

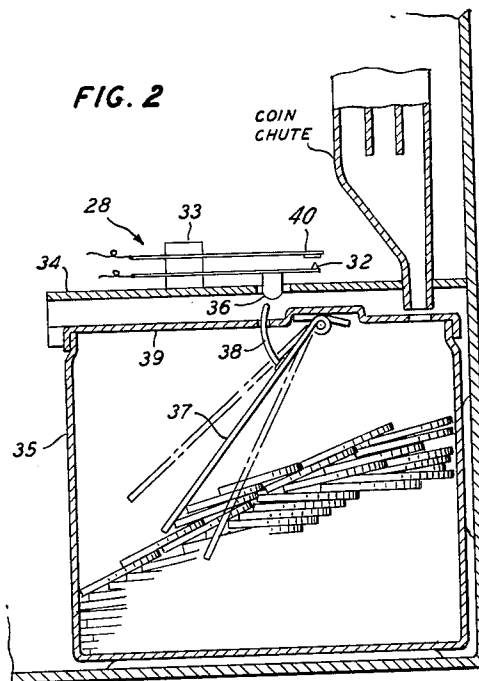
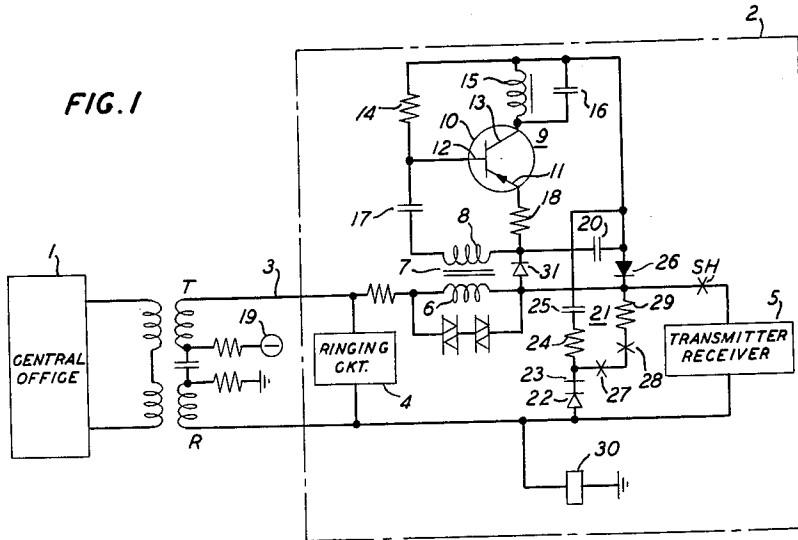
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R. R. STOKES

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COIN BOX TELEMETERING ARRANGEMENT

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INVENTOR
R. R. STOKES
BY *T. P. Priolo*
ATTORNEY

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COIN BOX TELEMETERING ARRANGEMENT
Rembert R. Stokes, Springfield, N.J., assignor to Bell Telephone Laboratories, Incorporated, New York, N.Y., a corporation of New York
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This invention relates to telemetering means, and more particularly to an arrangement for indicating to a remote location that the cash receptacle of a coin operated device has been filled to a predetermined degree.

Coin operated devices are assuming an increasingly prominent role in fulfilling the needs of today's society. In general, one of the most important maintenance problems associated with this field is that of scheduling coin collections. To the telephone industry in particular, which maintains an extensive network of coin operated subscriber substations, this problem is of significant interest from two aspects: namely, profit margin and customer satisfaction. The relationship between profits and collection scheduling stems from the obvious fact that substantial waste results from dispatching a man to collect a partially filled cash receptacle. The relationship between customer satisfaction and collection scheduling arises from the vulnerability of a substation's coin refund mechanism to be disabled by coins which accumulate in the deposit chute when a cash receptacle is full. In order to prevent the occurrence of these undesirable events, information must be obtained which reveals when cash receptacles of coin operated telephones have been filled to a predetermined level.

