

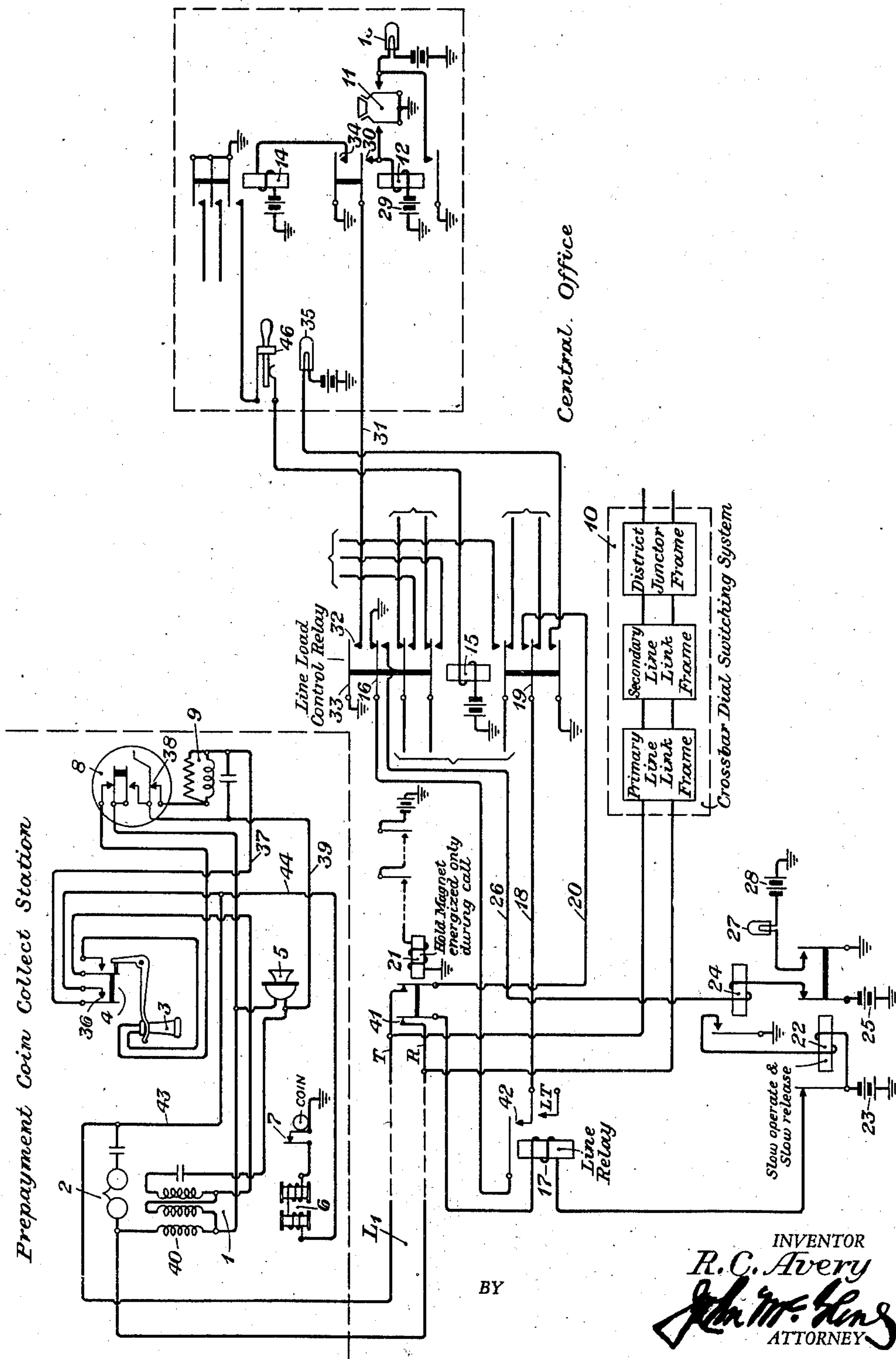
May 1, 1945.

