

April 24, 1934.

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1,956,360

TELEPHONE INSTRUMENT

Filed May 11, 1931

2 Sheets-Sheet 1

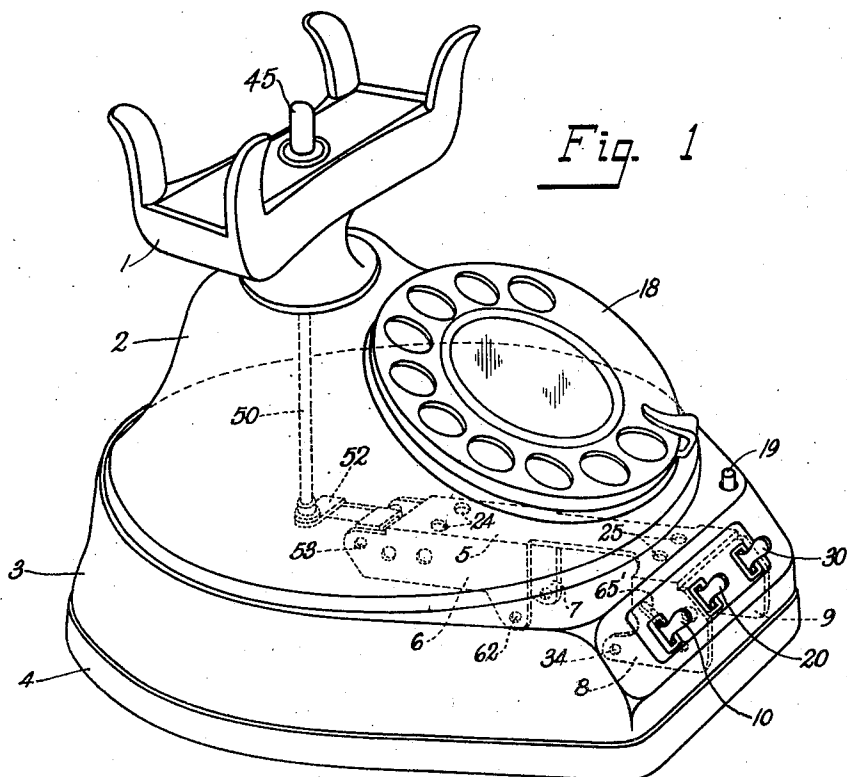


Fig. 1

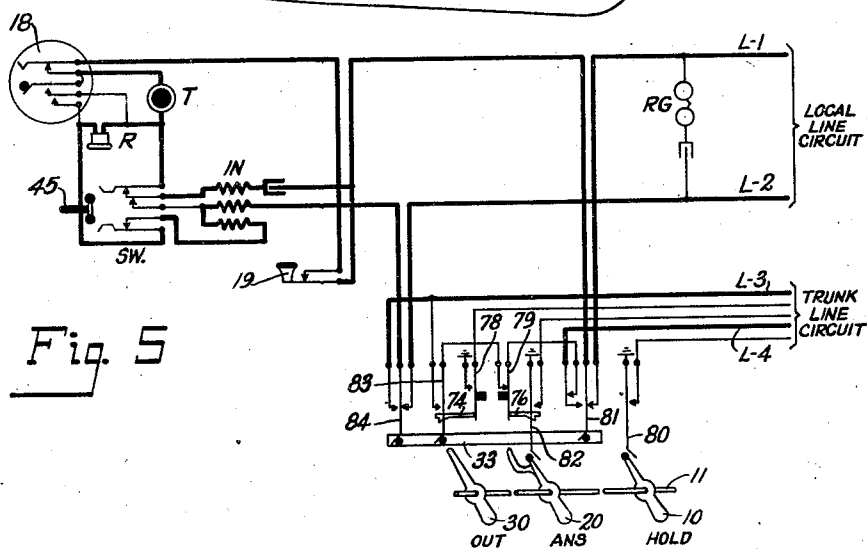


Fig. 5

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2 Sheets-Sheet 2

Fig. 4

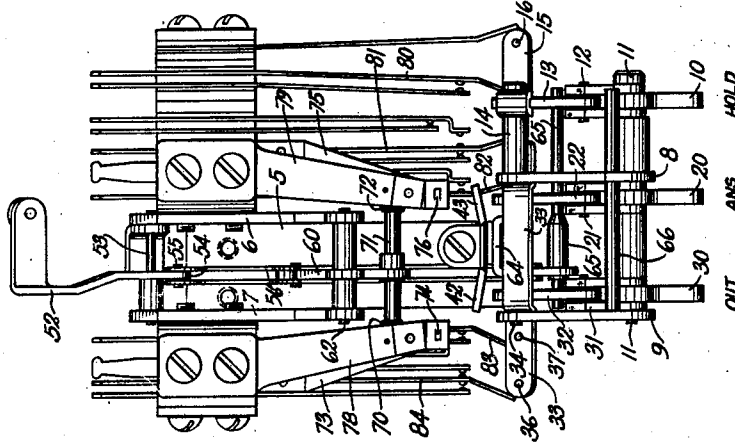


Fig. 3

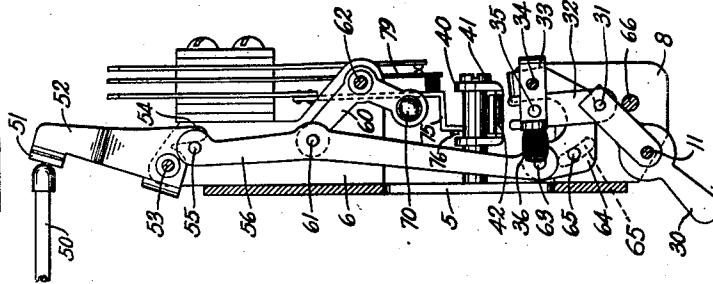
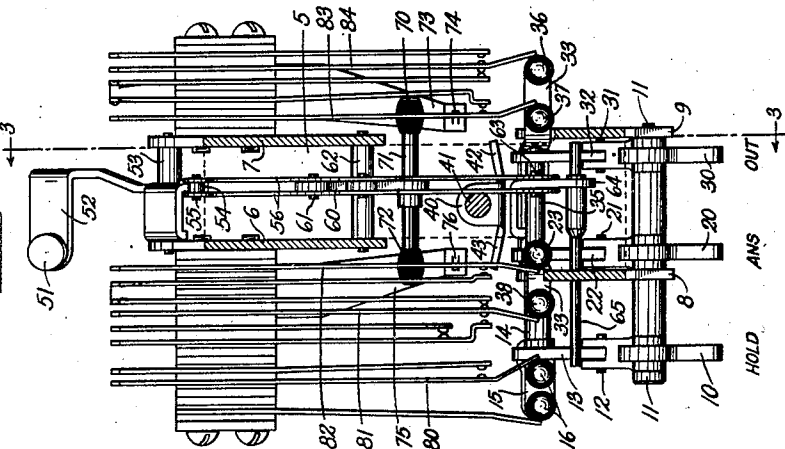


Fig. 2



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## UNITED STATES PATENT OFFICE

1,956,360

## TELEPHONE INSTRUMENT

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by mesne assignments, to Associated Electric  
Laboratories, Inc., Chicago, Ill., a corporation  
of Delaware

Application May 11, 1931, Serial No. 536,424

10 Claims. (Cl. 179—100).

The present invention relates in general to telephone instruments, but more particularly to a new and improved substation telephone instrument with which it is possible to communicate over two or more different kinds of telephone systems from the same instrument, such as, for example, a private branch exchange and a central public exchange telephone system.

Telephone instruments of the above type have been usually provided with a number of push-buttons for performing the various switching operations, one of the buttons being used for talking with a subscriber on one system, a second button for talking to a subscriber on another system, and a third push-button when a connection is desired with one subscriber while holding the other subscriber. When a connection in any case was released, the operated push-buttons had to be manually restored to normal or, as was the usual case, it was necessary to note or check the operated or non-operated condition of the push-buttons when a call was to be made or answered.

It is an object of this invention to design a telephone instrument which eliminates the use of the objectionable push-buttons and at the same time provides an improved means of giving the above and additional services in a telephone system. In accordance with this object, a particular feature of the invention resides in providing a number of lever type keys together with means for automatically restoring them to normal position when a telephone connection is terminated. One of the keys is operated when a main exchange call is desired, another when more than one main exchange connection is to be made and it is desired to hold one connection while another connection is being established, and a third key for answering incoming main exchange calls.

A feature of the invention resides in the provision of means whereby local calls may be made or answered without the necessity of operating any of the keys.

An additional feature is concerned with an interlocking arrangement between several of the keys so that only one at a time can be operated to perform certain circuit changes and prevent the mutilation of existing connections.

An additional feature of the invention resides in providing an auxiliary stand or sub-base for a standard telephone instrument which serves as an enclosure and support for the keys so that they are conveniently accessible for operation.

The above objects and features and others not specifically pointed out will be apparent from the

detailed description which, together with the two sheets of drawings, constitutes a preferred embodiment of the invention.