In the past, attempts to predict optimum collection schedules were based, to a large extent, on extrapolations of previous records. This method has serious shortcomings, however, because many stations, due to their location among other things, fail to establish consistent usage patterns. If, for example, a pay station is situated along a highway, its rate of use is influenced by such unpredictable factors as traffic conditions, weather, and the like. In view of this statistical disability, attempts have been made to contrive supervisory arrangements for electrically signaling to a central office whenever coins in a receptacle have accumulated to a predetermined height. Such schemes, however, by invariably requiring a transmission line exclusively devoted to supervisory signaling, have been found too costly for wide-scale application.

Accordingly, it is one object of this invention to increase the efficiency of coin collection from coin operated devices.

It is a more specific object of this invention to indicate to a remote location that the coins in the cash receptacle in a coin operated device have accumulated to a predetermined height.

According to the invention, a signal generator, situated in a coin operated device and adapted to transmit supervisory information to a remote location, is constructed to be activated by the concurrent operation of a pair of switches, one of these switches being operable in response to a condition existent when coins in the cash receptacle of the device have accumulated to a predetermined height.

One feature of the invention resides in a switch mechanism for establishing an electrical conduction path when coins in a receptacle accumulate to a predetermined height. A preferred embodiment of this mechanism comprises a vane member pivotally secured to the ceiling of the receptacle in such a manner that accumulating coins bear against the vane, thereby exerting a force directed to initiate pivotal movement. Movement of the vane forces a pair of armatures into contact with each other, thereby establishing the required path.

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Another feature of the invention resides in a signal generator connected to be activated by the concurrent operation of two switches. In one embodiment, the generator is a transistor oscillator which is coupled to a source of activating power through a pair of switches having armatures which, by closure of the switches, are placed in series circuit with each other.

Still another feature of the invention resides in a source of power for activating the above-mentioned transistor oscillator. The source comprises, in one illustrative configuration, an energy storage circuit connected to develop a potential across its terminals and apply that potential, upon the concurrent existence of two conditions, between the collector and emitter circuits of the transistor.

A further feature of the invention resides in an arrangement whereby a supervisory signal, indicating that coins in the cash receptacle of a telephone pay station have accumulated to a predetermined height, is transmitted over a telephone speech line to a central office without a separate operator command. In one embodiment, this arrangement includes a supervisory signaling circuit operable in response to both a condition existent when coins in the cash receptacle have accumulated to a predetermined height and the operation of a conventional coin control relay regulated by the central office.

The foregoing and additional objects and features of the invention will be more thoroughly understood by reference to the following detailed description of an illustrative embodiment of the invention and the accompanying drawing of which:

FIG. 1 illustrates, in schematic form, a supervisory signaling circuit situated in a coin operated telephone substation and operable to transmit tones to a central office over a conventional voice transmission line; and

FIG. 2 depicts, in sectional view, an illustrative embodiment of a switch disposed in the cash receptacle and operable to establish an electrical conduction path when coins deposited in the receptacle accumulate to a predetermined height.

With reference now directed to FIG. 1 of the drawing, the invention is shown embodied in a telephone system comprising a central office 1 and a coin operated substation 2, coupled together by transmission line 3. As is conventional in telephone practice, a ringing circuit 4 and the transmitter-receiver portion 5 of substation 2, both shown in functional block diagram, are bridged across tip and ring conductors, labeled T and R respectively, of transmission line 3. A switchhook mechanism SH, which may assume any of a number of standard forms, is situated in series with tip conductor T at a point immediately preceding transmitter-receiver 5. Transmission line 3 is energized by a source of unidirectional current 19 poled, as shown, to render tip conductor T negative with respect to ring conductor R. Connected in series with the tip conductor between ringing circuit 4 and transmitter-receiver 5 is the secondary winding 6 of transformer 7, the transformer having a corresponding primary winding 8 coupled to be energized by tonal signals generated by a transistor oscillator 9.

Oscillator 9 includes a transistor 10 shown, for illustrative purposes, as being of the P-N-P variety having emitter, base and collector electrodes 11, 12 and 13, respectively. Coupled between base 12 and collector 13 is resistor 14 connected in series with the parallel combination of an inductor 15 and capacitor 16. Coupled between base 12 and emitter 11 is a capacitor 17, winding 8 of transformer 7, and a resistor 18, serially connected in the order recited. To complete the oscillator circuit, a capacitor 20 is connected between the junction of winding 8 and resistor 18 and the junction between resistor 14 and the shunt combination of inductor 15 and capacitor 16.