R. C. AVERY

2,375,066

AUTOMATIC COIN RETURN SYSTEM

Filed Sept. 23, 1943



UNITED STATES PATENT OFFICE

2,375,066

AUTOMATIC COIN RETURN SYSTEM

Robert C. Avery, Jackson Heights, N. Y., assignor
to American Telephone and Telegraph Com-
pany, a corporation of New York

Application September 23, 1943, Serial No. 503,498

6 Claims. (Cl. 179—6.3)

This invention relates to a crossbar dial telephone system and particularly to means for automatically returning to a pay station user the coin deposited by him for the making of a call when that pay station line is under lineload control.

In order to limit the number of calls that may be placed at any one time by the subscribers or users of telephones in a given central office district which would interfere with the handling of essential traffic through that central office, there has been developed and put into service a system of traffic regulation known as lineload control. By means of that system it is possible to prevent users of telephones, upon which the lineload control feature is impressed, from establishing a telephone connection through that central office and thereby prevent an overloading of the lines and the switching facilities of that central office in the event that an abnormal number of calls originated at the same time, which is possible and highly probable under emergency conditions such as may occur during a state of war.

The present invention is concerned with a particular feature of the lineload control system, namely, means for insuring the return of the coin or coins deposited in a prepayment coin collect telephone by a user attempting to make a call during the time in which the lineload control is in operation. This invention will be clearly understood from the following description when read in connection with the attached drawing which shows schematically one form of embodiment of the invention.

In the drawing, the apparatus within the dot and dash lines, shown in the upper left-hand corner when the drawing is viewed from the right-hand side, represents a prepayment coin collect station which station is connected by the line L_1 to the apparatus at the central office, part of which represents the standard apparatus of a crossbar dial switching system and the remainder of the apparatus, which is shown in greater detail, represents that in which the invention is embodied.

The coin collect station which, as shown, is a standard type of the Bell system, comprises an induction coil 1, a ringer 2, a receiver 3, a hook switch 4, a transmitter 5, a coin relay 6 having associated therewith a coin contact 7, a dial 8 and a filter 9. The function of this apparatus, in so far as it is necessary for the description of the present invention, will be more fully described hereinafter. The telephone station is connected by the line L_1 to the crossbar central

office a portion of which is represented symbolically by the apparatus designated 10 within the dotted lines, comprising the hold magnet and a plurality of select magnets in the line link frame of the well-known crossbar dial switching system. Such a system is described in a paper entitled, "Crossbar Dial Switching System," by Scudder and Reynolds, published in the Bell System Technical Journal, volume 18 (1939), page 76 et seq. In such a line link frame a hold magnet is associated with each line and the connection is extended into the subsequent switches of the system by operation of one of the select magnets shown, under control of suitable apparatus. Since the remainder of the apparatus through which the call would normally pass were the line not under lineload control is fully described in that paper and forms per se no part of this invention, detailed description is unnecessary.

The lineload control circuit includes a common control circuit which includes a manually operated switch 11, a relay 12 and a lamp 13. Relay 12 controls an auxiliary control relay 14 through the contacts of which a plurality of lineload control relays, such as 15, may in turn be controlled. The connection between relays 14 and 15 is established by a locking type key 46 at the control frame. The lineload control relay 15 has a plurality of armatures and contacts certain of which are connected with the apparatus shown on the drawing, and the others of which are intended to establish connections for apparatus for other lines, similar to that shown upon the drawing. The armature 16 of relay 15 is connected to the armature of the line relay 17, and the upper contact of that line relay is connected by conductor 18 to the armature 19 of relay 15. The upper contact of armature 19 is connected by conductor 20 to the inner armature of the hold magnet 21, which armature normally makes a closed contact with the tip side of the line L_1 . The outer armature of relay 21 is connected to one terminal of the winding of relay 17 and the other terminal of that winding is connected to the normally closed contact of relay 22. The left-hand armature of that relay has connected therewith a battery 23 which battery is also connected to the winding of relay 22 and serves to operate that relay whenever relay 24 is operated. The inner right-hand armature of relay 22 has connected thereto battery 25. The contact of that armature is connected to one terminal of the winding of relay 24 and the other terminal thereof is connected by conductor 26 to the lower con-

tact of armature 16 of the lineload control relay 15. The outer right armature of relay 22 is connected to ground and its contact is connected to a circuit that includes lamp 27 and the battery 28.