In the drawings, Fig. 1 shows a perspective view of an ordinary cradle type of desk telephone supported on an auxiliary base containing a number of lever type keys; Fig. 2 illustrates a top view of the lever key arrangement detached from the sub-base of the telephone and showing the contact spring combinations controlled by the lever keys; Fig. 3 is a cross-sectional side view along the line 3—3 looking in the direction of the arrows of Fig. 2, with certain parts omitted for the sake of clearness; Fig. 4 is a rear view of Fig. 2 showing the lever key arrangement; while Fig. 5 is a schematic representation of the circuit arrangement involved in a telephone substation of the invention.

Referring now more particularly to Fig. 1, this shows a well-known cradle-type telephone having a base or standard 2 supporting a cradle member 1 for the handset. The handset (not shown) normally rests between the posts of the cradle member 1 and in this position it presses down the hookswitch member 45 which controls the hookswitch springs. A sub-base or auxiliary base 3 of the general shape indicated serves as a support for the base 2 of the telephone. This auxiliary base 3 is provided with an additional base plate 4 for enclosing the apparatus contained in the base, which may be covered with rubber or felt so that polished surfaces will not be scratched in moving the telephone. An impulse sender or calling device 18 is mounted on the front side of the base 2 and is used for extending telephone connections. An opening in the sub-base 3 is provided at the front of the telephone immediately below the calling device 18, and a number of lever keys 10, 20, and 30 extend through this opening. These lever keys are supported by a mounting plate or bracket 5 as indicated by the dotted lines in Fig. 1, and the bracket 5 in turn is rigidly mounted in the upper surface of the auxiliary base 3. It is provided with a number of extensions formed at right angles to and on one side of the body of the bracket. The extensions 6 and 7 formed on each side of the rear of the bracket serve as mounting plates for a number of spring combinations and provide bearing means for a number of pins and rods, while the extensions 8 and 9 on each side of the front of the bracket 5 serve as bearing plates for additional levers and members, as will be pointed out. The top of the plate 5 has a pair of openings 24 at the rear and an additional pair 25 at

the front, so that the plate may be rigidly attached to the top surface of the sub-base or auxiliary base 3 as a unit by means of screws.

Referring now to Fig. 2, this shows a top view of the lever key unit removed from the auxiliary base 3 with the mounting plate 5 cut away and the extension pieces 6 and 7, and 8 and 9 shown in cross-section in order to more clearly show the internal apparatus. The manner in which each of the keys operate the contact springs and perform other operations will first be described in detail.

The lever key 10 designated the "Hold" key is pivoted on the shaft 11 which is journaled in extension plates 8 and 9. A spacer bushing is provided on the shaft 11 between each of the keys 10, 20, and 30. The other end of the key lever 10 is connected by pin 12 to the link member 13. The end of the link member 13 is fork-shaped so that it moves in and out on a pin passed through the U-shaped member 15 which serves as a support for a pair of insulated bushings 16. The U-shaped bushing support 15 is rotatable on a rod 14 fastened to the extension plate 8. The construction just described is similar to that illustrated in connection with the lever key 30 shown in Fig. 3, and it is seen that when the lever key 10 is moved downward and rotated about the shaft 11 it imparts movement to the link member 13 by means of pin 12. Link member 13 engages the pin in the U-shaped member 15, forcing the member outward so that the bushings 16 will engage the armature spring 80 and force it to make contact with its make spring. The lever key 10 operates independently of any of the other lever keys and it is likewise restored manually or automatically independently of them, as will be pointed out. Its purpose is merely to operate the armature spring 80.

The lever key 20 which is termed the "ANS" key is pivoted as the lever key 10 to the shaft 11. The end is pivoted by pin 21 to the link member 22. The fork-shaped end of the link member 22 engages the shaft 35 which is secured in the U-shaped bushing support 33. The support 33 in turn is pivoted on the bottom of the extension plates 8 and 9 by the rod 34, as is shown in Fig. 3. An insulated bushing 23 is rigidly secured on the top side of the link member 22 so that it can engage and operate the armature spring 82 when the handle of the key lever 20 is depressed. This action likewise moves the rod 35 outward, thereby moving the bushing support 33 so that bushing 38 on the left of the support 33 engages armature spring 81 and the bushings 36 and 37 on the right-hand side of the support 33 can engage armature springs 83 and 84 to operate them. The operation of lever key 20, therefore, moves the bushings 23, 38, 37, and 36 at the same time to engage their associated armature springs.

