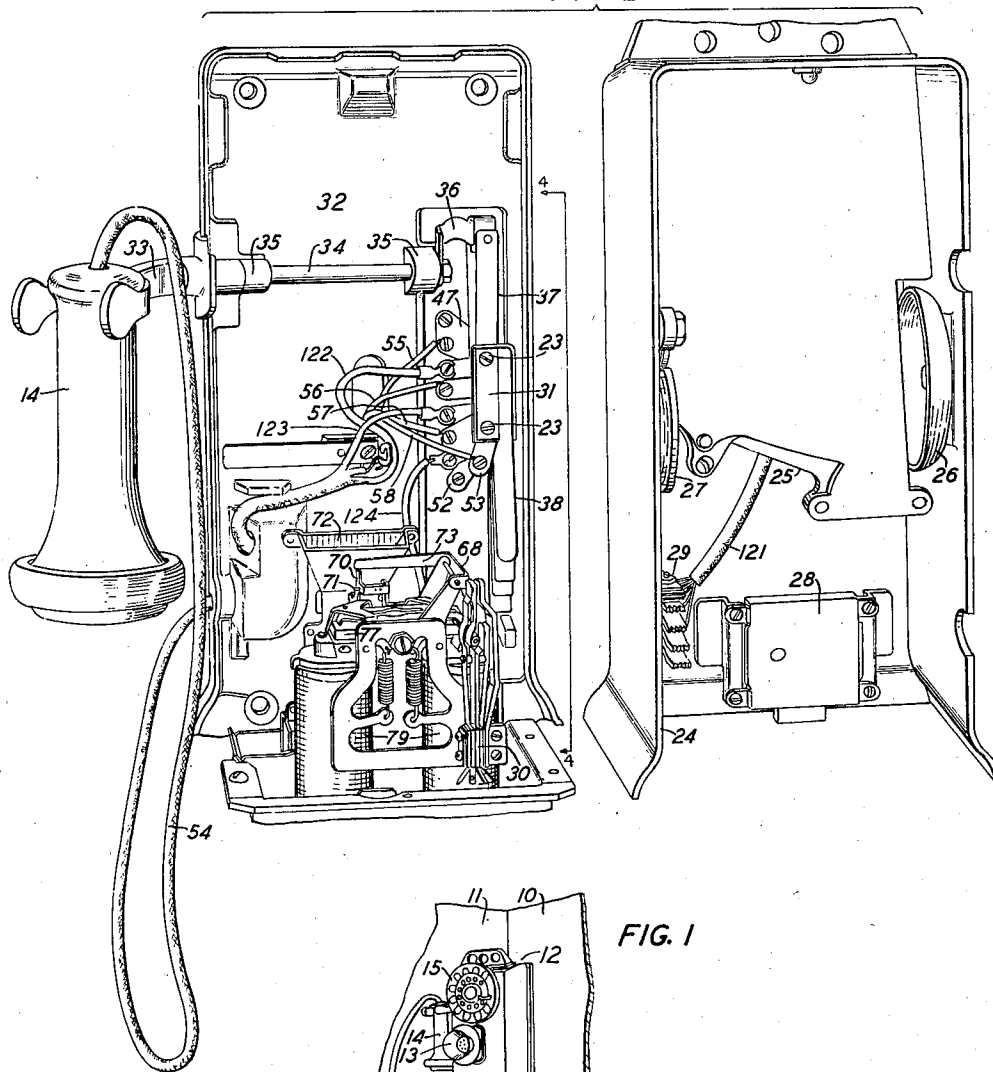
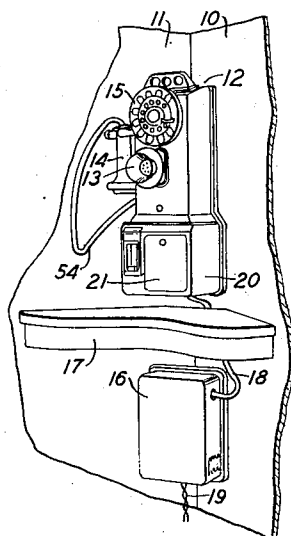