The manner in which the system operates to perform the function that the present invention is designed to perform, is as follows: Let it be assumed that the conditions are such as to necessitate the exercising of lineload control over the group of lines within which the coin collect station connected to the line L_1 would belong. The attendant at the dial switching office would operate the master key 11 and thereby would operate relay 12, and also would operate key 46, which is subordinate to the key 11, and controls the particular group of lines involved. That relay would be locked by a circuit extending from battery 29, through contact 30 of relay 12 and thence over conductor 31 and the contact 32 of armature 33 of relay 15 as soon as the latter relay has operated. The operation of that relay is effected in the following manner: Upon the closing of contact 34 of relay 12, relay 14 will operate and that will place a ground upon the winding of relay 15 assuming that the key 46 at the control frame has been operated. The operation of relay 15 would be indicated by the lighting of the lamp 35. The lineload control relay 15 will remain operated as long as the key 46 remains in its operated position and all of the armatures of that relay will move to their inner contacts. Now let it be assumed that an attempt is made to originate a call from the coin collect station by placing a coin in the slot at that station and by removing the receiver 3 from the hook. The coin contact 7 will be closed in the usual manner when the coin is dropped into the slot and a circuit will be established from ground that will include the contact 7, the windings of the coin relay 6, contact 36 of the hook switch, conductor 37, contact 38 of the dial, conductor 39, transmitter 5, the winding 40 of the induction coil 1, the ring side of the line, contact 41 of the hold magnet 21, the winding of relay 17, the left-hand contact of relay 22 and battery 23 to ground. The flow of current over the circuit just traced will operate the line relay 17 but it will not operate the coin relay 6 to effect the return of the coin to the user of that station. That act, however, will follow almost instantly upon the operation of the line relay 17. When that relay operates and closes its contact 42 a circuit will be established from the battery 25 which is connected to the right-hand inner armature of relay 22, which circuit would include the contact of that armature, the winding of relay 24, conductor 26, the lower contact of armature 16 of relay 15, contact 42 of relay 17, conductor 18, the inner contact of armature 19, conductor 20, the contact of the inner armature of hold magnet 21, the tip side of the line L_1 , conductors 43 and 44 of the telephone station, coin relay 6, contact 7 and ground. That current is of sufficient strength to operate the coin relay 6 and thereby to cause the return of the coin to the user of that station. The flow of current through the winding of relay 24 will cause that relay to operate and will put a ground upon the winding of relay 22 which would cause the operation of the latter relay. Upon the operation of relay 22 the contacts of its left-hand armature and its inner right-hand armature are opened. The opening of the left-hand contact opens the circuit through the winding of line relay 17 and causes the release of that relay. The opening of the right-hand contact of the

inner armature opens the circuit through the relay 24 thereby causing that relay to release which removes the ground from the winding of relay 22. The opening of the right-hand contact of relay 22 also discontinues the flow of current over the tip side of the line and through the winding of the coin relay 6. The operation of relay 22 also closes the contact of the outer right-hand armature of that relay which in turn would cause the lighting of the lamp 27 which lamp serves to indicate to the attendant the operation of relay 22. Ordinarily the lighting of that lamp would be disregarded. It serves as an indicator of trouble upon the line as, for example, the accidental grounding of both conductors of the line or of one conductor, and the removal of the receiver at the station. Under those conditions the lamp would flash until the trouble was located and removed.

If the user of the prepayment coin collect station attempted to repeat the call by again inserting a coin in the slot during the continuance of lineload control over that station, the system would again operate in the manner just described, that is, the line relay 17 would operate and the circuit would be closed from the battery 25 to the tip side of the line and thence through the coin relay 6 to ground, thus causing the operation of that relay and the return of the coin again to the user.