The lever key 30, termed the "Out" key, is pivoted on the shaft 11 and the opposite end is pivoted by pin 31 to the link member 32. The other end of link member 32 is fork-shaped so as to engage the rod 35. This arrangement of lever key 30 is clearly shown in Fig. 3. The operation of lever key 30 rotates the link member 32 about pivot 31 and forces the fork-shaped end into engagement with rod 35 which is secured to the bushing support 33. The bottom of this bushing support 33 is pivoted between the frame members 8 and 9 by the pin 34 and it is seen that when the lever key 30 is operated or moved downward the bushing support 33 is rocked about the pivot 34 by the link member 32, there-

by forcing the insulated bushings 36, 37, and 38 outward so as to engage respective armature springs 84, 83, and 81. In this connection it will be noted that the insulated bushing 23 which is controlled by lever key 20 does not engage its armature spring 82 because the rod 35 is forced outward from the fork-shaped end of link 22 by link member 32, and for this reason lever key 20 operates all four bushings, while the lever key 30 will only operate bushings 36, 37, and 38. When key 30, Fig. 3, for example, is operated, the arrangement is such that the key is held in its operated position until it is released. This is brought about by the toggle operation which takes place when pin 31 connecting the ends of key 30 and link 32 is moved upward and it in turn rotates bushing support 33 about shaft 34. The pin 31, therefore, assumes a position beyond a center line drawn between the shafts 11 and 34 to hold the key in its operated position. A stop rod 66 secured in the mounting plates 8 and 9 serves as a stop for the normal position of the keys.

A locking member 40 is securely held and pivoted by screw 41 to the bottom surface of mounting plate 5. This locking member has a pair of wing-shaped surfaces 42 and 43, the wing 42 adapted to be engaged by the fork-shaped end of link member 32 when it is operated, while the wing 43 is adapted to be engaged by the fork-shaped end of link member 22. This locking member 40 is for the purpose of preventing the operation of either lever key 20 or 30 when either one of them has already been operated. For example, should key 20 be operated, the end of link member 22 will engage the wing 43 and impart a slight rotary motion to the locking member 40 about its pivot 41 so that the wing 42 will be moved against the end of link member 32. In this position if the key 30 should attempt to be operated, it would be prevented from being moved because of the operated condition of key 20. It is therefore seen that only one of the keys 20 or 30 can be operated at a time.

The lever keys 10, 20, and 30 after having once been operated may be either manually or automatically restored to their normal position. According to the invention, novel automatic means is provided for returning the keys to their normal positions which is controlled by the removal and replacement of the handset on the cradle member. Referring to Fig. 1, it will be seen that the handset is shown removed from the cradle member 1, thereby permitting the plunger 45 which controls the switchhook springs SW, Fig. 5, to be operated. When plunger 45 is released, it permits the rod 50, to which it is attached, to move vertically with it, as shown in Fig. 3. Although in Fig. 1 the handset has been shown removed from the cradle member 1, in Fig. 3 the cradle member is shown with the handset upon it, so that the pin 50 bears upon the insulating washer 51 which is attached to the movable lever arm 52. The lever arm 52 is pivoted so that it is rotatable about the pivot pin 53 which is secured in the extension plates 6 and 7. A pair of like-shaped flat lever arms 56 are secured together as a unit by means of the pins 55, 61, and 63. At the rear of the key unit the pin 55 is engaged by hook 54 formed in the lever 52. With the handset resting upon the cradle, rod 50 bears down upon the lever 52, which is thereby turned about its pivot 53 and at 54 engages the pin 55 to give a slight upward movement to the

lever 56. A link member 60 is pivoted by pin 61 to the lever 56 and the opposite end is securely pivoted to the bearing pin 62 which is journaled in the extension plates 6 and 7. The end of the link member 60 is provided with a rod 71 extending from each side of the link member 60 and the ends are provided with insulated bushings 70 and 72. With this arrangement it is seen that when lever 52 is moved downward it moves lever 56 upward by the hook 54 engaging the pin 55. This imparts a rotary motion to the link member 60 because it is pivoted by the pin 61 and this moves the link member 60 about its pivot 62, so that a forward thrust is imparted to the plate 56. The pin 71 thereby moves the bushings 70 and 72 downward so that they bear against the locking springs 73 and 75, as seen in Fig. 2.