FIG. 1



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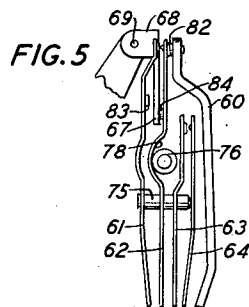
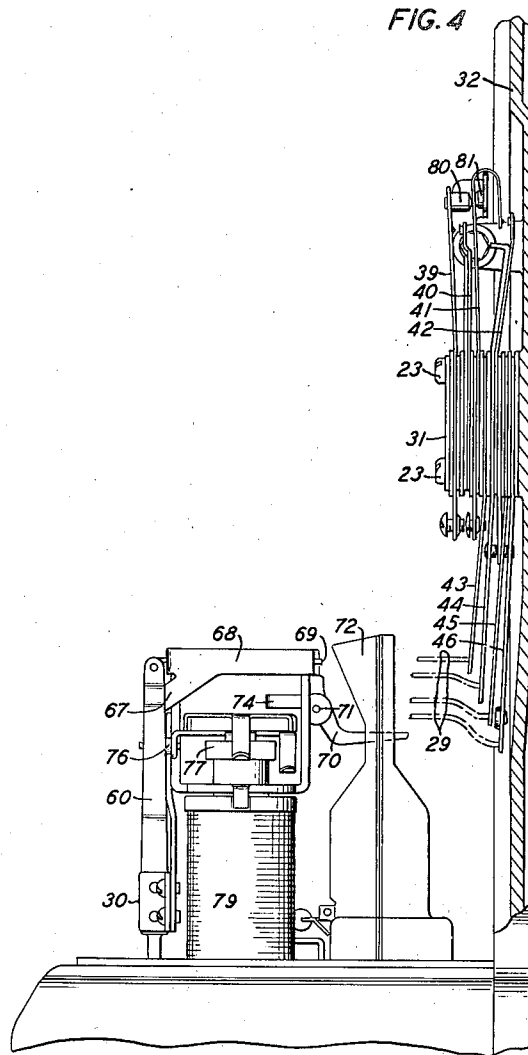
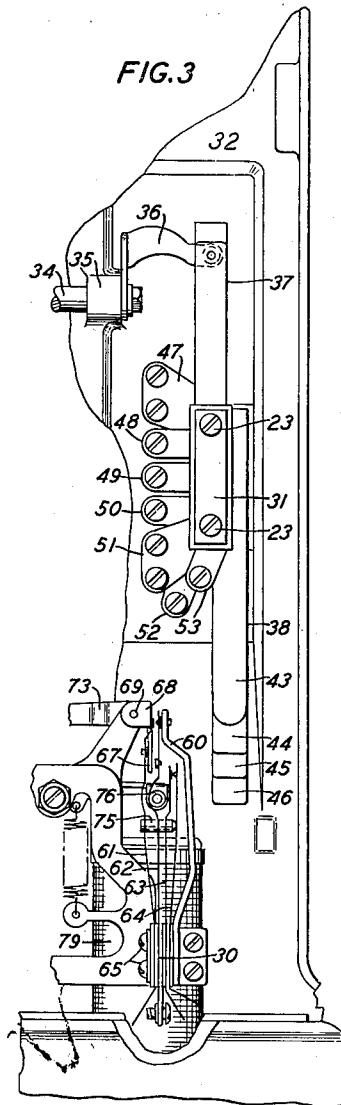
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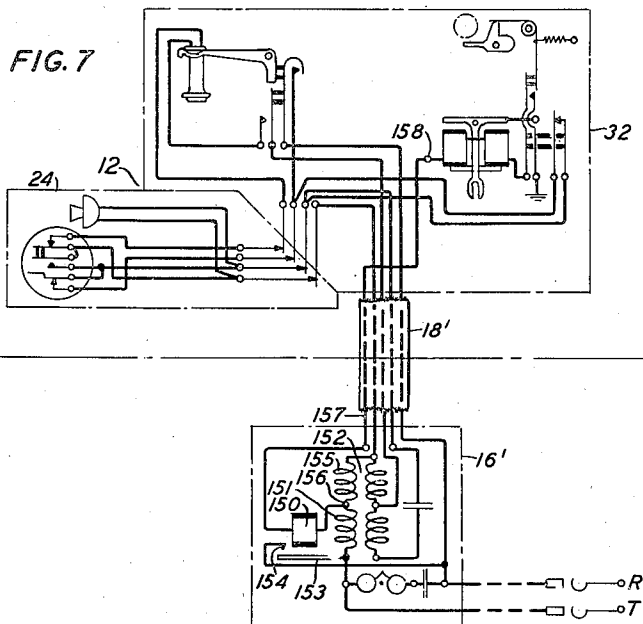
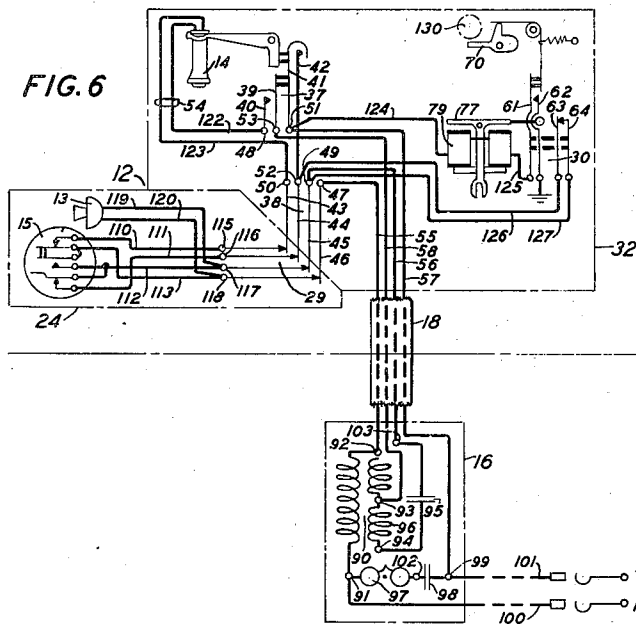
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2,262,571