As soon as conditions return to normal, so as to permit restoring to service the group of lines containing the line illustrated here, key 46 would be released and relay 15 would be deenergized thus permitting its armatures to fall back to their normal positions. Contact 32 would be opened and relay 12 would be released upon release of all lineload control relays such as relay 15. That, in turn, would release relay 14 of the common control circuit. The circuit that extended from the battery 25 over the tip side of the line L_1 and through the coin relay 6, by which that relay was heretofore operated, would be opened when the armatures 16 and 19 return to normal and, consequently, the operation of the coin relay 6, for the collection or the return of the coins deposited at that station, would be normally under the control of apparatus that forms part of the crossbar dial switching system. Relay 22, by which current for the operation of the line relay and the coin relay is applied to the several circuits, is designed to be sufficiently slow in operation in order to allow the necessary time for the full operation of the coin relay at the pay station. Relay 22 is also designed for slow release in order to permit the lamp 27 to be lighted for a sufficient time to be noticeable.

While this invention has been described as embodied in a particular form and arrangement of parts, it is capable of embodiment in other and different forms without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In a crossbar dial telephone system, the combination with a lineload control circuit adapted to be operated at will, of a line relay, a pay station having a coin relay associated therewith, the said coin relay having a contact adapted to be closed by the presence of a coin, and a coin return control circuit having a relay associated therewith adapted to apply current to the said line relay whenever the said coin contact at the pay station has been closed and the receiver thereat has been removed from its hook, and a second source of current also controlled by the said

relay of the coin return control circuit adapted to apply to the coin relay a voltage of such polarity and such magnitude as to effect the return of any coins deposited while the lineload control circuit is operated.

2. In a crossbar dial telephone system arranged for lineload control, the method for automatically returning the coins deposited in a pay station telephone whenever the system is under lineload control, which consists in operating the lineload control relay thereby closing a path from a source of current to the contacts of the line relay, automatically operating said line relay by the grounding of the line by depositing a coin, whereby current is caused to flow from the said source through the coin relay of the said telephone set, the current being of such polarity and such strength as to operate the coin relay in such direction as to return the coin.

3. In a crossbar dial telephone system characterized by the provision of means to control the lineload thereof, the method of returning coins to users of prepayment coin collect telephones whenever lineload control is applied to the system, which consists in operating the lineload control relay, grounding the line by inserting a coin in the coin collect telephone, automatically transmitting current through the line relay connected to one side of the grounded line to effect the operation of that relay and thereby to close another circuit between the said coin relay and a source of current of such magnitude and polarity as to effect the operation of the coin relay and the return of the deposited coin.

4. In a crossbar dial telephone system characterized by the provision of means to control the lineload thereof, the combination with a pay station telephone connected by a line to a dial central office, the said pay station having a coin relay connected thereto, of a line relay at the said office, one terminal of the winding of which is

connected to one side of the said line, a coin return relay arranged to connect a source of current to the winding of the said line relay whenever the coin contact is closed at the said pay station, another source of current also associated with the said coin return relay arranged to be connected to the coin relay at the pay station whenever the said line relay is operated, the said other source of current being of such magnitude and polarity as to effect the operation of the coin relay and the return of the coin at the pay station.

5. In a crossbar dial telephone system characterized by the provision of means to control the lineload thereof, the combination with a pay station telephone connected by a line to a dial central office, the said pay station having a coin relay connected thereto, of a line relay at the central office, one terminal of the winding of which is connected to one side of the said line, a coin return relay arranged to connect a source of current to the winding of the said line relay and to effect its operation whenever the coin contact is closed at the pay station, another source of current, also associated with the said coin return relay, arranged to be connected to the coin relay at the pay station whenever the said line relay is operated, the said other source of current being of such magnitude and polarity as to effect the operation of the said coin relay and the return of the coin, and a disconnect relay operable by the current flow from the said other source of current to effect the deenergization of the said coin return relay within a predetermined time after the operation of the latter relay.

6. The system defined by claim 5 further characterized by the provision of a signal to be operated upon each operation of the said coin return relay to indicate such operation.

ROBERT C. AVERY.