The forward ends of the lever 56 are riveted together by the pivot member 63 to a release arm 64. This release arm, as shown in Fig. 3, is rotatable about the shaft 34, so that forward movement of the lever 56 will pivot the arm 64 about the pin 34 and rivet 63 and the releasing rod 65 which is securely fastened to the arm 64 will thereby exert pressure upon the top side of each of the link members 13, 22, and 32 of the respective keys 10, 20, and 30. This downward motion of the release rod 65 restores the keys to their normal position against the normal stop rod 66. The release rod 65 is limited in its movement by the crescent-shaped slot 65' cut in the mounting plate 8 in which it rides. The restoring action of the lever keys is assisted materially by the spring tension stored in each of the armature springs 81, 82, 83, and 84, which at their ends are in engagement with the insulated bushings 16, 33, 23, 36, and 37. This action of the armature springs is sufficient to impart a snapping return action of the key levers which is initially started by the release rod 65. When the handset is removed from the cradle member 1, the rod 50 is permitted to move upward from the lever 52, and the lever 56 is moved longitudinally rearward due to the tension stored in the locking springs 75 and 73 which bear against the bushings 70 and 72 and impart a rotary motion to the link member 60 about its pivot 62. This motion is transmitted through the pivot pin 61 to the lever 56.

The locking springs 73 and 75 are each provided at their extremities with projections 74 and 76, respectively, which are formed out of the metal of which the locking springs are made. These projections extend upward into the path of movement of the armature springs 83 and 82, so that, for example, when the bushing 37 engages armature spring 83 to move it, the edge of armature spring 83 slides over the top of the projection 74 and the spring is locked in its operated position, although the bushing 37 has been restored. The same action takes place when armature spring 82 is operated by bushing 23 and it is locked by the projection 76 of locking spring 75, and the armature spring remains in this position although the bushing 23 may be restored to normal.

In the normal position of the key unit the pin 50 bears on the lever 52 due to the weight of the handset, and the lever 56 is given a longitudinal movement about the pivot 62. The link member 60 thereby moves the rod 71 supporting bushings 70 and 72 upon their respective locking springs 75 and 73, so that normally the locking projections 74 and 76 are out of the path of movement of the armature springs 82 and 83.

However, as soon as the handset is removed from the cradle member, motion is imparted, as has been pointed out, to the lever 56 and, due to the tension stored in the locking springs 73 and 75, link member 60 is given a partial rotation about its pivot point 62 which in turn is transmitted to the lever 56 by way of the pin 61. Projections 74 and 76 are thereby placed in operative relation to the armature springs 82 and 83, and the replacement of the handset on the cradle member and the consequent movement of the lever 56 will turn the link member 60 about its pivot 62 and move the bushings 70 and 72 against locking springs 73 and 75 to disengage the projections 74 and 76 from armature springs 82 and 83. In addition to serving as locking springs for armature springs 82 and 83, the springs 74 and 76 likewise control contact springs 78 and 79.

Referring now more particularly to Fig. 5, this shows a schematic diagram of the circuit arrangement involved with a diagrammatic representation of the key unit of the invention. The telephone circuit is of the usual type and includes a transmitter T, a receiver R, and a calling device 18 which has a set of impulse springs connected in the line circuit and a set of shunt springs for short circuiting the transmitter and receiver when the calling device 18 is operated. An inductance coil IN is also provided, as are the switchhook contacts SW which are controlled directly by the switchhook operating button 45 controlled by the handset. The local line circuit L1 and L2 is provided with the ringer RG and these conductors extend to the switching apparatus located in the local exchange. In answering or making a local call it is not necessary to operate any of the keys 10, 20, and 30, as the line conductors L1 and L2 normally extend over a circuit path from the line L1, normally closed contacts and armature springs 81, a push-button contact 19, through the telephone circuit, back over armature spring 84 and its normally closed contact, and out over line L2. All incoming and outgoing local calls take place over this circuit path without the necessity of operating any of the lever keys.

For a more detailed explanation of the circuit operations brought about through the operation of the keys, reference may be had to a co-pending application of John H. Voss, filed May 11, 1931, S. N. 536,342, which discloses the circuit arrangements at the central exchange and the local exchange. The line conductors L1 and L2, as pointed out, extend to a private or local automatic telephone system to provide communication, for example, between a number of telephones situated in close proximity to each other, such as in the same building, and connections are established through automatic switches by means of the calling device 18. A number of other conductors including the line conductors L3 and L4 extend to other automatic switching apparatus and by means of the lever keys 10, 20, and 30 control the establishment of connections, either incoming or outgoing, over one or more trunk lines leading to a public exchange telephone system, which may be either of the automatic or manual type.