TELEPHONE STATION CIRCUIT

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Application March 30, 1940, Serial No. 326,926

5 Claims. (Cl. 179—6.3)

This invention relates to a telephone set, and, more particularly, to a pay station telephone set.

The present invention is particularly adapted for that type of coin collecting telephone pay station wherein the calling party uses a calling dial to call his party or, in appropriate cases, to get the operator at the central office, and wherein the impulse springs of the dial are normally short-circuited, the short circuit being removable by the deposit of a coin. It involves such an arrangement of structure in the coin collector of the pay station set and such a circuit arrangement for the set that not more than four conductors are necessary to electrically connect the coin collector to the substation set or "bell box" of the pay station set and, through the latter, to the line leading to the central office. These conductors may be enclosed in a close wrapping, for example, woven fabric, to constitute a conductor cord; or may be run through a conduit; or may be separate flexible conductors, concealed from view by being placed behind the wall or surface on which the telephone pay station set is mounted, the ends of the conductors extending through suitable apertures in the wall or surface and in the substation set and coin collector. If a relay is included in the substation set, to enable the paralleling of the line loop conductors, to reduce the impedance of a long loop to facilitate operation of a coin collect relay design for use on shorter loops, an additional conductor may be necessary, in which event a maximum of five conductors is sufficient. In any event, the conductors are suitably insulated from one another, preferably by individual insulating coatings or wrappings.

A more complete understanding of this invention will be derived from the detailed description which follows, taken in conjunction with the appended drawings, wherein:

Fig. 1 is a view in perspective of a pay station telephone set showing a coin collector, subscriber's shelf or arm rest, and subscriber's substation set or bell box;

Fig. 2 is an elevational view of the upper part of the back plate and of the upper housing or cover of the coin collector of Fig. 1;

Fig. 3 is an enlarged view of that portion of the coin collector which includes the spring assembly on the back plate and the spring assembly on the coin collect relay;

Fig. 4 is an end elevational view of the coin collector along the line 4—4 of Fig. 2;

Fig. 5 is an enlarged view of the upper portion of the coin collect relay spring assembly;

Fig. 6 shows a circuit arrangement for a telephone pay station in accordance with the invention; and

Fig. 7 shows a modification of the circuit arrangement shown in Fig. 6.