Bridged across the tip and ring conductors of transmis-

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sion line 3 is an energy storage circuit 21 which, as will subsequently be explained in detail, functions to selectively activate oscillator 9 to transmit supervisory signals to central office 1 over transmission line 3. Storage circuit 21 includes a unidirectional current element 22 having its anode connected to ring conductor R, a normally closed switch 23, a resistor 24, a capacitor 25, and a Zener diode 26 having its cathode coupled to tip conductor T, serially connected in the order recited. Connected to form a selective series discharge path linking the junction of switch 23 and resistor 24 to the cathode of Zener diode 26 are a pair of tandemly arranged normally open switches 27 and 28, and a resistor 29. Connecting the cathode of Zener diode 26 to transistor 10 through tip conductor and resistor 18 is a diode 31 poled to conduct forward current toward the transistor.

In a preferred embodiment of the invention, switches 23 and 27, shown schematically in well-known "detached contact" form, are a pair of transfer contacts which, under the command of a coin control relay 30, alternately make and break the conduction paths in which their armatures are serially situated. As is familiar to those versed in the art, coin control relay 30, by means of structure not shown, operates either to refund a coin to a subscriber or to deposit it in the cash receptacle in accordance with the polarity of a pulse applied to ring conductor R by an operator located at the central office. Switch 28, one arrangement of which is shown in detail in FIG. 2, establishes a conduction path when coins in the cash receptacle have accumulated to a predetermined height.

As shown in FIG. 2, switch 28 comprises a contact member 40 and a resilient armature 32 suspended in cantilever fashion from block 33 mounted on a supporting plate 34 which is situated directly above cover 39 of cash receptacle 35. Armature 32 includes a finger 36 protruding from its lower surface which extends down through an opening in plate 34. Pivotaly secured to the internal surface of cover 39 is a vane 37 having an arcuate member 38 projecting from its upper surface. The member 38 extends upward and protrudes through an opening in cover 39. Coins deposited in receptacle 35 accumulate, as illustrated, in a conical pile. As the quantity of coins in the box increases, a lateral force is exerted on vane 37 thereby imparting vertical motion to member 38. When the coins in receptacle 35 accumulate to a particular height dictated by the geometrical characteristics of the vane, a conduction path is established by virtue of member 38 forcing finger 36 to bring armature 32 into contact with member 40.

In operation, current flowing through a path comprising diode 22, normally closed switch 23, resistor 24, capacitor 25 and Zener diode 26 develops a potential across the terminals of capacitor 25. Normally, oscillator 9 is inactive due to the absence of an activating potential. Upon coins in receptacle 35 accumulating to a predetermined height, the discharge path for capacitor 25 is conditioned by closure of switch 28. When relay 30 is next operated, switch 27 closes, thereby fully establishing the discharge path. Simultaneously, switch 23 opens and decouples the storage circuit from ring conductor R. As a result, capacitor 25 discharges through the established path thereby rendering Zener diode 26 in its reverse-bias breakdown condition. Since the cathode of the Zener diode is coupled to emitter 11 through diode 31 and resistor 18, and the anode of the Zener diode is coupled to collector 13 through the parallel combination of inductor 15 and capacitor 16, oscillator 9 is activated and applies a distinct tone to the transmission line 3. Coin relay 30 is a slow release device which insures that the tone is applied for a distinct period of time. When relay 30 releases, switches 23 and 27 revert to their original states in which the charging path for capacitor 25 is established and, conversely, the discharge path opens. During each subsequent operation of coin control relay 30, tones will

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be transmitted to the central office until receptacle 35 has been emptied.

Although only a single embodiment of the invention has been disclosed herein, it should be evident to one skilled in the art that numerous other arrangements may be devised without departing from the spirit and scope of the invention.

What is claimed is:

1. A telephone system including a coin operated telephone station, a coin receptacle associated with said station, a telephone line coupled to said station, signal generating means for applying a signal to said line, and control means for selectively activating said signal generating means, said control means including first switching means to condition said signal generating means for operation when coins in said receptacle have accumulated to a predetermined height, second switching means operable to activate said signal generating means when said signal generating means are conditioned, and means to operate said second switching means.