In briefly describing the operation of the various circuit changes brought about by the operation of the keys, it may first be pointed out that each telephone is provided with a ringer such as RG for informing the associated subscriber of the presence of an incoming local call. How-

ever, in a system in which telephones provided with keys are to be placed, either all of the telephones may be provided with a sub-base 3 and a corresponding number of lever keys 10, 20, and 30, or only a certain number of them may be so provided. Any number of trunk lines may extend from the local exchange to the public main exchange and the selection of these trunk lines is performed automatically, as pointed out in the above application. Only one signal or ringer is provided for all the trunks extending to the main exchange. This one signal is placed in such a position that it will be visible or audible to all of the telephone substations in the local exchange, so that a person equipped with a telephone provided with a sub-base and keys may answer any of the calls by operating the proper key. It will be noted in Fig. 5 that the key set unit is indicated only diagrammatically with the keys in their normal positions and in a similar position or rear view as indicated in Fig. 4 of the drawings.

When an incoming call from the public exchange is received over one of the trunk lines and the trunk signal is operated in a manner so that it is noted by a person having one of the telephones equipped with a sub-base and the keys, he will answer the call by first removing the handset from the cradle 1. Removing the handset permits the plunger 45 to move upward and operate the switching springs SW to close the line circuit. The plunger 45 permits the rod 50 to move upward and allow the lever 52 to move about its pivot 53. This action permits the lever 56 to move forward and rotates link 60 about the pivot 62 so that the bushings 70 and 72 will be forced upward by the tension stored in the locking springs 73 and 75, thereby permitting the contact springs 78 and 79 controlled by these locking springs to be operated. The tension stored in the locking springs 73 and 75 furnishes the motive power for moving the plate 56 backward.

After the handset is removed, the key 20 is then moved downward and, according to the arrangement, link member 22 will move its bushing 23 into engagement with armature spring 82 and, due to the fork-shaped end of link member 22 engaging the lever 35, the bushing support 33 is likewise moved and, accordingly, bushings 36, 37, and 38 are forced into engagement with armature springs 84, 83, and 82, respectively. As soon as armature spring 82 closes its make contact through the action of bushing 23 moving the spring to the left, the projection 76 on the locking spring 75 engages with the edge of this armature spring, so that it remains operated even though the bushing 23 is subsequently disengaged from armature spring 82. A similar action takes place in connection with armature spring 83 which is moved by bushing 37 beyond the edge of projection 74 of locking spring 73, so that the projection 74 will hold armature spring 83 in its operated engagement with its make contact even though the bushing 37 may subsequently be disengaged from the end of the armature spring 83.

The above operations disconnect the local line circuit comprising the line conductors L1 and L2 from the telephone circuit at the normally closed contacts of armature springs 81 and 84, and connects it instead directly by way of these armature springs and their normally open contacts to the trunk line conductors L3 and L4. The contact springs 79 are opened, while contact springs 78 are closed so as to perform certain operations in the

local exchange apparatus for connecting the subscriber's telephone with the trunk line over which the call is being made. The closing of armature spring 83 on its make contact is without effect at this time. The closing of armature spring 82 on its make contact completes a circuit to the local exchange apparatus for operating certain relays for a purpose pointed out in the above-mentioned co-pending application. If the incoming call is for the subscriber who has answered, he proceeds with the conversation. However, if the call is for another person at another of the telephones, it may be transferred by manually restoring the answering key 20. This action retracts the insulated bushing 23 from armature spring 82, but the armature spring does not disengage from its normally open contact because it is locked in its operated position by the extension 76 on locking spring 75. The bushing support 33 is likewise permitted to restore to normal, which restoring motion is assisted by the tension stored in the operated armature springs 81 and 84. Armature spring 83, however, is now locked operated to its normally open contact by the projection 74 on locking spring 73. Armature springs 81 and 84, therefore, restore their operating contacts to their normal positions. The subscriber then operates his calling device 18 to set up a connection to the other subscriber to whom the incoming trunk call is to be transferred, and when he responds he is requested to operate his answering trunk key, whereupon the call is automatically transferred through suitable circuit arrangements to the trunk upon which the incoming call is made. As soon as the subscriber making the transfer receives a tone to indicate that the other subscriber has picked up the transferred call, he replaces his handset upon the cradle 1, thereby depressing the hookswitch operating member 45 and this in turn operating the rod 50 downward. The lever 52 thereby moves the lever 56 forward by means of the hook 54 and rotates the link 60 about its pivot 62. Bushings 70 and 72 are thereby given a slight rotary downward motion a distance sufficient to move the locking springs 73 and 75 downward so that the projections 74 and 76 will disengage from armature springs 82 and 83 and permit them to restore and open their associated normally open contacts. Contacts 78 and 79 are likewise restored by the locking springs 73 and 75.