With particular reference to the drawings, Fig. 1 discloses a typical pay station telephone set mounted in the angle formed by a pair of intersecting surfaces or walls 10, 11, for example, of a room or of a telephone booth. The set comprises a coin collector 12, including transmitter 13, receiver 14 and calling dial 15, and a subscriber's substation set or "bell box" 16, mounted under a shelf or support 17 adapted to serve as an arm rest, package carrier, or change platform. The coin collector and the substation set are connected electrically through the cord 18, which, in accordance with this invention, is a four-conductor cord for the circuit arrangement of Fig. 6, or a five-conductor cord for the circuit arrangement of Fig. 7. Connection to the central office is made through a conventional telephone cord 19.

The coin collector may be essentially the same as that disclosed and described, for example, in O. F. Forsberg 1,043,219, patented November 5, 1912, in the provision of coin runways leading past a coin bell or gong and to a coin directing device; of a coin collect relay or polarized electromagnet; of a coin return chute; of a coin collect chute (the outlet of which is shown in Fig. 1); and coin box or container (not shown, but normally enclosed in the lower housing 20 of the coin collector, and access to which is had by removal of the front plate 21). The coin relay has associated with it, however, a contact spring assembly 30 comprising four springs, two of which are normally in conductive contact, and two of which are normally not in conductive contact, the springs being provided with four terminals, one of which is connected to ground, all of which is treated in greater detail hereinafter.

In the telephone set disclosed herein, the transmitter and the calling dial are mounted and are movable with the upper housing or cover 24, which supports on its interior the coin runways 25; the coin signal bell 26 and gong 27; the upper housing lock 28; and the contact or housing spring assembly 29, each spring of which is provided with a serrated end or extremity for engagement with one of the lower springs of the contact spring assembly 31 on the back plate or base 32. When in position on the back plate, the upper housing encloses the coin relay.

The back plate 32 provides a support for a receiver switch hook comprising a receiver hook 33

and a straight rod portion 34 adapted for rotative movement in bosses 35 and terminating in an angle piece 36 for operating the upper switching spring pile-up 37 of the spring assembly 31 in preassigned manner, when the receiver is removed from the hook. The lower spring pile-up 38 of the spring assembly 31 is adapted to have its individual springs normally (i. e., when the upper housing is on the back plate) engaged by the serrated ends of the springs of spring assembly 29. Normally, i. e., with the receiver on the hook 33, the pairs 39, 40 and 41, 42 of springs are out of electrical contact, with springs 39, 41 under tension because of pressure of the angle piece 36; but, removal of the receiver releases this pressure, and enables the springs 39, 41 to move into engagement with the springs 40, 42. It will be observed that, of the lower springs 43, 44, 45, 46, spring 44 is clamped against, and is electrically, or effectively, unitary with the switchhook spring 42. The springs, otherwise, are insulated from one another and from the back plate 32, and are secured to the latter by screws 23.

The springs of the spring assembly 31 are provided with terminals 47, 48 . . . 53 furnishing the necessary terminals for the conductors of the telephone receiver cord 54, for the conductors of the cord 19, and for the conductors within the coin collector for the coin relay and its spring assembly 39.