2. A telephone system including a coin operated telephone station, a coin receptacle associated with said station, a telephone line coupled to said station, signal generating means for applying a signal to said line, first and second switching means associated with said signal generating means, control means connected to activate said signal generating means in response to the concurrent operation of said first and second switching means, means responsive to a condition existent when coins in said receptacle accumulate to a predetermined height for operating said first switching means, and means for selectively operating said second switching means.

3. A telephone system including a coin operated telephone station, a coin receptacle associated with said station, a telephone line coupled to said station, signal generating means for applying a distinctive tone to said line, a Zener diode, said diode being connected to activate said signal generating means when in the reverse bias breakdown state, a first and a second switch, means responsive to the concurrent operation of said first and second switches for rendering said diode in the reverse bias breakdown state, means responsive to a condition existent when coins in said receptacle have accumulated to a predetermined height for operating said first switch, and means for selectively operating said second switch.

4. A telephone system including a coin operated telephone station, a coin receptacle associated with said station, a telephone line coupled to said station, a transistor oscillator connected to generate a distinctive tone, means for coupling electrical energy indicative of said tone to said line, first and second switches, means for energizing said oscillator to generate said tone upon the concurrent operation of said first and second switches, means responsive to a condition existent when coins in said receptacle accumulate to a predetermined height for operating said first switch, and means for selectively operating said second switch.

5. A telemetering arrangement for indicating the existence of a condition to a remote location comprising a coin operated device, a receptacle suitable for the deposit of coins required to operate said device, electrical transmission means interconnecting said remote location and said coin operated device, first and second switches associated with said coin operated device, means responsive to a condition existent when coins deposited in said receptacle accumulate to a predetermined height for operating said first switch, means for selectively operating said second switch, a transistor oscillator and means for applying signals generated by said transistor oscillator to said transmission means upon the concurrent operation of said switches.

6. A telemetering arrangement for indicating to a remote location that coins in the cash receptacle of a coin operated device have accumulated to a predetermined height comprising transmission means interconnecting said

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coin operated device and said remote location, means for generating an electrical signal, a transformer having first and second windings, said first winding being connected to said transmission means and said second winding being connected to the signal generating means, first and second switches, means responsive to a condition existent when coins in said receptacle have accumulated to a predetermined height for operating said first switch, means at said remote location for operating said second switch, and means for activating the signal generating means upon the concurrent operation of said first and second switches.

7. A telemetering arrangement for indicating to a remote location that coins in the cash receptacle of a coin operated device have accumulated to a predetermined height comprising a member pivotally connected to an interior surface of said receptacle, said member being disposed such that coins which have accumulated above a predetermined height in said receptacle bear against said member thereby exerting a force directed to produce pivotal motion, a first switch connected to said member, said switch being constructed to operate in response to said pivotal motion, an oscillator associated with said coin operated device, transmission means for transmitting signals generated by said oscillator to said remote location, a second switch, means for operating said second switch, and means for activating said oscillator upon the concurrent operation of said first and second switches.

8. A telemetering arrangement in accordance with claim 7 wherein said means for operating said second switch is disposed at said remote location.

9. In a telephone system a coin operated telephone station including a coin receptacle and a coin control relay, enabling means for operating said relay, switching means operative in response to coins in said receptacle having accumulated to a predetermined height, means for estab-

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lishing a conduction path during the concurrent operation of said relay and said switching means, and indicating means operative in response to the establishment of said path for transmitting a signal to a remote location, said indicating means including a transistor oscillator and a transformer.

10. In a coin operated telephone station connected to transmit speech energy over a transmission line, a transistor oscillator, a transformer connected to apply signals generated by said oscillator to said line, control means responsive to the application thereto of a suitable electrical potential for activating said oscillator, energy storage means for developing a potential suitable to activate said oscillator, means for applying energy appearing on said line to said storage means, a cash receptacle for storing coins deposited to operate said station, a first switch associated with said receptacle, means responsive to a condition existent when coins in said receptacle have accumulated to a predetermined height for operating said first switch, a second switch, means for operating said second switch, means responsive to the concurrent operation of said first and second switches for establishing a conduction path, and means for applying the potential developed by said energy storage means to said oscillator through said conduction path, whereby said oscillator is rendered operative.

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