Should the telephone user desire to make an outgoing trunk call, he first removes the handset from the cradle member 1, thereby permitting the rod 50 to assume a position away from the lever 52 and permit the lever 56 to move toward the rear of the key set through the tension stored in the locking springs 73 and 75. This action moves the release arm 64 about its pivot points 34 and 63 and permits the release rod 65 to move out of the path of movement of the lever keys and their associated link members. The telephone user then operates the "Out" key 30, which, through the medium of the link member 32, moves the bushing support 33 about its pivot 34, as is clearly shown in Fig. 3, forcing the bushings 36, 37, and 38 into engagement with armature springs 81, 83, and 84 and operating their associated contacts. The operation of the key 30, it will be noted, only moves the bushings 36, 37, and 38, and the bushing 23 remains in its normal position and does not engage the armature spring 82 at this time. Armature spring 83 is now locked under control of the locking spring 73 and its projection 74 until the switchhook is replaced upon its support. Due to the operation of armature springs 81 and 84, the

subscriber's telephone circuit is switched from the local line circuit direct onto the trunk line circuit preparatory to operating the automatic switching apparatus at the central office in response to impulses generated by the calling device 18. In setting up this connection, contact springs 78 are closed, due to the release of locking spring 73 by the bushing 70, and complete circuits for performing certain switching operations and to prevent intrusion on this trunk line by any other telephone while this trunk is in use. The contact springs 79 are at this time opened, but without effect.

When the subscriber has completed the conversation and desires to disconnect, he merely restores the handset upon the cradle member 1, thereby depressing the switchhook operating member 45 and moving the rod 50 downward onto the lever 52 to move the lever 56 forward and pivot the link member 60 about the pivot point 62. This permits bushings 70 and 72 to bear onto locking springs 73 and 75 and disengage the projection 74 from the armature spring 83 and permits it to restore to normal. As a further result of the movement of the lever 56, the release arm 64 has a rotary motion imparted to it about its pivot 34 so that it moves the releasing rod 65 against the end of the key lever 30 at the point approximately opposite the pivot point 31 and initiates the release action of the key which is accelerated by the tension stored in the armature springs 81, 83, and 84, until the key 30 strikes the stop rod 66, whereupon all of the armature springs disengage from their operated contact springs and permit the apparatus at the central office and at the local office to restore to its normal condition preparatory to receiving additional incoming or outgoing calls.

If at any time during the existence of either an incoming or an outgoing call the corresponding key should be operated, it will be impossible for the user of the telephone to operate the other key because of the interlocking arrangement. For example, should the key 20 be operated, the locking plate 40 will be moved by the action of the link member 22 engaging the wing 43 and rotating the member 40 about its pivot 41 so that the wing 42 will be resting against the fork-shaped end of link 32. In this event, should the key 30 be attempted to be operated, the wing 42 will prevent such action, as the pressure exerted against wing 42 will exert a corresponding pressure against wing 43 which presses against the end of link member 32. However, this will not result in the release or restoration of the key 20 because this key, together with the link member 22, is in its operated position and, therefore, due to the toggle arrangement, is beyond the line center between the two pivot points 21 and 34.

If at any time a connection with the public exchange is desired to be transferred from the answering or the calling telephone to another telephone in the system, either the key 20 or the key 30 is restored manually to normal position, thereby completing a holding circuit extending over the trunk line L3, armature spring 83 which is locked closed by the projection 74 on the locking spring 73, closed contacts 79, normally closed contacts of armature spring 81 and out over line L4. This short circuit across the line conductors L3 and L4 prevents the automatic switches at the public exchange or central office from releasing the connection with this subscriber. The subscriber dials the number of the party to whom he desires to transfer the call and this party in turn operates his answering key, whereupon the first party may replace his hand-

set upon a switchhook member and release his portion of the connection.

A push-button 19 shown in Fig. 1 and also diagrammatically in Fig. 5 is connected through suitable contacts in one side of the line circuit L1, and the purpose of this is that if the trunk line to the public exchange is connected to a manual exchange instead of an automatic exchange, the person or user of the telephone may flash the operator, whereas ordinarily he would move the hookswitch member 45 up and down slowly to flash the lamp before the operator. However, in the instant case the operation of switchhook member 45 would automatically release all of the keys and knock down the connection and, therefore, the key 19 is provided. This key is also used when making calls if the user of the telephone should inadvertently make a mistake when operating the calling device 18. The connection in this case may be released by operating the push-button 19 without operating the switchhook member 45.