The assembly 30 comprises a frame or supporting member 60 and four metallic contact springs 61, 62, 63, 64 insulated from one another by strips of insulation and fastened to the member 60 by screws 65. In Figs. 2 and 3, the springs 61 . . . 64 are shown in their normal positions, i. e., the position they occupy when the receiver is on the hook, or after a deposited coin has been collected or returned. Springs 61, 62 are out of conductive contact and springs 63, 64 are in conductive contact, spring 61 being under tension produced by the depending arm 67 of the angular switch-operating lever 68, pivoted at 69 and maintained in the position shown by the coin-operable trigger 70 pivoted at 71. As is well known in the art, when a coin is deposited in a coin runway and drops into the coin directing device or chute 72, it strikes the trigger 70 and deflects it out of the chute passage and such that the arm 73 of lever 68 drops slightly and rests on the extension 74 of trigger 70 to hold it in its deflected position, and to release the pressure of lever arm 67 on the spring 61. The latter then makes conductive contact with the spring 62, and, through the insulating spacer 75 carried by spring 61, separates the springs 63, 64 and opens the circuit between them. Fig. 5 shows the springs 61, . . . 64 immediately after the receiver has been lifted from the hook and the coin has been deposited. When the electromagnet 79 of the coin relay is energized from the central office at the termination of the connection, the insulation roller 76, carried by the armature 77 and normally lying in the depression 78 of spring 62, rides out of this depression and by pressure on spring 62 causes the lever 68 to pivot, thereby raising the arm 73 thereof to allow the trigger 70 to recover its original position by virtue of its portion 74 normally being heavier than and overbalancing the portion extending through the constricted portion of the coin chute. The inserts or spacers 80, 81 . . . 84 are of insulating material.

With specific reference to Fig. 6, it will be observed that the substation set 16 comprises a

three-winding induction coil 90 having four terminals, 91, 92, 93, 94; a condenser 95 connected in series with the receiver winding 96 to exclude battery supply current from the receiver 14; a station signaling device or ringer 97; a condenser 98 to exclude battery supply current from the ringing circuit; and a pair of line terminals 91, 99 for the line conductors 100, 101 of cord 19 leading to the central office with which the pay station may be connected. The set has two other terminals 102, 103; seven terminals in all. This substation set provides the components for an anti-side tone circuit of the type disclosed in Figs. 1 and 1A of J. W. Gooderham Patent 1,901,958, issued March 21, 1933.

Fig. 6 shows the circuit arrangement for the telephone pay station of Figs. 1 to 5. A telephone cord comprising only four conductors connects the substation set with the coin collector, these conductors 55, 56, 57, 58 being terminated at the substation set at terminals 92, 103, 99, 93, respectively, and at the coin collector at terminals 47, 49, 51, 53, respectively. Of course, instead of being included in a cord, the conductors 55 . . . 58 could be concealed, loosely grouped set of separate, insulation-covered conductors, or be separate conductors insulation covered running through a conduit. In practice, the conductors connecting the coin collector and the substation set or "bell-box" would be concealed or protected by a suitable conduit to prevent possible fraudulent operation, or unauthorized interference with the pay station set circuit.

Connection through conductors or wires 110, 111, 112, 113 are made from the terminals 115, 116, 117, 118, respectively, of the housing spring assembly 29, to the terminals of the calling dial 15, and through wires 119, 120 from terminals 117, 118, respectively, to the terminals of the transmitter 13. These wires could be included in the group of wires or single cord 121 shown in Fig. 2. The conductors 122, 123 of the receiver cord 54 are connected to the receiver terminals at one end and to terminals 48, 50, respectively, at their other ends. The electromagnet or winding of the coin collect relay 79 is connected at one end to terminal 51 through conductor or wire 124, and at its other end to spring 61 through a conductor 125; these wires 124, 125 may be the terminations or leads of the relay winding. The conductors or wires 126, 127 connect springs 63, 64, respectively, to terminals 52, 49, respectively. As shown, the circuit is not in use, the receiver 14 being on its hook, and the pulsing springs of the dial being short-circuited by the conductors 126, 127 and springs 63, 64 connected across terminals 49, 52.

The operation of the circuit is as follows: A call is initiated by lifting the receiver from its hook, resulting in establishment of conductive contact first between springs 41, 42 and then between springs 39, 40. The dropping of a five, ten or twenty-five cent coin 130 in a coin runway results in deflection of the coin chute trigger 70, the release of pressure by the lever 68, the establishment of conductive contact between springs 61, 62, and the opening of, or cessation of conductive contact between, springs 63, 64, with a consequent removal of the short circuit of the dial pulsing springs. Closure of springs 61, 62 completes a circuit from ground through springs 62, 61, coin collect relay 79, terminal 51, conductor 57, terminal 99, and the tip side or conductor of cord 19 to the central office of the area in which the pay station is located. If the