In case a larger number of exchange trunk lines are to be made accessible to any of the telephones, an additional key such as key 10 is provided. This key 10, upon being operated, merely moves the link member 13 to engage bushing 16 with armature spring 80 and close its contacts. This key is restored to normal by the release bar 65 when the handset is replaced upon the switchhook member. This key, it will be noted, has no locking or interacting motion with either the answering key 20 or the out key 30. It merely closes the armature spring 80 upon its make contacts and when released opens these contacts. This key is provided so that when a trunk call is either held by the user of the telephone or is transferred to another telephone in the system and then a second call comes in over another trunk line, the key 10 may be operated. In this case the second trunk call may be transferred to the desired other party or held while the first trunk call is taken care of. When the second trunk call is being held, the user of the telephone may return to it at any time either before or after the first trunk call is disposed of. The armature spring 80, upon closing, onto its make contact, completes circuit connections at the local exchange which operates the mechanism to take care of situations of this nature.

What is claimed is:

1. In a telephone instrument, a plurality of sets of contact springs, a pair of keys for operating and releasing said springs, means responsive to the operation of one of said keys for operating all of said contact springs, means responsive to the operation of the other of said keys for operating only certain of said sets of contact springs, means for holding said keys in their operated position, and means for releasing said keys to restore all of the contact spring sets to their normal positions.

2. In a telephone instrument, a plurality of sets of contact springs, a plurality of keys for operating said contact springs, means for locking said keys in their operated position, means responsive to the operation of one of said keys for operating all of said contact springs, means responsive to the operation of the other of said keys for operating only certain of said sets of contact springs, and means controlled by said locking means for preventing the simultaneous operation of both of said keys.

3. In a telephone instrument, a plurality of sets of contact springs, a first key for operating

all of said sets of contact springs, a second key for operating only certain of said sets of contact springs, means for locking said keys in their operated position, and means controlled by said locking means for preventing the operation of both of said keys at the same time.

4. In a key set for telephone instruments, a plurality of sets of contact springs, a first key for operating all of said sets of contact springs, a second key for operating only certain of said sets of contact springs, means responsive to the operation of either key for locking it in its operated position, and means responsive to the operation of either one of said keys and controlled by said locking means for preventing the operation of the other key.

5. In a telephone instrument, a plurality of sets of contact springs, a first key for operating all of said sets of contact springs, a second key for operating only certain ones of said sets of contact springs, means for locking said keys in their operated position, means responsive to the operation of either of said keys for operating said locking means and preventing the operation of the other key, and means for releasing said locking means for automatically restoring said keys to their normal positions.

6. In a key set, a plurality of sets of contact springs, a pair of keys for operating said contact springs, means responsive to the operation of one of said keys for operating certain of said sets of said contact springs, means responsive to the operation of the other of said keys for operating all of said sets of contact springs, and means for locking said operated sets of contact springs in their operated positions independent of the position of the keys.

7. In a key set, a plurality of sets of contact springs, a pair of keys for controlling said springs, means responsive to the operation of one of said keys for operating certain of said sets of contact springs, means responsive to the operation of the other of said keys for operating all of said sets of contact springs, means for releasing said operated keys, means responsive to the operation of

said sets of contact springs for locking them in their operated position after said keys have been released, and means for releasing said sets of contact springs independent of the release of said operated keys.

8. In a telephone instrument, a plurality of sets of contact springs, keys for operating said contact spring sets, each of said keys operating said contact spring sets in different combinations, said keys manually restored at will, means responsive to the operation of said contact springs for locking them in their operated position independent of the position of their associated keys, and an operating member automatically controlled for unlocking said operated contact spring sets and for restoring any operated key to normal.

9. In an assembly, a plurality of sets of contact springs, a key having means for operating a particular set of said sets, to the exclusion of the other of said sets, a second key having means for operating a plurality of said sets excluding the set operable by said first key, and a third key having means for operating a set of said sets not operable by either the first or second key and including mechanism for also operating the means operable by the second key whereby operation of the third key also effects the operation of the sets operable separately by the second key.

10. In an assembly, a plurality of sets of contact springs, keys for operating said sets of contact springs; means responsive to the operation of certain springs of said sets for locking them in their operated position independent of the subsequent operation of their operating keys, while other springs of said sets not equipped with locking means are permitted to follow the movements of said keys; and a member, operable at will, arranged to automatically release any of the spring sets which have been locked and to at the same time effect the restoration of any actuated ones of said keys.

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