user is making a local call, and has deposited the appropriate coin for such a call, he then proceeds to call his party by operation of the dial in well-known manner. If the user seeks information, or wants the central office or exchange operator for any reason, he dials in accordance with the instructions to be found at the pay station or in the telephone directory. In the latter case, after the information desired is given, the operator either collects or returns the deposited coin by sending current over the tip side of the line to operate the coin collect relay. Such operation causes the roller 76 to move and thereby restores the springs of assembly 30 to their original condition. After completion of the local call, assuming that the called party has answered, the user replaces the receiver on the hook and the springs of assemblies 30 and 37 are restored to the condition shown in Fig. 6.

The circuit operation has been described as for a dial type pay station telephone set. If the dial is omitted, terminals 115 and 118 should be connected together; and terminals 116 and 117 should be connected together. To complete a telephone connection, the operator at the exchange or central office would be reached by removing the receiver from the hook and inserting a coin in the coin runway, the resultant ground on the coin relay completing a circuit for a signal at the operator's position. The procedure, thereafter, would be as is well known in the art.

It will be observed that only seven terminals are required in the coin collector for the completion of all circuit connections between the substation set and the apparatus of the coin collector, that these seven terminals are located on the base or back plate of the coin collector and that a maximum of four conductors between the "bell box" and the coin collector is sufficient for all talking, signaling and coin collect circuit operations. Heretofore in pay station telephone sets, a group of six conductors or six-conductor cords have been necessary in place of the four in accordance with this invention, and more than seven terminals at the coin collector base were required.

The circuit arrangement of Fig. 7 is the same as that of Fig. 6 except that the coin collect relay winding is connected in series with the winding of a second relay 150 located in the substation set 16', in series with portion 151 of the line winding 152 of the induction coil, so that, for coin refund or collect operations over a relatively long loop, the tip and ring conductors can be connected in parallel by operation of relay 150 to close the circuit between its armature 153 and front contact 154. Such a loop impedance reducing arrangement is disclosed in O. Cesareo Patent 1,788,704, issued January 13, 1931. An additional conductor 157 becomes necessary with this circuit, and a group of five conductors or a five-conductor cord 18' is employed in such a pay station telephone set, in place of the seven-conductor cord that would be required by prior art practice and an extra terminal 158 is provided on the coin collector base. The winding 152 is divided into equal portions 151 and 155 by the tap 156, this tapped induction coil arrangement reducing inductive noises that might be introduced by the ground through the coin collect relay. Such a tapped induction coil arrangement is disclosed in W. H. Edwards et al. Patent 2,024,280, issued December 17, 1935. The

tip and ring leads in the circuit of Fig. 7 are reversed from those of Fig. 6, because the coin collect or coin refund current finds a path to ground through the coin relay over the tip lead through winding 151, the relay 150 and the coin relay after the handset has been replaced on the hook.

This invention has been disclosed with reference to specific structure and circuits, believed at this time to be the preferred embodiment of the invention. It is to be understood, of course, that it is not intended to limit the invention thereto, and the latter's scope is to be determined by the appended claims and in the light of the prior art.

What is claimed is:

1. A telephone pay-station comprising an equipment group comprising a pair of line terminals, a three-winding induction coil and a condenser; a second equipment group comprising a receiver, a transmitter, a calling dial, a coin relay, and a plurality of pairs of circuit-controlling spring contacts; and a circuit connection between said equipment groups to provide receiving, transmitting, dialing and coin relay circuits across said line terminals, said circuit connection comprising not more than four conductors, one of said conductors being connected between a point common to two of said induction coil windings and one spring of one pair of said spring contacts, a second of said conductors being connected between a point common to a second pair of said induction coil windings and one spring of a second pair of said spring contacts, a third of said conductors being connected between said condenser and one spring of a third pair of said spring contacts, and the fourth of said conductors being connected between one of said line terminals and one spring of a fourth pair of said spring contacts.

2. A telephone pay-station comprising an equipment group comprising a pair of line terminals, a three-winding induction coil and a condenser; a second equipment group comprising a receiver, a transmitter, a support for said receiver, a calling dial, a coin relay and a plurality of pairs of circuit-controlling spring contacts; and a circuit connection between said equipment groups to provide receiving, transmitting, dialing and coin relay circuits across said line terminals, said connection comprising not more than four conductors; a circuit in bridge of said line terminals comprising in the order named one winding of said induction coil, one of said conductors, one pair of said spring contacts, the transmitter, the pulsing springs of said dial, a second pair of said spring contacts, said one and said second pair of spring contacts being adapted to be permanently engaged except when the second equipment group is disassembled, a third pair of spring contacts adapted for engagement only when the receiver is removed from said support, and a second of said conductors; and a shunt circuit around said dial pulsing springs from one terminal of said transmitter to one spring of said second pair of spring contacts, said shunt circuit including a pair of normally engaged spring contacts on said coin relay adapted to be disengaged upon deposit of a coin in the coin collector.

3. A telephone pay-station as claimed in the preceding claim, which includes a first circuit in bridge of said transmitter and comprising the other two windings of said induction coil, said condenser and a third one of said conductors, and a second circuit in bridge of said transmitter and

comprising said receiver, the fourth conductor, one of said other two windings, said condenser and said third conductor, said fourth conductor having one terminal common to said other two windings.

4. A telephone pay-station comprising a subscriber's substation set, a coin collector, a plurality of conductors connecting said set and coin collector, and line wires for connecting said set with a central office; said set comprising a three-winding induction coil having four terminals, a first terminal being common to one line wire and one of said windings, a second terminal being common to a pair of said windings and one of said conductors, a third terminal being common to another pair of said windings and a second of said conductors, and the fourth terminal being common to one of said windings and said condenser, said condenser being connected between said fourth terminal and an auxiliary terminal to which a third of said conductors is connected, and an additional terminal common to a second line wire and a fourth of said conductors; said coin collector comprising a receiver, a transmitter, a coin relay, a support for said receiver, four pairs of spring contacts, a first and a second pair of said contacts being normally open when the receiver is on said support and a third and a fourth pair of said contacts being associated with said coin relay, the third pair being normally open with one spring connected to one end of the coin relay winding and the other adapted to be connected to ground and the fourth pair normally being closed, four terminal members, a connection from one terminal member through the winding of said receiver to one spring of said first pair of contacts, the other spring of said first pair of contacts having said second conductor terminated thereat in said coin collector, a connection from one spring of said second pair of contacts through the coin relay winding to said non-grounded spring of said third pair of contacts, said fourth conductor being terminated in said coin collector

at said one spring of said second pair of contacts, a connection from a second terminal member to a third terminal member through said fourth pair of contacts, said first and third conductors being terminated in said coin collector at the latter fourth and third terminals, respectively, said calling dial and transmitter being connected with the other components of the pay-station through said terminal members.

5. In combination, a coin collector comprising a front housing portion and a rear housing portion; said front housing portion supporting a calling dial, a transmitter, a plurality of contact prongs and a coin runway, and said rear housing portion supporting a coin relay including two pairs of relay springs, one pair being normally open and the other normally closed, a switchhook for a receiver, a pair of receiver-circuit contacts, a pair of line-circuit contacts and a plurality of contact springs for engagement by said contact prongs, said contact springs and prongs constituting the sole electrical connection between the components on the front and rear housing portions; a subscriber's station set comprising a housing separate from said coin collector, a three-winding induction coil whose windings are terminated at four terminals, line terminals, an auxiliary terminal, and a condenser connected between said auxiliary terminal and a terminal of one winding of the induction coil; and four conductors connecting said coin collector and set, one of said conductors connecting one contact spring in said coin collector and a terminal in said set common to a pair of the coil windings, a second conductor connecting one of said receiver-circuit contacts and a terminal in said set common to a different pair of the coil windings, a third conductor connecting another contact spring in said coin collector and said auxiliary terminal in said set, and the fourth conductor connecting one of said line-circuit contacts in said coin collector and a line terminal in said set.

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